

**FEDERAL REPUBLIC OF NIGERIA
GOMBE STATE GOVERNMENT**



**Agro-Climatic Resilience in Semi-Arid Landscapes Project
(ACReSAL)**
(World Bank Assisted Project)



Draft Final Report for

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)
Federal College of Education (Technical) Erosion and Flood Control Site
in Gombe, Gombe State Nigeria

DRAFT FINAL REPORT

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

FOR

**FEDERAL COLLEGE OF EDUCATION (TECHNICAL) GOMBE EROSION AND
FLOOD CONTROL**

GOMBE STATE

SUBMITTED TO

THE STATE PROJECT MANAGEMENT UNIT (SPMU)

**GOMBE STATE AGRO-CLIMATIC RESILIENCE IN SEMI-ARID LANDSCAPES
(GM-ACReSAL)**

**OPPOSITE NNPC DEPOT
NEAR WAMLARA GUEST HOTEL
TUMFURE GOMBE
GOMBE STATE**

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LIST OF ACRONYMS AND THEIR DEFINITIONS

ACReSAL	Agro-Climatic Resilience in Semi-Arid Landscapes
CAs	Community Associations
CBOs	Community-Based Organizations
CEC	Cation Exchangeable Capacity
CHS	Community Health and Safety
CIGs	Community Interest Groups
CSOs	Civil Society Organizations
Db	Decibel
DEM	Digital Elevation Model
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EMP	Environmental Management Plans
ESAs	Environmental/Social Assessments
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESO	Environmental Safeguard Officer
ESP	Exchangeable Sodium Percentage
FAO	Food and Agricultural Organization
FCE(T)	Federal College of Education (Technical)
FEPA	Federal Environmental Protection Agency
FGN	Federal Government of Nigeria
FMEv.	Federal Ministry of Environment
FPMU	Federal Project Management Unit
FRSC	Federal Road Safety Corps
GBV	Gender-Based Violence
GDP	Gross Domestic Product
GIS	Geographical Information System
GOSEPA	Gombe State Environmental Protection Agency
GPS	Geographical Positioning System
HSE	Health Safety and Environment
IDA	International Development Association
ITCZ	Inter-Tropical Convergence Zone
ITD	Inter-Tropical Discontinuity
KIIs	Key Informant Interviews
LGA	Local Government Area
LTM	Line Transect Method
LULC	Land Use Land Cover
MDAs	Ministries, Departments and Agencies
NCDC	Nigeria Centre for Disease Control
NDVI	Normalized Difference Vegetation Index
NESREA	National Environmental Standards and Regulations Enforcement Agency
NGOs	Non-Governmental Organizations

ODK	Open Data Kit
OHS	Occupational Health and Safety
PAP	Project-Affected People
PDO	Project Development Objective
PHC	Primary Health Care
PIM	Project Implementation Manual
PWD	People Living with Disability
PPM	Parts per Million
RPF	Resettlement Policy Framework
RAP	Resettlement Action Plan
SAR	Sodium Adsorption Ratio
SME _{Env}	State Ministry of Environment
SPMU	State Project Management Unit
STDs	Sexually Transmitted Diseases
TOR	Terms of Reference
UNDP	United Nations Development Programme
WHO	World Health Organization

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EXECUTIVE SUMMARY

ES 01: INTRODUCTION

The Agro-Climatic Resilience in Semi-Arid Landscapes (ACReSAL) project is an initiative of the Federal Government of Nigeria (FGN) supported by the World Bank. The project aims to assist the Nigerian government in tackling critical challenges of desertification control and landscape management in Northern Nigeria. ACReSAL Project is structured around four components, namely: Component A: Dryland Management with three sub-components (i.e., Strategic Watershed Management, Watershed Infrastructure and Special Ecosystem); Component B: Community Climate Resilience with two sub-components (i.e., Community Strengthening and Community Investment); Component C: Institutional Strengthening and Project Management also with two sub-components (i.e., Institutional and Policy Strengthening and Project Management) and Component D: Contingency Emergency Response Component (CERC).

The Federal Ministry of Environment is the lead agency at the Federal level in collaboration with some Federal Ministries, Departments and Agencies (MDAs), which is replicated in the states. The MDAs include those of Planning, Economy, Agriculture, Environment, Water Resources, Finance, Works, Transport, Power, and Emergency Response as well as those focused on Climate and Hydrological Information or Watershed/Basin regulations.

The ACReSAL Project Development Objective (PDO) is to increase the adoption of climate-resilient landscape management practices and enhance livelihoods in targeted arid/semi-arid watersheds in Northern Nigeria such as the Gully Erosion Reclamation Intervention Project proposed by the Gombe state for The Federal College of Education (Technical) FCE(T) Gully Intervention Site in Gombe LGA of Gombe State. This is one of the priority sites for intervention under the Gombe state ACReSAL project. The Gully Erosion Site originated from the FCE(T) demonstration/staff school and passes through eight (8) densely populated low-income dwellings of London Mai Doruwa (N10.30624; E11.15609), Jauro Abare (N10.30667; E11.15942), Jauro Kuna (N10.31028; E11.16647), Wuroladde (N10.31125; E11.15607), Alhakira (N10.31315; E11.18195), Koranzaki (N10.31055; E11.16683), Arawa (N10.31184; E11.16957), Kagarawal Runde (N10.31321; E11.20353). The gully cut across the Pindiga formation (limestone) and Bima sandstone substrate resulting in variable dimensions of gully channels in terms of depth and width.

ES.02: RATIONALE FOR ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The intervention will involve the construction of concrete and gabion structures to channel runoff from the area, structures to line the gully bed and stabilise the gully bank e.g., i) drain Inlet Structure; ii) concrete lining of drains, iii) chute structure with stilling basins; iv) drop structures; and v) exit system/outlet structure will be constructed. In addition to bank stabilization measures using i) gabion retaining wall; ii) concrete retaining wall with weeping holes; iii) slope cutting with geo-textile and grass; and iv) bio-remediation grass and tree planting on both sides of the drain channel. The activities are phased into the pre-construction, construction, and operation and demobilization phases involving i.e.

- a) Clearing of vegetation to create access and expansion work where relevant.

- b) Demolition of structures like houses within the project right of way (ROW) to create a 15m X15m setback and removal of failed hydraulic infrastructure.
- c) Construction of access routes for heavy-duty equipment and vehicular movement.
- d) Reclamation of degraded land area by sand filing or stabilization of dormant gully fingers.
- e) Bioremediation and creation of 5m x 5m buffer from the 15m x 15m set-back along the gully channel.

Staging areas, batching plants, borrow pits, and campsites for workers would be constructed in the pre-construction phase. Heavy equipment and machinery will be used for clearing vegetation, bulldozers, and excavators for creating staging areas, and demolition of existing structures. Compactors for levelling materials sand, laterite, gravel etc., and payloaders for transporting gravels, laterites, sand etc. in the construction through to the demobilization phase. Other components are:

- a. Earthworks and excavation for storage embankment, gabion and retaining walls.
- b. Concrete work for the construction of retaining walls.
- c. Sand traps/check dams for energy dissipation,
- d. Provision of gabion and renomatress as channel bank protection, and
- e. Bio-engineering work; planting of tree seedlings and grasses for erosion control.

The intervention would undoubtedly trigger the World Bank's Environmental and Social Framework (ESF) specific standards - ESS1 - Assessment and Management of Environmental and Social Risks and Impacts, ESS2 - Labor and Working Conditions, ESS3 - Resource Efficiency and Pollution Prevention and Management, ESS4 - Community Health and Safety, ESS5 - Land Acquisition, Restrictions on Land Use and Involuntary Resettlement, ESS6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources, ESS8 - Cultural Heritage and ESS10 - Stakeholder Engagement and Information Disclosure; likewise the Nigeria EIA Act due to the environmental and social risks the proposed intervention will generate. Thus, based on the screening exercise conducted, an ESMP is the appropriate safeguard tool required to address all environmental and social concerns related to the proposed FCE(T) gully erosion and flood control intervention. This is also in compliance with the project-level Environmental and Social Management Framework (ESMF), Resettlement Policy Framework, and Environmental and Social Commitment Plan (ESCP) of ACRoSAL. The ACRoSAL project is categorized as a high-risk project under the World Bank, hence ACRoSAL ESMF requires site-specific instruments to be prepared for sub-projects such as this.

ES 03: GULLY EROSION AND FLOOD CONTROL ACTIVITY DESCRIPTION

This involves the following activities including those mentioned in ES 2 above i.e.,

- ✓ Mobilization, labour recruitment and engagement
- ✓ Surveying, demolition, pegging, and site clearing.
- ✓ Excavation for drainage and gully route
- ✓ Construction of Culverts and drainages Construction (casting and concrete work)
- ✓ Backfilling and protection of buffers
- ✓ Operation and maintenance
- ✓ Decommissioning

ES04: BIOPHYSICAL ENVIRONMENT OF STUDY LOCATION

The FCE(T) intervention site is geologically underlain by the Bima and Gombe Sandstone, Siltstone and Shale formations along the various lengths of the gully alignment. The climate is of two types i.e., a long dry season and a short rainy season, the dry season is characterized by a warm period, often exceeding 40°C during the hottest months of March through May. The topography is mainly mountainous, undulating, and hilly to the South-East and flat open plains in the Central, North, North-East, West, and North-Western parts of the state. The terrain is of undulating nature with hilly projections above 1,200m mean sea level. The major ecological issues in the area are land degradation, erosion, and flooding. The erosion issues are aggravated due to extensive forest clearing, and continuous cropping with little or no replenishment of soil nutrients. The development of gullies in the area is threatening urban infrastructure, properties, lives, and the physical growth of the town.

The ambient air quality of the FCE(T) intervention area was examined according to these parameters i.e., NO₂, SO₂, CO, CO₂, Volatile Organic Carbon, H₂S and Ammonia (NH₄) are found to be within the threshold (limits). The soil composition on average is 76.8%, 16.8% and 6.4% for sand, clay, and silt particles respectively, while the texture is predominantly Loamy Sand. However, the percentages of clay, silt, and sand show variations, indicating different soil textures across the sampling points. Additionally, comparisons of the threshold limits for Zn, Mn, and Cd, were found to be high, which could be attributed to the parent rock material which contains high level of these minerals. Equally, the comparison of Fe and Pb were found to be slightly high except for Cu, which was found to be moderate. The analysis of ground and surface water shows most of the parameters of interest are within the FMEnv acceptable limits, but turbidity, calcium, manganese, and chromium slightly exceeded the limit.

ES 05: DESCRIPTION OF THE SOCIOECONOMIC ENVIRONMENT

Seven hundred and nine (709) respondents were interviewed, alongside five (5) community consultation meetings and six (6) Key Informant Interviews (KIIs) were undertaken for data collection. Furthermore, eight (8) communities along the FCE(T) area of influence interacted with including traditional leaders, community associations, women groups, and youth groups. In the same vein, an open engagement with community members and opinion leaders in *Arawa* and *Malam Inna* communities was held. About half of the respondents are within the age bracket of 30-49 years of which 32% are youths (i.e., 18-29 years), while those of 50 years and above constitute about 17%. 33.9% are females while 66.1% are males. The communities are patriarchal where decisions are made by men, however, the sample has a fair representation for gender since female form about 33.9% of the respondents. This was a deliberate approach to encourage female participation in the stakeholder engagement.

Majority of the respondents are low-income earners, 60% earn 20,000 Naira and below while about 11.6% earn above 20,001 Naira monthly. Only 23.5% earn above the national minimum wage of 30,000 Naira. Very few have incomes above 50,000 Naira monthly. Clearly reflecting the general characteristics of the people in terms of household income and proves the communities to be dominated by low-income earners. This is a factor that must be considered when assessing GBV hotspots, tendency for child labour and labor exploitation during project implementation. Although the areas within the intervention's area of influence (AoI) is classified as a low-income

neighbourhood; they have their own share of infrastructure e.g., hotel, food joints, bakery, telecommunication, recreation, viewing centres, institutions of learning etc.

ES 06: POTENTIAL RISKS AND IMPACTS

Several significant positive and negative impacts were identified and assessed during the preparation of this ESMP and documented in Chapter 5.

Potential Positive Impacts

The execution of the erosion reclamation and flood control project would help to ameliorate the present community health and safety issues from the drainage distortion the gully erosion presently poses without constituting further environmental and social risks by preventing pedestrians or vehicles from falling into the gullies created by the erosion impact. The reclamation works will eliminate hideouts for criminals thereby improving the security of lives and properties (it will prevent burglars). In addition, the land reclamation will help to eliminate water ponding capable of breeding mosquitoes thereby leading to high quality of the environment and freeing the inclined sections of the adjoining settlements and communities from runoff water encroachment. The land reclamation will ultimately help to improve the landscape and drainage flow of the area leading to a potential increase in land value in fields with less erosion and better soil health.

Potential Negative Impacts

There are potential negative impacts that may be triggered by the proposed intervention works such as pollution from poor waste management practices, contamination of soil and water, traffic impact due to the influx of trucks into the work sites, community health & safety risks such as accidents, child labour, forced labour, Occupational Health & Safety (OHS) risks such as work accidents etc, labour influx risks which may pose risks of Sexual Exploitation (SEA)/Sexual Harassment (SH) risks. Mitigation measures implementation of a site-specific traffic management plan, waste management plan, community health & safety plan to minimize disturbance and accidents and OHS Plan. The project labour management plan which prohibits forced labour and child labour etc., signing of a Code of Conduct by workers amongst other measures detailed in Chapter 6 of this ESMP, including a monitoring plan, and responsibilities will assist mitigation and monitoring process.

Table 1: Summary of Activity Specific Risks and Impacts, and proposed mitigation.

Project Phase	Activities	Associated and Potential Impacts	Mitigation
Pre-Construction	Land acquisition and demolition of existing buildings	★ Reduction in access to land resources and anxiety on the part of the communities. ★ Opportunities for income generation ★ Economic activities may thrive in the affected communities. ★ Grievance /conflict due to resettlement and compensation issues	★ Stakeholder Engagement Plan. ★ RAP-GRM ★ Occupational Health and Safety Management Plan.

Project Phase	Activities	Associated and Potential Impacts	Mitigation
		★ Work related accidents leading to injury /death of workers. ★ Accidents and injuries to scavengers or community members during demolition and removal of structures	★ Demolition Management Plan
	Mobilization of equipment and personnel	★ Increase traffic and delays. ★ Noise from heavy-duty vehicles ★ Gas emission from vehicles and machines	★ Traffic and Vehicle Management Plan. ★ Noise and Vibration Control Management Plan. ★ Air Quality and Dust Control Management Plan
	Site clearing and preparation	★ Loss of species diversity and abundance ★ Potential increase in erosion of area(s) cleared. ★ Increased generation of solid and liquid waste ★ Dust generation and emissions from vehicles and machines	★ Vegetation Clearing and Biomass Management Plan. ★ Waste and Chemical Management Plan. ★ Air Quality and Dust Control Management Plan
	Recruitment of local labour	★ Employment opportunities for the local populace ★ Increase in economic activities. ★ Increase in the price of commodities (High demand for food, fuel etc.) ★ Influx of people in search of jobs, which may lead to population / demographic change. ★ Increase in the spread of communicable and sexually transmitted diseases (e.g., HIV, Hepatitis) ★ Cultural conflict between migrants and local people. ★ Increase demand for housing	★ Occupational/Public Health and Safety Management Plan. ★ Labour Management Plan. ★ GRM and Stakeholder Engagement Plan
Construction	Excavation for drainage/gully route	★ Change to local topography of the area. ★ Work related accidents leading to injury /death of workers. ★ Flying rocks from rock blasting	★ Occupational Health and Safety ★ Rock Blasting Management

Project Phase	Activities	Associated and Potential Impacts	Mitigation
		★ Soil and surface water pollution because of accidental spill of fuel and lubricant ★ Noise and ground vibration from heavy equipment ★ Respiratory effects on the health of the workers because of dust	★ Storage of fuel and toxic material management plan. ★ Control of Noise and Vibration Management Plan ★ Waste Management Plan.
	Construction of drain canal	★ Creation of deviation/diversion routes that will likely take up land and cause traffic delay. ★ Hinder access to homestead during drainage construction due to depth of ditches created along the gully route. ★ Noise pollution from equipment and workers may create nuisance in the communities. ★ Concerns over oil/fuel spills from fuel dump areas and workshop at the project sites. ★ Generation of waste from camp sites and sites where works are undertaken. ★ Work related accidents leading to injury /death of workers. ★ Flash Flood during rainy season	★ Traffic and Vehicle Management Plan. ★ Control of Noise and Vibration Management Plan. ★ Storage of fuel and toxic material management plan. ★ Waste Management Plan. ★ Occupational Health and Safety. ★ Flood Emergency Preparedness Management Plan
	Backfilling	★ Noise and vibrations from heavy machineries ★ Alteration of soil profile / gully bathymetry ★ Fugitive emission of hazardous dusts with potential impact on human health and the ecosystems ★ Work related accidents leading to injury /death of workers.	★ Control of Noise and Vibration Management Plan. ★ Air Quality and Dust Control Management Plan. ★ Occupational Health and Safety
Operation	Flow of storm water	★ Possibility of flooding from blocked drain channel or poorly constructed drain.	★ Flash flood Emergency Preparedness Plan. ★

Project Phase	Activities	Associated and Potential Impacts	Mitigation
	De-silting	★ Exposure of workers, motorist, and nearby community residents to odour ★ Waste nuisance within the community work area and material transport route ★ Traffic obstruction around the desilting work area ★ Work related accidents leading to injury /death of workers.	★ Waste Management Plan ★ Traffic and Vehicle Management Plan ★ Occupational Health and Safety (OHS). ★ Community Health and Safety (CHS)
Demobilization	Dismantling and Removal of Equipment and vehicles	★ Noise and vibration ★ Traffic congestions	★ Control of Noise and Vibration Management Plan.
	Land Restoration	★ Restoration of aesthetic value to the environment. ★ Leisure and social activities may resume in the affected communities	★ Bioremediation and establishment of green area on 5m buffer of both sides of the rehabilitated channel.

ES 07: OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT PLAN

The negative impacts are mostly temporary in nature, subsisting only during the pre-construction and construction phases of the project, but eventually disappearing after completion of the work. The negative impacts have appropriate mitigation measures instituted to ameliorate and or compensate for such conditions. The Contractor shall prepare and implement an occupational/community health and safety (OHS/CHS) plan for the workforce and local community. The OHS/CHS plan which shall be submitted for approval before mobilisation will cover impacts identified in this ESMP i.e., flood risk emergency preparedness against heavy downpour during construction work physical/mechanical hazards due to movement of materials and mechanical equipment, safety of mechanical equipment, hazards resulting from soil contamination, excavation and trenching to avoid collapse or failure, construction waste of all types including hazardous and non-hazardous, security, safety guidelines for demolition of structure to protect community members and scavengers from accidents and injuries when scavenging for building materials from demolished houses etc., related to the different phases of the project.

The Contractor(s) shall identify in the plan, assign responsibilities, and develop activation strategy to respond to an event/incidence. The OHS/CHS shall be in tandem with the World Bank Group Environmental, Health and Safety Guideline (WBG-EHSG), national and local safety regulations for the avoidance of injury to workers, community members or damage to plants and machinery.

ES 08 MONITORING PROGRAM AND IMPLEMENTATION SCHEDULE

The implementation of the ESMP shall be primarily driven by the Gombe State Project Management Unit of ACRoSAL, Contractors and relevant MDAs. This is important in mitigating the risks and impacts associated with the project, and to ensure smooth implementation of activities related to the rehabilitation and checks for compliance and the efficacy of the institutional arrangement and responsibilities. Also, stakeholder engagement plan is incorporated to promote participatory approach in project planning, implementation to enhance project policy, ownership, sustainability and empower targeted beneficiaries. The schedule is envisage for 18 months covering all phases of construction.

ES 09 TRAINING AND CAPACITY BUILDING

To achieve effective implementation of the ESMP, the environment officer, CAs, CIGs, contractors, workers, and other relevant stakeholders shall be acquainted with the basic requirements embedded in this ESMP, including awareness on their individual and collective responsibilities. This will be achieved through training and re-training of key personnel that are directly involved in the project execution. The training may typically include but not limited to i) basic understanding of the key environmental features of the construction work, construction site and the surrounding environment; ii) familiarization with the requirements of this ESMP and the environmental specifications as they apply to the intervention work; iii) basic training in the identification of archaeological artefacts, rare and endangered floral and faunal species that may be encountered on the site, spotting Gender Based Violence/ Sexual Exploitation and Abuse/Sexual Harassment (GBV/SEA/SH), child labor and exploitation etc.

ES 10 COST OF IMPLEMENTATION OF THE ESMP

The cost of implementing this ESMP is estimated at one hundred and seventy-nine million four hundred- and fifty-thousand-naira ~~N~~179,450,000 only, equivalent of two hundred and twenty-eight thousand eight hundred- and ninety-dollar thirty-one cent (\$228,890.31) at the exchange rate of \$1 to N784.532. The successful implementation of this ESMP will depend on the commitment and capacity of the SPMU, Contractors, and other relevant institutions (MDAs) to implement the program effectively. The roles and responsibilities of those involved in the implementation and monitoring of this ESMP are spelt out. Also, the ESMP implementation will be monitored throughout the project period.

Table 2: Estimate for management plan Implementation (to be integrated in BEME).

S/N	Budget for implementing specific management plan	Amt (N)
1	Preparation of C-ESMP	1,200,000
2	Public/Stakeholder Consultation Plan Implementation	10,000,000
3	Chance Find	2,000,000
4	OHS Plan implementation	15,000,000
5	GBV/SEA/SH Prevention Plan Implementation	15,000,000
6	Vegetation and Biomass plan Implementation	7,500,000
7	Air Quality Management Plan Implementation	1,000,000
8	Emergency Response and Incident Prevention Plan Implementation	17,000,000
9	Water Management Plan Implementation	3,500,000
10	Erosion and Sedimentation Management Plan	12,500,000

S/N	Budget for implementing specific management plan	Amt (N)
11	Traffic and vehicle management plan implementation	15,000,000
12	Waste Management Plan Implementation	12,000,000
13	Chemical Management Plan Implementation	5,000,000
14	Grievance Redress Mechanism Implementation	10,000,000
15	Monitoring and Reporting	13,800,000
16	Capacity Building Plan Implementation	4,000,000
17	ESMP Management Costs	35,450,000
	TOTAL	179,950,000

Exchange rate: US\$1.00 = N 784.532 as at 08/09/2023.

Source: <https://www.cbn.gov.ng/rates/ExchRateByCurrency.asp>

ES 11 GBV/SEA/SH ISSUES ASSOCIATED WITH LABOUR INFLUX

The Gender Based Violence/Sexual Exploitation and Abuse/Sexual Harassment (GBV/SEA/SH) risk issues are addressed and specific requirements for tackling them were presented to stakeholders during consultation meetings to be aware of their responsibilities and have knowledge of their inclusion in the bidding document. Some specific measures were recommended for implementation as a means of mitigating the risk of GBV/SEA/SH in the project. The GBV risks likely to occur are Intimate Partner Violence (IPV), public harassment, verbal insults, physical abuse, child molestations, harmful widowhood practices, and women and child trafficking. Targeted support to women under the program would reduce these risks. Development and implementation of specific GBV risk prevention and mitigation strategies, tailored to local contexts, will be critical. Guidelines for a situation analysis of GBV and safe reporting guidelines will conform with the survivor-centred-approach in line with international best practices.

ES 12: GRIEVANCE REDRESS MECHANISM (GRM) IMPLEMENTATION

GRM issues shall be resolved through an amicable means to save time as opposed to court, however a griever may approach the courts only when the GRM process is exhausted. The mechanism is designed to be easily accessible, transparent, and fair. As far as possible, the objective is to avoid the need to resort to complicated formal channels for redressing grievances. It is considered that by resolving grievances within the project's administrative structures, not only will the process be effective and efficient, but the progress of project implementation will also not be affected.

ES 13: PUBLIC CONSULTATION

A public consultation (stakeholder Engagement) was held from the 24th to 29th June 2023 with ward heads, community leaders, and representatives from the eight (8) communities along the gully fringe and other interest groups within the project area of influence (AoI). In their view, the intervention will improve communication as commercial bikers (okada riders) and tricycles (keke Napep) can easily transport passengers across to the other sides of communities. Others expressed fears that households along the gully are highly vulnerable and suffer movement restrictions, increases in transport fares, and accidents.

The people expressed difficulties accessing water sources, and challenges faced by pregnant women in accessing health care facilities due to delays in transportation especially during rainy seasons and attributed the worsening erosion to construction works and drainages e.g., on Dukku road which re-directs runoff to increase runoff in the gully channel, On the rates of accidents, they opined that it is high but would reduce with the successful completion of the intervention. The people are enthusiastic and cannot wait for the work to begin, they indicate a strong desire to cooperate and participate in everything that would bring the project to its successful completion.

ES 14 THE DISCLOSURE OF THE ESMP REPORT

After passing through the review processes at the SMPU, FPMU and World Bank, the Bank would issue clearance for the ESMP to be disclosed. The disclosure would be done through the FMEnv, WB site, copies would be displayed at the Gombe State Ministry of Environment and Forest Resources, the Office of the District Head, and the Gombe Local Government Area Secretariat. This will be done to keep stakeholders abreast of the proposed project activities, the anticipated impacts, and the mitigation options for comment/feedback. This procedure is a requirement for an EIA certificate from the Federal Ministry of Environment (FMEnv), which the consultant shall endeavor to assist the SPMU through the entire process.

ES 15 STRUCTURE OF THE REPORT

The report is organized into seven chapters i.e., the introduction; legal, policy and administrative framework; the description of the biophysical environment; socio-economic characteristics and consultations with stakeholders; assessment of potential impact and analysis of alternatives; environmental and social management plan; and the summary, conclusion, and recommendations.

ES 16 RECOMMENDATIONS AND CONCLUSIONS

Generally, the study has indicated that the proposed erosion and flood control project is desirable and will not trigger adverse effects on the existing environmental, social and health situations of the general community landscape, as well as the safe conditions of the community residents. In essence, it would rather improve the drainage landscape of the communities.

The successful application of the mitigation measures outlined in the ESMP is hinged on stringent monitoring and enforcement of measures highlighted in the ESMP by the SMPU, FPMU and World Bank. The SPMU and Supervising Engineer, working together with other stakeholders must ensure that the project is properly monitored during its implementation.

Specific recommendations received from stakeholders and project-affected-persons (PAPs) which include the involvement of community associations, the FMEnv and GM-ACReSAL during the preparation of this ESMP include:

- Community associations should be involved during the pre-construction and construction stages of the intervention, to mediate in resolving grievances or concerns in a manner that is consistent with the GRM setting of the Gombe State ACRReSAL.

- The traditional rulers in the communities are to be continuously updated by the Gombe ACREsAL on all aspects of the intervention project in the area that concerns or relate to them.
- The State Focal NGO should be adequately briefed and/or given orientation on the grievance procedure, including whom to contact in the Gombe State ACREsAL.
- Dust suppression should be ensured by contractors before and during work, and the use of caution signs, tapes, and traffic guide/marshals must be adhered to.
- Stalls should be prepared for food hawkers and vendors, and mobile toilets strategically placed especially during the construction phase with care to avoid GBV/SEA/SH issues.
- Security and safety should be prioritized through contractors' collaboration with community associations, traditional rulers, and security agencies in line with the Gombe State ACREsAL Security Management Plan.
- Safety helmets, hand gloves, safety boots, and general safety kits should be adequately provided, and a fund set aside for compensation in the case of accidents on the job, for victims to access easily.
- Development Resettlement Action Plan should be immediately initiated for PAPs living along the gully site to prevent any damage to lives and properties.
- Sourcing of both skilled and unskilled opportunities irrespective of gender should be considered by the Contractor among local youths for economic empowerment except when not available.
- local sourcing of goods and services in the community should be encouraged provided such meets the required standard to improve economic activities in the area.
- There would be a significant increase in traffic density into and out of the community during the construction stage, proper traffic planning and management should be implemented to reduce road traffic accidents. Thus, the use of suitable traffic warning signs and speed control measures should be enforced. Project drivers should be conversant with defensive and safe driving to avoid accidents.
- A competent Health and Safety officer should be on hand, to ensure the safety of the workers, project's sub-contractors and visitors to the site. The manager should keep and maintain a record of injuries, near-misses, and maintenance of a First Aid Box on site,
- The project site should be well condoned off with conspicuous caution tape to warn non-project workers and prevent intruders. This is necessary to reduce work site accidents and related hazards.

In conclusion, the proposed erosion reclamation and flood control works can conveniently be executed in an environmentally sustainable, socially responsible, and inclusive manner, and it is most desirable because of the obvious environmental and socio-economic benefits and the easily reversible and low significance of environmental and social risks and impact.

CHAPTER ONE: INTRODUCTION

1.0 ACRoSAL Project Background

The Agro-Climatic Resilience in Semi-Arid Landscapes (ACReSAL) project is an initiative of the Federal Government of Nigeria (FGN) with the support of the World Bank. The project is assisting Nigeria in tackling its critical challenges of desertification and land degradation in Northern Nigeria, a region that is characterized by high poverty, low literacy level and an environment of fragility, conflict, and violence (FCV), natural resource degradation, poor agricultural productivity, climate risks, desertification, and weak institutional capacity.

The ACRoSAL project would address these issues through a multi-sector approach in collaboration with 19 northern states and the Federal Capital Territory (FCT) Abuja. Under the arrangement, the Federal Ministry of Environment will be the lead agency at the Federal level and will collaborate with other Federal Ministries, Departments and Agencies (MDAs). The states on the other hand are led by their respective Ministries of Environment in collaboration with the states Ministries of Agriculture and Water resources as Co-Chairs, the MDAs include those responsible for Planning, Economy, Finance, Works, Transport, Power, Emergency Response and those focused on Climate and Hydrological Information or Watershed/Basin regulations.

The Federal Government of Nigeria (FGN) expressed the desire to restore 4 million hectares of degraded land by 2030, from which the ACRoSAL project commits to restore 1 million by leveraging on available modern technology, strengthening institutional capacity and field level project implementation in an integrated participatory catchment management approach. The integrated approach is designed to reduce exposure, manage sensitivity, and build community resilience to changing factors of production and climate change. Sustainable natural resource management is critical in addressing land degradation and building climate resiliency communities. To achieve this, action must be scaled up to encourage cost-effective land restoration practices for sustainable soil and water conservation in the face of impending consequences of changing climate. An integrated catchment management approach is a framework considered appropriate for addressing natural resource management and human development challenges.

1.1 Project Development Objectives of the ACRoSAL Project

The ACRoSAL Project Development Objective (PDO) is to increase the adoption of climate-resilient landscape management practices, enhance livelihoods in targeted arid/semi-arid watersheds, and strengthen long-term integrated landscape management in Northern Nigeria. The ACRoSAL project seeks to build on the lessons from other international development partners including the World Bank Group to help develop a more integrated, spatial, multi-sectoral approach to building community resilience and improve the sustainable productivity of its natural resources. Particularly, the project will support activities to develop multi-sectoral approaches for desertification control and landscape management, improve community livelihoods and resilience, and strengthen institutions.

1.2 The ACRoSAL Project components:

The Project is built on four components and other sub-components which are targeted at addressing desertification and improving sustainable soil and water productivity in targeted areas of degraded and desert landscapes. Since the project would utilize community

participation, it will support communities to improve capacity and investment in sustainable livelihoods. The ACREsAL Project components are structured as follows:

1.2.1 Component A: Dryland Watershed Management

This component will implement integrated watershed management planning and address challenges of large-scale watershed degradation in northern Nigeria. Under this component are the following subcomponents:

- A1. Strategic Watershed Management** will support large-scale integrated watershed planning and implementation.
- A2. Watershed Infrastructure** will support large landscape-level investments. These may include those related to water resources (e.g., surface and groundwater storage, managed aquifer recharge, riverbank restoration, gully rehabilitation, irrigation, improved water systems), environmental management (stabilization of sand dunes, forest management, afforestation), and agriculture investments at a large scale.
- A3. Special Ecosystems** is an investment that will improve the management of special ecosystems, including wetlands, desert oases, and protected areas. The investments cover wetland improvement, monitoring systems, water management, biodiversity conservation, stabilization of oasis and improved water provision and management systems for targeted protected areas.

1.2.2 Component B: Community Climate Resilience:

Most of the challenges of dryland management are at the local levels, where it constitutes the day-to-day reality of communities and farmers. Communities need support to be more resilient, households need targeted investments to put new approaches into effect in targeted micro-watersheds. This component will support the following sub-components:

- B1. Community Strengthening** aims to strengthen the capacity of communities for sustainable natural resource use and management. Support will be provided to local project implementation committees, or their local equivalent under the strategic watershed management intervention. Particular attention will be given to addressing the needs of vulnerable and marginalized groups (including the poor, women, youth, the elderly, persons with disabilities, pastoralists, and ethnic or religious minorities) and internally displaced persons (IDPs) to address inequality and promote peace building initiative and ownership.
- B2. Community Investments** aims to finance physical investments through the micro-watershed planning process, which could vary from community to community. Four groups can be described, i) investments in community-level infrastructure to improve dryland management: soil conservation, surface and ground water management, streambank restoration, community-managed rainwater harvesting, expanding agroforestry enterprises, agro-processing and storage, and shared community infrastructure, ii) landscape restoration in selected communities using the FAO approach of using Delfino plow to mimic traditional half-moon water harvesting technique, and iii) support farmers at the household level to optimized climate-smart rainfed agriculture and farmer-led irrigation.

1.2.3 Component C: Institutional Strengthening and Project Management

This Component aims to improve the enabling institutional and policy foundation for multi-sectoral integrated landscape management as well as support project management. This includes the following sub-components:

- C1. Institutional and Policy Strengthening** aims to improve the enabling institutional and policy foundation for integrated landscape management in Nigeria - with an initial focus on ACRoSAL activities but setting the foundation for long-term national frameworks. This will include work on improving institutional infrastructure (IT, connectivity, and office improvements) in key agencies at federal and state levels; setting up data, analytics, and decision support framework and facilitating technical assistance and collaboration to improve the policy environment for long-term integrated landscape management. The platforms for data, analytics, knowledge, and learning will leverage on national-level platforms for use at national, State, and local levels.
- C2. Project Management** will support overall project monitoring and management, by providing support for key overall consultancies to support (e.g., project monitoring and management, watershed implementation support, and capacity-building), as well as incremental operating costs (for specialized expertise, project-related travel, meetings, documentation, etc.). The monitoring systems and documentation of lessons learned on an ongoing basis will be used to support adaptive project management and for identifying activities that can be scaled up.

1.2.4 Component D: Contingency Emergency Response Component (CERC)

This component provides immediate support to an eligible crisis or emergency. A CERC is a financing mechanism available to Borrowers in IPF operations to access funds rapidly in response to an eligible crisis or emergency (including disasters and health emergencies). The component allows redistribution of uncommitted and undisbursed funds to finance emergency and recovery needs.

1.3 Description of the Intervention Site

The Federal College of Education (Technical) Gully Erosion Site originates from the FCE (Technical) demonstration/staff school on Latitude 10° 18' 24.17"N and Longitude 11° 9' 10.72"E down to and beyond Arawa "B", through densely populated low-income dwellings (). The gully cut across the Pindiga and Bima sandstone substrate; the result is variable dimensions of gully channels in terms of depth and width.

Since the gully transverses through densely populated area (

Plate 1. 1), many of the homes located along the gully banks are constantly exposed to hazards during rainfall and high flood. Although the limestone areas are to an extent resistant to erosion, it has deleterious future implications, whereas the sandstone areas easily give way to erosive agents, which results in channel bank erosion (widening) and increase in base level incision (depth), causing serious damage to homes and properties along the channel.

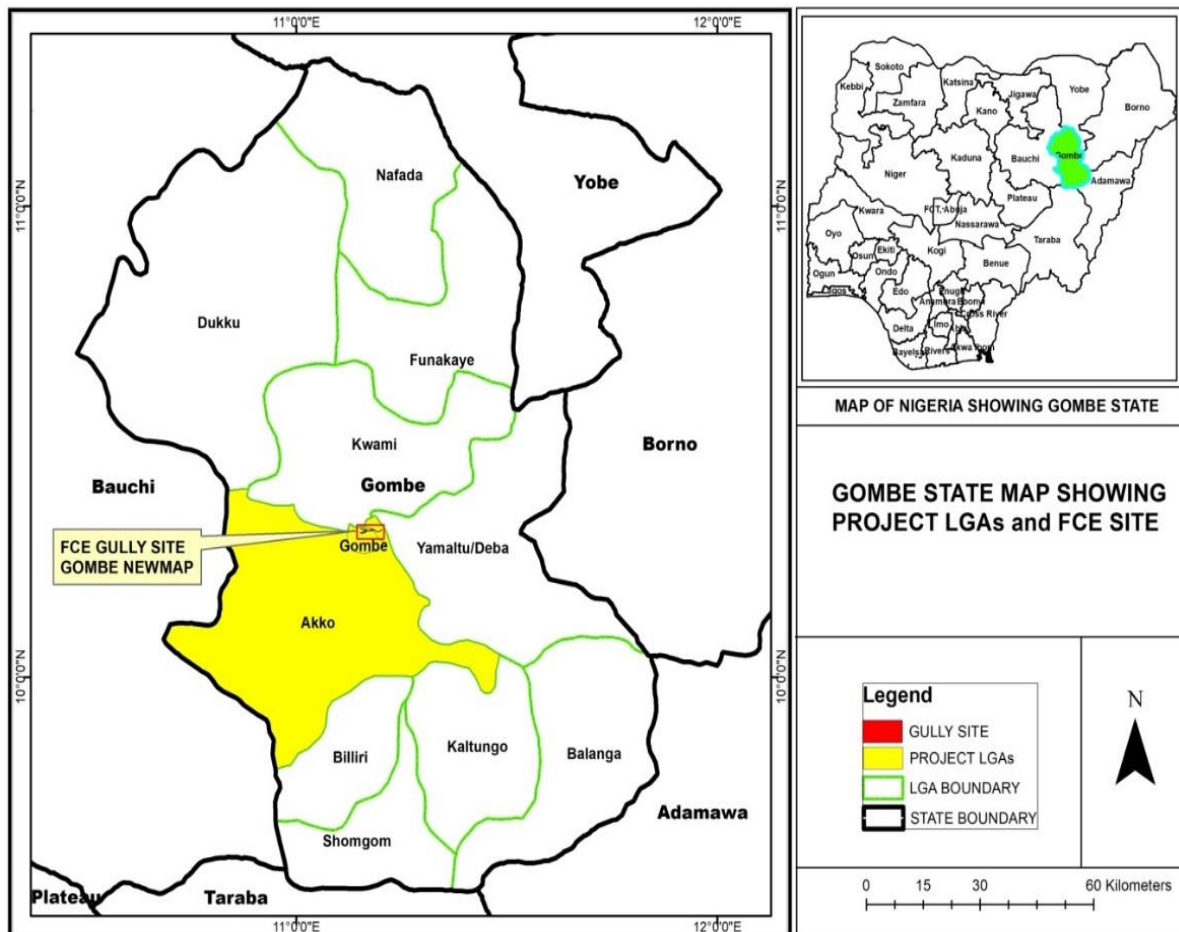


Figure 1. 1: Gombe State map showing Project LGAs and FCE Site (Source: GIS team)



Plate 1. 1: FCE (T) main gully upstream beginning at London Mai-dorowa.

The metropolis of Gombe is being ravaged by series of stormwater channels running through severely degraded and overcrowded residential areas in the form of a conveyance systems conveying stormwater away from the metropolis.

The gully erosion problem at the Federal College of Education (Technical), has reached a gully complex that warrants high specifications and technicalities, as it has continued to worsen over the years, to the extent that the college itself and eight neighboring communities: London Mai Doruwa (N10.30624; E11.15609), Jauro Abare (N10.30667; E11.15942), Jauro Kuna (N10.31028; E11.16647), Wuroladde (N10.31125; E11.15607), Alhakira (N10.31315; E11.18195), Koranzaki (N10.31055; E11.16683), Arawa (N10.31184; E11.16957), Kagarawal Runde (N10.31321; E11.20353), which this gully cut-across have been affected directly. The gully system to be intervened on consists of a main gully and four fingers. The main gully (Gully 1) has an estimated length of about 7.3 km, 27m width and 10m depth at some points transversing through. Gully 2 has an estimated length of 1km, 35m width and 4.2m depth, while Gully 3 has a length of 1.2 km, 23.5m width and 5.6m depth. Gully 4 is 800m in length and width of 25m and depth of 6.5 m. Gully 5 has an estimated length of 1.7 km, width of 24.51m and depth of 5.6 m. These makes a total length of 12km (see Figure 1. 2).

The topographical survey conducted by the design engineers established an area of about 914 ha (9.14 km²) as the boundary and extent that the remedial works would cover. The objective of the design was to completely eradicate erosion problems and ensure proper management of watersheds taking into cognizance suitability, durability, and economic benefit of the project. The ACRoSAL project has designed and develop an effective drainage system that would properly channel or convey the stormwater away from residential areas and the communities to

safely discharge outside of the metropolis, towards the main tributaries of the River Gongola/Dadin-kowa Dam (see Figure 1 and detailed sectional information in ANNEX 15).

1.3.1 Rational for the Intervention Project

Evidently the FCE(T) gully system is very active and continues to cause threats to human lives, properties, and the environment. The gully easily meanders away from obstacles (refuse dump, sand mining etc.) to erode gully banks or incise (create) new channels or expand the gullies. Like other urban drainage systems, the following factors are responsible for the devastating menace of gully erosion in the area: i) intensity of rainfall; ii) drain blockages by waste and refuse, which often lead to flow stagnation, overflow, and flooding; iv) increase impervious (hard) surfaces due to urbanization, which increases runoffs (surface and rooftops) exceeding the capacity of hydraulic structures etc.

The FCE(T) gully erosion and flood site is a part of Gombe Metropolis that experiences incessant flood and erosion hazards causing loss of lives, houses, lands, farmland, and livestock in the area. The FCE(T) name is a nomenclature (i.e., an identifier of convenience), because the gully cut across more than eight neighboring communities (i.e., Jauro-Abare Nahuta, Jauro-Abare London, Jauro-Abare Zirin Gaza, Jauro-Abare Koran Zaki, Jauro-Abare Kayel Badi, Alkahira, Wuro Ladde and Jauro-kuna) and continue to pose serious threats to lives and properties of these community members.

At various points, the resultant stagnation form ponds that become breeding ground for waterborne diseases/vectors. There are also several psychosocial issues relating to free movement and access restriction which serves as hideouts for thieves, and hotspot where people are easily robbed, raped, and harassed. The intervention is not only needed to protect human lives, property, and the environment but also to improve livelihoods and restore people's confidence in Government.

1.4 Project Description and Project Activities

The project will involve construction of concrete drainage structures to channel runoff away from the area and empty the rivers/streams emptying into tributaries of River Gongola. The main structures in the design include channel bed and bank stabilize. According to the "Concept Design Report" prepared for the site, three concepts/options were considered before adopting the third for this intervention (Loraj Consult, 2018 as Revised by Ultikonsults, Sept 2022).

The first concept was the "Provision of Concrete Structures throughout the Sections of the gullies". This approach negates easy rejuvenation of the gully and possible natural healing and reclamation over time. The gullies are strategically located at/or near the heart of the college campus and transverses through eight communities, and serves several key functions including the federal railway, which is a major intersection and link for pedestrians and community network.

The second option was the "Provision of Flexible Structures (gabion walls, check dams and mesh) throughout the Sections of the Gullies", which is not cost effective but gives opportunity for

rejuvenation and natural reclamation of the gully over time. This option is not sustainable, as the connections between existing and new concrete structures (e.g., culverts and channels) may pose a problem during service or use. Also, there is the risk of failure and non-functionality of the structure when the interstices are clogged with debris due to improper solid waste management.

The third option was the "Partial Use of Concrete and Flexible Structures" at Strategic Sections, which was adopted as the best suited for the site and its environs. To achieve this, the design recognizes the space requirements for the college and affected communities for remediation measures. Consequently, the design considered land area immediately adjacent to the banks or corridor of the main gully in its natural state of vegetation on which construction activities would take place without hindrances to equipment and material movement as a 15m buffer on both sides (banks) of the gully (i.e., 30m in total) measured horizontally from the edge of the gully. Once the final stabilization of the site is achieved, a buffer may be thinned or trimmed and terraced; surfaces covered with protective vegetative cover.

The project will involve the construction of concrete and gabion drainage structures to channel runoff away from the area into rivers/streams emptying into River Gongola. The main structures in the design include a channel bed and bank stabilization. The drainage bed construction structures like i) drain Inlet Structure; ii) main lined canal with four fingers making the total length 12km; iii) chute structure with stilling basins; iv) drop structures; and v) exit system/outlet structure. The designed bank stabilization measures include i) gabion retaining wall; ii) concrete retaining wall with weeping holes; iii) slope cutting with geo-textile and grass; and iv) bio-remediation grass and tree planting on the 5m x 5m buffer of both sides of the drain channel. Other following subprojects during the pre-construction, construction, and operation phases of the works are i.e.

- f) Clearing of vegetation to create access and expansion work where relevant.
- g) Demolition of existing structures like houses within the project right of way (ROW) or (15m X 15m) setback and failed hydraulic infrastructure.
- h) Rehabilitation of access routes for heavy-duty equipment conveyance.
- i) Reclamation of degraded land area by sand filing or stabilization of dormant gully fingers.
- j) Bioremediation and creation of 5m x 5m buffer zones along the gully channel.

Other related activities are staging area creation, campsite establishment for workers and material sourcing including burrow pits. Heavy equipment and machinery may be used for clearing vegetation, bulldozers, and excavators for creating staging areas, and campsites, and demolition of existing structures. Compactors may be used for levelling materials like sand, laterite, gravels etc., and payloaders for transporting materials like gravels, laterites, sand etc. Construction vehicles for transporting materials to site and off-site, drainage trenches for creating trenches/drainage. The proposed structural members and construction components of the erosion and flood control project will be constructed with concrete, steel, and other construction materials to conform with the work description in the engineering design.

1.4.1 Structural and Construction Requirements.

Channelization is an engineering method that requires widening or deepening or realigning of existing waterways to increase the carrying capacity of the channel to carry anticipated volume of water (flow), so that during flood, water can move freely with less damage to the banks. A thorough study and investigation were done by the Engineering Design Firm to produce and bankable engineering design for the site. To achieve this, hydrological design and analysis were conducted, including but were not limited to i) land use and runoff coefficient determination, ii) development of intensity, duration curve and discharge computation, iii) geological and geotechnical assessment of the sub-surface materials, iv) Stability analysis of side slopes, v) existing gully slopes, vi) soil fertility and bioremediation consideration, vii) hydraulic design considerations etc.

The FCE(T) gully alignments are serpentine or curvilinear (meander) in its form, allowing runoff (water) to hammer on intercepting walls (gully banks), which can result to the eventual collapse and washing out or flooding of adjacent land resources and homes, with its attendant loss of lives and properties. To reduce the meander, gully realignments were integrated into design to reduce curve sections along the longitudinal direction as recommended in the series of World Bank Design Clinics/Training for Bankable Designs (Loraj Consult 2018).

Realignment requires excavation of uneroded and stable ground for placement of hydraulic structures like culverts, stilling basins, chute channels, check dams, etc., to ensure proper connectivity in a straight alignment with the direction of flow. In the case of the FCE(T) site, realignments were carried out where necessary in the design, however, most places where the realignments were proposed are either open spaces or temporal shanties built on natural waterways, which the RAP document has effectively captured. The material excavated will be used to reclaim the original adjacent gully areas.

The proposed structural and non-structural control measures for the erosion and flood control project and the components of the construction work are as follows:

- f. Earthworks and excavation for storage embankment, gabion and retaining walls.
- g. Concrete work for the construction of retaining walls.
- h. Sand traps/check dams for energy dissipation,
- i. Provision of gabion and reno mattress as channel bank protection, and
- j. Bio-engineering work; planting of tree seedlings and grasses for erosion control.

The existing gully channel is designed to conform with the work description in the engineering design (Figure 1. 2), which divided the project area into sectional (zones) views from A to F.

1.4.1.1 Overview of View A

View A is the beginning of the gully at the Federal College of Education (FCE) Technical, which is on latitude 10° 18' 24.17"N and Longitude 11° 9' 10.72"E. Land acquisition or displacement is not anticipated along this corridor because there are no structures to be directly impacted. In "view B" there are four (4) communities consisting of i) London Mai Doruwa, ii) Jauro Abare Nahuta

iii) Wurolodde and iv) Alkahira. It starts from London Mai Doruwa at Chainage 8+575 to 8+648 corresponding to latitude $10^{\circ}18'41.3''\text{N}$ and longitude $011^{\circ}09'48.2''\text{E}$.

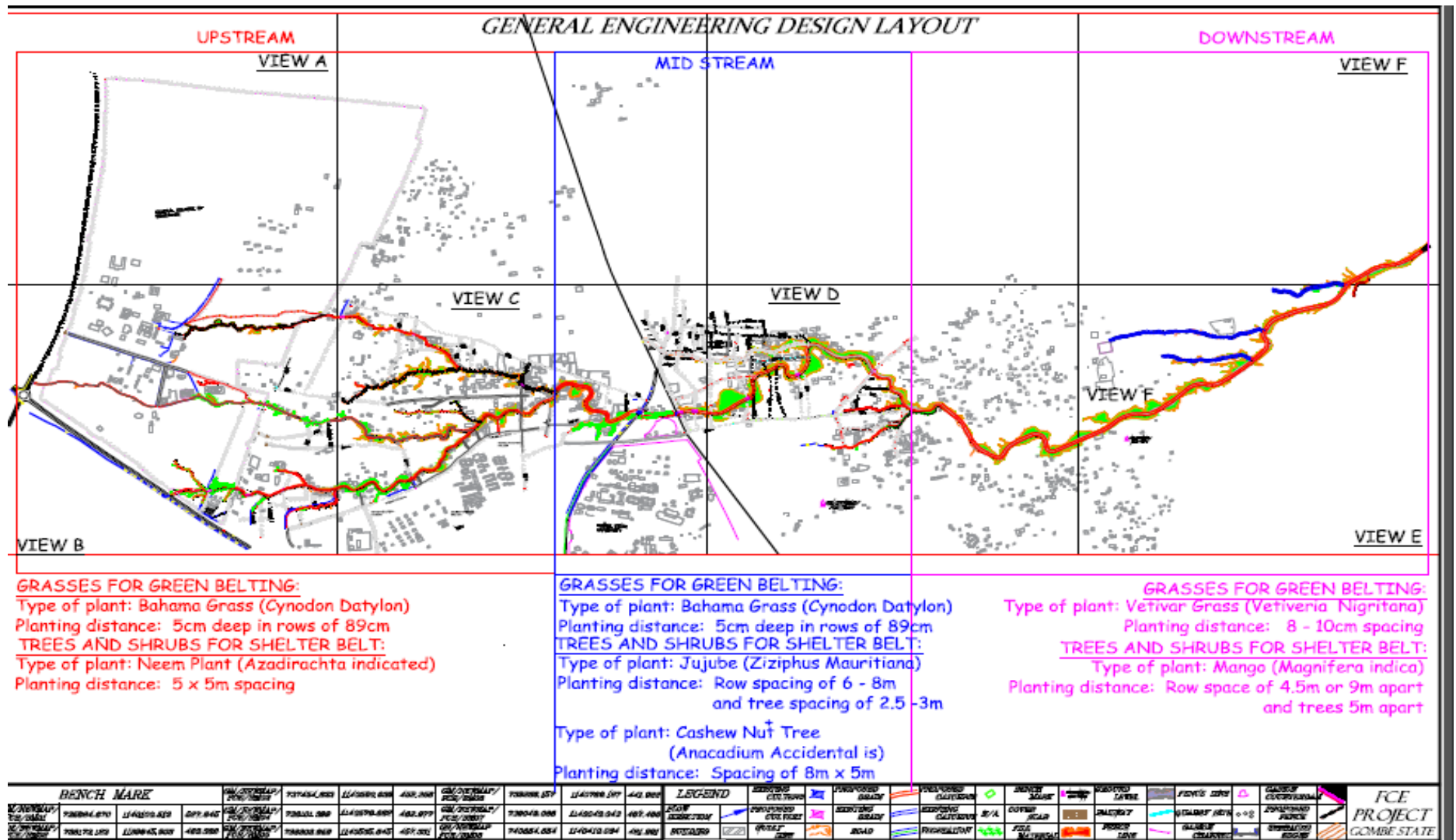


Figure 1. 2: Engineering design general layout of the intervention sites showing the sections (Zones) A-F (Gombe ACRoSAL, 2023)

At view B there are three (3) sub-catchments. Sub catchment 1 terminates at the boundary between London Mai-Dorowa and Jauro Abare/Koranzaki) on latitude 10.30633N and longitude 011.15917E; Sub catchment 2 terminates at Wurolodde community on latitude 10.30943N and longitude 011.16287E while Sub catchment 3 terminates at Alkahira on latitude 10.31599N and latitude 011.16059E linking View C. The intervention activities proposed for the View B project area is a rectangular concrete channel constructed at varying specifications as depicted in **Error! Not a valid bookmark self-reference..**

Table 1. 1: Description of intervention specification in View B

S/N	Community	Lat.	Long.	Gully Location	Work Specification	Size/ Setback
1	London Mai Doruwa	N10.30624	E011.15609	Sub catchment 1 gully at the FCE fence, Upstream	Drainage Channel 3.0X1.4m	13m
2	London Mai Doruwa	N10.30557	E011.15753	Beginning of Finger 2	Drainage Channel 1.2X1.2m	11.2m
3	London Mai Doruwa	N10.30688	E011.15803	Sub catchment 1 gully, Upstream	Drainage Channel 4.0X2.0m	14.m
4	Jauro Abare Nahuta	N10.30712	E011.16258	Finger Interception to the main gully Upstream	Drainage Channel 1.2X1.2m	11.2m
5	Wuroladde	N10.31125	E011.15607	Sub catchment 2 gullies at the FCE fence, Upstream	Drainage Channel 2.5X2.0m	12.5m
6	Wuroladde	N10.30973	E011.16086	Sub catchment 2 Gully, Upstream	Drainage Channel 3.2X2.5m	13.2m
7	Wuroladde	N10.31033	E011.15965	Sub catchment 2 gullies, Upstream	Drainage Channel 3.2X2.5m	13.2m
8	Alkahira	N10.31565	E011.15762	Sub catchment 3 gully at the FCE fence, Upstream	Drainage Channel 3.5X2.2m	13.5m

1.4.1.2 Overview of View C

View C consists of six (6) communities including Jauro Abare, Arawa, Koranzaki, Jauro Kuna, Wuroladde and Alkahira from Chainage 5+262 to 8+575 corresponding to latitude 10°18.400N and longitude 011°09.565E. View C has many fingers that are linked to the main gully. The fingers and their terminal points are described in

Table 1. 2, the work activities to be carried out in VIEW C include construction of culverts and drainage channels of varying sizes.

Table 1. 2: Description of intervention specification in View C

S/N	Community	Lat.	Long.	Gully Location	Work Spec.	Size/ Setback
1	Jauro Abare	N10.30667	E011.15942	Main gully down stream	Drainage Channel 4.0X2.0m	14m
2	Jauro Abare/ Koranzaki	N10.30973	E011.1653	Main gully down stream Interception	Drainage Channel 4.0X2.0m	14m
3	Koranzaki	N10.31070	E011.16540	Intersection finger on upstream	Drainage Channel 1.2x1.2m	11.2m
4	Koranzaki	N10.31055	E011.16683	Finger Interception to the main gully	Drainage Channel 8.0x2.0m	18m
5	Koranzaki	N10.30957	E011.16085	Sub catchment to the main gully	Drainage Channel 3.5x2.0m	13.5m
6	Koranzaki	N10.30957	E011.16085	Sub catchment to the main gully	Drainage Channel 3.5x2.0m	13.5m
7	Jauro Kuna	N10.31028	E011.16647	Main gully up stream	Drainage Channel 8.0X2.0	18m
8	Jauro Kuna	N10.31047	E011.16755	Main gully up stream	Drainage Channel 8.0X2.0	18m
9	Jauro Kuna	N10.31072	E011.16827	Jauro Kuna Culvert upstream	Drainage Channel 8.0X2.0	18m
10	Jauro Kuna	N10.31183	E011.16957	Interception between Jauro Kuna and Arawa Midstream	Drainage Channel 12.0x2.0	22

11	Jauro Kuna	N10.36993	E011.17211	Gully Finger interception to the main gully	Drainage Channel 1.2x1.2	11.2
12	Arawa	N10.31066	E011.17375	Culvert 1 Main gully Midstream	TRC 12x27	22
13	Arawa	N10.31059	E011.17569	Culvert 2 Main gully midstream	TRC 12x18	22m
14	Arawa	N10.31184	E011.16957	Finger intersection from main gully	Drainage Channel 3.5x2.2	13.5m
15	Alkahira	N10.31315	E011.18195	Finger intersection between Koranzaki and Alkahira to the main gully downstream	Drainage Channel 3.2x1.8m	13.2m
16	Wuroladde	N10.31004	E011.16074	Sub catchment 2 gully	Drainage Channel 3.5x2.0m	13.5m

1.4.1.3 Overview of View D

View D is made up of four (4) communities including Arawa B, Malam Inna, Kagarawal Runde, and Jauro Yaya. View D starts at Chainage 3+412 to 3+250. This corresponds to latitude 10.31078N and longitude 011.17678E. View D is made up of the corridor along the main gully and 3 fingers. Activities proposed for intervention in View D consists of rectangular drainage channels of average width 3.0mx1.2m and culverts of 12.2x3.1m, as shown in Table 1. 3 below providing information on the setbacks that would be used for green area (planting of trees and grasses) along both sides of the gully channel.

Table 1. 3: Description of intervention specification in View D

S/No	Community	Lat.	Long.	Gully Location	Work Spec.	Size/ Setback
1	Arawa B	N10.31374	E011.18047	Finger	Drainage Channel 3.0mx1.2m	13m
2	Mallam Inna	N10.30890	E011.19011	Main gully	Drainage Channel 12mx2m	22m
3	Kagarawa Runde	N 10.31321	E011.20353	Main gully	Drainage channel 3.0mx1.2m	13m

		N 10.31310	E011.20374	Main gully	Culverts, 12.2m x 3.1m	22.2m
4	Jauro yaya	N 10.30301	E011.19889	Main gully	As in drainage and culverts above	As in drainage and culverts above
		N 10.31950	E011.21193	Finger 1	1.2m x 1.2m	11.2m
		N 10.33210	E011.21198	Finger 2	1.2m x 1.2m	11.2m

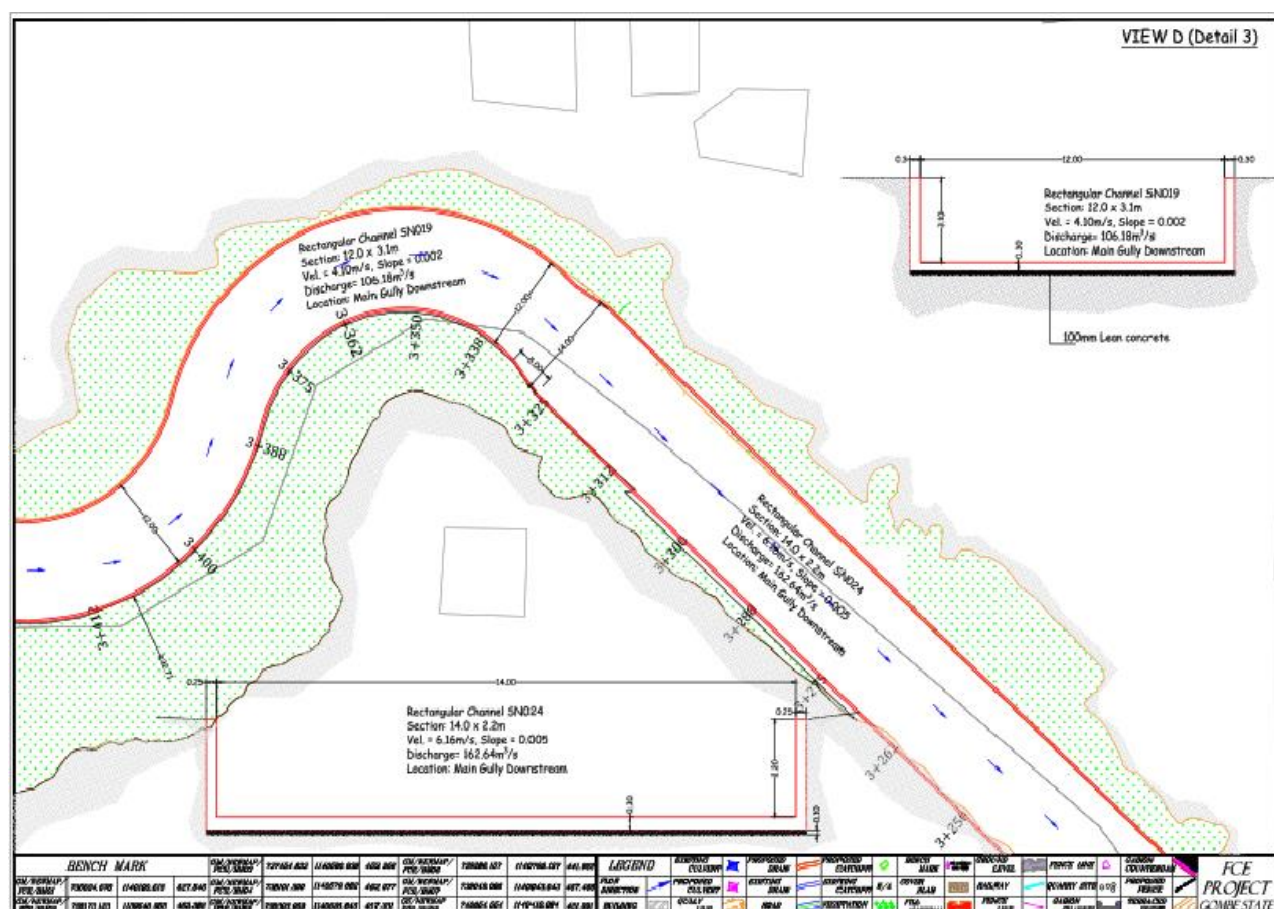


Figure 1. 3: Profile of the proposed concrete and gabion channelling of the FCE(T) Gully (see Annex 15).

1.4.1.4 Overview of View E and F

View E and F are at the downstream area of the project. Intervention in view E is the construction of Trapezoidal Reno Mattress/Gabion Channel (Figure 1. 4), made up of a corridor in the main gully and 3 fingers with measurements of main gully 14m, finger1 is 8.22m, finger2 is 8.22m and finger3 is 11.33m (Figure 1. 4) respectively. As in view E, view F is in the downstream, the intervention in this zone includes rectangular channel Rip Rap, with 14m specification.

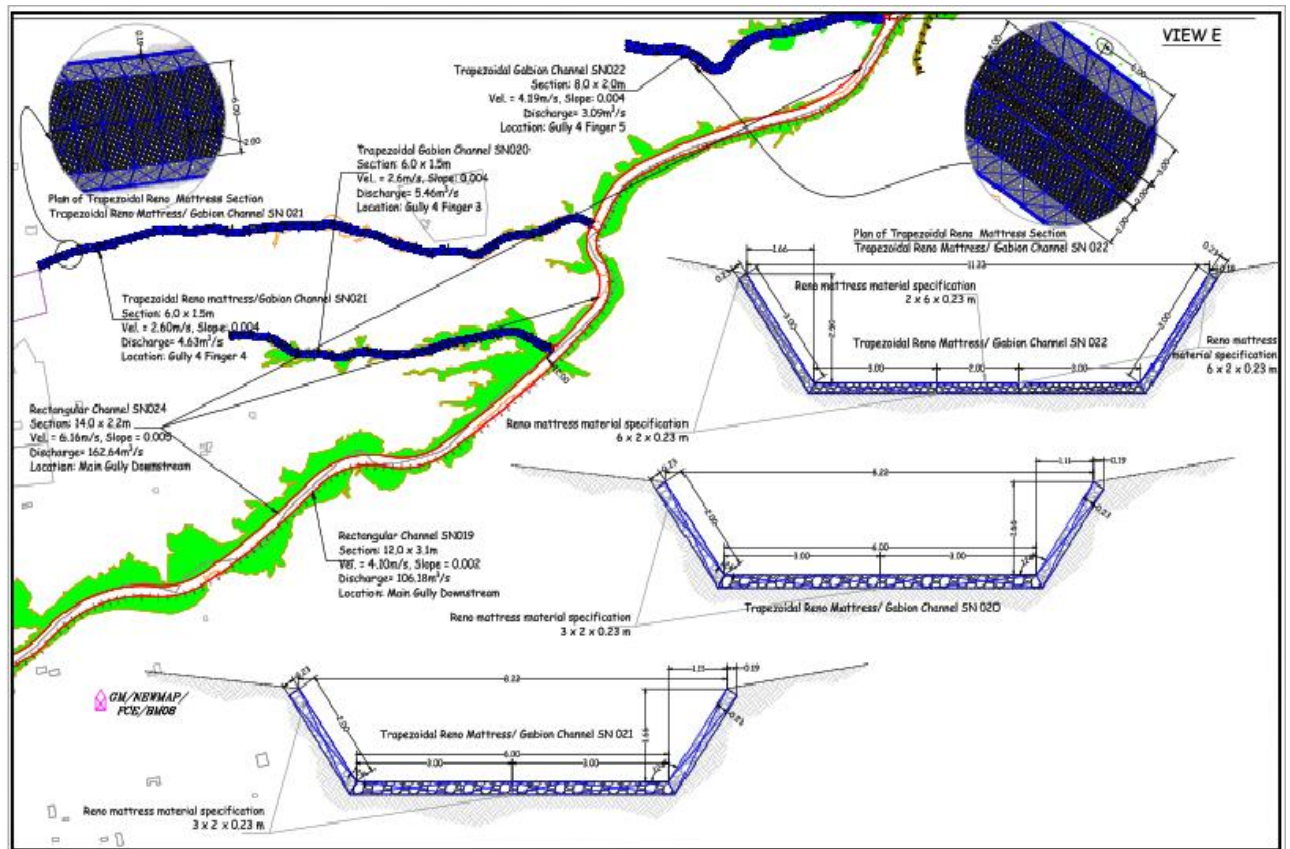


Figure 1. 4: Trapezoidal shaped canal along view E showing fingers in linear blue) (see Annex 15).

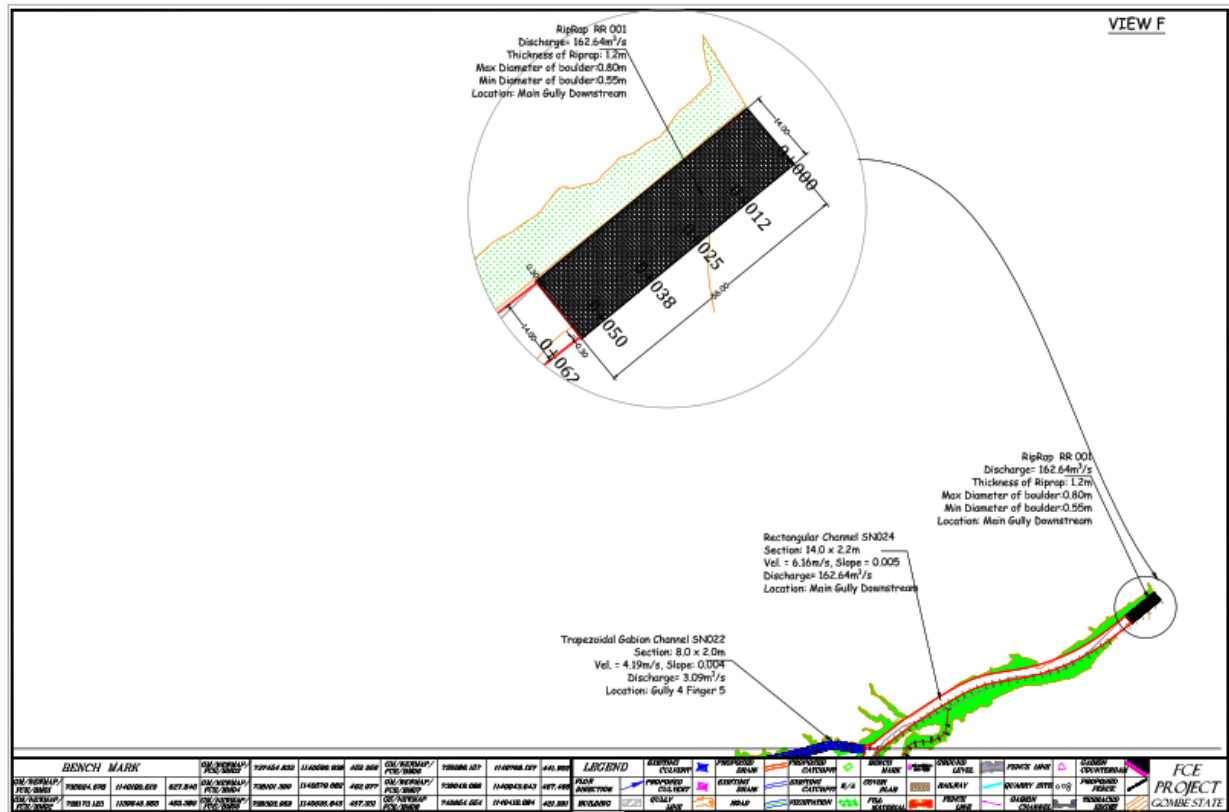


Figure 1. 5: Relative position of Trapezoidal Gabion channel at SN022, Rectangular channel at SN024 and RipRap at RR001 (see Annex 15).

1.5 Rationale for ESMP

The proposed Gully Erosion reclamation intervention project works will involve structural and non-structural, solid and flexible, engineering and bioengineering controls measures that includes earthworks and excavations, construction of RC channels, bioremediation works using gabion and renomatress for gully and channel bank protection, other civil works include backfilling of gullies, provision of drainage structures, provision of retention structures and stabilization of gully banks that will require massive earth works and human movement interacting with adjoining community residents with its associated impacts and risks..

Although the proposed gully erosion reclamation project will be beneficial to the communities in many significant areas, like addressing the prevailing issues of incessant flooding, erosion, safety, and insecurity. The erosion reclamation and flood control intervention project works will trigger the World Bank's Environmental and Social Framework (ESF) - ESS1 - Assessment and Management of Environmental and Social Risks and Impacts, ESS2 - Labor and Working Conditions, ESS3 - Resource Efficiency and Pollution Prevention and Management, ESS4 - Community Health and Safety, ESS5 - Land Acquisition, Restrictions on Land Use and Involuntary Resettlement, ESS6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources, ESS8 - Cultural Heritage and ESS10 - Stakeholder Engagement and Information Disclosure; likewise the Nigeria EIA Act due to the environmental and social risks the proposed gully erosion

reclamation works will generate. Thus, based on the screening and scoping exercise conducted, an ESMP was the appropriate safeguard tool required in addressing all environmental and social concerns related to the proposed FCE(T) gully erosion and flood control intervention works. This is also in compliance with the project level Environmental and Social Management Framework (ESMF), Resettlement Policy Framework, and Environmental and Social Commitment Plan (ESCP) of ACRE SAL. The ACRE SAL project is categorized as a high-risk project under the World Bank, hence ACRE SAL ESMF requires site-specific instruments to be prepared for sub-projects such as this.

1.5.1 Objectives of the ESMP

The overall objective of this ESMP is to ensure that all the potential environmental and social risks and impacts of the proposed activities are adequately identified in all the project construction phases (Pre-construction, Construction and Post construction phase) and addressed. Also, to ensure that adequate mitigation measures including monitoring, and institutional arrangement are provided and embedded in the project implementation phases to eliminate/reduce potential adverse environmental and social risks and impacts or offset same to a level that is as low as reasonably possible (ALARP). The ESMP shall be in line with the Environmental and Social Framework (ESF) of the World Bank and the embodied Environmental and Social Standards (ESSs).

CHAPTER TWO: POLICY, LEGAL AND REGULATORY FRAMEWORK

2.1 Introduction

Several national and international environmental guidelines are applicable to the operation of the ACRoSAL project in Nigeria. However, the power to enforce guidelines for managing activities that impact on the environment is vested in the Federal Ministry of Environment (FMEnv). Internationally, agencies such as the World Bank, IFC and other financial organizations usually set their own environmental and social criteria or requirement for the projects they support, which must be met by the borrower or project proponents before investments can be made.

On the part of the World Bank, the ACRoSAL project has been classified as a high-risk project requiring all potential environmental and social risks and impact of all interventions be assessed to prevent undue harm to people and the environment irrespective of the scale of investment. The Environmental and Social Framework (ESF) employs proportionality concept in supporting risk management approach, based on assessment, mitigation, and monitoring of environmental and social risks and impacts in a manner that is proportionate to the nature and scale of the potential risks and impacts of the project.

Accordingly, since the implementation of the proposed ACRoSAL Project could cause adverse environmental and social risks and impacts, the Nigerian safeguards requirements contained in the Nigerian EIA laws as well as the applicable World Bank Environmental and Social Framework (Environmental and Social Standards - ESS) are critical. The ACRoSAL project only triggered eight (8) of the ten (10) standards as presented in Table 2. 1.

Table 2. 1: World Bank Environmental and Social Framework Policies that are relevant to the proposed project.

WB Environmental and Social Standard	Applicability to ACRoSAL		Applicability to the proposed project		Applicable to ACRoSAL due to	How Project Addresses ESS Requirements
	YES	NO	YES	NO		
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	♦		♦		The scope of anticipated civil work activities will result in environmental and social risks and impacts. Therefore, the Environmental concerns associated with the construction work include waste generation, debris from rehabilitation activities, community health and safety, occupational health and safety of workers, noise, dust emissions etc. Although these impacts may seem limited and site specific, they can be mitigated. The project also has some social risks that are associated with labour influx, grievances, social conflicts, security, and the risk of excluding vulnerable groups from benefiting from the project.	These potential E&S risks and impacts are addressed through the mitigation measures identified and proposed in this ESMP in addition to the guidelines prepared in the ESMP for the ACRoSAL projects and the Site-specific management plan in the ESMP is materially consistent with the requirement of ESS1.
ESS2: Labor and Working Conditions	♦		♦		The project will result in employment creation and involvement of worker-management relationships throughout the pre-, during and post-construction phases of the project.	The project will comply with the Labor Management Plan (LMP) prepared for the ACRoSAL project, in addition to other mitigation measures for different impacts linked to labour management. The Site-specific Labor management plan (LMP) has also been prepared according to the requirements of ESS2.
ESS3: Resource Efficiency and Pollution Prevention and Management	♦		♦		The project activity may generate pollution of air, water, and land, and consume resources that may threaten human health, ecosystem services and the environment at the local, regional, and global levels.	The Mitigation measures for preventing pollution include a Waste Management Plan and promotion of ecosystem protection in bioremediation/provision of green areas as included in this ESMP. The integrated pest management plan (IPMP) prepared for the ACRoSAL project has also been done to meet the requirements of ESS3.
ESS4: Community Health and Safety	♦		♦		Project activities, equipment, and infrastructure may increase community exposure to health and safety hazards.	The mitigation measures addressing community health and safety risks are captured in this ESMP reflecting site-specific conditions in addition to relevant provisions in the OHS guideline and the requirements of ESS4.

WB Environmental and Social Standard	Applicability to ACRoSAL		Applicability to the proposed project		Applicable to ACRoSAL due to	How Project Addresses ESS Requirements
	YES	NO	YES	NO		
					Then movement and use of heavy machines, and influx of labour may increase exposure to health and safety risks and impacts in the community. Also, the communities may be subjected to accelerated climate change impact' or its intensification due to project activities involving vegetation clearing, topsoil removal and excavation works.	
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	♦		♦		Involuntary Resettlement, Land acquisition and restrictions would be triggered by the proposed gully rehabilitation project. Project-related land acquisition and restrictions on land use may cause physical displacement (relocation, loss of residential land or loss of shelter), economic displacement (loss of land, assets, or access to assets, leading to loss of income sources or other means of livelihood), or both.	To address this, a site-specific Resettlement Action Plan (RAP) will be prepared - to meet the requirements of ESS5.
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	♦		♦		Protecting and conserving biodiversity and sustainable management of living natural resources are fundamental to the sustainable development of any project. The project activities may impact natural resources either through material sourcing, destruction of flora and fauna and earth excavation amongst others.	The mitigation measures provided to protect biodiversity and conserve natural resources are captured in this ESMP. Thus, the site-specific management plan included in this ESMP contains relevant mitigation measures that conform with ESS6.
ESS7: Indigenous Peoples		♦		♦	This applies to a distinct social and cultural group identified by the provisions for indigenous people, which does not apply to the 19 participating northern states in the country and the FCT Abuja and the ACRoSAL project in Nigeria.	Not Applicable

WB Environmental and Social Standard	Applicability to ACRsAL		Applicability to the proposed project		Applicable to ACRsAL due to	How Project Addresses ESS Requirements
	YES	NO	YES	NO		
ESS8: Cultural Heritage	♦		♦		The scope of civil work activities may result in impacts on the traditions and cultural heritage of the people including gravesites, shrines, traditional monuments, and other significant places of economic and social value to the people (these include both tangible and intangible assets).	Site site-specific management plan to ensure proper handling of instances like these has been prepared for ACRsAL projects and this ESMP contains mitigation measures for chance-find and incursion into areas of cultural significance.
ESS9: Financial Intermediaries		♦		♦	The project is not about financial sector development or enhancing the role of domestic capital and financial markets. Standard is not relevant to the ACRsAL project.	Not applicable
ESS10: Stakeholder Engagement and Information Disclosure	♦		♦		The development of strong, constructive, and responsive relationships is an important ingredient for successful project management of the project 's environmental and social impacts and risks. It is also important for project buy-in through accurate information disclosure, interaction, accountability, and transparency.	A stakeholder engagement plan (SEP) has been prepared for the project alongside a grievance mechanism to ensure functional public and stakeholder involvement in the project by ESS10.

2.2 Relevant Regulatory Policies of Nigeria

Under Section 20 of the 1999 Constitution of the Federal Republic of Nigeria, the state is empowered to protect and improve the environment and safeguard the water, air, land, forest, and wildlife of Nigeria. The power to regulate all environmental matters in Nigeria is vested in the Federal Ministry of Environment (FMEnv) - a mandate that previously rested with the defunct Federal Environmental Protection Agency (FEPA) set up by Federal Act 88, of 1988.

2.2.1 The National Policy on the Environment (NPE) of 1989

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

The objective of the policy is to achieve sustainable development in Nigeria and to:

- a) Secure a quality environment adequate for good health and well-being.
- b) Conserve the environment and natural resources for the benefit of present and future generations.
- c) Raise public awareness and promote understanding of the essential linkages between environmental resources and development and encourage individual and community participation in environmental improvement efforts.
- d) Maintain and enhance the ecosystems and ecological processes essential for the functioning of the biosphere to preserve biological diversity.
- e) Co-operate with other countries, international organizations, and agencies to achieve optimal use and effective prevention or abatement of transboundary environmental degradation.

2.2.2 Environmental Impact Assessment Act No. 86, 1992

National EIA Act 1992, Clause 2 provides that the public or private sector of the economy shall not undertake embark on or authorize projects or activities without prior consideration of the effects on the environment. The act makes an EIA mandatory for any development project and prescribes procedures for conducting and reporting EIA studies. As part of the effective utilization of the EIA tool, the Federal Ministry of Environment (FMEnv) has produced sectoral guidelines.

2.2.3 National Guidelines and Standards for Environmental Pollution (March 2001)

The National Guidelines and Standards for Environmental Pollution Control in Nigeria (March 2001) is the basic instrument for monitoring and controlling industrial and urban pollution.

2.2.4 NESREA Establishment Act, 2007.

The National Environmental Standards and Regulations Enforcement Agency (NESREA) is responsible for enforcing environmental regulations and biodiversity conservation, including coordination and liaison with relevant stakeholders within and outside Nigeria on matters of environmental standards, regulations, rules, laws, policies, and guidelines. The following NESREA National Environmental Regulations are considered relevant in this study:

- i. National Environmental (Construction Sector) Regulations. 2011.

- ii. National Environmental (Soil Erosion and Flood Control) Regulations. 2011.
- iii. National Environmental (Desertification Control and Drought Mitigation) Regulations. 2011.
- iv. National Environmental (Surface and Ground Water Control) Regulations. 2011.
- v. National Environmental (Watershed, Mountainous, Hilly and Catchment Areas) Regulations, 2009.

2.2.5 The National Effluents Limitations Regulation

This instrument makes it mandatory for industries to install anti-pollution equipment, make provision for further effluent treatment, prescribe the maximum limit of effluent parameters allowed for discharge, and spell out penalties for contravention. It also provides that all industries in Nigeria should operate on Best Available Technology (BAT).

2.2.6 The NEP (Pollution Abatement in Industries and Facilities Generating Waste) Regulations

Restrictions are imposed hereunder on the release of toxic substances and the requirement of stipulated monitoring of pollution to ensure permissible limits are not exceeded; Unusual and accidental discharges; contingency plans; generator's liabilities; strategies of waste reduction and safety for workers.

2.2.7 The Management of Solid and Hazardous Wastes Regulations

These regulate the collection, treatment, and disposal of solid and hazardous waste for municipal and industrial sources and give a comprehensive list of chemicals and chemical waste by toxicity categories.

2.2.8 National Guidelines on Environmental Management Systems (1999)

The guidelines establish the requirement for an Environmental Management System (EMS) in all Organizations /facilities in Nigeria '. They also state that this EMS should be audited annually or as deemed necessary.

2.2.9 National Guidelines for Environmental Audit

These are designed to serve as a reference for compliance with the Environmental Audit requirements of the FMEEnv. It states that a company must carry out an audit every 3 years or at the discretion of the Hon. Minister of the FMEEnv.

2.2.10 National Erosion and Flood Control Policy 2005

The general soil erosion & flood control guidelines provide necessary instructions for soil and water resources users to develop, implement and monitor plans that are to assure erosion and flood hazard mitigation. The maintenance of levees and other protective structures are also to be developed as areas with potential impacts. In addition to this, all requests for project plan approvals must include soil type and drainage pattern/structures in and around the project area and the likely impact of the project on these duly certified.

2.2.11 National Air Quality Standard Decree No. 59 of 1991

The FMEEnv is the regulatory agency charged with enforcing ambient air quality standards in Nigeria. The World Health Organization (WHO) air quality standards were adopted in 1991 as the national standards by the FMEEnv. These standards define the levels of air pollutants that should not be exceeded to protect public health.

2.2.12 The National Oil Spill Detection and Response Agency Act 2005 (NOSDRA ACT)

This statutory regulation makes adequate regulations on waste emanating from oil production and exploration and its potential consequences on the environment.

Other Acts and Legislations.

2.2.13 Land Use Act of 1978

The basic legal framework for the acquisition of land in Nigeria is the Land Use Act 1978 as amended in 2004, Chapter L5 under the laws of the Federation of Nigeria. Part 1 of the amended Act 2004 vests all land within the urban areas of any Nigerian State in the Executive Governor of that state. Land within the rural areas of the state is vested in the Local Government. Part VI, Section 29 of the law provides for compensation to the holder of any land title when such land is to be acquired for public purposes. For developed land, the Governor (in the case of urban areas) or Local Government (in the case of rural areas) may, instead of compensation, offer resettlement in any other place as a reasonable alternative accommodation and in acceptance of resettlement, the holder's right to compensation shall be deemed to have been duly satisfied.

The land-use Act of 1978 states that 'It is also in the public interest that the rights of all Nigerians to use and enjoy land in Nigeria and the Natural fruits thereof in sufficient quality to enable them to provide for the sustenance of themselves and their families should be assured, protected, and preserved'. This implies that acts that could result in the pollution of the land, air, and waters of Nigeria negates this decree, and is therefore unacceptable.

2.2.14 Approved National Forestry Policy 2006

The extant national forest policy which is included within the document —Agricultural Policy for Nigeria published by the Federal Ministry of Agriculture in 1988 recognized forestry as the management and utilization of forests as renewable natural resources. The policy's overall objective is to achieve sustainable forest management that would ensure sustainable increases in the economic, social, and environmental benefits from forests and trees for the present and future generations including the poor and the vulnerable groups.

The Forest Policy encourages and supports an aggressive establishment of plantations of economic trees of both exotic and indigenous species. It provides for the preservation of forests and the setting up of forest reserves and provides goals, targets and implementation strategies for the management, development and use of forests and their resources and products. Nigeria is at present a wood deficit nation. The policy on forest resources management and sustainable use is aimed at achieving self-sufficiency in all aspects of forest products using 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 protective purposes, on already deforested fragile land.

The national biodiversity conservation strategy continues to be based on a system of Protected Areas, including Forest Reserves, National Parks, and Game Reserves. In recognition of the fact that the local communities must share the benefits of these Protected Areas, there must be a meaningful participation of these communities in their management. Efforts to safeguard biodiversity in private forests and to improve agricultural biodiversity through farm forestry initiatives must be supported.

2.2.15 Inland Waterways Authority (NIWA), 1997

Nigeria Inland Water Authority (NIWA) Act 13 of 1997 established NIWA whose functions among others to i) ensure the development of infrastructural facilities for a national inland waterways network connecting the creeks and the rivers with the economic centres using the river ports as nodal points for inter-model exchange, ii) ensure the development of indigenous technical and managerial skills to meet the challenges of modern inland waterways transportation; and iii) carry out an environmental impact assessment of navigation and other dredging activities within the inland water and its rights-of-way management that would ensure sustainable increases in the economic, social, and environmental benefits from forests and trees for the present and future generation including the poor and the vulnerable groups.

2.2.16 National Policy on Occupational Safety and Health, revised 2020

The policy was approved by the Federal Executive Council (FEC) in September 2020 to provide guidelines for voluntary compliance and serves as the basis for occupational health and safety (OHS) programs for workers under development projects like ACREsAL. An Occupational Health and Safety (OHS) Plan has been prepared in this ESMP to ensure compliance with the Occupational Health and Safety Policies.

2.2.15 National Gender Policy (Revised 2022)

The revised National Gender Policy 2021-2026 approved in March 2022, promotes gender equality, good governance, and accountability across the three tiers of government in the country. The goal is to eliminate cultural and religious gender-based biases and harmful cultural and religious practices, that give rise to inequalities in gender-role relations in Nigeria, by ensuring that women have access to critical resources and investment in human capital as a means of reducing extreme poverty in families; and eliminate the high risks linked to all harmful traditional and cultural practices that threaten the health of women.

2.3 Relevant International Conventions

Nigeria subscribes to several international regulations and conventions relating to Environmental Protection. The international protocols signed by Nigeria and relevant to the ACREsAL project include:

- i. International Union for Conservation of Nature and Natural Resources (IUCN) Guidelines
- ii. Convention of Biological Diversity
- iii. Convention Concerning the Protection of the World Cultural and National Heritage Sites (World Heritage Convention)
- iv. United Nations Framework Convention on Climate Change (1992)
- v. UN Convention to Combat Desertification
- vi. Forced Labor Convention, 1930
- vii. Freedom of Association and Protection of Right to Organize Convention, 1948
- viii. Right to Organize and Collective Bargaining Convention, 1957
- ix. Equal Remuneration Convention, 1951.
- x. Abolition of Forced Labor Convention, 1957
- xi. Discrimination (Employment and Occupation) Convention, 1958
- xii. Minimum Age Convention, 1973
- xiii. Worst Forms of Child Labor Convention, 1999

- xiv. Labor Inspection Convention, 1947
- xv. Tripartite Consultation (International Labor Standards) Convention, 1976
- xvi. Right of Association (Agriculture) Convention, 1921.
- xvii. Protection against Accidents (Dockers) Convention.

2.3.1 The Basel Convention on the Control of Transboundary Movement of Hazardous Waste and Disposal, 1989

The convention focuses attention on the hazards of generation and disposal of hazardous wastes. The convention defines the wastes to be regulated and controls their transboundary movement to protect human and environmental health against adverse effects.

2.3.2 UN Framework Convention on Climate Change - Kyoto Protocol (1992)

To achieve sustainable social and economic development, energy consumption for developing countries needs to grow considering the possibilities of achieving greater energy efficiency and control of greenhouse gas emissions. This also applies to the application of new technologies in a manner that is economically and socially beneficial, as determined to protect the climate system for present and future generations.

2.3.3 Agenda 21 - UN Conference on Environment and Development

At the United Nations Conference on Environment (also the Earth Summit) in Rio de Janeiro (1992), with recommendations from the WHO Commission, more than 150 member states adopted Agenda 21 - an action plan to guide future strategies for health and environment activities on a national and international level. This fact provided the background for FEPA's EIA framework to ensure the environmental sustainability of all types of activities in the oil and gas industry (FEPA, 1995).

2.3.4 Public Health Legislations and Regulations

Several countries have legislation and regulations that stipulate the administrative and policy framework for conducting a health impact assessment for a development project, whether as part of an EIA or a standalone study. In addition, several international agencies have endorsed this process, such as the World Bank, the Asian Development Commission, and the World Health Organization. In Nigeria, the Public Health Law (L.N47 of 1955, Cap 103) justifies the execution of developmental projects under guidelines that promote health by protecting the environment and safeguarding human health.

2.3.5 WHO Health and Safety Component of EIA, 1987

WHO in its report on the health and safety component of environment impact assessment (EIA) set to protect human health indicates that:

- i. One of the fundamental considerations in the approval of projects, policies and plans should be the health of communities affected by them; greater consideration should be given to the consequence of development policies/programs for human health.
- ii. Environmental Impact Assessment should provide the best available information on the consequences for the health of projects, policies, and plans; and
- iii. Information on health impact should be available to the public.

2.3.6 United Nations Guiding Principle on the Human Environmental

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

2.3.7 The Violence Against Persons Prohibition (VAPP ACT 2015)

The VAPP Act was signed into law on 23rd May 2015. This act prohibits all forms of violence against private and public life and provides maximum protection and effective remedies for victims and punishment of offenders. Nigeria's national government has taken steps to penalize and address GBV and SEA, although a clear leadership with the leverage to garner multi-sectoral support to address this complex problem seems absent.

2.4 World Bank Group EHS Guidelines

The Environmental, Health, and Safety (EHS) Guidelines of the World Bank Group (WBG) are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). The EHS Guidelines that are relevant and applicable to the ACRoSAL project include the following: i) General EHS, ii) ESHG for Perennial Crop Production, iii) EHS for Annual Crop Production, iv) EHS for Mammalian Livestock Production; and v) EHS for Waste Management Facilities.

2.5 Gombe State

2.5.1 Gombe State Ministry of Environment and Forest Resources

The Gombe State Ministry of Environment and Forest Resources is responsible for protecting, preserving, and improving the state's environment and forest resources. The Ministry is responsible for designing and executing programs that will help in the control of environmental disasters such as flooding, erosion, desertification, and management of forest Resources.

2.5.2 Gombe State Environmental Sanitation and Protection Agency (GOSEPA).

This is an agency in the state Ministry of Environment responsible for planning, sanitation and development of urban centres, provision of amenities, infrastructures, and other functions necessary for a healthy environment and orderly urban growth.

2.5.3 Gombe State Ministry of Agriculture and Natural Resources

The Ministry of Agriculture in Gombe state is largely responsible for formulating and implementing agricultural policies in the state. The ministry is also involved in enlightening and coordinating farmers' activities in the state.

2.6 Gaps between Nigerian Legislation and World Bank E&S Standards

The gaps between the triggered Nigerian current legislation and WB policies as they relate to this project are summarized Table 2. 1 below:

Table 2. 1: Gaps between Nigeria Legislation and WB Policies.

Project Triggered Policies	Nigerian Legislation	World Bank ESS	Gaps Between the Policies
ESS1 Environmental Assessment	The act makes an EIA mandatory for any development project and prescribes procedures for conducting and reporting EIA. Responsibility for monitoring EIA activities lies with the NESREA and State ministries of environment.	An EA is conducted to ensure that Bank-financed projects are environmentally compliant and sustainable. A project that has the potential to cause adverse environmental and social risks and impacts requires an EA to identify the risks and impacts and the mitigation measures.	Nigeria currently has a framework for assessing and managing the environmental impacts of development projects. However, in comparison with the World Bank ESS1, it lacks the requirements or guidance in the assessment of the impact of an activity on public health. In this case, the policy of the bank prevails.
ESS2 Labour and Working Conditions	Labor Act, Chapter 198, Laws of the Federation of Nigeria (LFN) 2004, on promoting fair treatment and equal opportunities of project workers. Child Labor Act. 2019 prohibits child labour or their engagement under certain conditions	ESS2 recognizes the importance of employment creation and income generation. Borrowers can promote sound worker management relationships and enhance the development benefits of a project by treating workers equally without discrimination and a grievance mechanism to address issues.	The ESF provides guidelines for managing all categories of workers in a project based on agreed conditions, but the Labor Act. Gives an advantage to the employer. In this case, the policy of the bank prevails. The Child Labor Act. 2019 essentially satisfies the requirements of the International Labor Organization (ILO) on child labour and is consistent with ESS 2
ESS3 Resource Efficiency and Pollution Prevention and Management	The policies, standards, legislation, and guidelines under the EIA Act in consonance with the NESREA Act set out compliance to address water quality, environmental health, and sanitation. It enforces compliance with guidelines on sustainable management of the ecosystem, biodiversity conservation and the development of natural resources; The regulations seek to use the most appropriate means to prevent and combat various pollutions; and address GHG emissions.	ESS3 recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels. At the same time, more efficient and effective resource use, pollution prevention GHG emission avoidance, and mitigation technologies and practices are required.	Requirements for pollution prevention and waste management are similar, but the ESF provides additional requirements for improving efficient consumption of energy, water, and raw materials to reduce waste and encourage efficient use of resources. In this case, the policy of the bank prevails

ESS4 Community Health and Safety	The NESREA Act, Section 20(1), the EIA Act specified protection and enhancement of the quality of life through good public health and welfare. It articulates a minimum standard for air quality and control of substances which separately or in combination can endanger human health and the environment.	ESS4 recognizes of risks and impacts of development projects and community exposure to such risks and impacts. ESS4 addresses the health, safety, and security risks and impacts on project-affected communities to avoid or minimize such risks and impacts, particularly vulnerable persons.	These issues are not adequately covered in the EIA Act and are not often comprehensively assessed because of the fragmentation of requirements into various laws. In this case, the policy of the bank prevails
ESS 5 Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement	Chapter 202 of Nigeria Land Use Act, 1990 is the legal basis for land acquisition and resettlement in Nigeria.	The World Bank's ESS5 aims to avoid or minimize involuntary resettlement. assist displaced persons in improving their former living standards, income earning capacity and production level, or at least in restoring them; encourage community participation and involvement.	Land acquisition, restriction and involuntary resettlement are not adequately covered in the Land Use Act. The Land Use Act does not give priority to vulnerable people, fails to improve livelihoods, nor encourages community participation. In this case, the policy of the bank prevails
ESS6 Biodiversity Conservation and Sustainable Management of Living Natural Resources	The provisions under the Nigerian EIA Act seek for the protection and development of the environment, biodiversity conservation and sustainable development of Nigeria's natural resources in general.	ESS6 recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development. ESS6 recognizes the importance of maintaining the core ecological functions of habitats, including forests, and the biodiversity they support.	The Nigerian EIA Act and the World Bank ESS6 are similar. ESS6 also addresses sustainable management of primary production and harvesting of living natural resources,
ESS8 Physical Cultural Resources	The National Commission for Museums and Monuments Act of 1990, Chapter 242 seeks to protect and preserve objects of archaeological interest wherever they are. Any person who discovers an object of archaeological interest during operations permitted under section 19 of this Act shall notify the Commission.	The Bank seeks to assist countries in managing their physical cultural resources and avoid or mitigate the adverse impact of development projects on these resources.	No difference in framework, however, responsibility for monitoring activities and enforcement under the Nigerian regulations is effectively lacking. In this case, the policy of the bank prevails.
ESS10 Stakeholders Engagement and Information Disclosure	The EIA Act in consonance with the NESREA Act recognizes the need for public awareness provides environmental education on sustainable environmental management, and promotes private sector compliance with environmental	This ESS recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement	The EIA lacks guidelines for stakeholders' identification, only focus groups, no stakeholders' engagement plans and functional Grievance Redress Mechanisms throughout the life cycle of

	regulations. The Act requires public disclosure of environmental and social instruments.	improves project acceptance and sustainability.	the project. In this case, the policy of the bank prevails
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CHAPTER THREE: BIOPHYSICAL AND ENVIRONMENTAL CONDITIONS

3.0 Introduction

The biophysical components of the proposed FCE(T) gully erosion and flood control site describe the existing (biophysical baseline) status of the project environment, which may be affected by the development of the proposed gully erosion reclamation project. The information on the project area is crucial for the Environmental and Social Management Plan (ESMP) processed as it helps to identify the key environmental and biophysical parameters of the project area of interest likely to be impacted by the intervention as well as provide data for determining the potential E&S risks and impacts of the proposed project intervention. The description of the biophysical baseline conditions is based on the analysis of data collected from both primary and secondary sources.

Environmental and biophysical parameters including Noise, Air Quality, Water quality (ground and surface), Erosion morphometry, Flora and Fauna, Sediments, Geology and Watershed analysis, Climate and Meteorology as well as Soil characteristics were identified to form the baseline information regarding the site's biophysical baseline assessment.

3.1 Project Location

The proposed intervention site is one of the most prominent gully erosion sites threatening livelihoods and environmental sustainability in the Gombe metropolis. The intervention is meant to control the menace of the gully and inhibit its advancement from causing further damage to life and properties. The biophysical, ecological, and environmental baseline information for the proposed site forms the basis of this site-specific ESMP.

The formation of gullies is one of the major environmental challenges confronting Gombe town, and fast becoming hazardous to human habitation. Several lives and properties are lost every year to flash floods and expansion of the gully bank due to the action of erosive forces acting to undercut the banks/cliffs leading to the collapse of houses. The situation is exacerbated every year since the town assumed the status of a state capital in 1996 (Mbaya, 2011).

The FCE(T) site is located at latitudes 10° N to 10° 20'N and longitudes 11° 01'E and 11° 19'E (Figure 3. 1). It shares a common boundary with Akko Local Government Area in the South and West; Yamaltu-Deba to the East and Kwami to the North. Gombe town is well linked by road to other regional centres such as Biu/Maiduguri, Potiskum/Damaturu, Bauchi/Jos, and Yola/Jalingo.

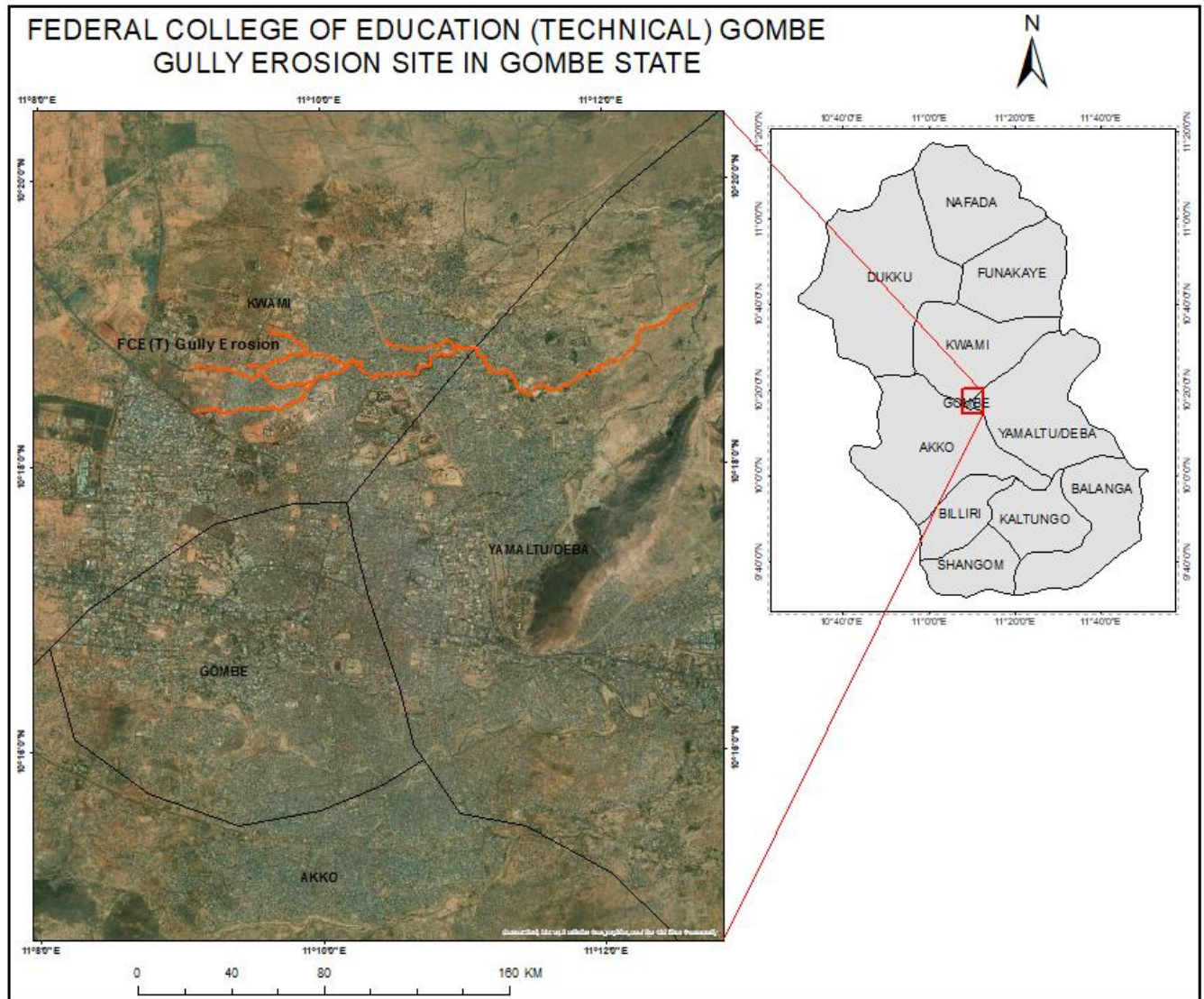


Figure 3. 1: Map of the study location.

3.1.1 Project Area of Influence

The project's Area of Influence (AOI) is presumably the area where the project activities could have the most direct risks and impacts is delineated to cover an area of about 8.122km² stretching from the FCE(T) Staff School to a confluence (Figure 3. 2) where it meets the downstream/river, this area is defined based on the extent to which the proposed project activities may interact with the surrounding environment, whilst taking into consideration the nature of the project and its associated activities, nature of surrounding ecosystem and ecosystem resources, the spatial distribution of the affected/ host communities.

The project area of influence is believed to capture the full reach of possible areas to be affected by the proposed gully rehabilitation project, especially the affected biophysical environment. Figure 3. 2 presents the area considered as AoI (a 500 by 500m buffer on both sides of the gully channel).



Plate 3. 1: Confluence between FCE (Technical) and FCE(T) erosion site.

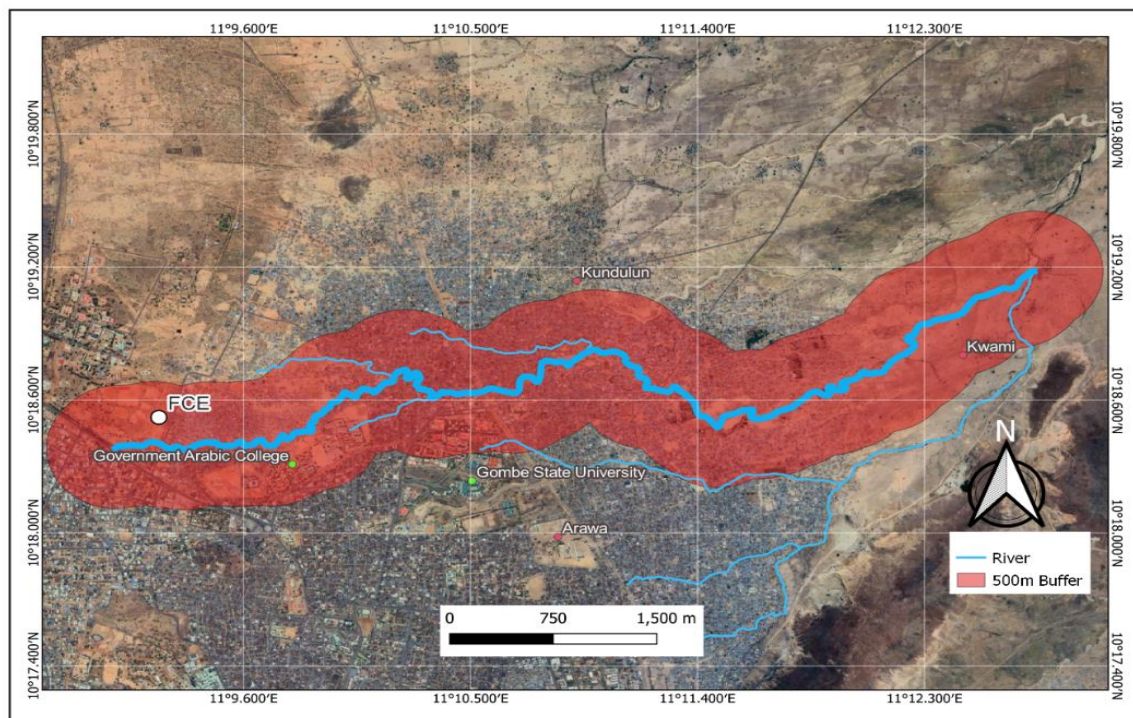


Figure 3. 2: Project's Area of Influence (AoI) -500mx500m buffer.

3.2 Data Acquisition Approach and Methods

The baseline data generated for this study covers aspects of biophysical and chemical properties of soil, water, and air, these are described in subsequent sub-section. Plate 3. 2 show some personnel during data collection in the field.



Plate 3. 2: Personnel collecting soil samples and making observations in the field.

3.2.1 Instruments used for data collection.

The instruments used include high-precision GPS, measuring tape (30m tape), Ranging poles, Abney level, Noise level meter, Air quality monitor, Soil auger, water sampling bottles, Soil sampling bags, Meter rule etc. All data collected were processed, analyzed, and presented using a combination of descriptive and pictorial techniques for easy comprehension.

3.2.1.1 Sampling

The collection of biophysical and environmental parameters (data) such as air quality, noise level, climate and sediment, gully depth and height, soil quality, surface, groundwater quality, flora, fauna geology, and hydrology commenced on the 06th of June 2023. A purposive sampling technique was adopted in the selection of biophysical sampling locations within the project area of influence. The sampling procedure focuses on the population of interest, which best answers the objectives of the assignment. The study team applied these purposively in defining the samples of interest on the sites.

3.2.1.2 Desktop Studies/Literature Review

The desk review involves a review of relevant literature materials and project documents i.e., ESF, ESCP, Engineering design, EHSG etc. The archival data generated from the review include climatological/meteorological data, maps, geological data as well and geographic data, among others. Additional information was obtained from the Upper Benue River Basin Development Authority (UBRBDA), Gombe State Ministry of Environment, Gombe State Ministry of Land and Survey, and the Gombe State ACRoSAL project etc.

3.2.1.3 Reconnaissance

A site reconnaissance survey was conducted on the 5th day of June 2023 by the team of environmental and socioeconomic experts together with the Environment and Safeguard Officer of the Gombe State ACRoSAL, and Head of Livelihood and Support (Plate 3. 3). This was done

to familiarize the team with the gully site. The biophysical characteristics of the area were observed during the visit, which enabled the team to plan and organize the appropriate techniques adopted.



Plate 3. 3: Biophysical and socioeconomic team members with the Gombe State ACRoSAL representatives.

3.4 Field Data Collection

This section describes the data collection techniques used/adopted for the site. Several biophysical, environmental, and ecological parameters were observed, measured, photographed and or collected using standard techniques. All other data relevant to the biophysical variables including soil, water (surface and ground), flora and fauna, gully morphometry, sediment, geology, hydrology, climate etc. were all observed and collected using appropriate data collection techniques.

3.4.1 Measurement of Gully Slopes and Dimensions

The gully length, width, and depth were measured using measuring tape, and ranging poles, the values were recorded in the field record book. A ranging pole was stationed at the end of the bottom wall of each side of the gully, for which the distance between the two poles was measured with a measuring tape. Similarly, the top width was measured by stationing the ranging poles on each end of the gully banks and the distance between them was measured and recorded. Plates 3-4 show the data collection procedure for gully morphometry.



Plate 3. 4: Slope measurement at FCE Erosion Site.

The depth was determined by deepening the measuring tape into the gully to the middle of the gully's bottom width and the tape was allowed to rest on the wall of the gully to the gully bank and the value was recorded. The length was measured from the gully head (where it was initiated) to the terminal end of the gully segment (lower catchment). The same procedure was repeated throughout the entire site.

Other biophysical attributes that are critical to the study were observed in situ; these include faunal and floral species, sources of environmental pollution from nearby discharge points, primary causes of soil erosion, soil colour, soil texture, geological settings, and other human-related activities. All observed variables were recorded, and pictures were captured where necessary.

3.4.2 Method of Data Analysis

The Soil Water Assessment Tool (SWAT) was used to determine the runoff and sediment fluxes. The SWAT model is a process-based tool widely used in simulating hydrological processes (Jiang et al., 2021). It uses the Digital Elevation Model (DEM), land use, soil, and climatic data as inputs.

For the morphometry analysis, the profile plugin in QSWAT was used to plot gully characteristics like slope, shape, and height for a proper understanding of the interaction between the gully geomorphological features, water, and sediment in the landscape.

3.4.3 Quality Assurance

For quality assurance, the criteria employed in the collection of bio-physical data cover all aspects of the study including sample collection, handling, laboratory analysis, data coding, statistical analysis, and data presentation were undertaken in a manner consistent with established QA/QC. The sampling and handling of ambient air quality, water (surface and ground), soil, noise, and vegetation were conducted in line with the recommended procedures and

best practices for environmental data collection in Nigeria, using approved standards and methods. The collected soil and water samples were preserved and transported to the laboratory for analysis under strict adherence to laid down procedures and best practices.

3.5 Result of Biophysical Environment

3.5.1 Climate and Meteorology

The proposed intervention site is situated in a semi-arid area, where the climate condition is shaped by the movement of the Inter Tropical Convergence Zone (ITCZ). Thus, between April and May when the ITCZ moves closer from the southwest, it brings in rainfall, while from September when the ITCZ gradually shifts southwards, it results in reduced and less frequent rainfall.

3.5.2 Rainfall

The annual rainfall pattern in the area can be summarized as thus: i) the onset of rainfall is between May to June, a period characterized by wind speeds between 5.5m/s and 7 m/s, ii) a short dry intermittent spell between June-July is experienced as rainfall amount suddenly decline by about 50%, iii) rainfall reaches its peaks during August with more than 250mm associated with decreasing winds, iv) the cessation of rainfall begins in September (above 150mm) to October (less than 50mm) and v) a long dry season that stretches from November to April and characterized by persistence harmattan winds that are derived from the anticyclone systems from up north, vi) annual rainfall varies across the year ranging from 600 to 1200mm. Figure 3. 3 and Figure 3. 4 presents the monthly and annual rainfall patterns of the area.

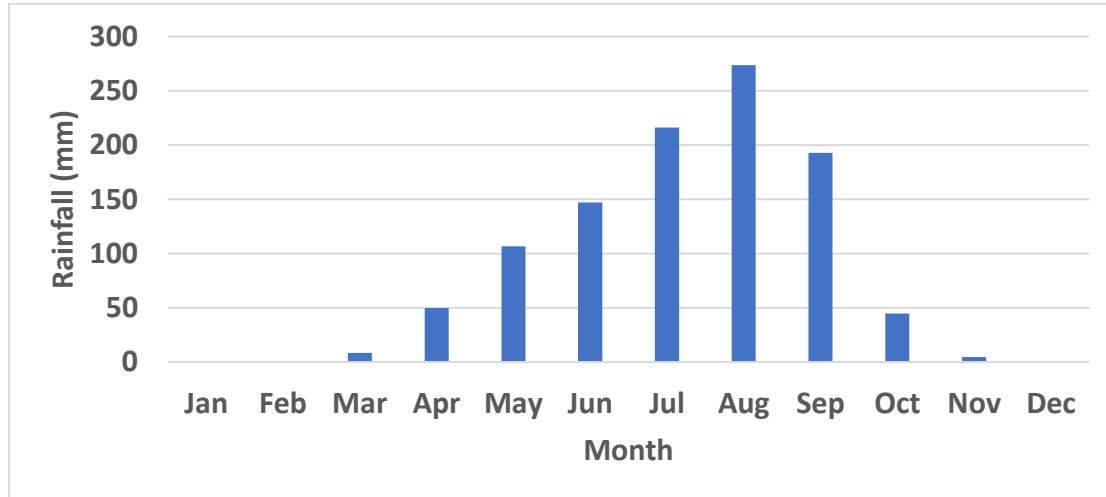


Figure 3. 3: Monthly precipitation at the FCE (Technical) erosion project site.

The rainfall data was sourced from the NASA Langley Research Centre's Power Data Access Viewer (<https://power.larc.nasa.gov/data-access-viewer>), a reliable and extensive repository of climate and weather-related information. Acquiring this data proved to be crucial for the study, as it provided a comprehensive record of precipitation patterns over a significant period of 22 years (2000 to 2022). The decision to rely on this data source was driven by the scarcity and inaccessibility of site-specific meteorological data for the FCE(T) site.

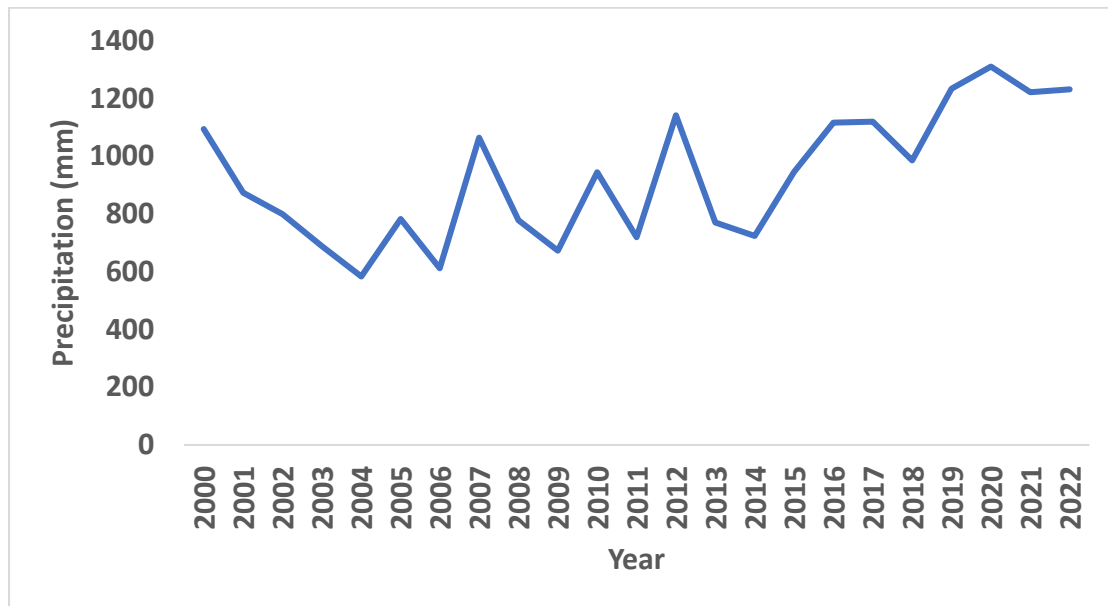


Figure 3. 4: Annual precipitation at the FCE (Technical) erosion project site.

3.5.3 Maximum and Minimum Temperature

The project area including the entire state has a constant high temperature. The data for the temperature was also collected from NASA Langley Research Center's Power Data Access for the period of 22 years (2000-2022). The temperature is presented in Figure 3. 5.

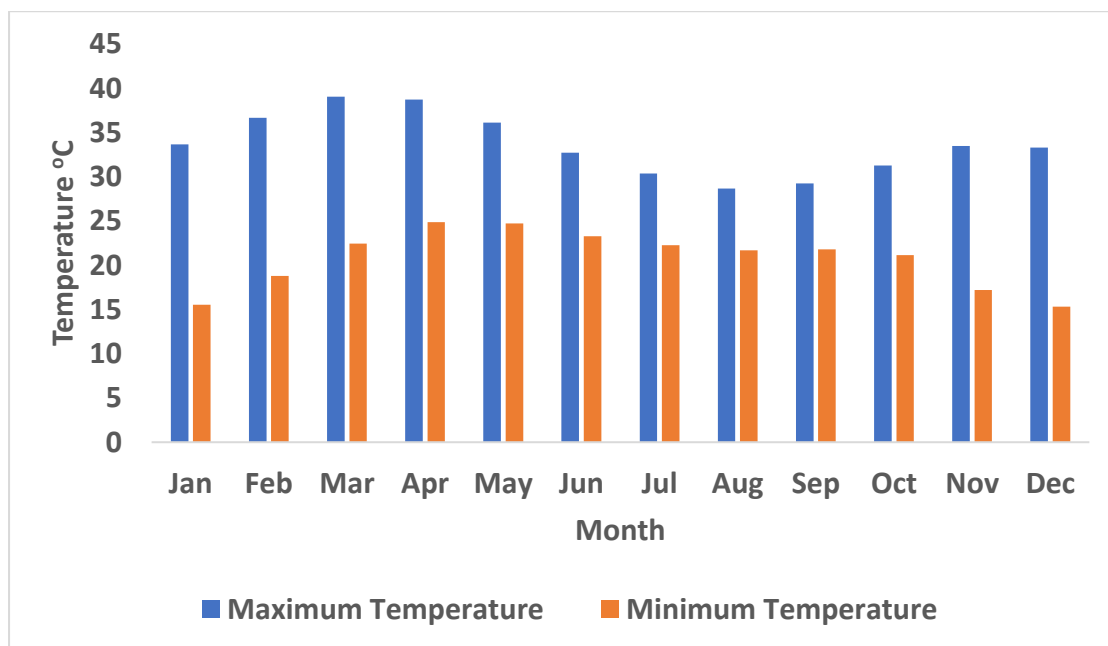


Figure 3. 5: Monthly temperature at the FCE (Technical) erosion project site.

The hottest months (April and May) coincide roughly with the passage of the sun overhead in Nigeria. The lowest temperature occurs around December-January which coincides with the harmattan period.

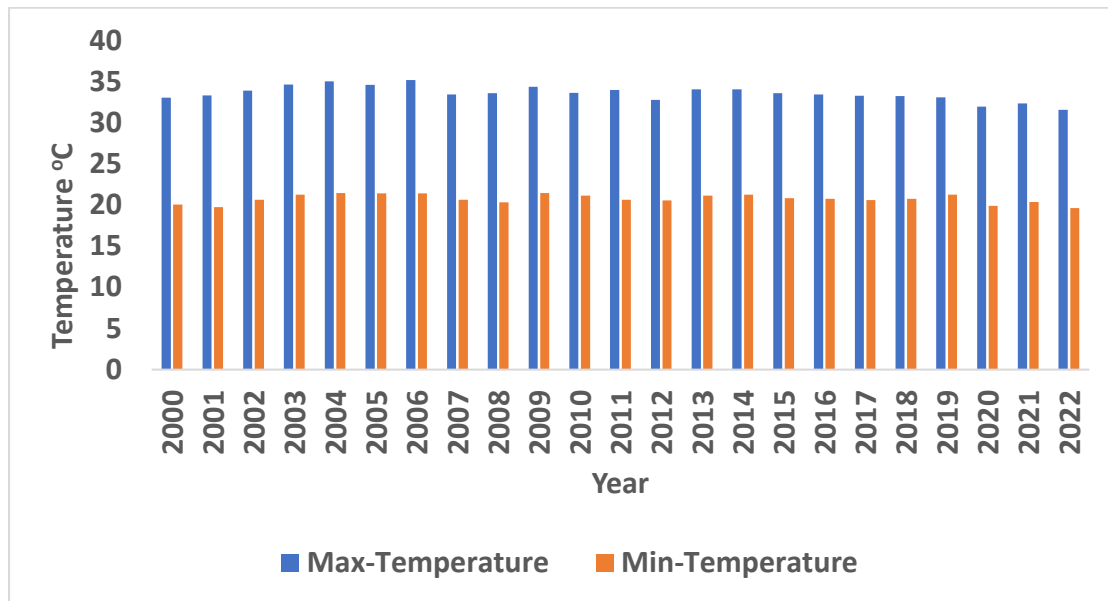


Figure 3. 6: Annual temperature at the FCE (Technical) erosion project site.

3.5.4 Relative Humidity

The area experiences low humidity during January to March. However, as rainfall begins, the humidity starts to increase. The period from July to August corresponds to the highest humidity levels for the project site, aligning with the peak rainfall periods. Figure 3. 7 presents the monthly relative humidity.

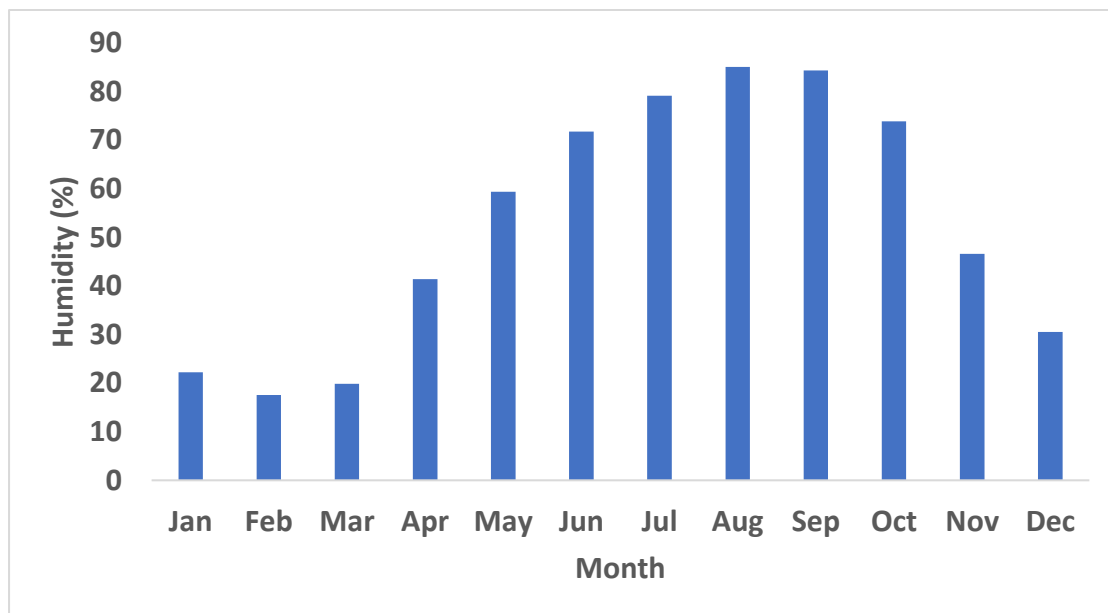


Figure 3. 7: Monthly relative humidity at the FCE (Technical) erosion project site.

As the rainfall diminishes, the humidity also decreases. In August, the highest relative humidity reaches around 70-80%. Detailed information on annual relative humidity in the area can be found on Figure 3. 8. These graphs provide a comprehensive overview of the humidity patterns throughout the year and on a monthly scale.

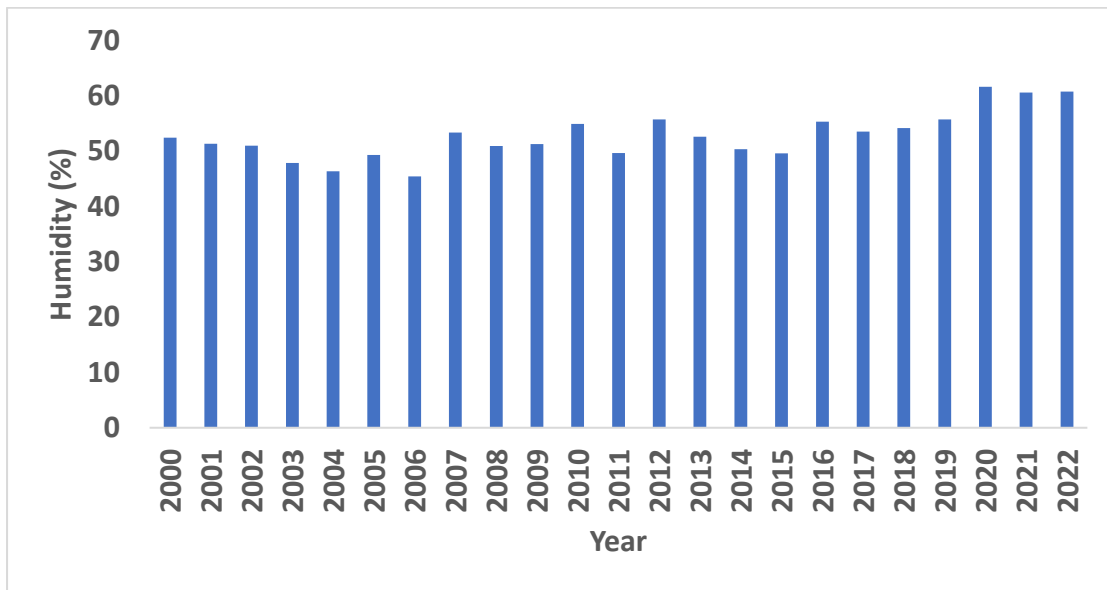


Figure 3. 8: Annual relative humidity at the FCE (Technical) erosion project site.

3.5.5 Wind direction and speed

The prevailing wind is from the Southwest. The wind rose Figure 3. 11 shows the dominant wind direction of 45° with a mean speed of about 5.5m/s (Figure 3. 10). Figure 3. 9 presents the daily wind speed in the area for 22 years. The pattern of the wind speed is similar except for a few years.

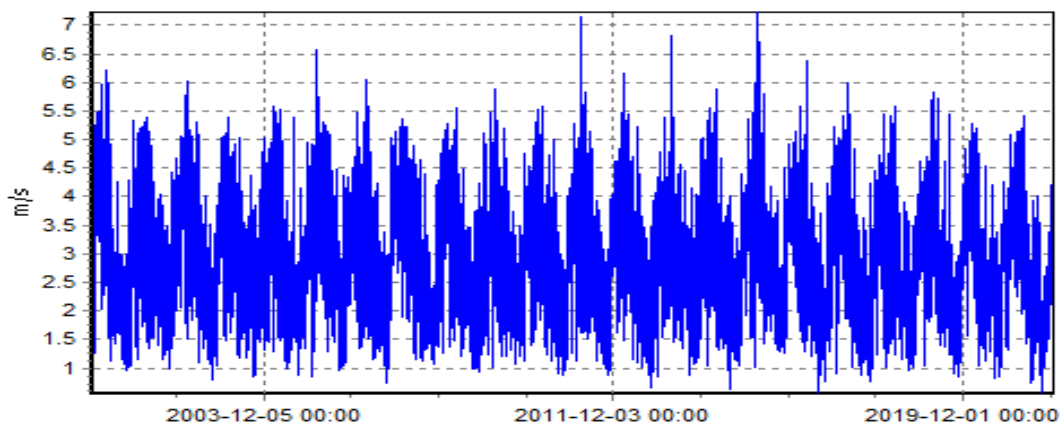


Figure 3. 9: Daily wind speed at the FCE erosion project site.

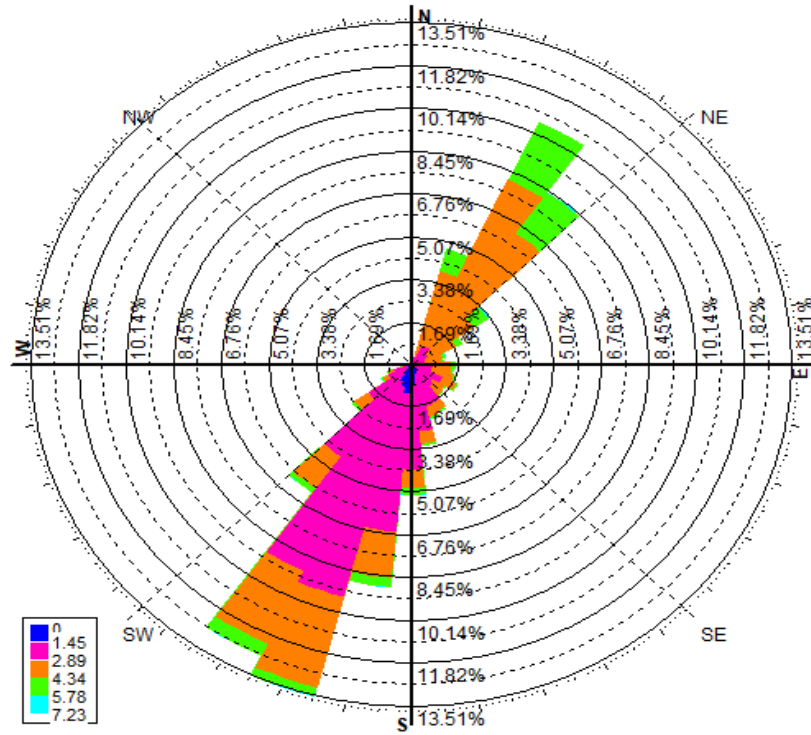


Figure 3. 10: Average annual wind speed in the area.

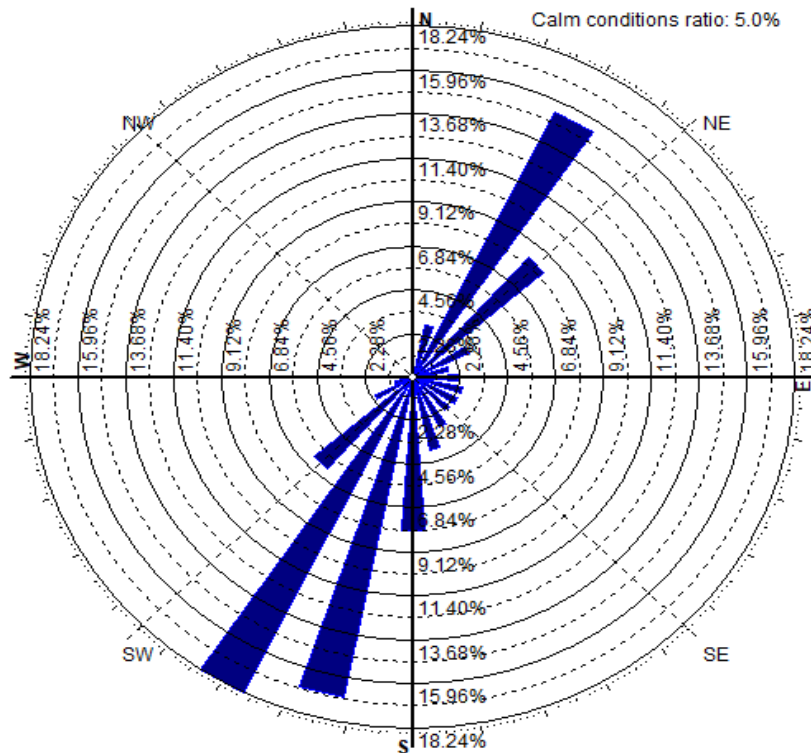


Figure 3. 11: Average annual wind direction in the area.

The wind speeds are at their highest between April and May, which marks the end of the dry season. Conversely, at the peak of the rainy season in July and August, wind speeds are lowest,

measuring between 2.2 and 2.6m/s. From February, wind speeds begin to rise steadily and peak in April, just before the rains begin.

The rate of wind speed can cause deflation, a process where the finest and lightest soil particles are removed from the surface, leaving behind coarser materials. This deflation can result in the exposure of bare soil in gullies, making them more susceptible to water erosion during rainfall events. However, the site experiences a mild wind speed indicating runoff and other factors as the major cause of the gully erosion in the area. The data for the wind speed and direction for the period of 2010-2020 were downloaded from <https://cds.climate.copernicus.eu//>.

3.6 Geology

3.6.1 Local geology

The geology of the area consists of sandstone, shale, and clay, forming the foundational rocks that shape the landscape. Each of these rock types brings unique characteristics and implications to the project's development and environmental considerations. Figure 3. 12 depicts the local geology of the project area. The presence of sandstone, shale, clay, siltstone, and ironstone has significant implications on sheet, rill, and gully erosions, these are forms of soil erosion that lead to the formation of deep channels or ravines in the landscape.

This composition no doubt played a very influential role in the formation, development, and severity of the FCE(T) gully erosion site. Hence by understanding the implications of the different rock types and erosion processes, effective erosion control and management strategies can be implemented to preserve the landscape, protect natural resources, and safeguard the environment.

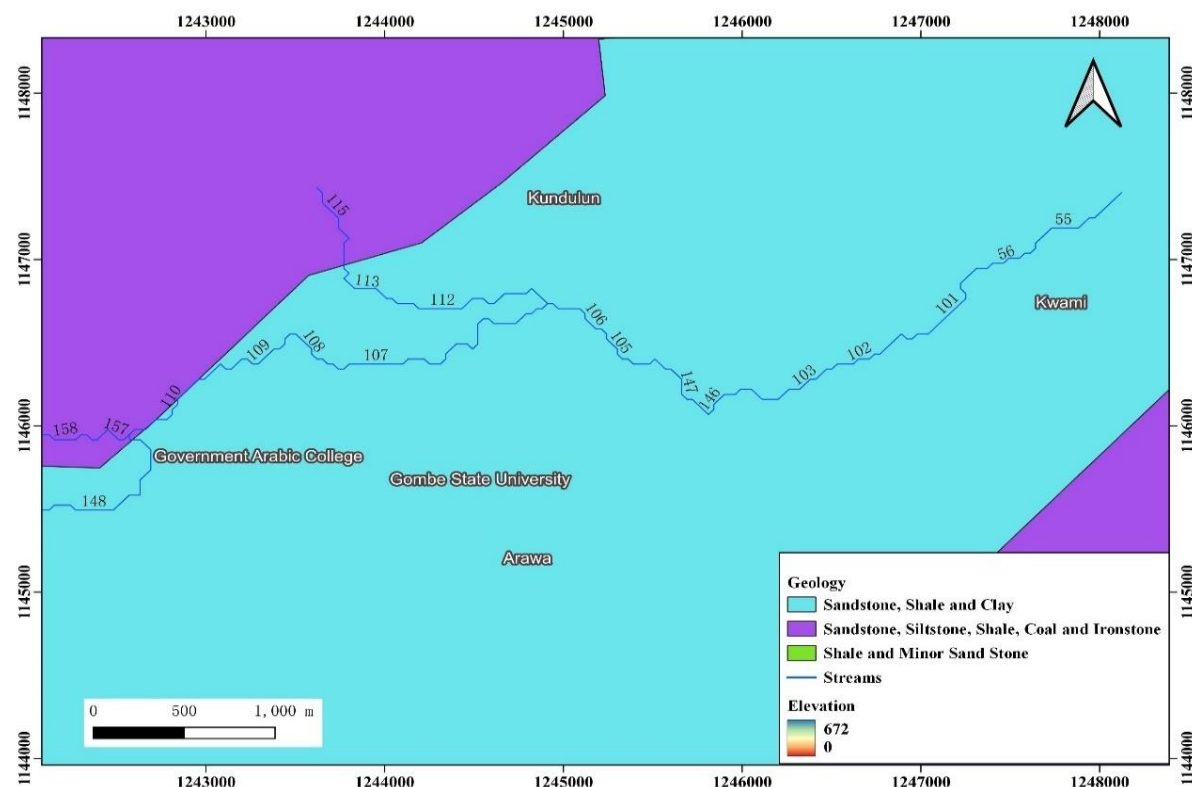


Figure 3. 12: The geology of the intervention site (Source: Mayomi et al. 2017).

3.6.2 Micro Watershed and Hydrological Analysis

The micro watershed(catchment) of the FCE(T) erosion site was delineated, resulting in the identification of 33 sub-catchments. This division allows for a detailed understanding of the drainage patterns and enables a targeted and effective approach towards managing gully erosion within the catchment. Figure 3. 13 illustrates the drainage pattern of the FCE(T) erosion site and highlights the stream ordering of the drainage system within the project area. The stream ordering system provides valuable insights into the hierarchical structure of the river network, aiding in the assessment of flow dynamics and identification of key tributaries and confluence points.

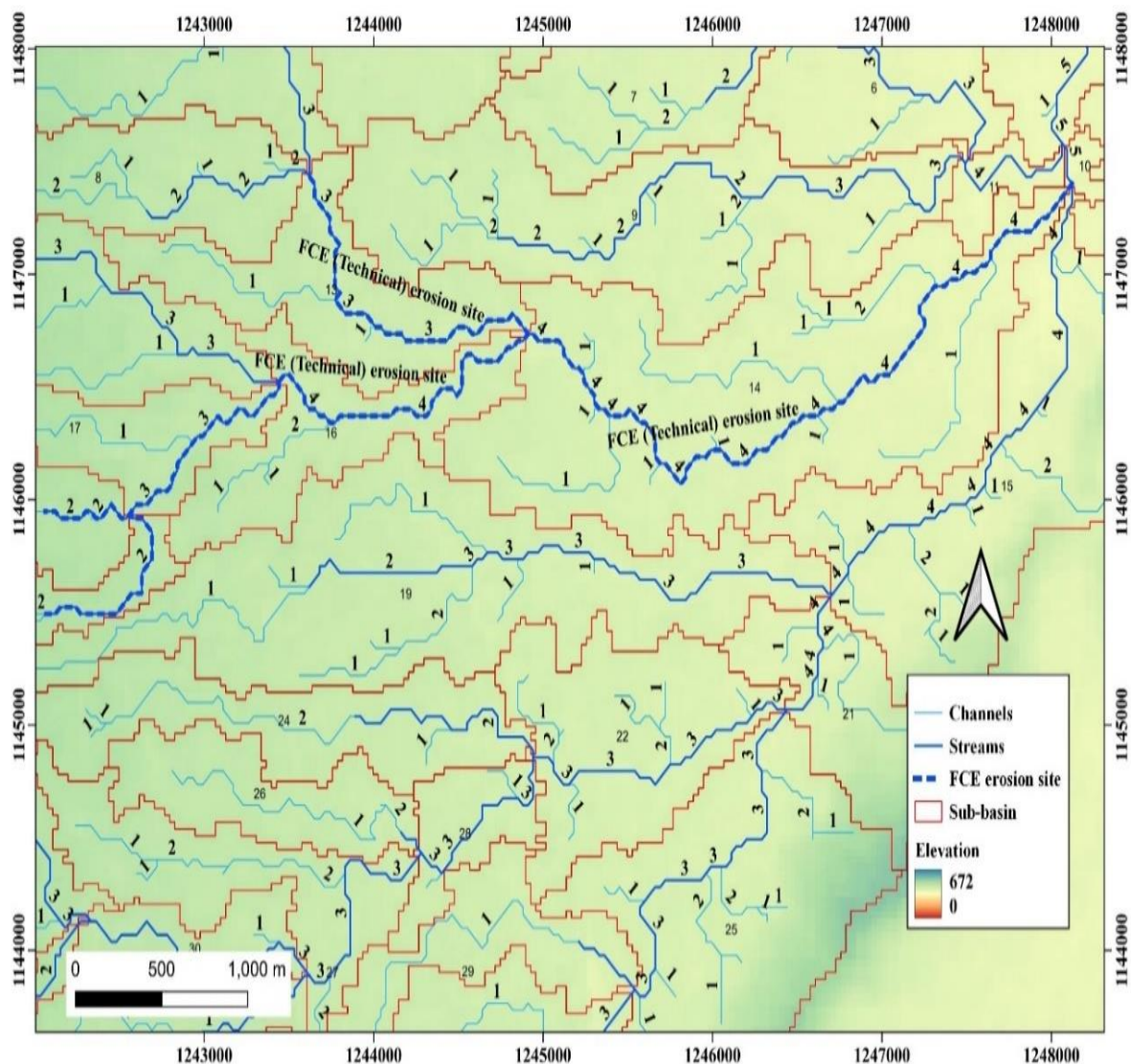


Figure 3. 13: Delineated watershed showing the FCE(T) erosion site and stream order.

At the FCE(T) erosion site, the main river exhibits different stream orders along its course. Downstream, it falls under stream order 2, signifying the convergence of smaller tributaries into a larger river channel. In the mid-stream area, the main river is classified as stream order 3, indicating the further integration of tributaries and an increased stream size. Finally, in the

upper stream region, the main river reaches stream order 4, representing the highest level of hierarchy within the river network.

Understanding the stream order variations along the course of the main river is crucial for effective gully management. It allows for a targeted approach towards addressing erosion issues and implementing appropriate erosion control measures based on the specific characteristics of each stream order. By considering the unique characteristics and challenges associated with each stream order, gully management strategies can be tailored to the specific needs of the affected areas. This informs the capacity of the proposed drainage channels described in Tables 1.1, 1.2, and 1.3 highlighting channel specifications, sizes and setbacks at various locations, and Annex 15 shows the design approach.

3.6.3 Annual Runoff Influxes

To gain further insights into the hydrological dynamics of the micro-watershed, a hydrologic simulation was conducted to assess the runoff outflux from 2000 to 2022. Figure 3. 14 depicts the results of the simulation, providing valuable information on the distribution of runoff within the watershed(catchment).

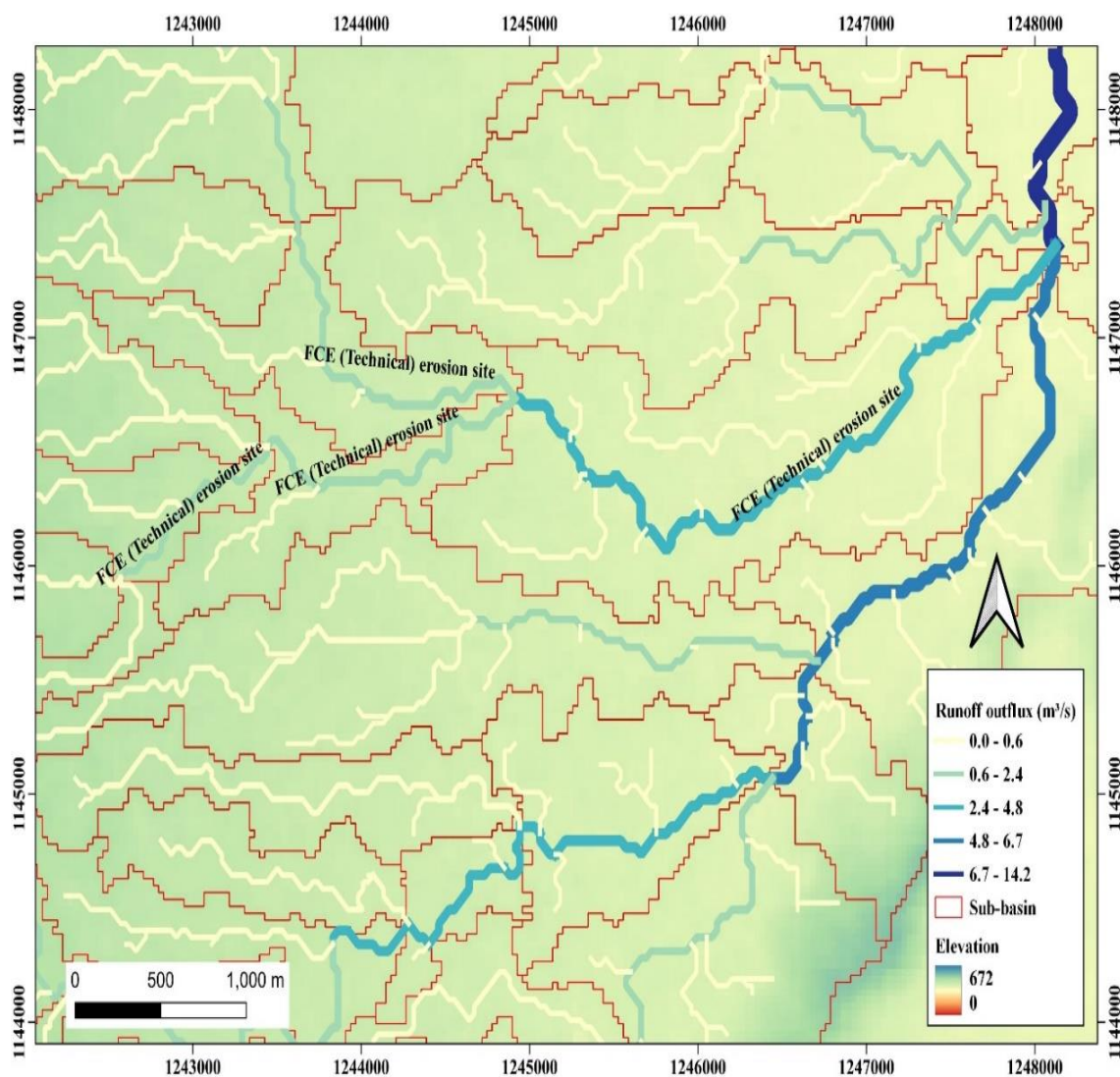


Figure 3. 14: Average runoff outflux in the project area during simulation.

The results revealed distinct patterns in the runoff outfluxes along the main river in the micro-watershed. At the upstream section, near the FCE(T) gully head, the runoff outflux is approximately 0.6 m³/s. This indicates a relatively lower volume of water entering the main river at this point.

The information presented Figure 3. 14 highlights the significance of sub-basin analysis in comprehending the hydrological dynamics of the FCE(T) erosion site. It emphasizes the need to consider the specific characteristics of each sub-catchment, such as topography, land use, and soil composition in implementing appropriate management practices. By identifying the sub-catchment with the highest runoff contributions, priority areas for erosion control measures can be determined, helping to reduce sedimentation and preserve the integrity of the main river.

3.6.4 Sediment Analysis

For a proper understanding of sediment influx and outflux in the sub-catchments, names were assigned to adjoining channels in the gully system. Figure 3. 15 provides a visual representation of these channels. Notably, cha055 and cha056 both in Kagarawal demonstrate similar sediment influx and outflux values, suggesting a balanced sediment load and effective sediment transport within these channels (see

Table 3. 1).

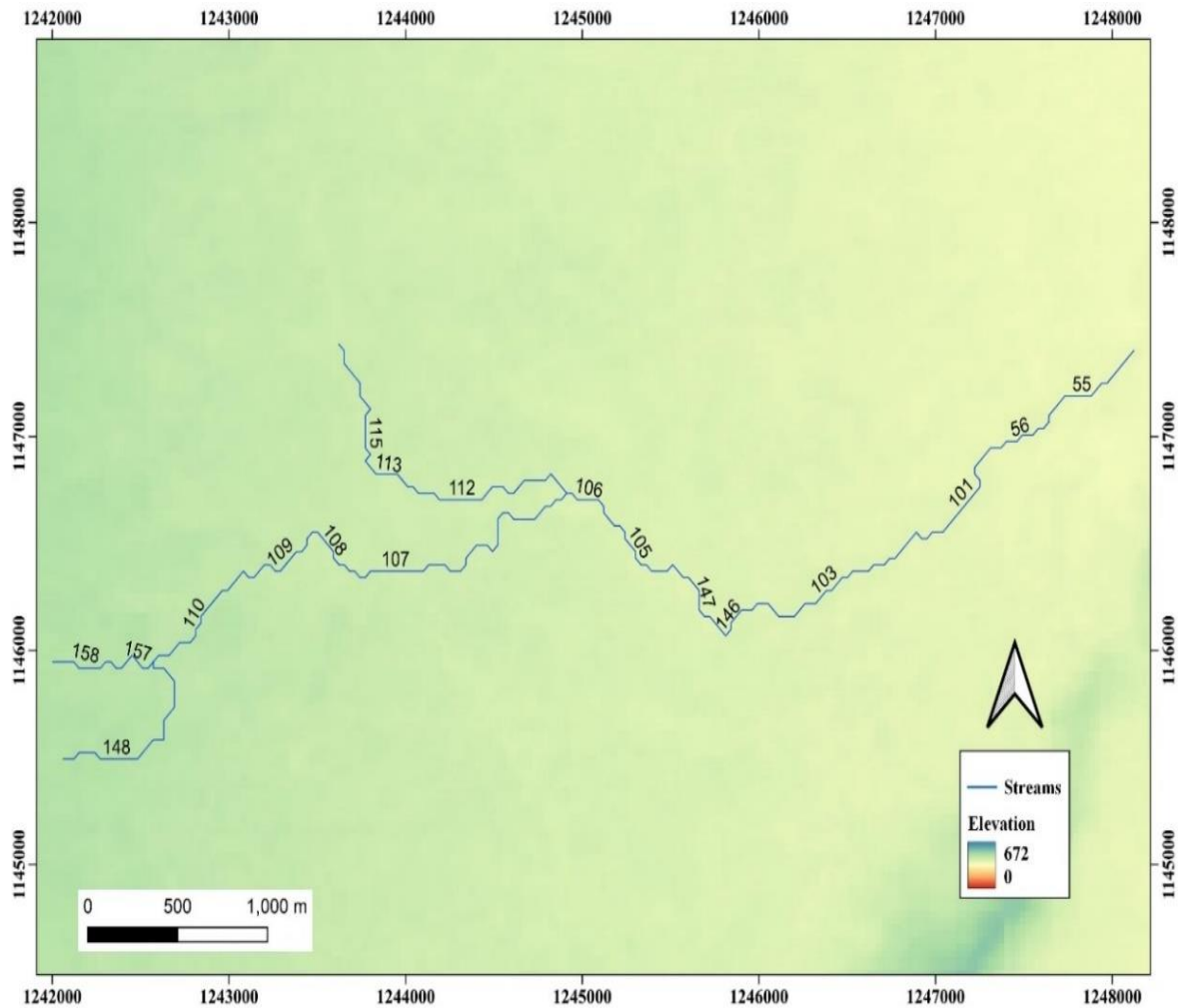


Figure 3. 15: Analysis of sediment load in the gully Channels at the FCE(T) erosion site.

In contrast, cha115 exhibits significantly higher sediment outflux compared to the influx, indicating efficient sediment transport and a relatively lower sediment retention capacity. This suggests that cha115 acts as a channel with high sediment export, potentially contributing to sediment deposition downstream. Additionally, channels such as cha109 and cha110 display relatively high erosion in the channel bank. This indicates ongoing bank erosion processes, which can lead to channel instability and exacerbate sediment-related issues.

The observed variations in sediment dynamics and erosion patterns among the channels highlighted the spatial heterogeneity within the catchment. This is valuable for identifying channels prone to erosion, identifying potential sediment sinks, and determining areas that require specific erosion control measures or bank stabilization efforts.

Comprehending the sediment dynamics and erosion patterns in each channel is pivotal for effective gully erosion management. By targeting channels with high sediment influx, addressing erosional processes in the channel bottom and bank, and implementing appropriate erosion control measures, it is possible to safeguard the overall health and stability of the catchment. Through these actions, the potential impacts of gully erosion can be mitigated, preserving the integrity of the channels, and ensuring the long-term sustainability of the catchment.

Table 3. 1: Sediment influxes and outfluxes at the FCE(T) Technical erosion site.

Channel name	Sediment influx (tons)	Sediment outflux (ton)	Erosion in channel bottom (ton)	Erosion in channel bank	Community
cha055	19060	9564	0	34.53	Kagarawa Runde
cha056	19670	9855	0	19.91	kagarawal
cha066	16.9	9346	1256	6160	Mallam Inna
cha101	27450	13770	0	46.15	Arawa
cha102	14520	7268	0	7.042	Arawa B
cha103	22370	11220	0	34.55	Arawa B
cha104	70350	35180	0	3.332	Jauro Yaya
cha105	121000	60520	0	8.649	Arawa B
cha106	227500	113800	0	19.32	Jauro kuna
cha107	137600	119400	8003	42610	Jauro kuna
cha108	233000	116500	0	8.977	Koranzaki
cha109	148900	127200	7569	45170	Koranzaki
cha110	131300	81410	2392	13390	Alkahira
cha112	154700	108300	4996	25920	Alkahira
cha113	273600	138400	278.7	1300	Wuroladde
cha115	28600	220100	25500	180300	Wuroladde
cha146	36940	18490	0	21.43	Jauro Abare Nahuta
cha147	58240	29140	0	22.11	Jauro Abare Nahuta
cha148	45680	113400	11660	78850	London Maidoruwa
cha157	34850	18030	108.1	494.4	London Maidoruwa
cha158	64710	34890	424.8	2112	FCE(T)
cha178	30.08	15.04	0	0.001572	FCE(T)

3.7 Morphometry Analysis of Gullies

3.7.1 Width, depth, and length

The morphometric analysis provides important insights into the physical characteristics of the gully channels. These measurements help in understanding the channel's capacity to carry water and sediment, its potential for erosion and deposition, and its contribution to the overall flow and sediment dynamics within the watershed.

By considering the morphometric parameters alongside other factors such as sediment influx, outflux, and erosion patterns, it is possible to assess the relationship between channel morphology and sediment dynamics. This information is crucial for designing effective erosion control measures, channel maintenance strategies, and overall watershed management.

In conclusion, the morphometric analysis of the FCE(T) gully channels offers valuable information on its width, depth, and length, hence providing a better understanding of the channel's capacity, stability, and potential contributions to sediment transport. Incorporating this knowledge into erosion management plans and channel maintenance efforts can help preserve the integrity of the channels and ensure the long-term sustainability of the catchment. Table 3. 2 present some characteristics of the FCE(T) channel morphology. Thus, Channels like cha109 and cha115

demonstrate substantial width and depth values suggesting the potential for higher water and sediment-carrying capacity.

On the other hand, channels like cha108 and cha178 displayed smaller widths and depth, indicating narrower and shallower channels. The length of the channels also varies, with some channels like cha109 and cha112 being relatively longer compared to others (see Figure 3. 15).

Table 3. 2: Characteristics of channel morphology at FCE(T) erosion site.

Name	Width (m)	Depth (m)	Length (m)	Community
cha055	7.451	0.3691	636.6	Kagarawal Runde
cha056	7.25	0.3626	380.5	Karawal
cha066	7.74	1.863	1441.6	Mallam Inna
cha101	7.102	0.3577	905.4	Arawa
cha102	6.842	0.3494	145.3	Arawa B
cha103	6.811	0.3481	713.7	Arawa B
cha104	6.488	0.3369	72.6	Jauro Yaya
cha105	6.459	0.3356	188.5	Arawa B
cha106	6.405	0.3336	423.5	Jauro Kuna
cha107	21.35	3.54	1498.4	Jauro Kuna
cha108	3.951	0.2416	418.7	Koranzaki
cha109	28.7	6.116	691.9	Koranzaki
cha110	20.27	4.304	521.7	Alkahira
cha112	18.82	3.079	1039	Alkahira
cha113	11.9	1.763	290.5	Wuro Ladde
cha115	44.58	10.32	656.4	Wuro Ladde
cha146	6.721	0.3449	448.7	Jauro Abare Nahuta
cha147	6.656	0.3425	466.7	Jauro Abare Nahuta
cha148	24.62	7.241	1106.1	London Maidoruwa
cha157	6.54	1.301	273.2	London Maidoruwa
cha158	9.016	2.023	397.9	FCE(T)
cha178	0.2463	0.04294	30	FCE(T)

3.7.2 Slope and Gully Shape

Figure 3. 17 displays the longitudinal slope height, revealing that the elevation difference between the gully head and the bottom is approximately 200 meters. This indicates a significant change in elevation along the gully profile, with a steeper slope at the gully head and a gentler slope towards the bottom. The variation in slope height influences the velocity of water flow and sediment transport within the gully channel.

Figure 3. 18 depicts the slope characteristics of the site, showing higher slopes in the upper stream region and gradually decreasing towards the downstream area. This pattern suggests that the gully experiences more significant erosion and sediment transport in the upper catchment, but gradually diminishes as it approaches the lower catchment.

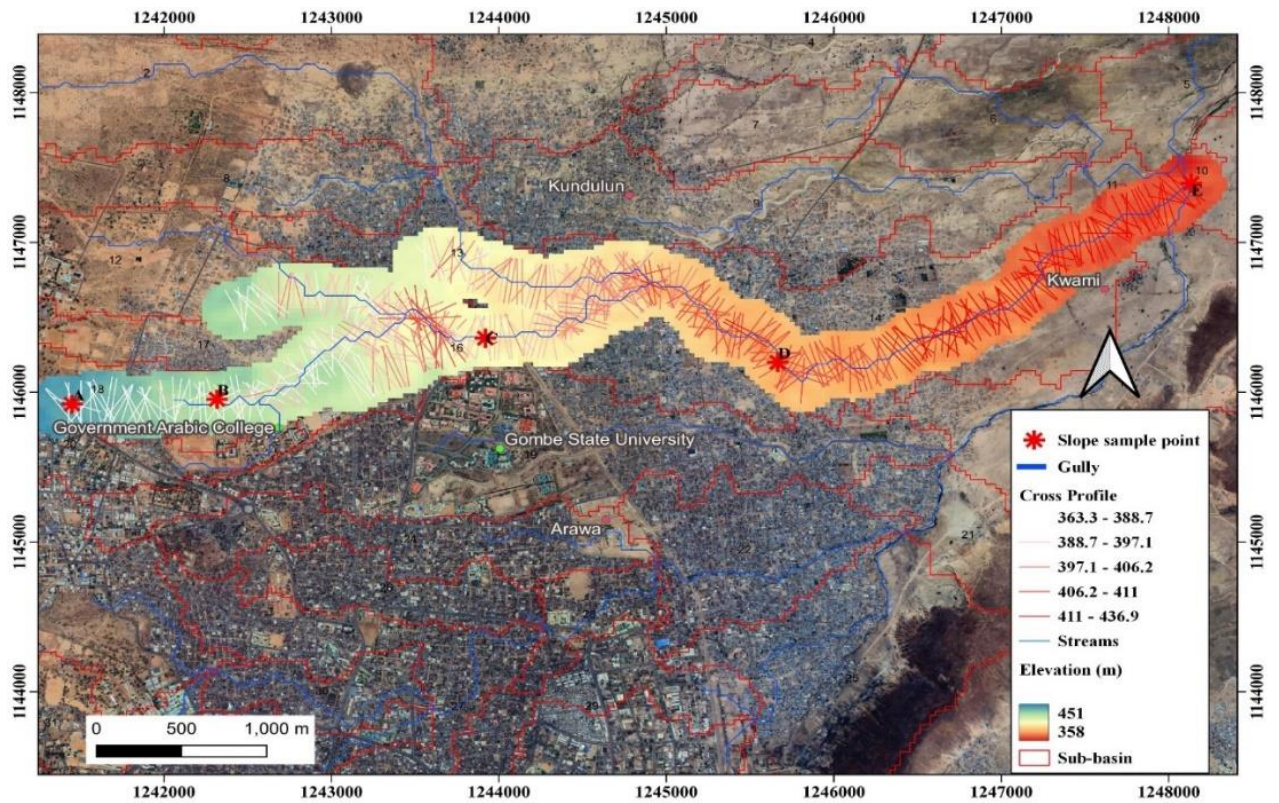


Figure 3. 16: Cross profile of the gully at FCE(T) erosion site.

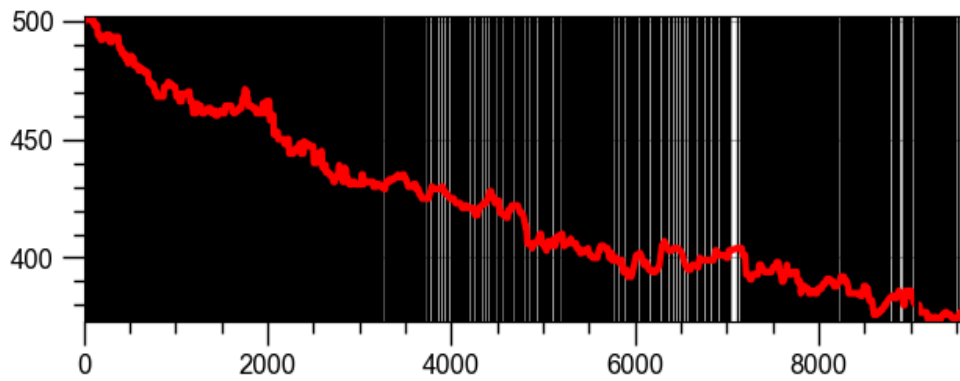


Figure 3. 17: Slope height of FCE(T) erosion site.

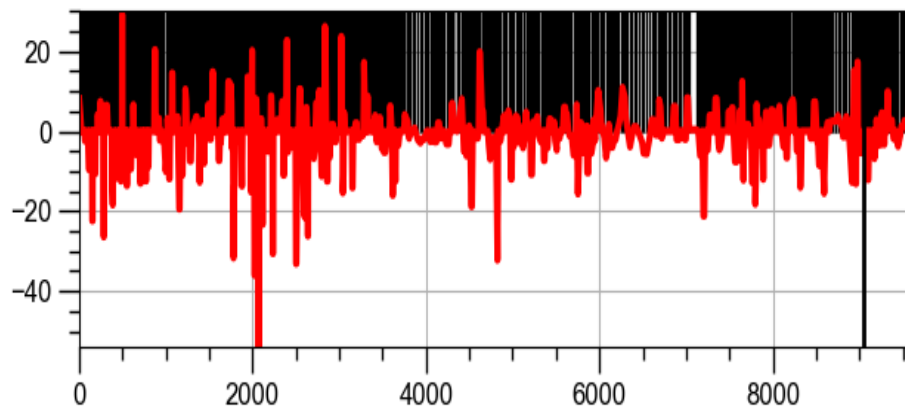


Figure 3. 18: Slope characteristics of FCE(T) erosion site.

Understanding the slope characteristics is essential for comprehending the erosion processes and sediment dynamics within the gully system.

Figure 3. 19 to Figure 3. 23 illustrate the gully shape at five sampling sites. Site A and B are characterized by a V-shape, indicating steep and narrow incisions. These sections of the gully exhibit deeper erosion and incision compared to the mid and lower stream sections. Conversely, sites C, D, and E show a U-shape, indicating wider and less pronounced incisions.

The differences in gully shape at different sampling sites highlight variations in erosion intensity and sediment transport dynamics along the gully profile. By analyzing the longitudinal slope height, slope characteristics, and gully shape, a more comprehensive understanding of the gully system at the site can be gained. These factors provide valuable insights into the erosional processes, sediment transport patterns, and the overall evolution of the gully.

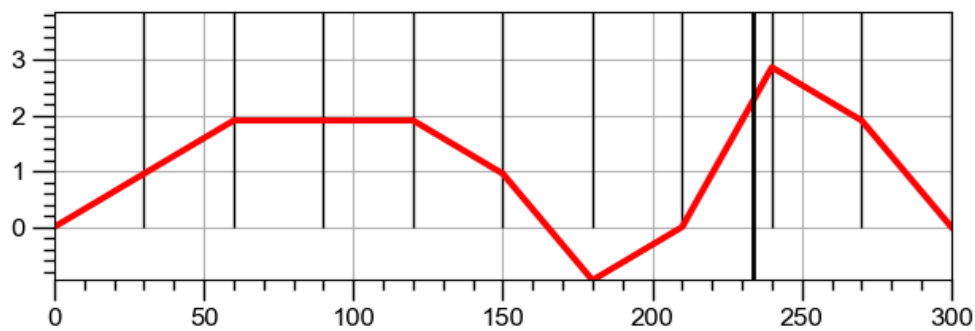


Figure 3. 19: Gully shapes at FCE(T) erosion site A. The V-shape indicates a steep and narrow incision channel bed.

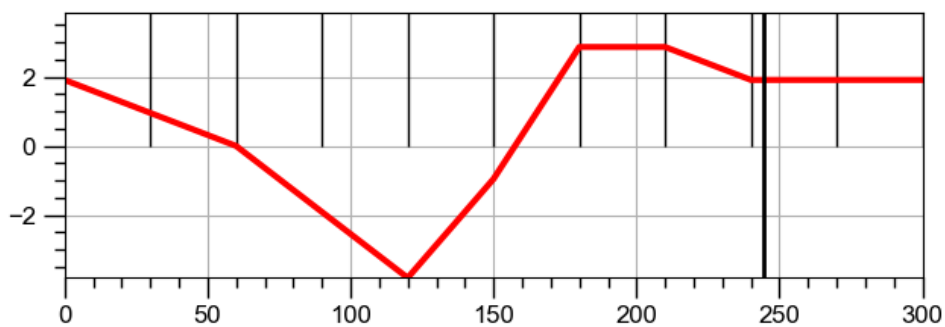


Figure 3. 20: Gully shape at FCE(T) erosion site B. The V-shape indicates a steep and narrow incision channel bed.

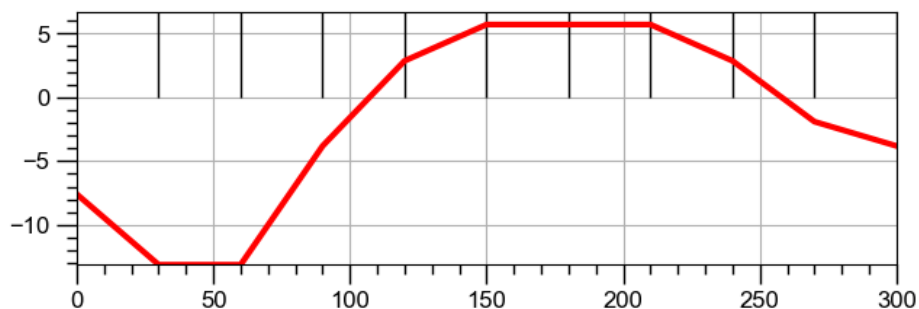


Figure 3. 21: Gully shapes at FCE(T) erosion site C. The U-shape indicates a wide and less pronounced incision channel bed.

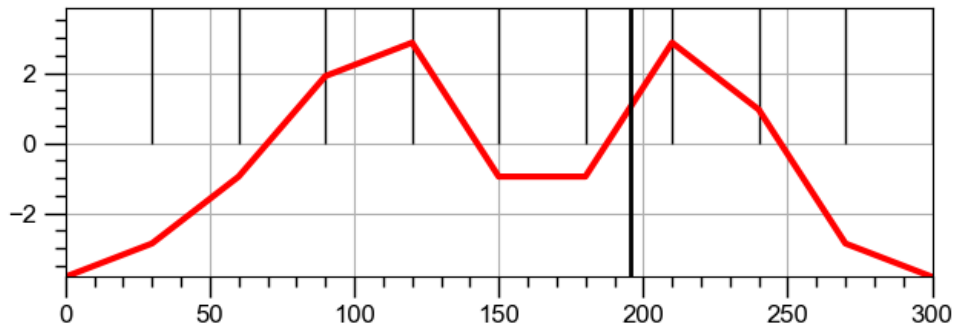


Figure 3. 22: Gully shapes at FCE(T) erosion site D. The U-shape indicates a wide and less pronounced incision channel bed.

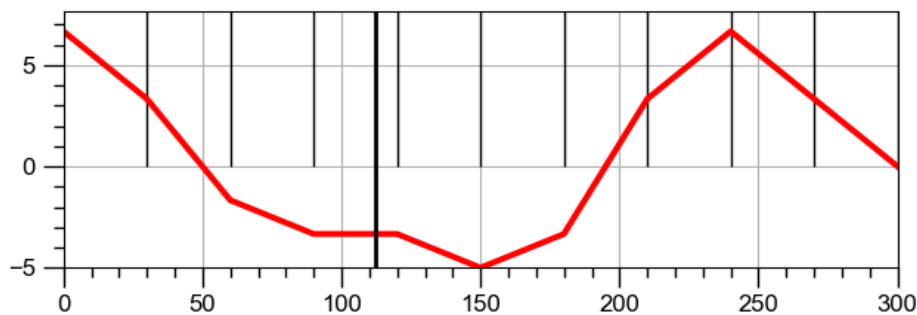


Figure 3. 23: Gully shapes at FCE(T) erosion site E. The U-shape indicates a wide and less pronounced incision channel bed.

This information is essential for implementing effective erosion control measures, stabilizing the gully banks, and mitigating sedimentation downstream. By considering the morphometric analysis, slope characteristics, and gully shape, a holistic approach to gully erosion management can be adopted. Implementing erosion control practices, such as terracing, vegetation planting, and sediment trapping structures, can help mitigate erosion, stabilize the gully banks, and promote sustainable water and sediment management within the catchment.

3.8 Water Quality Assessment

To assess water quality, several characteristics of the water are typically looked at. These include physical properties (such as water clarity-turbidity and temperature), and the concentration of various chemical substances (including nutrients, metals, minerals, and pollutants from human activities). Taken together these measurements indicated the status of the water in terms of quality and, importantly, how it changes over time. In assessing water quality, it is helpful to know what "normal" levels are for key characteristics in any given water sample. This provides a baseline for comparison to detect and understand the impacts of development activities, climate change or restoration efforts.

3.8.1 Surface and Groundwater Sampling Procedure

The groundwater was collected from the available boreholes and open hand-dug wells within the project area of influence and was then put into a plastic bottle (see Plate 3. 5), the bottles were

rinsed with distilled water to avoid contamination, it was then labelled with unique codes for easy identification. Five (5) samples were collected at convenience from the available sources of boreholes and hand-dug wells. Figure 3. 24 presents the surface water sampling points.

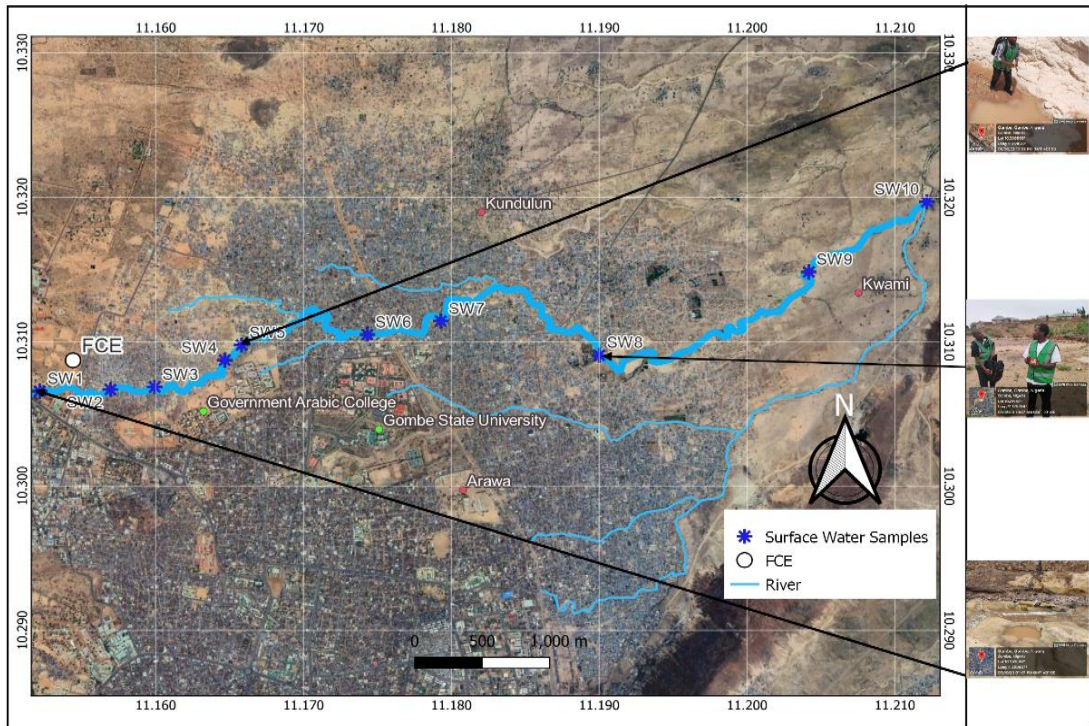


Figure 3. 24: Surface water sampling points.



Figure 3. 25: Groundwater sampling points.

The surface water was collected (as in Figure 3. 24) at an available source found in the gully potholes along the project area of influence, while ten (10) samples were collected for surface water (Figure 3. 25). The samples were collected in a plastic bottle and labelled with unique codes, hence a total of fifteen samples were collected for both surface and groundwater (i.e., 10 samples from surface water and 5 samples from groundwater). These were sent to the soil and water laboratory of Bayero University, Kano for analysis.

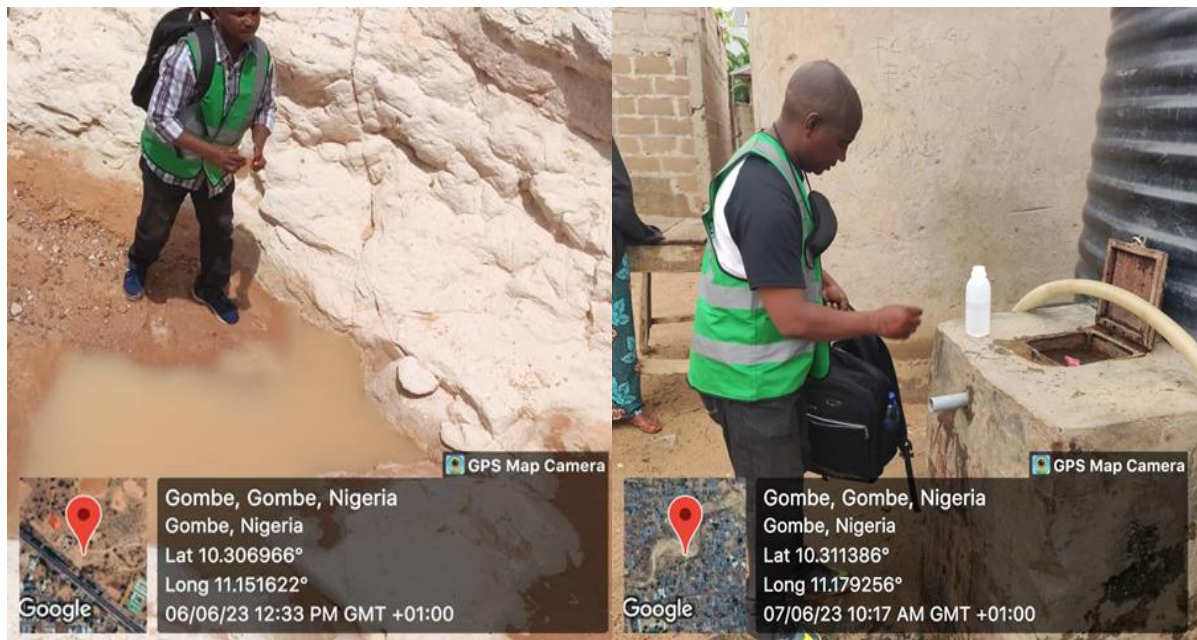


Plate 3. 5: Team members collecting surface and groundwater samples.

3.8.2 Results of Surface Water Assessment

The results of the surface water (analysis) quality parameters are presented Table 3. 3 and discussed in the following:

a) pH

pH defines the acidity or alkalinity of water on a scale of 0 (strongly acidic) to 14 (strongly basic), while in the middle 7 marks the neutral (like in pure water) point. The result of the surface water analysis was between 6.79 and 7.61, and on average 6.61 (Table 3-3), which is within the normal limit of the WHO and NESREA. Although the surface water is a little alkaline in some areas, this is not far from the permissible limits of 6.5 to 8.5 of NESREA 2007 and WHO 2006.

b) Surface Water Temperature

Temperature is a measure of the warmth or coldness of water. Temperature influences the types and presence of aquatic life in water, influences water's ability to readily mix, and influences the amount of dissolved oxygen in water (colder water holds more oxygen than warm water). The result of the analysis shows that the values of temperature range between 23.2°C and 25.9°C.

a) Electrical Conductivity

Electrical conductivity measures electricity flows through water. Like metal, water conducts (transport) electricity because there are dissolved salts in it. The values for electrical conductivity of water are an index of the total dissolved solids in it, and it ranges from 142 to 1763 $\mu\text{S}/\text{cm}$ as in Table 3. 3. The average value of the surface water samples was found to be 571 $\mu\text{S}/\text{cm}$ which is below the WHO guidelines of 1400 $\mu\text{S}/\text{cm}$. The highest value of 1761 $\mu\text{S}/\text{cm}$ can be attributed to domestic sewage discharge from households and refuse dumping along the gully channel.

This suggests that the surface water is of good quality. Electrical conductivity generally ranges from 0 to 200 $\mu\text{S}/\text{cm}$ in some water, while in major waters, conductivity may be as high as 1000 $\mu\text{S}/\text{cm}$. Very high conductivity. (1000-10,000 $\mu\text{S}/\text{cm}$) is an indication of saline (salty) conditions which is a characteristic of the observed results because of the baseline geology and pollutants from households. Electrical conductivity (EC) would not have any impact on the proposed project it is hoped to reduce the EC because the water would no longer pass through the baseline geology but rather flow through the concrete surface.

a) Hardness(T)

Hardness is a measure of dissolved minerals in water, primarily calcium and magnesium. The types of rocks in the geological formation (and the minerals they contain) in an area influence the hardness of the water. For example, limestone is rich in calcium and is easily eroded by water. The result shows that the hardness of the surface water is between 117 mgL^{-1} and 1,094 mgL^{-1} Table 3. 3 showing an average of 380 mg/L . The water is hard because of the underlying geology of the area with few points giving values that are very low compared with the WHO standards of 200 mg/L , thereby implying that the water is safe.

a) Cations

The major cations (Na and Ca) determined are low compared to the WHO permissible limits of 200 and 75 mg L^{-1} for sodium (Na) and calcium (Ca) in water, respectively. Although, these cations may not pose serious health problems, excess contents above threshold values may impact the taste of water. In general, groundwater often has higher hardness than surface waters because it is in close contact with rocks and minerals for long periods. Water hardness also reduces the toxicity of some metals to aquatic life.

b) Turbidity

Turbidity measures the cloudiness of water. It is of general concern in water due to its aesthetic consideration, filterability, and disinfection. The turbidity level of the surface water ranged from 2.0 to 6.0 NTU which is above the acceptable level of 1.0 NTU set by the FMEnv. No significant health implication has however been attributed to turbidity in drinking water.

c) Total Suspended Solids (TSS) and Total Dissolve Solids (TDS)

TSS and TDS measure the amount of particulate matter in water, which may include particles from algae, other organic matter, silt and clay, and inorganic substances (such as minerals, salts, and metals). These particles, or 'solids', can be divided into two types by passing the water through a filter. The particles that are large enough to be held back by the filter are called total suspended solids (TSS), while the particles that pass through the filter are called total

dissolved solids (TDS) and are often related to conductivity, salinity, alkalinity and measure of hardness.

Table 3. 3: Result of surface water quality parameters.

Samples	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
Physio-chemical parameter										
PO ₄ (mg/L)	9.14062	9.140625	18.89063	9.75	15.23438	10.96875	21.9375	24.375	29.25	15.23438
SO ₄ (mg/L)	0.52425	0.203875	1.237813	0.276688	0.1165	0.364063	0.393188	0.334938	0.364063	0.131063
TH (mg/L)	709.8	165.75	220.35	1093.95	555.75	247.65	117	167.7	138.45	399.75
Cl(mg/L)	191.7	99.4	102.95	216.55	429.55	188.15	81.65	71	92.3	99.4
TSS (mg/L)	52	72	396	62	58	80	14	240	12	70
TDS (mg/L)	230	532	353	51.4	101.3	257	119.6	152.2	190.9	245
pH	7.36	7.61	7.48	6.93	6.79	7.33	7.56	7.48	7.53	7.31
E.C(μs/cm)	883	168.9	267	1169	1763	396	141.9	151.5	201	339
Na(ppm)	2.125	0.875	0.875	2.75	3.5	1.5	0.75	0.75	0.875	1.375
Heavy metals										
Cu(ppm)	0.027273	0.236364	0.018182	0.027273	0.163636	0.009091	0.036364	0.054545	0.027273	0.018182
Cd(ppm)	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.02
Fe(ppm)	0.011111	0.007407	0.066667	0.011111	0.003704	0.011111	0.092593	0.077778	0.066667	0.014815
Pb(ppm)	0.008696	0.013043	0.004348	0.004348	0.008696	0.013043	0	0	0.004348	0.021739
Zn(ppm)	0.005556	0.008333	0.002778	0.005556	0.005556	0.008333	0.016667	0.005556	0.002778	0.002778
Mn(ppm)	0.01	0.01	0.035	0.17	0.025	0.045	0.165	0.135	0.115	0.015

The suspended solids consist of inorganic fractions of silt, clay, calcium, potassium, bicarbonates, and chlorides etc. organic fractions such as algae, zooplankton, bacteria and detritus or immiscible liquids such as oil and grease that impart turbidity characteristics of water in a water column.

The total suspended solid of the surface water ranges from 12 mg/L to 396 mg/L (Table 3. 3), being the extreme value in the analyzed results. The high concentration is consistent with the high turbidity value recorded for groundwater in the same sampling stations, which may be attributed to the exposure of the surface water. It is important to note that Total the TSS values are often related to the turbidity (cloudiness) of water, thus if TSS is high, and the water is murky then sunlight cannot travel well through the water, making it difficult for plants and algae to grow. This, in turn, can reduce productivity and oxygen generation. The analyzed values of the TDS in the surface water samples were between 51.4 and 532 mg/L as shown in Table 3. 3. The water quality samples showed an exceedance in Turbidity, an indication of the amount of erosion occurring within the catchment, transporting a high volume of sediments.

d) Iron-(Fe)

The results of surface water analysis Table 3. 3 indicate that the concentration of iron is between 0.001 to 0.025 mg/L, which is lower than the WHO threshold value of 0.3 mg/L. High concentrations of iron may cause severe health problems like liver cancer, diabetes, cirrhosis of the liver, diseases related to heart and central nervous system, infertility etc. The presence of high concentration of iron could also lead to adverse changes in color, odor and taste of water and stains clothes and utensils.

e) Manganese-(Mn)

The Mn concentration of the water samples is 0.01 to 0.17ppm, with an average value of 0.08ppm as shown in Table 3. 3, which is within the WHO and FMEnv permissible limit of 0.1ppm. The high level of manganese in the surface water may be attributed to the parent rock material, which contains high levels of manganese.

f) Chromium-(Cr)

The chromium concentration in the water samples ranges from 0.01 to 0.07 mg/l, which is above the minimum standard of 0.0001mg/l by NESREA. The high values of Cr can be attributed to both anthropogenic and natural sources. High values of Cr in drinking water can lead to carcinogenic effects, besides Cr has been firmly established to cause human respiratory concerns.

g) Cadmium-(Cd)

Cadmium is one of the heavy metals found in water, its concentration in the analyzed surface water samples ranges from 0.01 to 0.02ppm as in Table 3. 3, which is within the NESREA standard of 0.02ppm. This means the water is not toxic, but beneficial for human consumption, life forms and for irrigation purposes.

h) Copper-(Cu)

Copper is a naturally occurring metal found in rock, soil, water, and sediment. The amount of copper in water depends on the type and amount of minerals in the parent materials, the water

temperature, and its acidity. The result of the surface water samples in Table 3. 3 shows that the concentration of Cu ranges from 0.009 to 0.236ppm, which is below the permissible standard /limit of 0.5ppm approved by the WHO and FMEnv. Excess Cu can be detrimental to human health.

i) Zinc-(Zn)

The concentration of Zn in the analyzed surface water samples range from 0.003 to 0.017ppm (Table 3. 3). The result clearly indicates that the concentration of Zn is normal when compared with the approved WHO standard of 1500ppm. Excess Zn could be very detrimental to human health.

j) Lead (Pb)

Lead is one of the most harmful heavy metals sometimes found in water. The result in Table 3. 3 indicates the value of lead to range from 0.00435 to 0.01304ppm. This value is far below the recommended permissible limit of 1.0ppm set by WHO and FMEnv, 2011, therefore the water is safe.

k) Calcium-(Ca)

As a result of the natural occurrence and abundance of calcium in nature, it occurs naturally in water. Ca is a major determinant of water hardness. The measured value of Ca ranges from 45.59 mg/L to 73.48 g/L, which is above the FMEnv permissible limit (75mg/l) but consistent with the high total hardness value recorded in previous water samples from similar sources.

l) Sulphate (SO₄)

The concentration of Sulphate as indicated in the results of surface water analysis in Table 3. 3 range from 0.13 to 1.4 mg/L. This is lower than the 250mg/L standard approved by the WHO/FMEnv. In excess could be detrimental to human health.

m) Chlorine (Cl)

The value of Cl ranges between 71 and 429.45mg/l, on average is 216.55mg/L and 188.15mg/L. The concentration of Cl in water can be attributed to the indiscriminate dumping of solid waste and discharge of domestic sewage from households in the gully (see Plate 3. 6). Public drinking water standards require chloride levels not to exceed 250mg/l. Chlorides can contaminate freshwater streams and lakes. Fish and aquatic communities cannot survive in high level of chloride. Chloride may get into surface water from several sources including: rocks containing chloride, agricultural run-off, wastewater from industries and effluent wastewater from wastewater treatment plants. The higher values of both physical and chemical properties in surface water can be easily attributed to some anthropogenic activities like open dumping of waste, sewage discharge from households, as well as runoff of water that washes away some geological formations thereby increasing the concentration of minerals, metals, ions, among others.

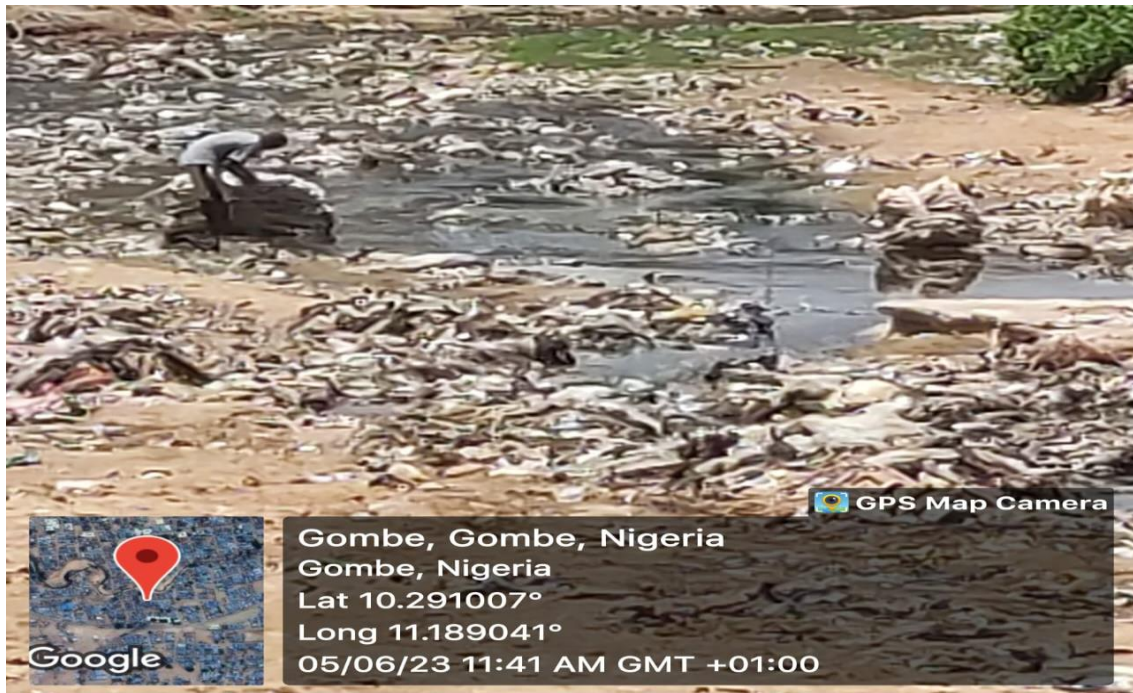


Plate 3. 6: Sack washing, and waste dumped in the FCE(T) gully channel releasing pollutant into the river.

n) Phosphate (PO_4)

Phosphorus is an important nutrient for plant growth and dissolves in water or can attach to particles floating on water and can be found in the bodies of all living organisms. Different forms of phosphorus are total phosphorus and orthophosphate (PO_4). Orthophosphate (or phosphate) is the most bioavailable form of phosphorus, meaning it is most easily used and taken up by organisms that live in water.

The major source of phosphate is from weathering and erosion activities. High amounts could lead to eutrophication and cause algae to bloom in water bodies thereby rendering them unhygienic for domestic purposes. The results from the surface water samples shows that phosphate concentrations range from 0.15mg/l to 0.48mg/L, which is within the FMEnv/ WHO (2011) permissible limit of 0.5 mg/l. Sewage, agricultural runoff, and fertilizers can contribute to high levels of phosphorus in water.

3.8.3 Results of the Ground Water

The result of the groundwater analysis is presented in Table 3. 4 showing the physio-chemical and heavy metals properties as discussed in the following.

Table 3. 4: Result of groundwater quality.

Sample	G1	G2	G3	G4	G5
PO_4 (mg/L)	12.1875	8.53125	14.625	10.96875	8.53125
SO_4 (mg/L)	0.262125	0.029125	0.05825	0.218438	0.029125
TH (mg/L)	187.2	136.5	224.25	235.95	136.5
Cl(mg/L)	102.95	63.9	88.75	110.05	63.9

TSS (mg/L)	52	50	70	52	50
TDS (mg/L)	83.1	309	700	240	309
pH	7.51	7.66	7.8	7.59	7.66
E.C(μ S/cm)	170	85.3	138.6	254	85.3
Cu(ppm)	0.009091	0.009091	0.018182	0.009091	0.009091
Cd(ppm)	0.02	0.01	0.02	0.02	0.01
Fe(ppm)	0.007407	0.007407	0.014815	0.007407	0.007407
Pb(ppm)	0.004348	0.004348	0.004348	0.004348	0.004348
Zn(ppm)	0.002778	0.005556	0.002778	0.002778	0.005556
Mn(ppm)	0.255	0.295	0.055	0.02	0.295
Na(ppm)	0.875	0.5	0.625	0.875	0.5

i) pH

The ground water on the other hand is between 7.51 and 7.80 (see

Table 3. 4), showing the groundwater be a little alkaline in some area, however, this is within the permissible limits of 6.5 to 8.5 by NSDWQ 2007, NESREA 2007 and WHO 2006 in most of the areas. The proposed project (gully reclamation) is not anticipated to alter the quality of the ground water as it is unlikely to temper with it.

ii) Hardness (TH)

The values of hardness of the ground water range from 136.50 to 234.95mg/L (Table 3. 4), this is low and at some points within the acceptable limit when compared with the WHO standards of 200 mg/L. At some points, the results show some level of hardness exceeding the permissible limit set by the WHO, this is likely due to contact with some geologic formations and seepage of waste materials from the surface. This implies that the water is safe for the project purpose, which is mainly construction and might likely not interfere with the ground table.

iii) Turbidity

The turbidity level of the ground water measured ranged from 2.0 to 6.0 NTU which is above the acceptable level of 1.0 NTU set by the FMEnv. However, no significant health implication has been attributed to turbidity in drinking water.

iv) Total Suspended Solids (TSS)

The total suspended solid of the groundwater ranged from 50 to 70mg/L, with an average value of 54.8mg/L (Table 3. 4). The high concentration may be attributed to shallow depth of the well.

v) Total Dissolve Solid (TDS)

The values of TDS range from 83.1 to 700mg/L, with an average value of 328.22mg/L (Table 3. 4). The groundwater TDS level is lower than the allowable limits of WHO (1000 mg/L) but at some points slightly above the 500 mg/L FMEnv standard.

vi) Sodium (Na)

The cation Sodium (Na) was found within the range of 0.50 to 0.875ppm, which is low compared with the WHO permissible limits of 200ppm.

vii) Iron-(Fe)

The concentration of iron is between 0.00741ppm to 0.01481ppm as in Table 3. 4, which is much lower than the WHO standards /threshold value of 0.3ppm.

viii) Manganese-(Mn)

The Manganese concentration in the groundwater samples was found to be 0.02 to 0.29ppm, with an average value of 0.17, which is slightly above the WHO standard value of 0.1 mg/L and the FMEnv permissible limits.

ix) Chromium-(Cr)

The concentration of chromium ranges from 0.01 to 0.07 mg/L, which is above the minimum standard of 0.0001mg/L of NESREA.

x) Cadmium-(Cd)

Cadmium is among the most dangerous heavy metals found in water; the result shows the concentration of Cadmium in the groundwater as 0.01 to 0.02ppm (Table 3. 4), which is within the 0.02ppm limit of NESREA.

xi) Copper-(Cu)

The concentration of Cu is from 0.009091ppm to 0.01818ppm, which is far below the approved standard 1.00ppm of the WHO.

xii) Zinc-(Zn)

The concentration of Zinc ranges from 0.002778ppm to 0.005556ppm as indicated in Table 3. 4, which appears normal compared with the WHO standard of 15.00mg/l.

xiii) Calcium-(Ca)

The Ca value ranges between 38.91mg/l and 63.49mg/l, which are below the FMEnv. permissible limit (75mg/l) though consistent with the high total hardness value recorded in water from similar sources.

xiv) Sulphate (SO₄)

The result of the analysis shows that the concentration of Sulphate ranges from 0.029 to 0.26mg/L with the average value of 0.12mg/l, far below the 250mg/L limit approved by the FMEnv/ WHO (2011).

xv) Phosphate (PO₄)

The result shows that the phosphate range from 0.14mg/L to 0.24mg/L, which agrees with the 0.5mg/l FMEnv/ WHO (2011) permissible limit.

3.9 Ambient Air Quality

3.9.1 Approach and Methods

The ambient air quality and noise pollution survey was conducted using the DM106 and Extech Multifunction sound level meter respectively to determine the criteria pollutants such as Particulate Matter (PM 1, 2.5 and 10), Total Volatile Organic Compounds (TVOCs), Formaldehyde

(HCHO).

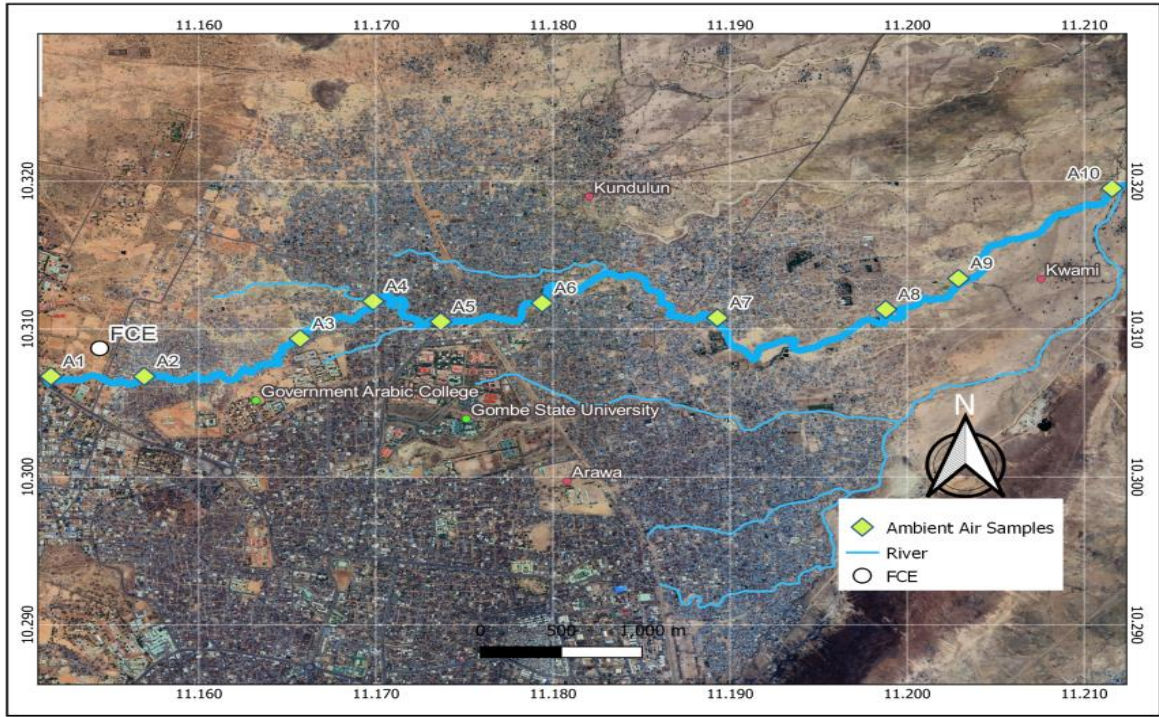


Figure 3. 26 and Figure 3. 27 presents the sampling location for both ambient air quality and noise level for the project site respectively.



Figure 3. 26: Sampling location for Ambient Air Quality at FCE (T) Gully site.

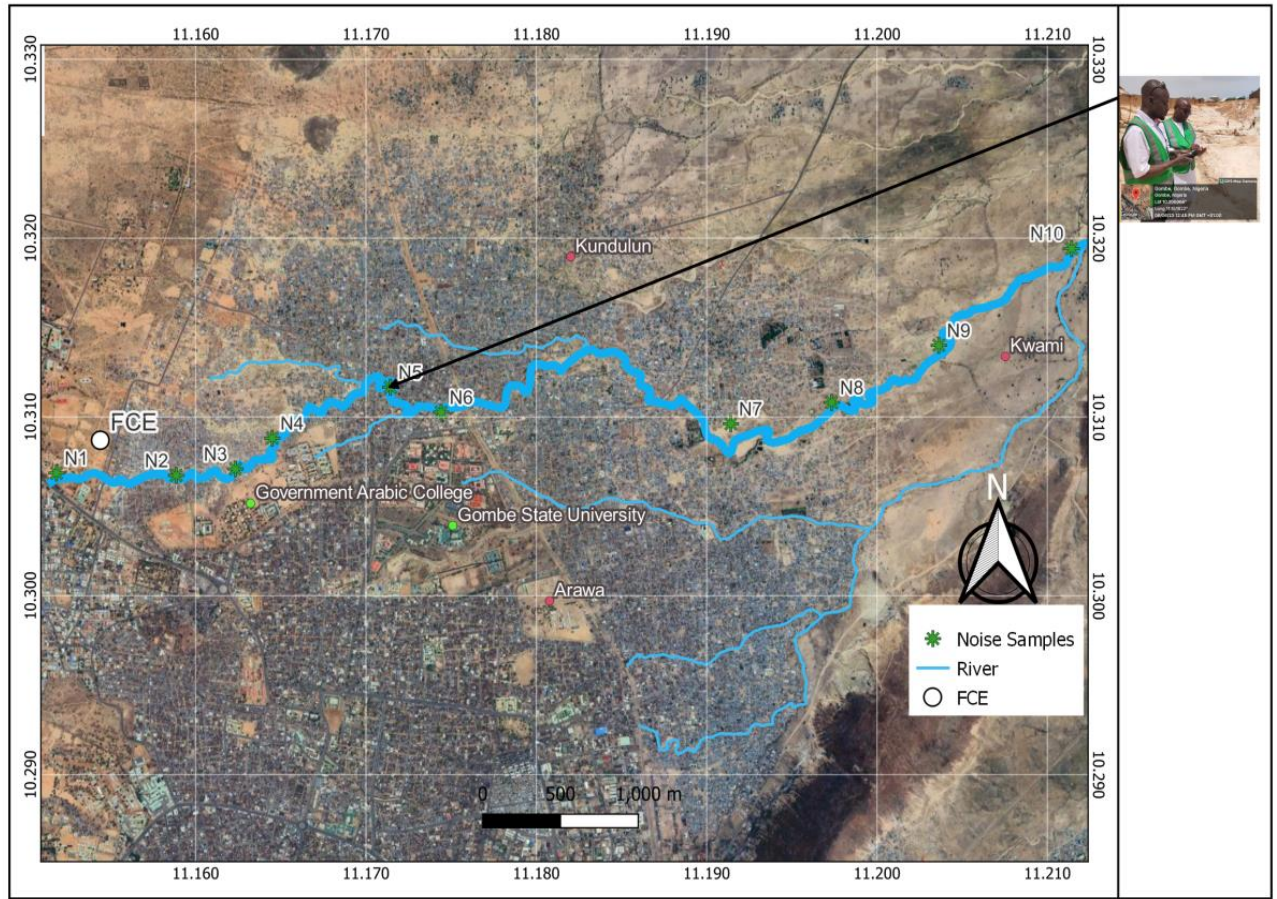


Figure 3. 27: Sampling Locations for Noise Measurement at FCE (T) Gully site.

The assessment of the air quality and noise level is critical in determining the ambient air quality and noise level in the area, which can be significant to human health.

This is to establish the existing baseline for air quality prior to project implementation. The baseline data is expected to provide informed knowledge on the atmospheric condition of the area. The information derived from the air quality survey guide during pre-construction, construction, and commissioning stage of the proposed project to ensure all activities are in-line with the national air quality regulations, emission prevention and control.

The air quality parameters determined are particulate matters (PM 1, 2.5 and 10), Volatile organic compounds (VOC), HCHO, Temperature, Humidity, Nitrogen dioxide (NO₂), Sulphur dioxide (SO₂), Hydrogen Chloride (HCl), Carbon monoxide (CO) and Carbon dioxide (CO₂). Air quality determination was carried out using an Air Quality Monitor (DM106) conducted at a height of 1.5 meters above ground level. The instrument measures several air quality indicators with HCHO detection range of 0 - 1.999mg/m³, TVOC with detection range of 0 - 9.999mg/m³ and PM_{2.5} detection range of 0 - 999ug/m³.

The sampling points were spatially distributed to ensure coverage, thus eleven sampling points from which 06 sampling points at FCE (T) Staff school, London Mai Dorawa, Jauro Abare, Malam Inna, Kagarawal, etc) were identified. Measurements were done at each of the pre-determined

sampling points for gaseous pollutants and the particulate matters. Noise level measurements were made with Tecpel 330 sound level meter (Plate 3. 7).

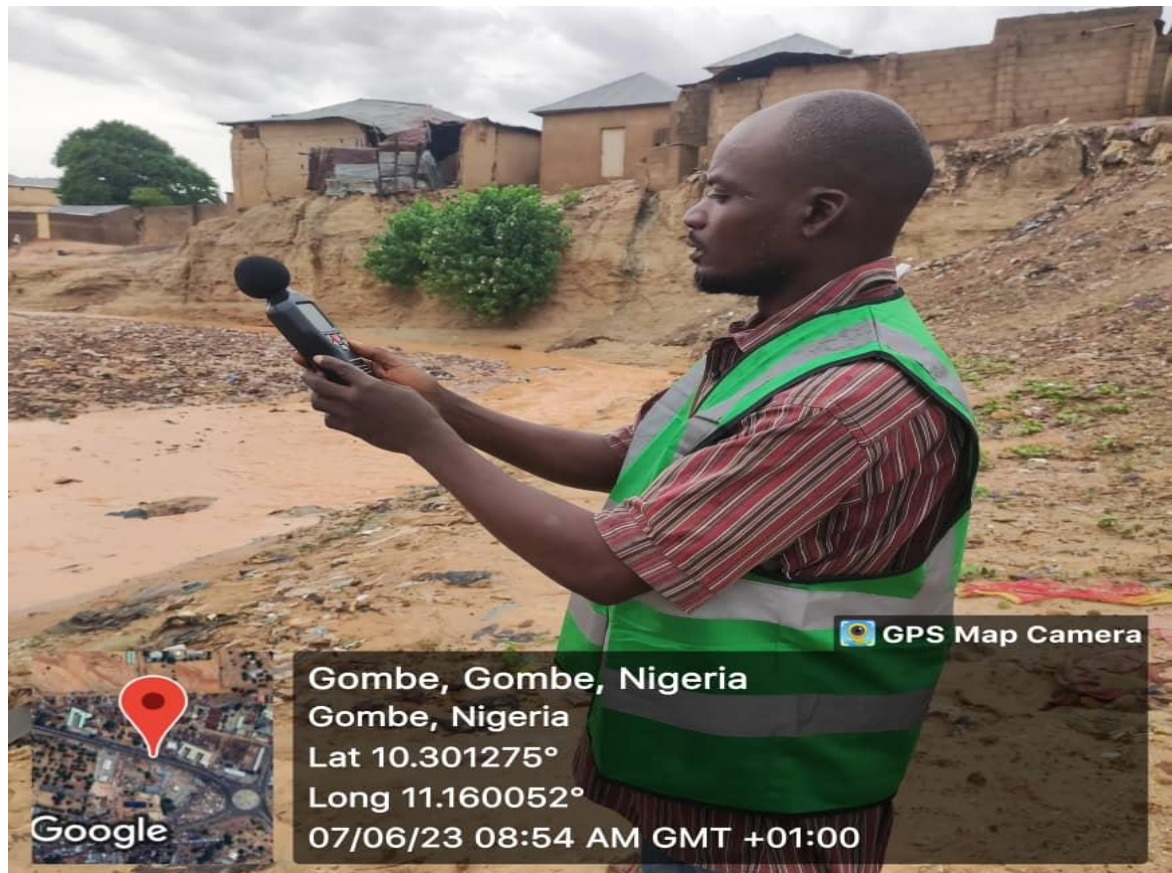


Plate 3. 7: Measurement of Air Quality Parameters in the field.

The results of the air quality and noise assessment were compared with the Nigerian Ambient Air Quality Standards (NAAQS), as obtained from the Air Quality and Noise Guidelines of the Federal Ministry of Environment (FMEnv), the United State Environmental Protection Agency (USEPA) and the World Health Organization (WHO). The threshold level of the outdoor concentrations of air pollutants established by FMEnv and WHO are presented

Table 3. 5. However, due to the absence of the FMEnv and WHO permissible threshold for outdoor concentration of CO_2 pollutant, the USEPA standard was adopted.

Table 3. 5: Threshold for outdoor Air Quality Standards.

Parameter	FMEnv		WHO		USEPA	
	Guideline Value	Averaging Period	Guideline Value	Averaging Period	Guideline Value	Averaging Period
PM	80 $\mu\text{g}/\text{m}^3$	1 - hour	25 $\mu\text{g}/\text{m}^3$	Annual	150 $\mu\text{g}/\text{m}^3$	Annual
	250 $\mu\text{g}/\text{m}^3$		50 $\mu\text{g}/\text{m}^3$	24 - hour	35 $\mu\text{g}/\text{m}^3$	24 - hour
Noise (Industrial Area)	90dB (A)	8 hours	70 dB (A)	24 hours	70	24 - hour
Noise (Residential Area)	-		55 dB (A)	16 hours	55	24 - hour

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

The ambient condition of ground level air quality in the project area was determined using the air quality index (AQI) rating equation set by the United State Environmental Protection Agency (USEPA).

$$AQI = PC/PS \times 100$$

Equation 1

Where, AQI is the air quality index, PC is pollution concentration and PS is the pollution standard level.

The visual record of the air quality and noise survey within the project area and the immediate host community can be seen in Plate 3. 7, while the air quality reading is presented in Table 3. 6.

3.9.2 Results of Air Quality and Noise Level Measurement

a) Air quality

Atmospheric gases occur naturally to ensure ecological stability; however, anthropogenic activities may equally increase the number of gases in the atmospheric boundary above threshold limits, thereby translating to air pollution. Table 3. 6 presents the result of the air quality parameters as measured in the area.

Site-specific air quality is determined by the ambient concentration of the various atmospheric gases (pollutants). Atmospheric air is a major sensitive environmental media, which can be degraded through emissions of dust particles, aerosols, and toxic gases into the environment, having both short and long-term effects on the environment and human health. Human interference with the physical environment during project development is the major pathway through which the stable state condition of the environment can be altered.

Table 3. 6: Ambient Air Quality Parameters Measured at FCE (T) Gully Site.

Locations	Parameters determined (Air pollutants)					
	TVOC	HCHO	FME _{env} (80µg/m ³) WHO (25µg/m ³)	FME _{env} (250µg/m ³) WHO (50µg/m ³)	RH (%)	Temp.(°F)
			PM2.5	PM10		
FCE(T)staff sch.	0.104	0.016	12	10	53	89.9
Wuro Ladde	0.078	0.011	7.0	5.0	56	86.9
Zirin Gaza	0.007	0.009	14	8.0	52	87.4
Jauro Abare	0.007	0.009	13	7.0	56	91.5
Jauro Kuna	0.006	0.009	12	7.0	58	87.3
Koran Zaki	0.013	0.009	15	9.0	44	96.2
Arawa U/Uku	0.105	0.029	34	23	81	71.8
Kagarawal	0.156	0.019	15	8.0	77	73.0
London Doraw	0.007	0.016	15	9.0	72	73.4
Malan Inna	0.065	0.016	26	17	68	75.4
Tukulma Beta	0.008	0.009	12	6.0	70	77.8
Mean Values	0.050	0.013	15.90	9.90	62.5	82.8

Source: Fieldwork, 2023

The effect of air pollution is directly proportional to the toxicity of the gases, level of exposure and susceptibility of individuals exposed. Most of the air pollutants were not detected around the proposed project area during the field assessment in June 2023, except PM (1.0, 2.5 & 10), TVOC, HCHO, Temperature and Humidity. However, at each stage of the project, significant release of pollutants into the environment is highly anticipated.

b) Particulate Matter (PM1.0, PM2.5 & PM10)

Particulate matter is present in the ambient air in the form of dust, fumes, smoke, and other aerosols, which are introduced into the environment from ground blown dust, and emissions from combustion engines. In the context of construction activities, PM2.5 and PM10 are of most concerns. The existing baseline of PM2.5 is higher around the Kagarawal and was found to be lower at London Mai Dorawa communities.

The result indicates that, ambient concentration of PM1.0 ranged from 10–46 $\mu\text{g}/\text{m}^3$ and the PM2.5 ranged from 7.0–34.0 $\mu\text{g}/\text{m}^3$ while the PM10 ranged from 5–23 $\mu\text{g}/\text{m}^3$ across sampling locations (Table 3. 6). The mean concentrations of PM1.0, PM2.5 and PM10 are 21.8 $\mu\text{g}/\text{m}^3$, 15.9 $\mu\text{g}/\text{m}^3$ and 9.9 $\mu\text{g}/\text{m}^3$ respectively. The concentration of PM2.5 recorded in all the sampling locations were below the FME_{Env} (80 $\mu\text{g}/\text{m}^3$) threshold hourly average values for outdoor concentration, but above the WHO (25 $\mu\text{g}/\text{m}^3$) standard annual average values (at Kagarawal community). On the other hand, the concentrations of PM10 in the ambient air within the project locations were below the FME_{Env} (250 $\mu\text{g}/\text{m}^3$) and WHO (50 $\mu\text{g}/\text{m}^3$) threshold daily (24-hour) average values for outdoor concentration. This indicates that the concentrations of PM2.5 and PM10 across the project location during baseline studies were within permissible limit.

Activities from the proposed project will further exacerbate the ambient concentration of particulate matter particularly during construction phase due to exposure of the earth surface resulting from land clearing, excavation activities, and emission from combustible engines during the project implementation stage. This scenario will lead to an increase in public health concerns among workers and the host community. Particulates may have short and long-term adverse effects on humans, animals, and plants. Health concerns of particulates on human include acute effects on eye and throat irritation as well as chronic respiratory diseases such as cancer. However, the effects depend on particle size and concentration. To offset the impact of particulate matter in relation to the proposed project, construction activities must be handled with care to ensure less emission of particles.

c) Total Volatile Organic Compounds (TVOCs)

The result obtained from the field revealed that the TVOCs ranged from 0.006 to 0.156 $\mu\text{g}/\text{m}^3$ with the mean values of 0.050 $\mu\text{g}/\text{m}^3$. The highest value was determined at Kagarawal while the lowest was at Jauro Kuna locations. The reason for the high TVOC at Kagarawal community was because of anthropogenic activities like smoke from household and burning of tires. Exposure to VOCs can cause health problems ranging from minor symptoms felt by chemically sensitive individuals to more severe effects like illness and even death, depending on the degree of exposure.

d) Noise Level

Table 3. 7 depicts the result of the noise level at the project site, with the minimum noise level ranging from 20.3dB to 76.6dB at a mean minimum of 50.81dB.

Table 3. 7: Ambient noise level within the FCE (T) project area (WHO limit 70dB).

Locations	Min. Noise (dB)	Max. Noise (dB)	Average Noise (dB)
FCE Staff Sch.	37.8	75.2	56.5
Wuro Ladde	62.3	81.1	71.7
Zirin Gaza	20.3	64.1	42.2
Jauro Abare	32.7	78.5	55.6
Jauro Kuna	55.0	87.0	71.0
Koran Zaki	76.6	97.4	87.0
Arawa U/ Uku	56.4	79.6	68.0
Kagarawal	57.0	83.0	70.0
London Dorawa	58.0	69.0	62.7
Malan Inna	52.0	73.0	61.3
Mean Values	50.81	78.79	64.6

Source: Fieldwork, 2023

The maximum noise level is from 64.1dB to 97.4dB with a mean maximum of 78.79dB and an average noise level of 42.2 to 87dB. The average noise level is 64.6dB.

The measured mean value of the minimum and average noise levels along the proposed project area of influence were mostly within natural background status of 20-60dB, but the mean maximum level exceeded the natural and WHO (70dB) limit, the mean values of the noise level were above the threshold limit (55dB) for residential areas. However, the background noise level is expected to soar higher during the project construction and operational phases due to the presence of heavy-duty machines and vehicular movement. The project construction phase is expected to generate noise far above the average baseline (64.6dB) noise level, as such, workers in the area and its vicinity will be exposed to hourly noise level. Prolonged exposure to the average noise level of about 85dB usually results in loss of hearing (SKC, 2000). NIOSH (1996) attributed hearing impairment among workers to mechanical noise exposure. Loss of hearing due to exposure to noise can equally lead to tinnitus, i.e., buzzing in the ear, while insomnia and tiredness can also be caused by exposure to noise.

The average noise levels at all the monitoring locations except for Zirin Gaza community, were well above the guideline level (Table 3. 7). The highest noise levels (minimum, maximum and average values) were recorded at Koran Zaki community, located in the middle catchment of the proposed project site. The dominant noise sources at this location included inhabitants, grinding machines, community center and distant traffic flow.

e) Air Quality Index (AQI)

The AQI of criteria pollutants, which include NO₂, SO₂, CO, H₂S, PM_{2.5} and PM₁₀ were determined using the mean concentration of the pollutants and the FMEnv standard for hourly concentration of the pollutant, while for CO₂, the USEPA standard was used since the FMEnv and WHO have no established emission limits. Table 3. 8 shows the AQI rating and its

associated health implication, while the current AQI of the project area is presented in Table 3. 9.

The entire project area has a good air quality rating for all criteria pollutant base on Table 3. 9. This shows that the existing baseline condition of the area indicates a safe environment for human habitation. Individuals in the project area can carry out their daily activities both indoors and outdoors without any health implications.

Table 3. 8: Air Quality Rating Table.

Good	Moderate	Unhealthy for sensitive group	Unhealthy	Very unhealthy	Hazardous
0 - 50	51 - 100	101 - 150	151 - 200	201 - 300	301 - 500

Table 3. 9: Air quality index of the FCE (T) project area.

Pollutant	FMEEnv/NESREA Limit	Mean Value	AQI	Levels of Health Concern
PM _{2.5}	80	15.90	19.8	Good
PM ₁₀	250	9.90	3.9	Good

Source: Fieldwork, 2023

It is expected that in all the development phases of the proposed project, the current ground level atmospheric condition should be maintained. However, at full-scale excavations and construction, a series of activities associated with the operation of machinery and generating sets will alter the existing environmental baseline. Criteria pollutant is therefore envisaged to increase due to emission of fumes from moving vehicles which is expected to increase during the project construction phase due to increase in traffic flow.

3.10 Soils Study

Soil resource is of vital importance for the survival and welfare of the people. Soil erosion, pollution and pedological changes are the most severe problems of soils on which developmental projects are sited. These changes degrade soil quality and alter physical, biological, and chemical parameters.

3.10.1 Methodology and Procedures

Composite sampling technique was adopted during the soil samples collection. As a result, ten (10) sampling stations were established as in Figure 3. 28. Because there is no established soil moisture in the sampling locations, Stainless steel, handheld Dutch type Soil Auger was found unsuitable for soil sample collection and thus sampling point (hole) was open using hoe, shovel and mattock, the samples were collected by scratching the wall of the hole from the surface to 30cm depth (Plate 3. 8) at each soil sampling station.

Soil samples were collected for laboratory analysis using a sample bag and labeled appropriately with a masking tape and indelible ink, indicating sample location, time, date, soil depth level and other relevant information. The coordinates of the sampling locations were also collected and recorded using a Global Positioning System (GPS).

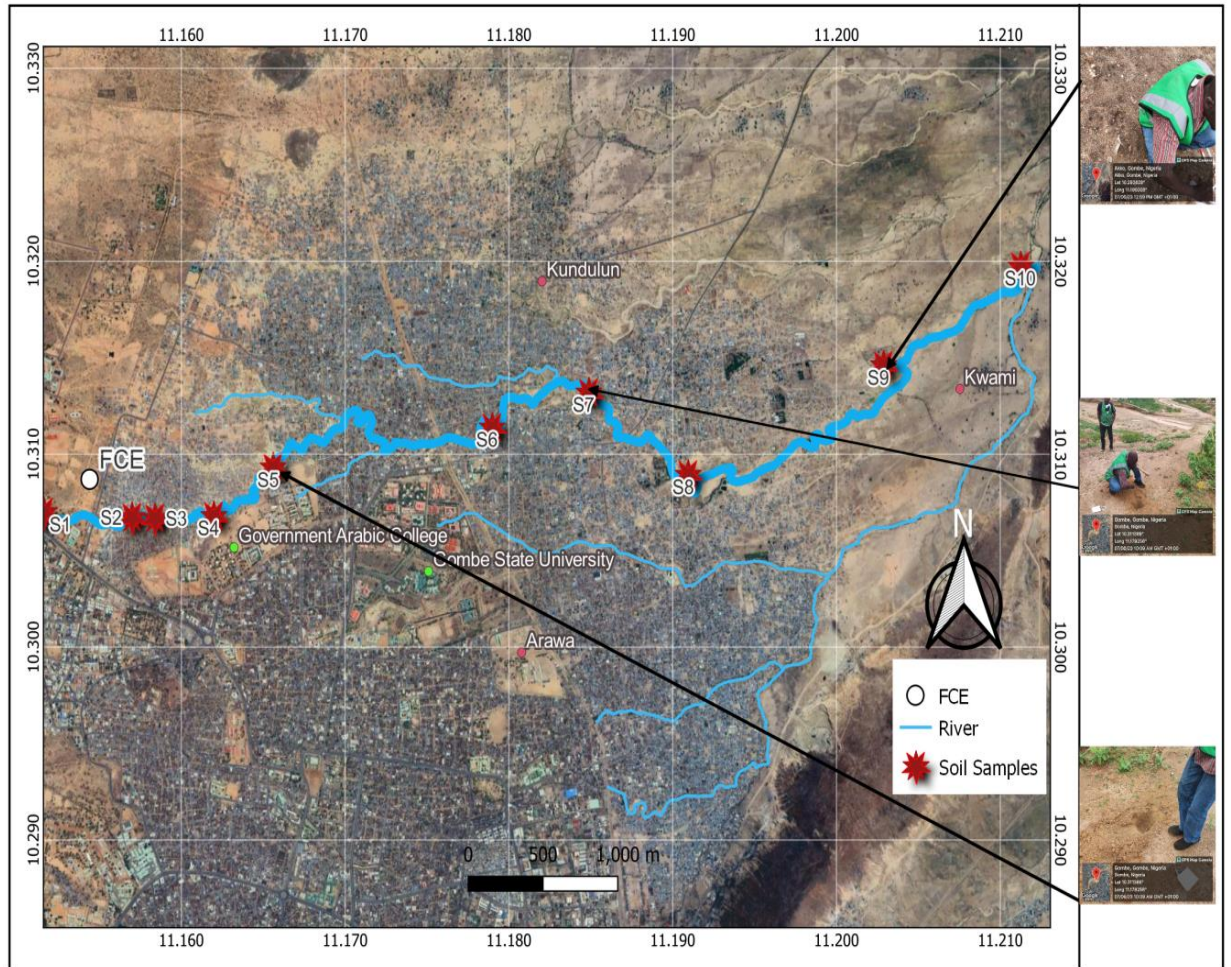


Figure 3. 28: Soil sampling locations in the FCE (T) Gully site.



Plate 3. 8: Soil sample collection and bagging bag.

The collected samples were taken to the laboratory for physical and chemical analysis. At the laboratory the samples were dried under room temperature, grounded into fine particles in a mortar and then sieved through 2mm sieve. The parameters of concern were then determined using the standard laboratory methods and procedures. Table 3. 10 presents the ratings and classifications of the soil macro and micronutrients.

Parameters determined include particle size distribution (texture), bulk density, organic carbon, organic matter content, phosphorous, soil pH, exchangeable cation, and heavy metals.

Table 3. 10: Rating and classification of soil macro and micronutrients.

Soil Characteristics	Low	Medium	High
pH	<6	6-7	>7
CEC (cmol/kg)	<8	8-15	>15
Base Saturation (%)	<50	50	>50
Exchangeable K (cmol/kg)	<0.15	0.15-0.4	>0.4
Organic Matter (%)	1.5	1.5-3	>3
Total Nitrogen (%)	0.08	0.08-0.15	>0.15
Total Phosphorus (mg/kg)	7	7-20	>20
AWHC	1.0	>1.0-2.0	>2.0
Organic Carbon	1.0	1.1 - 2.0	> 2.0
Fe ppm	42.5	>42.5 - 50	>50
Cu(ppm)	1.08	1.50	>1.5
Zn(ppm)	0.2	>0.20 < 0.5	>0.5
Mn(ppm)	0.03	>0.03-<0.1	>0.1
Cd(ppm)	2.16	>2.16-5.0	>5.0
Pb(ppm)	0.85	>0.85-1.2	>1.25

Source: FAO,1990

Appropriate statistical techniques such as mean, percentage standard deviation, coefficient of variation was used for statistical analysis and results presented with charts and graphical illustrations.

3.10.2 Result of Soil Quality Assessment

The results of soil physio-chemical analysis are summarized in Table 3. 11 for the macro and micronutrient elements, respectively.

a) Soil Texture

The sand, clay, and silt contents of the top (30cm depth) soil ranged from 58.80-88.80%, 9.20-31.20% and 2.00-14.00% respectively. The mean values obtained were 76.8%, 16.8% and 6.4% for sand, clay, and silt particles, respectively. The textural classification of the soil was predominantly Loamy Sand. However, the percentages of clay, silt, and sand show variations, indicating different soil textures across the sampling points.

The texture of a soil determines the water absorption/infiltration rate, the water holding capacity, erodibility function and migration of pollutants in soil. It also determines the amount of soil aeration, ease of tilling, and soil fertility. Low clay and high sand in the topsoil is an indication of porous soils which accelerate soil erosion, permit easy leaching of nutrients and

pollutants to the groundwater table. Other parameters that determine soil erodibility and the dynamics of pollutants in soil include bulk density and porosity.

b) Soil Bulk Density in project area of influence

The lower the bulk density, the higher the permeability. Bulk density varies with structural conditions of the soil; therefore, it is related to compacted soil and often used as a measure for soil structure. The results revealed the soil bulk density ranged from 0.686g/cm³ - 0.825g/cm³ with mean value of 0.739g/cm³. This indicates low bulk density of soils in the project area of influence, therefore highly vulnerable to erosive forces. The bulk density values are relatively similar across the sampling points.

c) Soil pH

The soil reaction falls within slightly acidic to slightly alkaline pH, ranging from 6.27-7.59 with mean value of 6.86, thereby indicating that soils in the area are slightly acidic. The present moderate pH condition of the soil may enhance the solubility and mobility of heavy metals and their subsequent leaching into the ground water table and may slow down microbial degradation. The optimum pH values for pollutant-degrading microorganisms ranged from 6.5 to 7.5.

d) Soil Organic Matter (SOM)

The Organic matter (SOM) content of the soil is low, ranging from 0.00-1.375% according to FAO (1990) classification (Table 3. 11). Spatial variation in the measured SOM values across the sampling stations is low. Many important soil properties including stability of soil structure, the absorption and retention of water, reserves of exchangeable bases, the capacity to supply nitrogen, phosphorus, and other elements to growing crops, adequacy of aeration and pollutants bioavailability are dependent to some degree on the quality of SOM present.

Table 3. 11: Soil physio-chemical and heavy metals at the project site

Sampling points	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Mean
	Soil Physio-chemical properties										
PO ₄ (mg/L)	4.570313	7.921875	7.3125	7.678125	9.75	7.3125	9.140625	9.75	15.23438	9.75	8.841
O.C(%)	0.1197	0.4389	0.7182	0.798	0	0.4389	0.6384	0.798	0.4788	0	0.442
%O.M	0.206363	0.756664	1.238177	1.375752	0	0.756664	1.100602	1.375752	0.825451	0	0.763
B.D(g/cm ³)	0.776269	0.750299	0.668955	0.825224	0.686119	0.764627	0.673433	0.825672	0.73209	0.700597	0.739
%CLAY	9.2	11.2	31.2	11.2	25.2	11.2	25.2	11.2	13.2	19.2	16.8
%SILT	2	4	10	4	14	4	8	4	4	10	6.4
%SAND	88.8	84.8	58.8	84.8	60.8	84.8	66.8	84.8	82.8	70.8	76.8
TEXTURE	Loamy Sand	Loamy Sand	Sandy	Loamy Sand	Sandy	Loamy Sand	Sandy	Loamy Sand	Loamy Sand	Sandy Loam	Loam Sandy
pH	6.47	6.78	6.29	6.68	7.55	7.07	6.88	6.75	7.59	6.61	6.86
	Soil Heavy metals										
Mg(ppm)	4	4	2	44	6	4	2	2	4	2	7.4
Cu(ppm)	0.909091	1.818182	0.909091	0.909091	0.909091	0.909091	0.909091	0.909091	2.727273	0.909091	1.181
Cd(ppm)	5	4	10	7	5	10	17	6	5	18	8.7
Fe(ppm)	14.81481	10.74074	12.96296	9.259259	10	28.51852	50.37037	18.88889	29.62963	15.92593	20.11
Pb(ppm)	0.869565	0.434783	0.434783	0.869565	0.434783	0.869565	1.304348	0.869565	0.434783	1.73913	0.825
Zn(ppm)	0.555556	1.388889	1.111111	0.833333	0.555556	3.055556	0.277778	1.388889	1.111111	0.277778	1.055
Mn(ppm)	5.5	9	6	9	17	30	25.5	18	34	34	18.8

The SOM acts as a glue, binding soil particles together to make the soil resistant to erosion activities. Thus, pollutant concentrations in soil are usually normalized with respect to the soil organic matter content in conjunction with clay content.

e) Soil Phosphorus

Total phosphorus (PO_4) contents of the soil range from 9.75mg/kg - 80.43775mg/kg with a mean value of 8.8475mg/kg. Phosphorus is an essential macro element because of its relatively large quantity requirement by plants. Plant growth can be limited because of low phosphorus than any other plant nutrient element. Phosphorus is present in soils as: (i) in soil solution (plant-available); (ii) labile phosphate precipitates and adsorbed to soil particles, mainly in clay minerals (potentially available top lants); (iii) non-labile phosphate in the form of calcium, iron, and aluminum phosphate (not plant- available); (iv) inorganic form, including P in soil organic matter (released after mineralization); and (v) in living soil biomass.

Phosphorus is utilized in its fully oxidized and hydrated form as orthophosphate. Deficiency of phosphorus may limit plant growth and microbial decomposition of pollutants in soils. Phosphorus is likely to be deficient in hydrocarbon-impacted soils and subsoils. This attribute may be responsible for the low vegetation density in the area and the attendant accelerated erosion activities.

f) Heavy Metals Concentration

The summary of the heavy metal concentrations in the soil samples is presented in Table 3. 11. All the heavy metals showed measurable concentrations with some below detection limit (<0.01 mg/kg). Iron (Fe) and Manganese (Mn) for instance recorded the highest concentrations of between 9.25-50.37ppm and 5.5-34ppm with a mean value of 20.11ppm and 18.8ppm respectively. The concentration of iron in soil is common in most Nigerian soils (Adiele *et al.*, 2015). However, iron concentration in soil above 360mg/kg is considered high and may adversely contaminate soils and affect crop yield (FAO, 1990).

Table 3. 12: Comparing the Mean and Contamination Index for Heavy Metal.

Elements	Contamination Index	Obtained Mean Values	Pollutant Grade
Zinc (Zn)	0.20ppm (very low)	1.05ppm (Higher than Index)	High
Lead (Pb)	0.85ppm (very low)	0.83ppm (very low, equals to Index)	Very low
Copper (Cu)	1.08ppm (low)	1.18ppm (slightly higher than Index)	Moderate
Manganese (Mn)	0.03ppm (very low)	18.8ppm (Higher than Index)	High
Iron (Fe)	42.55ppm (low)	20.11ppm (lower than the Index)	Very low
Cadmium (Cd)	2.16ppm (moderate)	8.7ppm (Higher than Index)	High

Contamination Index (WHO & FAO, 2016), South African & Canadian Soil Quality Standards for the protection of Human & Environmental Health (2016).

The concentrations of analyzed Zn were recorded across the sampling stations and were found to be at the range of 0.277ppm-3.055ppm. The mean value was 1.055ppm. Similarly, the

concentration of lead in the soils across the project area was determined to be at the range of 0.434ppm-1.739ppm with mean value of 0.825ppm.

The values of copper and cadmium range from 0.909ppm-2.727ppm and 4.0ppm-18.0ppm with mean values of 1.181ppm and 8.70ppm respectively. The measured concentrations of Zn (ppm) in the soil were in the order of Fe > Mn > Cd > Zn > Cu > Pb. The observed heavy metals mean concentrations are lower than their target values in soil, except for Cd with a mean value above the target value. This implies that the soils are not highly polluted with heavy metals (see Table 3. 11 and Table 3. 12).

Table 3. 12 compares the mean values obtained from the laboratory analysis and the contamination index of WHO, FAO and other soil quality standards. Based on the comparisons, Zn, Mn and Cd were graded high. This indicates that the soils in the project area are contaminated with Zn, Mn and Cd. The comparison shows that Fe and Pb were found to have slightly contaminated the soils of the FCE (T) gully site while Cu was found at moderate grade. This implies that the soil of the gully site contains some heavy metals at very low, moderate, and high-grade concentrations. Proper attention is required in order not to accelerate or increase the level of contaminants in the soil during intervention.

3.11 Floral Study

The vegetation of the area is of Savannah type, typically composed of trees, shrubs, herbs, and grasses. The dominant vegetation type being grasses with scattered trees and shrubs. At the gully fringe, the nature and characteristics of the vegetation is of riparian type with shrubs, herbs, and grasses along the gully banks especially at the lower catchment of the gully.

3.11.1 Methodology

The techniques adopted for the vegetation studies involved detailed assessment of plants through observations, identification, and taking inventory of economic trees in the project area. A GPS map camera was used to capture images of some of the observed tree species for visual presentation as in Plate 3. 9.

The assessment of the vegetation was done through careful observation of the vegetal composition of plant species in a sample location, which was then followed with comparison of the luxuriant nature of the plant species. The dominant and economic plant types at each sampling location were identified and recorded accordingly. Vegetation plays a very crucial role in the environment, especially the biotic component i.e.

- Protection of the fragile soils from the erosive impacts of rain and wind.
- Maintenance of soil fertility through continuous nutrient recycling.
- Conservation of water resources through shading
- Preservation of water sheds.
- Regulation of air and soil temperatures.
- Moisture balance.
- Provision of habitat for countless terrestrial flora and fauna
- Purification of the environment through carbon dioxide during photosynthesis and the release of oxygen for human and animal respiration.

Factors such as soil characteristics, climatic conditions as well as human activities (road construction, urbanization, agriculture, bush burning etc.) often influence the floristic composition of the environment.



Plate 3. 9: Locust tree (Endangered) at FCE (T) staff school.

3.11.2 Results of Vegetation Analysis

This section provides the results of the vegetation study in the project area as it relates to distribution, floristic, diversity index and evenness of identified vegetation. The distribution could well be influenced by the land use in the area. Some locations are sparsely vegetated while others are densely occupied with plant cover. Around the FCE (T) staff School to the downstream area where the two gully channels met, trees, shrubs, herbs, and grasses cover were observed. This could be attributed to the few households or buildings and trees planted by the people. Communities like *Wuro Ladde*, *Jauro Abare*, *Jauro Kuna*, *Koran Zaki* and *London Maidorawa* exhibit low vegetation density because the areas are densely populated and occupied with settlements and other structures. The major vegetation cover in these areas are trees planted within and around compound by the people, mostly for shade and medicinal purposes (

Plate 3. 10).



Plate 3. 10: Plate: vegetation cover at FCE Gully site.

a) Floristic Composition

The floristic composition shows that the area is made up of secondary or degraded riparian flora with widely spaced trees, lots of shrubs and continuous cover of herbs along the waterway.

The vegetation of the area is dominated by indigenous species that grows spontaneously except for *Azadirachta indica* and *Delonix regia*, which can be due to anthropogenic activities (planted as ex-situ conservation trees). Floristically, a total of 26 plant species were encountered in the area, consisting of trees, shrubs, herbs, and saplings (Table 3. 13). In comparison, FCE(T) Staff School and the downstream area where the two gullies make their confluence, has more trees, which could be because plants in that part are more protected from land use activities. *London Maidorawa*, *Jauro Abare*, *Jauro Kuna*, among others have fewer trees, this may be due to anthropogenic activities such as houses and other constructions activities that removes trees. It is observed that, there is competing land use in these communities, which can alter the floristic composition of the area and some important multipurpose tree such as *Azadirachta indica*,

Adansonia digitata, locust tree as well as *Parkia biglobosa* are becoming endangered due to over exploitations and over harvesting.

The confluence areas appear to be richer in saplings because of the riparian nature of the location. This riparian zone must be protected properly for its important services to the ecosystem and to the livelihood of the people in the area.

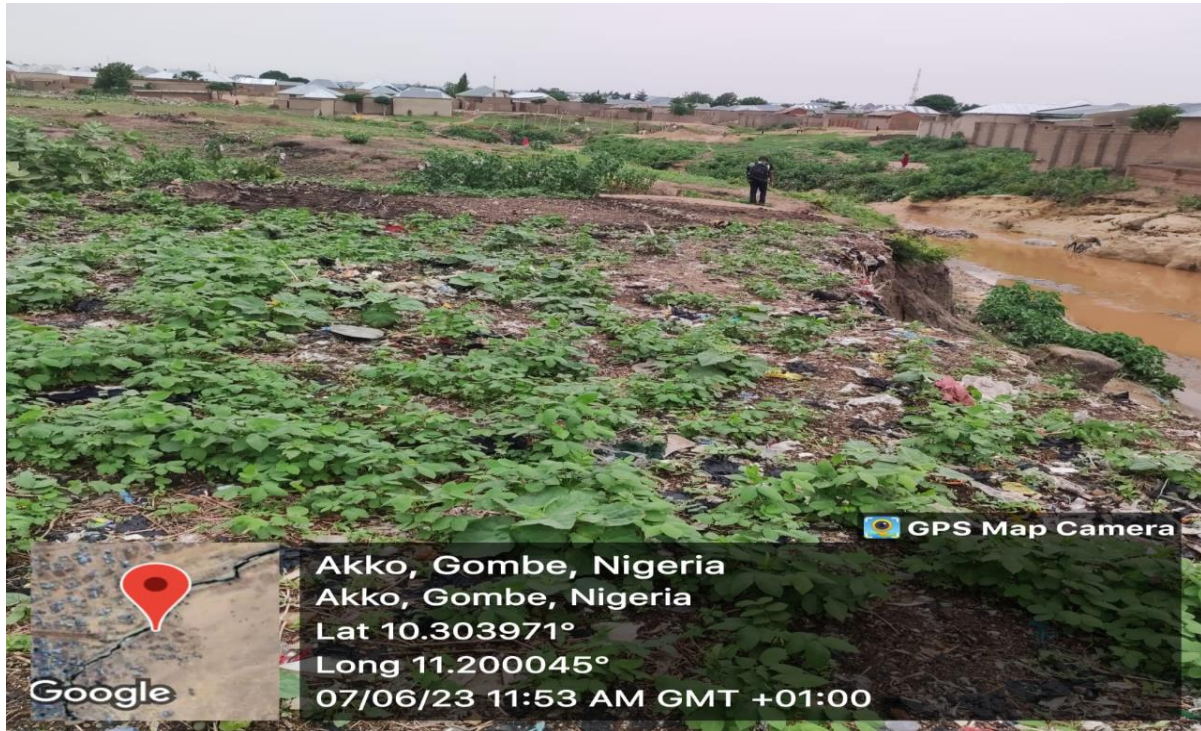


Plate 3. 11: Vegetation covers on the downstream (confluence) section of the FCE Gully site.

b) Species Diversity at the Erosion Site

Species diversity is one of the most important indices used to evaluate an ecosystem. A rich ecosystem is one with high species diversity i.e., higher value (H) while an ecosystem with lower value (H) will have low species diversity. As in Table 3. 13, the study area has high species diversity for both trees and saplings, the value is relatively above 1.5, which is an indication of high entropy and species richness. This shows that there is low richness and in the order of the community of species in the area (entropy). However, high abundance of *Azadirachta indica* and *Hyphaene thebaica* may be responsible for the richness, although some other species like *Adansonia digitata* are also high in the area. Selective logging of woody species and land use practice may be responsible for the loss of diversity in the area.

Table 3. 13: List of Floral Observed in the Project Area of Influence.

SN	Scientific Names	English	Local Names
1	Pennisetum purpureum	Elephant Grass	
2	Araucaria araucana	Monkey Puzzle tree	
3	Polyalthia longifolia	Mast tree	
4	Swietenia spp	Mahogany	Madachi
5	Pinus spp.	Evergreen tree	
6	Schefflera actinophylla	Umbrella tree	
7	Pterocarpus erinaceus	Senegal rosewood	
8	Phoenix dactylifera	Date tree Senegal rosewood	Dabino
9	Moringa Oliefera	Moringa	Zogale

10	Carica Papaya	Papaya	Gwanda
11	Azadirachta indica	Neem	Darbejiya
12	Eucalyptus	Shrubs (myrtle family))	Dogonyaro
13	Jatropha curcas	Barbados Nut	Bindazugu
14	Ipomoea carnea	Bush Morning Glory,	
15	Senna alexandrina	Senna Leaves	Raidore
16	Balanites aegyptiaca	Desert date	Aduwa
17	Manihot esculenta	Cassava tree	Rogo
18	Musa paradisiaca	Plantain tree	Ayaba
19	Araucaria columnaris	Christmas tree	
20	Mangifera indica	Mango tree	Magwaro
21	Adansonia	Baobab tree	Kuka
22	Borassus aethiopum	African Fan Palm	
23	Psidium guajava	Guava tree	Gwaiba
24	Genus Caryota	fishtail palm tree	
25	Syzygium cumini	Black Plum	
26	Ceiba pentandra	Kapok tree	

Specifically, the mid sections of the intervention site have low density value, which is an indication of a low abundance of species among all other sections. In the FCE (T) staff school and the downstream sections, the high species diversity in the area could be attributed to the deposition of alluvium sediments that are rich in organic content, and mineral resources from the various tributaries, which the plant utilize for growth and production (eutrophication).

c) Species Evenness

As a component of diversity, low evenness is an indication that there is lack of entropy in the distribution of species in the area. The low evenness value was due to dotted distribution of species along the erosion site. From the observations only FCE (T) Staff School and areas around the gully confluence have more plants thereby influencing the low evenness. The bank of the gully around the downstream section of the project area represents the transition zone between terrestrial and aquatic ecosystems.

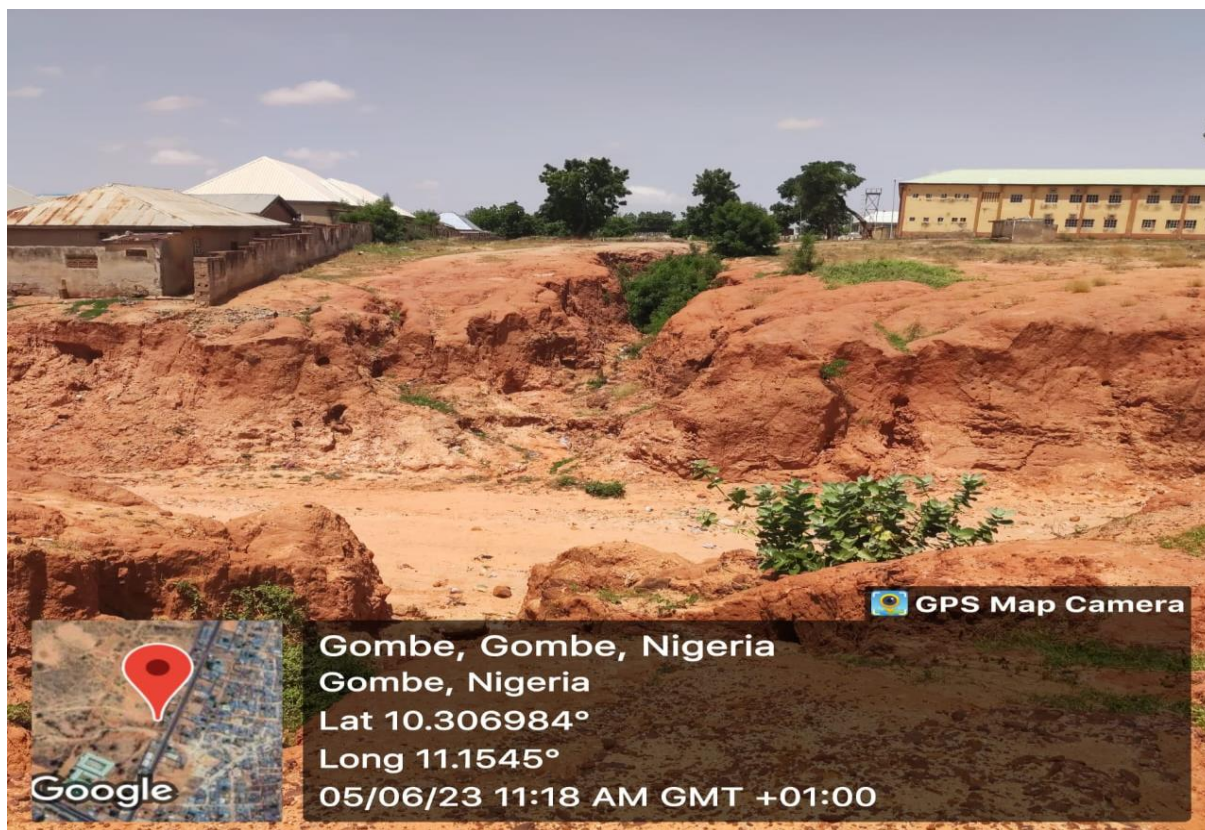


Plate 3. 12: Increasing headway in the gully fingers due to low vegetation cover.

The area shows a strong presence of a substantive number of shrubs and saplings, indicating a successful regeneration, though disturbances can reduce the capacity of the species to regenerate and capacity to render ecological services. *Hyphaene the baica* is a multipurpose species found to predominate on both sides of the gully.

The implication of this results is that the density of vegetation cover along the gully site could be an important factor impeding accelerated gully erosion activities, by resisting widening of the gully banks and deepening of the gully headways. The size of the gully channel is more spectacular at the mid-section of the gully where vegetation cover is sparse and vice-versa.

3.11.3 Inventory of food and Economic Crops

Since agriculture is the major occupation of inhabitants of the study area, there is evidence of the abundance of economic crops within and around the area. Consequently the observed dominant economic crops are : a) cereals - maize (*Zea mays*), Sorghum, Rice; b) food Legumes - groundnut (*Arachis hypogea*), Soybeans, c) tubers - Cassava (*Manihot esculentus*), Sweet potato (*Ipomea batatas*), d) vegetables: Peppers (*Capsicum annum*, *C. frutescence*), tomato (*Solanum lycopersicum*, formerly *Lycopersicon esculentum*), *Talinum triangulare* (water leaf), amaranthus (*Amaranthus cruentus*, *A. hybridus*), okra (*Abelmoschus esculentus*), jute mallow (*Corchorus olitorius*, *C. tridens*), eggplant (*Solanum raddi*, *S. melongena*), fluted pumpkin (*Telfairia occidentalis*), locust bean tree (*Parkia biglobosa*), scent leaf (*Ocimum gratissimum*), and fruits: Banana (*Musa sapientum*) and plantain (*Musa paradisiaca*), pawpaw (*Carica papaya*), orange (*Citrus spp.*), mango (*Mangifera indica*), Guava (*Psidium guajava*), as well as cash crops like Ground nut (*arachis hypogea*), Sesame, cowpea.

3.12.3 Endangered Tree Species

Pakia biglobosa, locust tree, dessert date, and date tree are vulnerable, threatened, and endangered tree species in the study area due to habitat loss and logging. These trees provide suitable habitat for many insects, birds, and reptiles. Those animals prefer to live on native trees, but the number of trees is being reduced every day due to deforestation and colonization of invasive species leading to migration of several species to more suitable locations for survival.

For the identified trees, only Kapok, Black plum, locust tree, Baobab, *Borassus aethiopum*, Dessert date, and Date trees are native. The remaining trees are non-natives. In General, habitat destruction, agriculture, logging, invasive species, and climate change have been the major factors affecting biodiversity in the area (See Plate 3. 13).



Plate 3. 13: Endangered plant species in the area.

3.13 Faunal Study

3.13.1 Methodology

The information presented for wildlife is obtained from a combination of literature sources, field observations and discussions with local people on species known to exist or have existed in the area. Pictures were captured to show the presence of some species of concerns in the area. The information is presented in Table 3. 14 and Plate 3. 14 to illustrate the findings.

3.13.2 Economic Significance of Wildlife

Animals are hunted for food, medicine and for sale. Apart from consumption as food, certain parts of wild animals are used in folk medicine. Some animals are kept as pets (e.g., doves, turtles, chickens, fowl etc.), but may later be consumed as soon as they attain maturity.

3.13.3 Result of Fauna Study

The study area is blessed with varieties of wildlife. However, most of the species are becoming extinct and endangered due to changing ecosystems because of human activities, settlement expansion and erosion. A total of thirty-six (34) species were identified in the area, i.e., birds, reptiles, and insect. Table 3. 14 provide the list and names of the fauna found in the area.

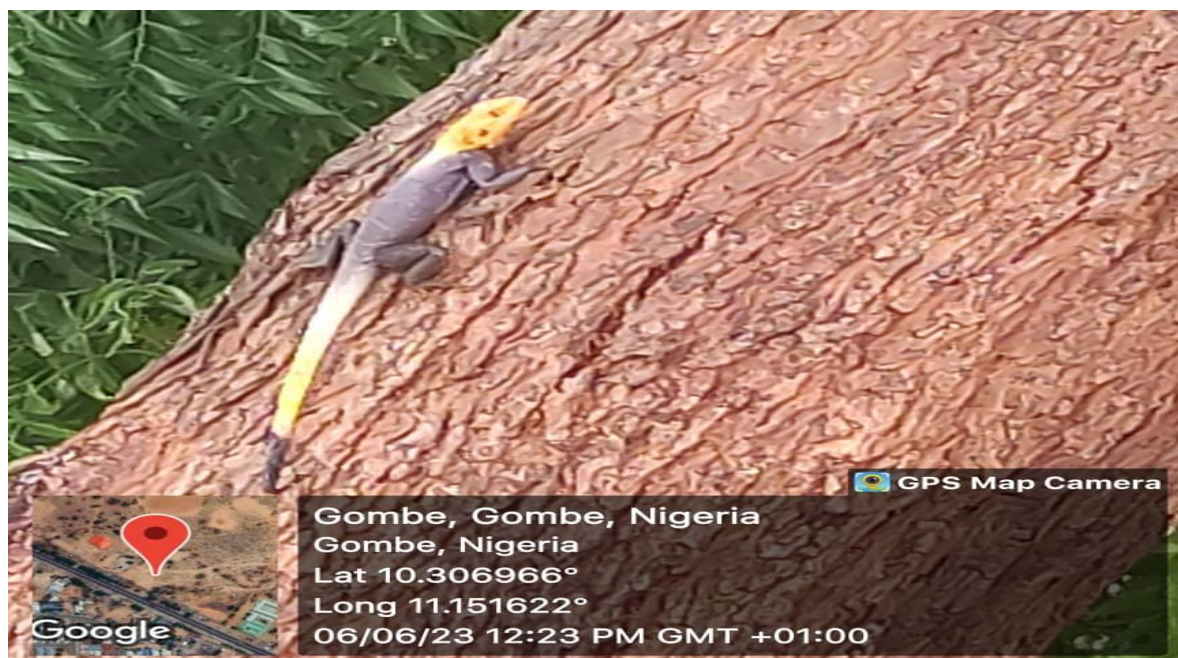


Plate 3. 14: Agama Lizard (reptile).

Table 3. 14: List of Wildlife Observed in the Project Area of Influence.

SN	Scientific Names	English	Local Names
1	<i>Serpentes</i>	Snake	Maciji
2	<i>Lacertilia</i>	Lizard	Kadangare
3	<i>Bufo spp.</i>	Toad	Kwado
4	<i>Cattle egret</i>	Egret	Balbela
5	<i>Rhopalocera</i>	Butterfly	Malam bude littafi
6	<i>Lumbricusterrestris</i>	Earthworm	Tana
7	<i>Trochilidae</i>	Hummingbird	
8	<i>Gallus gallus domesticus</i>	Hen	Kaji
9	<i>Meleagris gallopavo</i>	Turkey meat	Talo_Talo
10	<i>Columba guinea</i>	Speckled Pigeon	
11	<i>Passerina cyanea</i>	Indigo Bird	
12	<i>Sturnus vulgaris</i>	Starling	
13	<i>Anura</i>	Frogs	Kwado
14	<i>Passer griseus</i>	Northern_Grey Headed Sparrow	Gado
15	<i>Centropus senegalensis</i>	Senegal Coucal	
16	<i>Coracias abyssinicus</i>	Abyssinian Roller	
17	<i>Lagonosticta senegala</i>	Red_billed Firefinch	
18	<i>Euodice cantans</i>	African Silverbill	
19	<i>Vanellus tectus</i>	Black -Headed Lapwing	
20	<i>Ptilopsis leucotis</i>	Northern white-faced Owl	
21	<i>Crinifer piscator</i>	Western Grey Plantain Eater	
22	<i>Falco biarmicus</i>	Lanner Falcon	
23	<i>Anas platyrhynchos</i>	Mallard	

24	<i>Ovis aries</i>	Sheep	Tunkiya
25	<i>Capra aegagrus hircus</i>	Goat	Akuya
26	<i>Ciconia abdimii</i>	Abdim's Stork	
27	<i>Micronisus gabar</i>	Gabar Goshawk	
28	genus <i>Agama</i>	Agama Lizards	Jan Gwada
29	<i>Spilopelia senegalensis</i>	Laughing Dove	
30	<i>Orthoptera</i>	Grasshoper	Fara
31	<i>Annelida</i>	Worms	Tana
32	<i>Isoptera</i>	Termites	Gara
33	<i>Formicidae</i>	Ants	Tururuwa
34	<i>Bos taurus</i>	Cows	Shanu

3.13.4 Endangered Faunal species

Some of the birds are threatened due to anthropogenic activities, for instance, noise pollution from machinery and vehicular movement can cause migration of speckled pigeons. Abdimi's storks are threatened by the destruction of their habitat (Baobab tree) and are affected by pesticides used by farmers to control insects on farmlands.

CHAPTER FOUR: SOCIOECONOMIC CHARACTERISTICS, EXISTING CONDITIONS AND STAKEHOLDER CONSULTATIONS

4.0 Introduction

The baseline study examines the socioeconomic characteristics and existing conditions of the communities along the FCE(T) gully erosion site, to gather relevant data to evaluate, analyze and determine the social, economic, and traditional status of the communities in the intervention site. The objectives are to; i) analysis existing livelihoods opportunities and other socio-economic activities in the area ii) determine the perception of the people on the gully and the proposed intervention, iii) make consultations with relevant stakeholders and affected persons, iv) identity issues related to risks and impacts associated with the project activities, v) status of gender based violence/sexual exploitation and abuse, gender equality and vi) provide framework for community involvement, participation, monitoring of both project activities and risks/impacts mitigation.

4.1 Methodology

To achieve the above objectives, mixed method was employed using both secondary and primary data. The secondary data was acquired from project documents provided by the SPMU, while the primary data was collected through questionnaires administration using the kobo collect App, group interviews, reconnaissance survey, discussions, and observations to generate both quantitative and qualitative data. This was specifically conducted in the intervention communities, to this effect samples of seven hundred and nine (709) respondents of both male and female residents in the communities were interacted with based on availability. Other participants and consultations were drawn from the traditional institutions, community leaders, women and youth groups, community associations, vulnerable groups and officials of relevant ministries and agencies of ACRoSAL in the state.

4.1.1 Socio-economic Study

A socio-economic questionnaire was developed and administered to community members; households likely to be directly impacted by the project activities. This was done to profile the socio-economic status of the communities, specifically for areas that would be most exposed to the risks and impacts of the intervention. The information gathered covers age, gender, occupation, economic activities, income and source of livelihood, housing, land use pattern and tenure system, household size, education, and infrastructure etc. A sample of the socio-economic survey (ANNEX 4: Sample of Administered Questionnaire). In addition to the use of quantitative data collection method, other tools like Focused Group Discussion (FGD), Community meetings and interviewing of Key informants were used to collect information.

4.1.2 Public/Stakeholder Consultation

The consultation was done as part of the participatory approach designed to gain community buy-in and understanding of the environmental and social risks and impacts of the proposed intervention, and the community perception. The Focus Group Meetings and discussions were held at designated community centers, town hall and facilities within the project intervention communities.

4.1.3 Cultural and Archaeological Resources

There are no known designated historical or archaeological resources within the project areas. Neither are the existence of former or existing burial grounds or cultural relics within and near the project area of interest. Because none was identified or claimed by inhabitants in the community, for cautionary measure however, it is appropriate to prepare a site-specific mitigation measure for any exigencies relating to cultural resources that may arise during the project implementation, considering the extensiveness of the project area that cuts across low income and densely inhabited area. With respect to burial sites, these shall be handled in conjunction with the community leaders, religious leaders, and affected family members.

4.1.4 Traffic and Transport Infrastructure:

There are several inter-links of untarred road networks connecting the communities but are at several points exposed to the devastation of flooding and gully erosion. Currently, except for the untarred roads, the newly constructed tarred road is experiencing very high traffic regime as it serves as the only motorable short-cuts linking the communities with central Gombe metropolis. The common means of transportation is by car, bus, tricycle, motorcycle, bicycle, and walking. The transport system is envisaged to improve once the gully is rehabilitated through the proposed intervention project.

4.2 Description of the Socio-Economic Environment

4.2.1 Physical Setting

Gombe State is one of the 36 states in Nigeria, located in the northeast geopolitical zone between latitude 9°32'– 11°18'N and longitude 10°28'– 11°52'E in the Sudan and northern guinea savanna region of the country. Gombe State shares boundaries with Yobe State to the north, Adamawa and Taraba States to the south, Borno State to the east, and Bauchi State to the west (). The state covers an area of 18,768 km², with an estimated population of 3,585,131 (according to the DEVAGOM) distributed across the 11 local government areas of the state. The intervention site is the flood and erosion gully system that originates from the FCE (Technical) demonstration/staff school on Latitude 10° 18' 24.17"N and Longitude 11° 9' 10.72"E down to and beyond Arawa "B".

4.2.2 Tribe, Religion and Cultural Formation

The people of the area comprise of different tribal or ethnic groups, among which are the Hausa, Tangale, Terawa, Waja, Kumo, Fulani, Kanuri, Bolewa, Jukun, Pero/Shonge, Tula, Cham, Lunguda, Dadiya, Banbuka. Their social and cultural aspects are closely intertwined among the ethnic groups. Their cultural relationships and interaction come to light during festive periods e.g., cultural, and religious ceremonies and festivities. Like every other African culture, the clan is the center of cultural and political identity and decision making, even with urbanization and civilization, the clannism and kinship way of life still prevail, therefore forming the main focal point for political control, cultural integration, or disaggregation, and point of entry into the community. The people are mostly of the Islamic and Christian faith with few traditionalists.

4.2.3 Land Use Pattern, Housing and Settlement Pattern

The major type of land tenure system in the area is customary i.e., i) individual ownership; ii) family ownership; and iii) communal ownership. The individual ownership could be for locals or residents of the community. Family lands and individual lands are inherited from ancestral lineage or relatives. For community ownership, land is retained for the family and hardly sold. Such family lands are reserved for community development but may at times be temporarily allocated to family members or community members for agricultural purposes only.

Although the FCE(T) intervention site is a growing urban or semi-urban setting, the area is characterized with mostly residential buildings, some commercial buildings, and public buildings. The project area is densely populated with predominantly low-income dwellings, and the settlement pattern is typically of clustered or nucleated type, where houses are built close together. The majority of the houses are made of bricks and roofed with several type of roofing sheets. Most houses along the gully bank are made of clay and built to accommodate small household members, usually made up of 2 to 4 bedrooms.

Table 4. 1: Names of communities and number of respondents.

	Names of Communities	Frequency	Percent
1	Malam Inna Koran Zaki	112	15.8
2	Jauro Abare London Mai Dorawa	67	9.4
3	Jauro Abare Nahuta	54	7.6
4	Jauro Abare Zirin Gaza	64	9
5	Jauro Kuna	64	9
6	Jauro Abare Kael Badi	46	6.5
7	Jauro Abare Koran Zaki	58	8.2
8	Wuro Ladde	45	6.3
9	Jauro Abare Kael Oshi	45	6.3
10	Jaro Abare Alkahira	45	6.3
11	Arawa	58	8.2
12	London Mai Dorawa	51	7.2
	Total	709	100.0

The communities in Table 4. 1 are within the project intervention site covered during the survey and consultation meetings. The majority of the respondents are from Jauro Abare because they were widely mobilized even during the NEWMAP era and are very conversant with the proposed project.

About half of the respondents are within the age bracket of 30-49 years. More than 32% are youths i.e., 18-29 years, while those of 50 years and above constitute about 17% (Figure 4. 1).

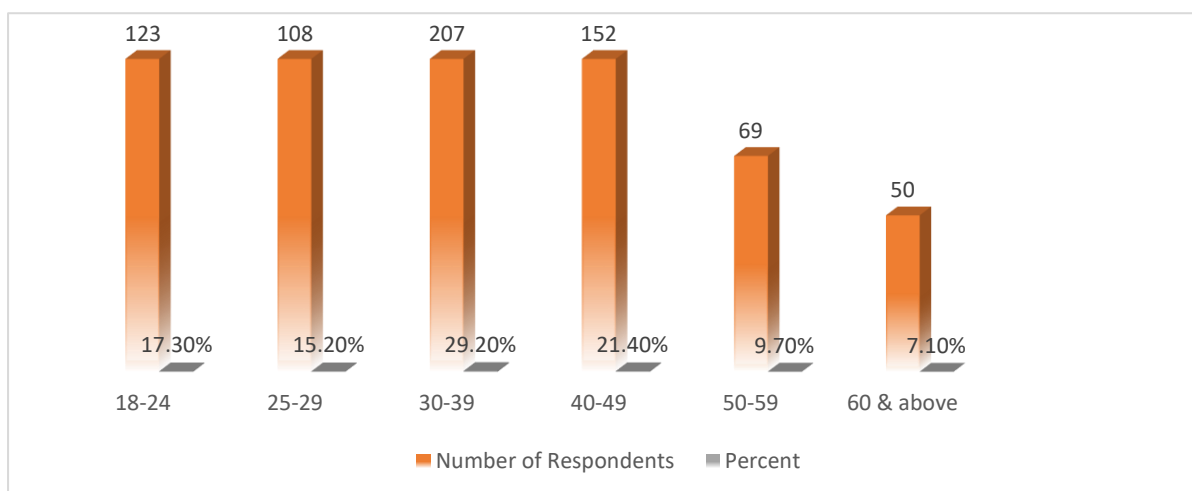


Figure 4. 1: Age distribution of respondents.

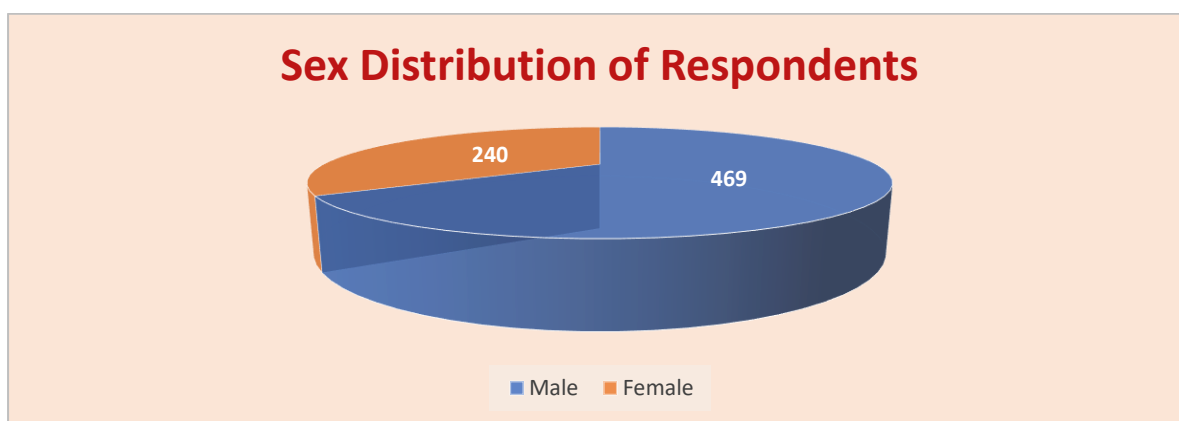


Figure 4. 2: Sex distribution of respondents.

33.9% respondents are females and 66.1% are males (Figure 4. 2). Typically, the communities are patriarchal, where decisions are largely made by men. However, the sample has a fair representation for gender since the female form about 33.9% of respondents. In fact, this was a deliberate approach to encourage female participation in the stakeholder engagement to allow and encourage them to freely express their concerns, as a right and the World bank's gender inclusiveness.

Table 4. 2: Marital status

Marital Status	Number of Respondents	Percent
Married	401	56.6
Never Married	273	38.5
Widowed	21	3
Divorced	14	2
Total	709	100.0

About 57% of the respondents are married, while 38% are single, only 3% are widowed and 3% divorced.

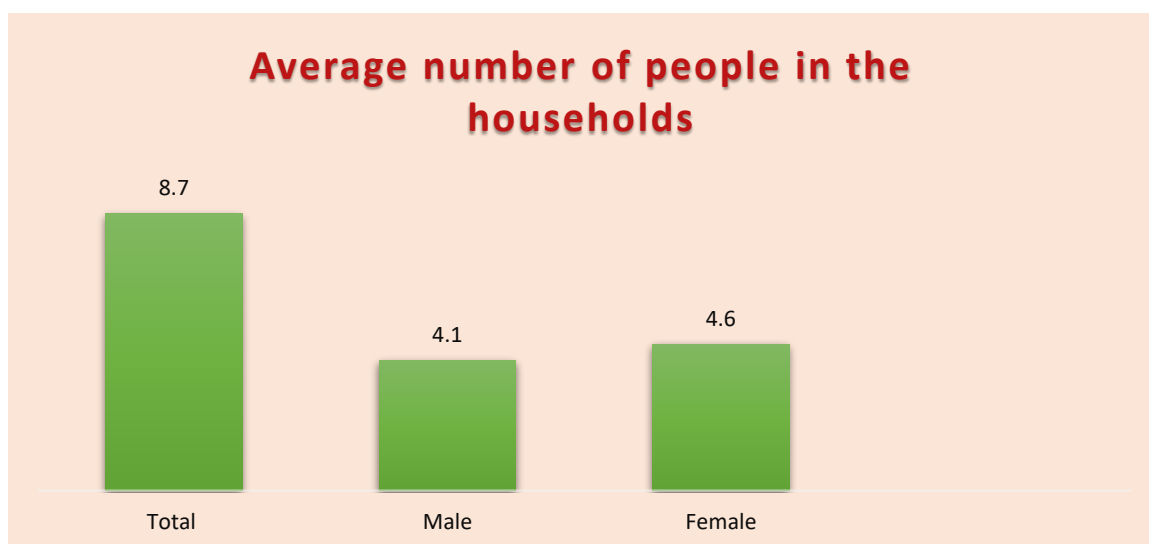


Figure 4. 3: Average number of people in the households

Figure 4.3 indicates that an average household has about 9 family members out of which 5 are females and 4 males. This coincidentally reflects the state-wide gender composition population of the National Population Census of 2006 and the 2022 projection, where both male and female population stood between the range 60% and 40%, respectively.

Table 4. 3: Opinions on the rate of unemployment

Rate of Unemployment	Frequency	Percent
High	421	59.4
Moderate	187	26.4
Low	101	14.2
Total	709	100.0

Table 4. 3 represents respondents' opinion on the rate of unemployment in the area, accordingly 59.4% rated it high, while 26.4% claimed moderate and 14.2% said it is low. The project is likely to provide opportunity for both skilled and unskilled labor for people in the area during the intervention period. Most of the houses in the area are made of bricks and cement, though a significant percentage (39%) are made with Mud, proving that the majority of the residents are low-income earners.

According to

Trading, artisanship, and farming are the dominant occupation of the respondents (Table 4. 5). Other occupations include driving, petty-trading, and food vending (engaged mostly by women), labor work (laborer's), tailoring, carwash, baking, business center operation and laundry work.

Based on Table 4. 6, most of the respondents are low-income earners as more than 60% earn 20,000 Naira and below while only about 11.6% earn above 20,001 Naira monthly, and just 23.5% earn above the national minimum wage of 30,000 Naira. Very few have incomes above 50,000 Naira monthly. Clearly, this reflects the general characteristics of the people in terms of household income and proves the communities to be dominated by low-income earners. This attribute must

be considered when assessing GBV hotspot, tendency for child labor and labor exploitation during project implementation.

Table 4. 4, almost all the respondents are literate, except 1%. Majority have up to secondary school level education, followed closely by those with Qur'anic education (31.6%) then tertiary education (21.7%) and 9.6% primary school certificate holders. Literacy is a determinant of receptivity and perception of developmental programmes or innovational changes; thus, this result is a good sign to the acceptability of the intervention project by people.

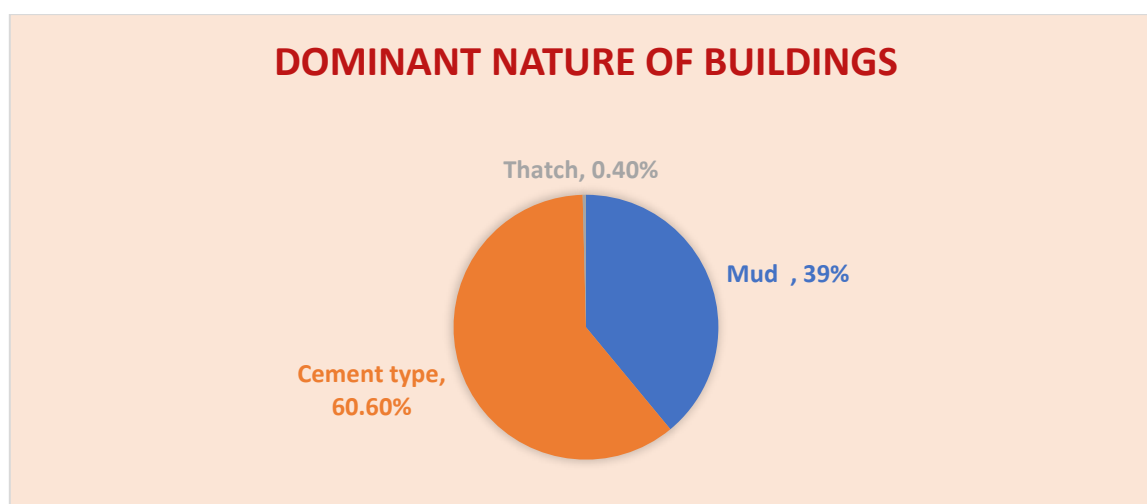


Figure 4. 4: Dominant nature of buildings.

Trading, artisanship, and farming are the dominant occupation of the respondents (Table 4. 5). Other occupations include driving, petty-trading, and food vending (engaged mostly by women), labor work (laborer's), tailoring, carwash, baking, business center operation and laundry work.

Based on Table 4. 6, most of the respondents are low-income earners as more than 60% earn 20,000 Naira and below while only about 11.6% earn above 20,001 Naira monthly, and just 23.5% earn above the national minimum wage of 30,000 Naira. Very few have incomes above 50,000 Naira monthly. Clearly, this reflects the general characteristics of the people in terms of household income and proves the communities to be dominated by low-income earners. This attribute must be considered when assessing GBV hotspot, tendency for child labor and labor exploitation during project implementation.

Table 4. 4: Educational attainment.

Level	Frequency	Percent
Qur'anic	224	31.6
Secondary	254	35.8
Tertiary	154	21.7
Primary	68	9.6
None	7	1
Non-Formal	2	0.3
Total	709	100.0

Table 4. 5: Primary occupations of the respondents

Occupation	Frequency	Percent
Civil/Public Service	76	10.7
Private Sector Work	38	5.4
Artisanship	87	12.3
Trading	104	14.7
Farming	80	11.3
Others	287	40.5
Unemployed	37	5.2
Total	709	100.0

Table 4. 6: Monthly income of the respondents.

Income	Frequency	Percent
Less Than N10, 000	285	40.2
N10, 001 - N20, 000	174	24.5
N20, 001 - N30, 000	82	11.6
N30, 001 - N40, 000	61	8.6
N40, 001 - N50, 000	52	7.3
Above N50, 000	55	7.6
Total	709	100.0

4.3 Assessment of the Affected Areas

There is lack of designated refuse collection points in the area, this is corroborated by the 90% respondents that concurred, while only 10% are of the opinion of the availability of approved refuse collection points. An approved refuse collection point here refers to any designated location for dumping household wastes for collection and disposal at appropriate dumpsites by the authorities.

This indiscriminate disposal of waste can lead to pollution and flooding if the gully channel, or tributaries are blocked with waste. Therefore, alternative sites for dumping waste would have to be provided during the construction and beyond to ensure sustainability of the project.



Plate 4. 1: A waste picker picking from refuse dumpsite to earn a livelihood.

Table 4. 7: Infrastructures in the communities.

S/N	Items Description	Jauro Abare Koran Z	Jauro Abare Zirin Gaza	Jauro Abare London Mai Dorowa	London Mai Dorowa	Jauro Abare Nahuta	Jauro Abare Ka'el Badi	Jauro Abare Wuro Ladde	Jauro Abare Ka'el Oshi A	Jauro Abare Ka'el Oshi B	Jauro Abare Alkahira B	Jauro Abare Alkahira B
1	Educational Facilities (Schools)	2 Public Private and Secondary Schol 1 Community School, 1 Private School	1 Public Primary School 1 Private School	1 Primary School, 3 Secondary School	Nil	FCE(T), FCE staff Sch, 1 Private Sch, 3 Islamiya School	1 Primary School (Public) 5 Islamiya School	1 Primary School (Public)	1 Primary School (Public)	1 Public School 1 Private School	1 Public School	Nil
2	Health Facilities	2 Private Hospitals	Nil	Nil	1 Hospital	Nil	Nil	1 Hospital	1 hospital	1 Hospital	1 Hospital	Nil
3	Recreation al Centre	2 football fields	1 Football field	3 Football Fields	Nil	5 Football fields	Nil	4 football fields	1 football field	1 Football Field	1 Football field	Nil
4	Types & Businesses Affected	Shops, Boreholes, 1 Table water company 1 Block making	Shops (trader) Chemist 3 Boreholes	Shops, Chemists Borehole	Shops, Chemists Borehole	Mini Market, Chemists Borehole	Shops, 10 Boreholes	Shops, Chemists 1 Boreholes	Shops, Chemist Food vendors	Shops, Chemist 3 Boreholes	Shops, Chemist Borehole	Shops, Medicine Store, Borehole
5	Occupation in and around the Gullies	Sand mining	Sand Mining	Sand Mining	Sand Mining	Sand Mining	Sand Mining	Sand Mining	Sand Mining	Sand Mining	Sand Mining	Sand Mining
6	Public Structures	Nil	Nil	Nil	Nil	Nil	Street Lights	Nil	Nil	Nil	Nil	Nil

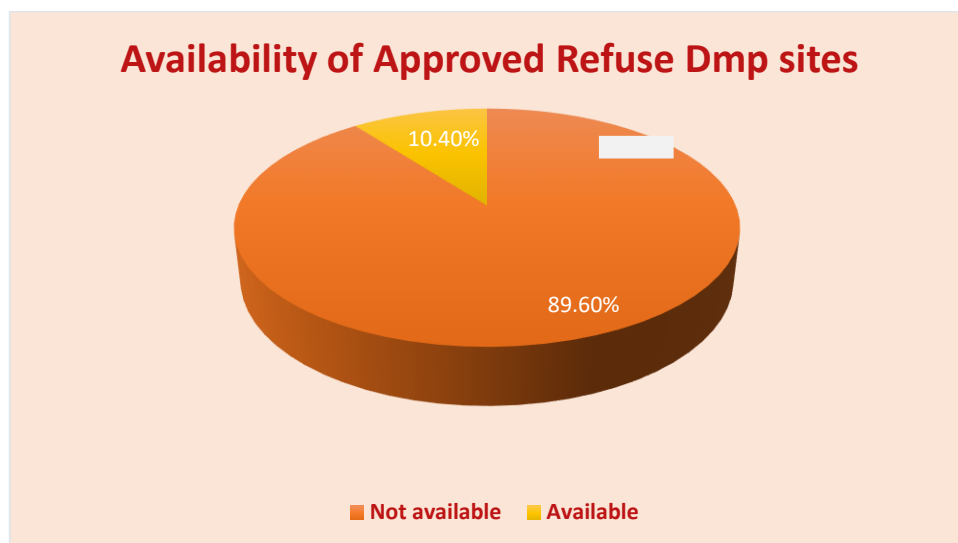


Figure 4. 5: Presence of designated refuse collection points.

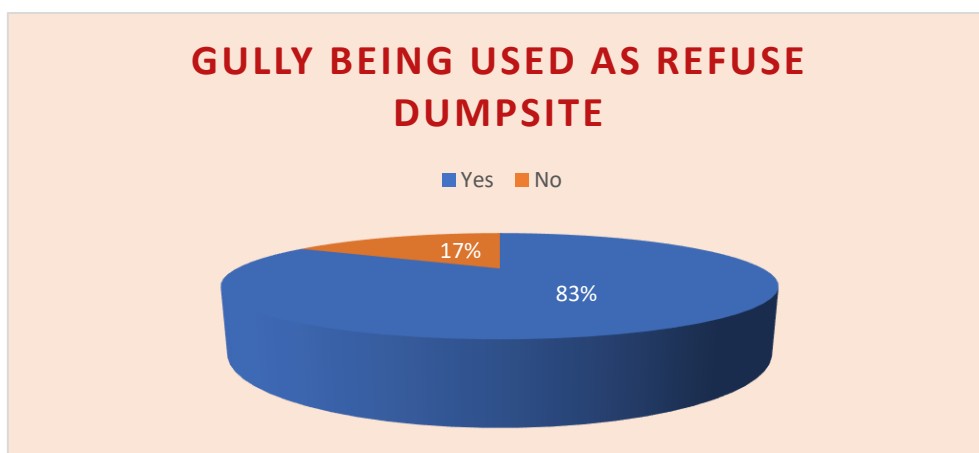


Figure 4. 6: Gully being used as refuse dumpsite.

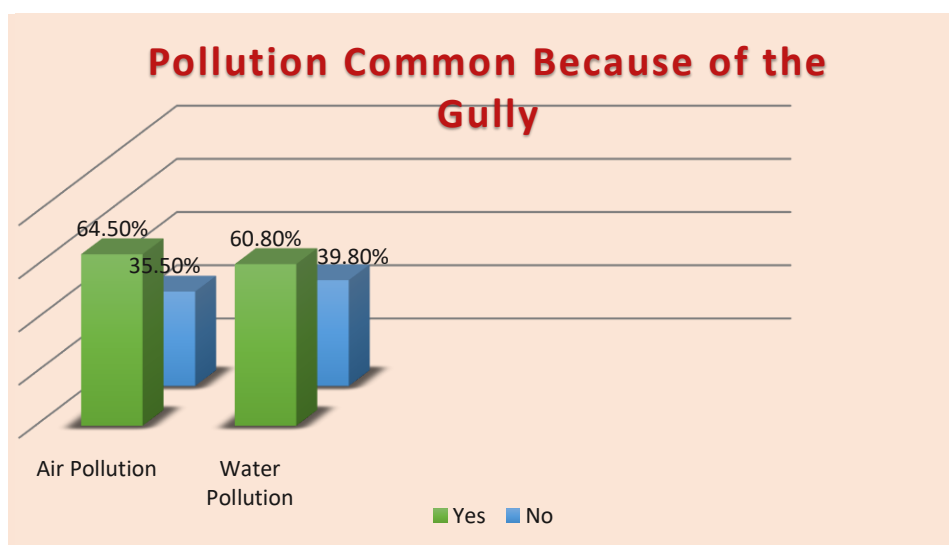


Figure 4. 7: Pollution common because of the gully.

In the absence of officially designated refuse dumpsites, 83% of the respondents dump their waste in the gully (Figure 4. 6). This is undoubtedly why there is a high rate of pollution and flooding in the area. Meanwhile according to Figure 4. 7 the increase in air and water pollution in the area is because the gully is being used as an alternate dumpsite or waste collection point by residents as attested to by more than 60% of the respondents.

Erosions, Landslides and Flooding are the common disasters in the communities. Accordingly, 40.2% reported gully erosion as the major natural disaster, followed by 30.9% who claimed Landslide, then 20.9% flooding (Table 4. 8). Thus, by executing this project, the most common natural disaster affecting the communities will be tackled and most importantly reduce landslides and flooding more significantly. The mitigation measure should anticipate and make provision for flash flood incidents in the rainy season, proper barriers and retaining wall must be placed to prevent slope failure or collapse during excavation because of lubrication (rain) in the occupational health and safety (OHS) and community health and safety (CHS).

Table 4. 8: Prominent natural disasters in the area.

Prominent Disaster	Frequency	Percent
Landslide	219	30.9
Gully Erosion	299	40.2
Flooding	148	20.9
Sheet/rill Erosion	40	5.6
No Natural Disaster	3	0.4
Total	709	100.0

Table 4. 9: Estimated distance from houses to the gully in communities.

Distance	Frequency	Percent
Less than 50m	391	55.1
50m - 100m	181	25.5
101m - 200m	84	11.8
No House	12	1.7
Above 200M	41	5.8
Total	709	100.0

The average distance of houses to the gully is mostly less than 50m as attested to by about half of the respondents. 25.5% have their houses located between 50 - 100m of the gully (Table 4. 9) an indication that these very people would form the majority of those to be directly affected during the construction work, hence indicating the need to ensure a resettlement action plan (RAP) is prepared and implemented before the project starts due to their vulnerability. Already the majority of the respondents are vulnerable to the threats posed by the gully.

Significant majority of the people interviewed do not own plots, but for the 37.2% who own plots, the average distance of their plots to the gully is less than 50m (Figure 4. 8). This is an indication that a good number of plots would be taken over during construction works, which further reinforces the need for a resettlement action plan in line with ESS5. The engineering design

made provision for a 15m x 15m set-back on either side of the gully to create space for right of way (ROW).

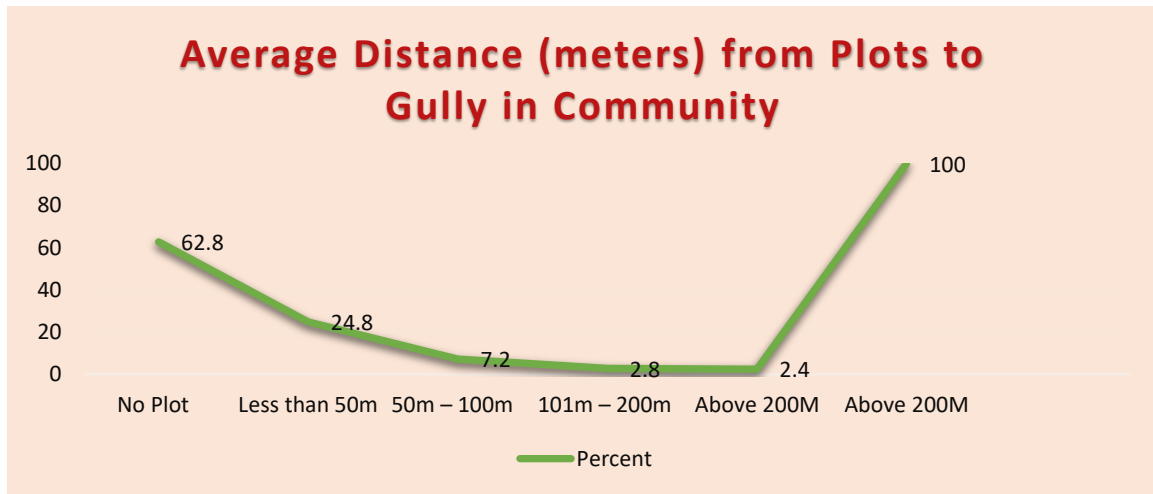


Figure 4. 8: Average distance (meters) from plots to gully in community.



Plate 4. 2: Showing a structure being protected with sandbags at risk due to its proximity to the Gully.

4.4 Social and Environmental Issues/Risks Associated with the Gully

Almost all participants except 4% (Figure 4. 9) admitted experiencing trauma due to the presence of the gully in their area. This is a source of concern and cause of fear and apprehension among community members, especially when it rains or at night, many people have been mobbed, robbed, and even lost their lives and properties because of the gully.



Figure 4. 9: Psychological Trauma Experienced by Residents Due to the Gully (%)

The presence of the gully has significantly increased the prices of goods and services like transportation in the areas due to lack of good roads. Although the newly constructed road linking the city to *London Maidorawa, Alkahira, Jauro Abare and Arawa* communities have made it relatively easier in terms of accessibility to goods and services for only those areas.

Table 4. 10: Increase in prices of goods and services due to gullies in communities.

Increase in Prices	Frequency	Percent
Yes	470	66.3
No	239	33.7
Total	709	100.0

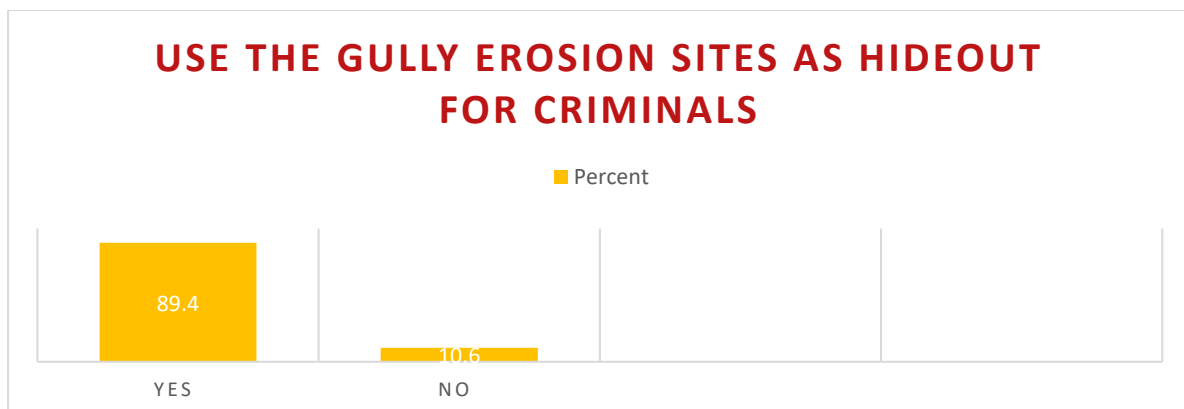


Figure 4. 10: Use of gully channel as hideout for criminals and criminal tendencies,

About 90% of the participants agreed that the gully site is used as hideout for criminals, as against 10.6% said not (Figure 4. 10). This means, the project when completed would reduce the criminal hideouts, but at the same time imply that the gully routes should be flagged as a potential security threat against workers of the construction company, their equipment, and properties.

Table 4. 11 buttresses the possibility of such aggressive criminal tendencies like theft, rape, and assault occurring, care must be taken against its occurrence during project execution.

Table 4. 11: Gully led to increase in crimes such as theft, rape, assault etc.

Response	Frequency	Percent
Yes	620	87.4
No	89	12.6
Total	709	100.0

Table 4. 12: Perceived risk(s) associated with the gully construction work.

Response	Frequency	Percent
Noise and vibration	152	49.19
Negative impact on the housing and settlement	138	44.66
Increased difficulty in movement of people, goods, and services	92	29.77
Safety concern	66	21.36
Health hazards	56	18.12
Others	49	15.86
Economic livelihoods	47	15.21
Air and water pollution	45	14.56
Disruption in water supply	35	11.33
Family activities affected	31	10.03
Educational activities affected	29	9.39
Gender issues affected	20	6.47

Although there are several concerns regarding risks and impacts associated with the proposed intervention project, majority identified noise, vibration, impact on houses/ settlements, difficulties in movement, and safety during construction works (Table 4. 12). Thus, the mitigation measures should be targeted not only on the most prominent concerns but the little ones as well.

Table 4. 13: Suggested measures to mitigate the potential risk(s).

Response	Frequency	Percent
Compensation/ resettlement	189	61.17
Conduct advocacy visits to affected communities	109	35.28
Provision of alternative access roads	81	26.21
Avoidance of total closure of access roads	72	23.3
Using less noisy equipment's	72	23.3
Putting caution, sign, tapes, and traffic guides	52	16.83
Give palliatives/ social support	42	13.59
Use of masks and other best practices	41	13.27
Provision of water tanks/ dams, etc	38	12.3
Wetting of surface before working	26	8.41
Give automatic employment for unskilled or semi-skilled workers during project	26	8.41
Regular maintenance of machines	21	6.8
Build temporary stalls for hawkers	20	6.47

Erect mobile toilets around	19	6.15
Others	17	5.5

In line with identified risks, the participants suggested mitigating measures like compensation/resettlement; advocacy visits and sensitisation of affected communities; provision of alternative access roads and traffic marshals to handle traffic etc (Table 4. 13). The risks and mitigating measures will be discussed in subsequent Chapters.

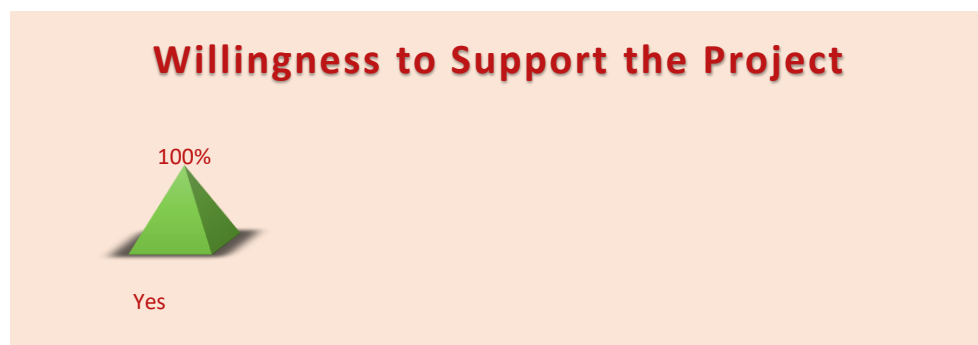


Figure 4. 11: Willingness to provide support for the intervention project.

In terms of their willingness to support the project, all the respondents expressed their willingness to do so. This is not surprising considering how the gully has impacted their lives and livelihoods.

4.5 Consultations with Relevant Stakeholders and Potential Project Affected Persons

The consultations with residents and stakeholders of the eight (8) communities living along the corridor of the FCE(T) gully site was conducted to create awareness and elicit support in readiness for the intervention work being proposed by the Gombe State ACRoSAL project in their area. The participants were informed on the ESMP process, issue of gender base violence (GBV), grievance redress mechanism (GRM), labor and their role/requirement in decision making as it relates to requirements of the World Bank Environmental and Social (E&S) management procedure, the ACRoSAL Environmental and Social Commitment Plan (ESCP) and others. The category of stakeholders consulted were traditional leaders, community association, age, and gender groups (ANNEX 14: Photographs of Community Consultations). The interaction elicited information on the following,

- i) the socio-cultural impact of the gully,
- ii) awareness of environmental impacts of human activities on the gully,
- iii) availability and adequacy of safe means of waste disposals, and
- iv) building and construction practices in the area,

4.5.1 Stakeholders Engagement and the Information

The stakeholders' consultation started on the 24th to 29th June 2023 with ward heads, community leaders, representatives of members of communities along the gully fringe and other interest groups in the project area. The information passed to them revolves round the project design, proposed timeframe for implementation of the intervention, and responsibilities of stakeholders in the E&S implementation during and after project implementation. The stakeholders were encouraged to freely express themselves, in their views, concerns, and suggestions on the project.

4.5.2 Environmental and Social Conditions in the Sub-Project Area

This section focused on the socio-cultural impacts of the gully as it relates to family/kinship ties, childcare/upbringing, and other social activities. Most participants expressed concerns that always face difficulties when crossing the gully, especially pregnant women and children who daily crisscross the gully going to school or to fetch water from the other side. According to them, the gully has effectively divided the communities. Thus, everybody had to cross through it to get to the communities on the other side. Consequently, participants expressed optimism that with the intervention, commercial bikes and tricycles can easily transport passengers across to other communities. On the rates of accidents, they opined that it is high but can be reduced with the successful completion of the intervention.

Others expressed fears that households along the gully are highly vulnerable and suffer movement restriction, increase in transport fare, landslides, and accidents. The following were expressed by stakeholders:

More than ten (10) people could not get home the previous day because of the heavy downpour; so, the effect of the gully affects people's movements. Last year five (5) people were lost (drawn) trying to cross the makeshift (crossing) bridge constructed by the villagers.

The effects of the gully affect people's movements. Children can't go to school; access to health care during emergencies is difficult, people don't want to visit us often because of challenges faced while crossing the gully.

*I am from **Wuro Ladde**, due to the gully; movement is restricted and often people find it difficult to go to town. When it rains the cost of coming over here on bike is higher than on normal days because of the gully.*

Other effects identified include difficulties accessing water sources, challenges faced by pregnant women in accessing health care facilities due to delays in transportation especially during the rainy season. Construction works on other major highways and drainages e.g., on Dukku road re-directs runoff to increase runoff into the gully channel,

The gully ripped away part of my house during the rain. To the community, transportation is very difficult. For example, if you want to take a pregnant woman to the health facility, it is a very hard process.

The difficulties accessing the community affect all socio-economic activities in the area. This includes access to health facilities and schools for the children, etc.

The gully is also a source of mosquitoes, which in turn makes the place malaria-prone and when the water inside the gully touches one's skin, it causes rashes.

4.5.3 Activities that Impact Negatively on the Environment

This section explores participant's notion on waste disposal (solid and liquid), whether the practices impact negatively on environmental health, especially whether people are aware of the environmental impacts of indiscriminate disposal of waste in the gullies. The stakeholders agreed that waste is disposed in the gullies to reclaim and or stop the gully from expanding e.g., when a gully finger has just started to form, it is quickly converted into a dumpsite to prevent it from enlarging into a bigger one. For the big gullies, however, it takes the use of sandbags and used tires filled with sand, etc. to stop it. They opine that although these methods have not been effective, it is the only indigenous way they can fight the gully erosion and retard its development in some cases. In addition, participants believe that the gully has caused so many flash floods that destroyed several houses in 2022 especially, and previous years.

When asked on the activities that negatively impact the environment, respondents opine that indiscriminate waste disposal calls for concern. Other stakeholders are concerned with the open burning of waste and indiscriminate disposal of polyethylene bags from sachet water everywhere in the area. They feel that these could cause increased pollution, which can impact on the local environment and the health of the residents. They expressed the need for better waste management to help reduce pollution. According to one female respondent *"They collect all their wastes in Koron Zaki area and burnt it for use as fertilizer on their farms."*

The participants (residents) also lament the use of the gully for open defecation which can affect public health through cases like typhoid fever, cholera etc. Dumping of waste in the gully by the people to control the development of the smaller gullies near their houses is exacerbated by lack of designated waste collection points. As a result, the people often revert to either dumping in the gullies or on the road. Surprisingly, stakeholders are aware of the impact of indiscriminate waste disposal, but due to lack of options, they still dump into the gullies. It is believed by the participants that if the gully is rehabilitated (constructed), their attitude might change. Open defecation in the gully is a common trend some participants revealed thus:

People practically use the gully as a toilet facility because most people don't have toilets in their houses and there is no public toilet in the area, so the gully is their best alternative.

People from adjoining communities come to defecate in the gully also.

4.5.4 Building Construction Practices

Most participants agreed that sand mining is a major activity that exacerbates the effect of the gully, the homes along the gully fringe are made of mud and mud bricks that are mined from the gully. Here no building code is adhered to, compliance with urban planning and building regulations is negative. Lack of monitoring and enforcement from the State Urban Planning Board means people continue to build indiscriminately along the gully channel, because of which gully fringes have been encroached on with buildings. On mining of sand and mud in the area: Several of the respondents identified the activity as illegal and that it is contributing to the worsening situation of the gullies. They believe that the gully provides easy, convenient, and cheap source of sand and mud for building, even though the majority agreed that sand mining (excavation and extraction)

contributes greatly to the expansion and change in alignment of the gullies. The following expressions attest to the situations.

Some people tried to build in front of my house, which can divert the flood water to my house, and I have small children that will be affected. So, I took up the case with the traditional leaders, and they [those responsible for construction] were stopped.

The rule is that the traditional leader must accept your purchasing right to a plot [of land] and your construction to make sure you do not encroach into public spaces such as roads. If you violate that, they stop or pull down the house.

The consultations yielded positive results as it is obvious that community members understood the impacts of sand mining/extraction and the need for sufficient drainage to discharge run-offs from buildings, access roads, waste collection points, public toilets etc.

4.5.5 Recommendations

Several recommendations on how best to address gully erosion problem in the area were offered by the stakeholders. The commonest are tree planting, construction of barriers using sandbags and concrete walls among other approaches. They suggest that these measures can only help reduce the impact of surface runoff on the soil thereby reducing surface erosion and most importantly expansion of the gullies due to gully bank undercutting and landslides. Meanwhile few respondents expressed hopelessness with regards to gully erosion control, according to them the communities around the area have no choice but to relocate from there.

The stakeholders were presented with the engineering design of the proposed gully rehabilitation project, describing the different components of the design and the various phases of the construction work. After which, they were provided with opportunities to discuss how they feel the construction activity could affect them. Their responses/questions were answered and analyzed to determine the appropriate mitigation measures to introduce to counter the potential impacts.

The stakeholders provided the following recommendations:

- i) Timely and adequate compensation: that compensation should be provided to people whose land and properties are likely to be impacted, this should be monitored to ensure everybody is compensated and that the activity does not cause further damage to the environment.
- ii) Stakeholder engagement and information dissemination: participants observed that community members should be informed and abreast with the project in advance and consulted on impact mitigation measures adopted so that they too can contribute. That all stakeholders should be involved in the decision-making of the project.
- iii) Provision of alternative access roads and culverts: according to respondents, in situations where movement of people is restricted, alternative access roads should be provided. This would ensure uninterrupted access to resources, hospitals, markets, and services for people in the area. It would also improve the safety of people traveling in the area.
- iv) Promote livelihood opportunities: the majority of the respondents are aware of the potential benefits of the project. They felt the project would bring about more economic opportunities

and improve the quality of life for their people, in addition to connecting their communities with the rest of the metropolis.

- v) Maximize leadership structure: the existing traditional system of leadership and consultation can be utilized in addressing grievances that are likely to come up. Hence this system of consultation should be open to all levels of society and should be accessible and transparent. The leadership should be responsive to the demands of their people and take proactive steps in addressing grievances in a free, fair, and transparent manner. All decisions must be prompt and open to public scrutiny.

CHAPTER FIVE: ASSESSMENT OF POTENTIAL IMPACTS AND ANALYSIS OF ALTERNATIVES

5.0 Introduction

Four sites (Railway line, Barunde - Doma and International Hotel gullies) were initially identified for intervention under the Nigeria Erosion and Watershed management project (NEWMAP). However, under ACRoSAL the FCE(T) topped the other three, not only because of its investment readiness, but because of its peculiarity and the hazards it presents to human lives, properties, and the environment. Moreover that the intervention is in tandem with the ACRoSAL project development objective of enhancing livelihoods in targeted watersheds (Section 1.1 Project Development Objectives of the ACRoSAL Project).

The areas affected by the gully are fast becoming hazardous for human habitation as hundreds of buildings and dwellers are directly or indirectly affected. While some have relocated within the neighboring communities, others are on the verge of doing so. Condition at the site shows that most roads within the communities have been cut-off by the gully, economic activities and communications have been affected including the Federal College Campus. The road linking the Federal College of Education main school quarters and the primary school has been cut-off by the gully, many buildings have given way while others are at risk as the gully erosion gradually encroach into them. The government has done little or no intervention/effort to stabilize the environment due to the complex nature of the gully, efforts by the affected communities to provide access roads in a bid to ameliorate the problem is not enough to curb the problem. Another devastating effect caused by the gully is the collapse of the outlet of a major four cell culvert of the Nigeria railway corporation. The continual existence of the culvert cannot be guaranteed if measures are not immediately put in place to prevent its complete collapse, the collapse will disrupt economic activities, with resultant hardship on the communities (the challenges the gully presents has been discussed in previous Chapters, particularly Section 1.3 Description of the Intervention Site).

In this light, the best alternative is to completely reclaim the affected areas, if nothing is done (i.e., non-reclamation), the risk posed is very high as the gully will gradually and eventually encroach into wider area thereby destroying lives and properties along its path. Three design concepts (options) were presented and the best suited for the site and its environs was chosen (Section 1.4 Project Description and Project Activities).

This chapter therefore provides an overview of the anticipated environmental and social risks and impacts of the proposed FCE(T) gully erosion and flood control project in Gombe metropolis, Gombe State. In here, details of the associated impacts on the biophysical environment, the socio-economic condition and human health and safety are presented alongside their proposed mitigations, as well as the beneficial impacts of the intended intervention are discussed. It also explains the methodology for assessing and analyzing the potential E&S risks and impacts.

5.1 The Potential Risks and Impacts Analysis.

The proposed intervention works will cause several risks and impacts on the environmental and social aspects of the intervention communities. Although some of these impacts could be said to be beneficial, when the rehabilitation is considered against doing nothing. All the same, construction works (civil work) and its associated activities can generate immediate adverse risks and impacts on the environment and social condition of a place.

The project will cut through residential areas, and open fields referred to as legacy land. Legacy land is a land lost to gully erosion, a land which use to be a farmland or a building but was lost to the meander nature of the gully. Most of this legacy land would be recovered/reclaimed by the intervention, thereby creating opportunity for future conflict between the original owners (who would want to reclaim or encroach on) and the government or community leaders. While taking cognisance of the set-back (project corridor) which is 30m (15m on both sides), a set-back management plan is required to avoid future conflicts that can trigger community health and safety issues. There is also the issue of land acquisition in the residential area and demolition/removal of structures, to give way for the set-back, though a standalone RAP document has been prepared, the impact could be beneficial as well as adverse and can cause serious conflict in the community.

There are also the issues of security concerns on Gombe state being part of the northeastern states that are exposed to insurgency, kidnapping etc., therefore the already developed project security management plan can be integrated to curtail issues of security challenges and management of security personnel during project implementation.

Also, the geologic nature of the site to be intervene on would require a rock blasting management plan to protect against injuries to workers and community members from flying rock debris when rock formations are encountered during excavation. Flash flood can easily occur without warning in the rainy season, when one considers the length of gully and volume of urban runoff discharged through the gully It is possible for a surge or sudden discharge to occur without notice. Hence a flood emergency preparedness plan should be covered in the occupational/community health and safety,

Thus, to ensure project sustainability, these risks and impacts must be prevented. Both the beneficial and adverse risks and impacts linked to the proposed intervention at the FCE(T) erosion and flood control site would be identified.

5.2 Methodology

The Leopold matrix method for environmental and social risks and impacts prediction and evaluation was used to identify the risks and impacts of the project on both environmental and social components. It is a two-dimensional matrix that cross-reference activities of a project against existing environmental and social condition of the FCE(T) site to determine their risks and impacts. This was done by first developing a checklist of possible project activities and actions that are likely to cause environmental and social risks and impacts at one stage or another during project implementation (see Annex 16).

5.3 Impact Identification and Rating Process

The possible risks and impacts were determined on the bases of interaction between a project activity and the environmental and social medium in the area. Judgement is governed by assessing the nature, extent, and experience from similar works, in addition to guidance from the World Bank's ESF's proportionality concept, and interaction with stakeholders and experts. Thus, the environmental and social components to be affected by the activities are categorised into i) biophysical, ii) human and socio-economic, and iii) cultural attributes.

The risks and impact on the other hand were categorised as beneficial/adverse, direct/indirect, cumulative/residual, reversible/irreversible, and long-term/short-term to evaluate their probability, likelihood, and frequency of occurrence.

The FCE(T) gully erosion and flood control project is envisaged to have a range of positive environmental and social impacts, some of which are a function of the objective of the rehabilitation project and the objective of the design.

It is important to note that some adverse impacts may be associated with the rehabilitation of the gully, but notwithstanding, the ESMP is prepared to ensure that these impacts are reduced to the barest minimum. As highlighted in previous sections, the first step in the identification of impact is the development of checklists of project activities that are likely to impact the environmental and social components of the project area. Details of the gully rehabilitation activities identified to cause impact are:

- ✓ Mobilization, labor recruitment and engagement
- ✓ Surveying, demolition, pegging, and site clearing.
- ✓ Excavation for drainage and gully route
- ✓ Construction of Culverts and drainages Construction (casting and concrete work)
- ✓ Back filling and protection of buffers
- ✓ Operation and maintenance
- ✓ Decommissioning

5.3.1 Preliminary Identification of Impacts

Prediction of impacts determines what would happen to the environmental and social components because of the project's associated activities. It is essential to assess the interactions between the project activities and the baseline environment, the information is updated from the possible interaction and possible impacts identified. Table 5. 1 provides the possible key impacts to occur during the preliminary stage of the implementation.

Table 5. 1: Some Environmental and Social Components and their Impact Indicators.

Aspect	Environmental Component	Impact Indicators
Biophysical	Atmospheric Elements	Gaseous emissions (like NO_x, SO_x, PM, CO₂) that contaminates ambient air quality and contributes to greenhouse effects.
	Noise Level	Increase in ambient noise level
	Soil	Changes in physico-chemical and biological properties of soil.
	Aquatic Ecology	- Changes in the baseline physico-chemical properties of water. - Changes in community composition and abundance of aquatic biota including microbes, plankton, macrobenthos, fishes, mammals, reptiles, amphibians, birds' species, etc.
	Topography	Changes in land terrain and topography
	Vegetation	Changes to vegetation population, health, species abundance and diversity and impact on engendered and economic species.
	Water	- Depletion of local water resources. - Contamination of source of water
Human, economic Cultural	Socio- Land-use pattern	Changes in land-use patterns and acquisition etc.
	Demolition of structures	- Changes to the physical environment - Scavenging opportunities for building materials e.g., roofing sheets, iron, timber etc. by community members, which can cause accidents and injuries.
	Local population level	Influx of migrant workers to the affected communities
	Socio-economic system	Changes in employment opportunities and income differentials.
	Socio-cultural center	Changes in social structure, organization and cultural heritage, practices, and beliefs.
	Basic Amenities and Infrastructure	- Easy access to goods and services, education, health care, water, fuel, and consumer goods. - Stressing of local infrastructural facilities.
	Aesthetics	The presence of unsightly or noisy facilities.
	Security threat	- Presence of armed security. - Insurgence and kidnappings

5.3.2 Impact Evaluation

The positive impacts include most if not all the challenges identified in Section 0 will be resolved.

Table 5.10: Potential Negative Impacts

1) Impacts to Geology, Soils and Land		
Phase	Potential impact	Mitigation
Pre-Construction and Mobilisation Phase	★ Restriction access to land and its resources	★ Provision of Alternative Access and Compensation Through RAP. ★ Management of Land Use Restriction
	★ Site clearing will lead to loss of species diversity and abundance, including soil organisms, fungi, invertebrates, and bacteria.	★ Vegetation Clearing and Biomass Management Plan.
	★ Impacts of Materials Borrow Sites	★ Borrow Pit Management Plan
Construction Phase	★ Excavation of large areas within the site may create footprints that may lead to impact on the site's natural topography and soil structure.	★ Erosion and Sediment Management Plan
	★ Potential increase in erosion of area(s) cleared.	★ Erosion and Sediment Management Plan
	★ Increased generation of solid and liquid waste	★ Waste Management Plan ★ Chemical Management Plan ★ Storage of Fuel and Other Toxic Waste Management Plan
	★ Accidental spills may lead to impacts on soils and land quality (e.g., Fuel and lubricant storage areas, re-fueling stations; maintenance areas; waste storage areas and plant and equipment holding areas).	★ Storage of Fuel and Other Toxic Waste Management Plan. ★ Construction Waste Management Plan
	★ Flying rock particles hit workers or community member during rock blasting.	★ Rock Blasting Management Plan
Operation and Decommission Phase	★ This impact may be prevalent during high rainfall periods (loose compaction).	★ Supervision and Monitoring.
	★ Change to local topography along the alignment of the gully	★ Management of Design Implementation, Monitoring, and Supervision.
2) Impacts on Surface Hydrology, Groundwater, and water quality		
Phase	Impact	Mitigation
Pre-Construction and Mobilisation Phase	★ Site operations during construction phase, primarily the extensive excavation and filling proposed, may change the surface hydrology, and thus impact the water quality and groundwater beneath the site.	★ Construction Waste and Excavated Material Management Plan. ★ Management of Removes Trees and Vegetation Cover.
Construction Phase	★ Increased water demand and depletion of available surface and well water used by community members.	★ Water Management Plan

	★ Alteration of natural drainage pattern ★ Flash flood and ponding of water during work can expose workers and community members to the risk of drowning, the ponds may become breeding ground for disease vectors. ★ Disruption or rupture of sub-surface water ways during excavation	★ Flash Flood Preparedness and Emergency Management Plan. ★ Flood Risk Management Plan. ★ Excavation And Trenching Management Plan
Operation and Decommission	★ Channel Bank overflow, causing flooding of adjacent land area	★ Flood Risk Management.
3) Impacts on Terrestrial Ecology		
Phase	Impact	Mitigation
Pre-Construction and Mobilisation Phase	★ Clearing for setting batching plants ★ Removal of vegetation cover	★ Tree and Vegetation Cover Removal Management Plan.
Construction Phase	★ Excavation of large areas within the site footprint may lead to direct loss of terrestrial habitat and some fauna. ★ There will be loss of habitat and disturbance. ★ The reshaping of the gully by a cut-and-fill civil works will result in direct loss of vegetation and habitat for terrestrial fauna. ★ Loss of vegetation due to the removal of vegetation cover for access roads and channeling ★ The construction of the drainage conduits upstream, gully bypass system and baffled chute will lead to direct and permanent loss of area for the terrestrial habitats and species. ★ An indirect effect on terrestrial faunal species could occur relating to construction activity such as noise and increase in human activity. ★ An indirect effect on terrestrial faunal species could occur relating to the continued storm water flow and increase in human activity. ★ Increased Soil Erosion incidences	★ Excavation and Trenching Management Plan. ★ Vegetation Clearing and Biomass Management Plan ★ Vegetation Clearing and Biomass Management Plan ★ Management Of Construction Noise. ★ Flood Risk Management Plan ★ Erosion and Sediment Management Plan.
4) Impact from Noise and Vibration		
Phase	Impact	Mitigation
Construction	★ Potential disturbance to birds in the area through construction noise and vibration.	★ Control of Noise and Vibration. ★ Traffic and Vehicle Management Plan

	★ Noise from construction plants and vehicles could cause nuisance impact. ★ Noise from vehicles due to increased traffic in the area could cause nuisance impact	
Operation and Decommission Phase	★ Channel blockage by waste to present free flow of discharge	★ Waste Management Plan
	★ Over topping the channel wall to cause flooding and or structural damage	★ Flood Risk Management Plan
5) Impact on Air Quality		
Phase	Impact	Mitigation
Construction	★ Fugitive emissions of hazardous dusts with potential impact on human health and sensitive ecosystems.	★ Air Quality and Dust Control Management Plan
	★ Emissions of nitrogen oxides (NOx) and other chemicals, and particulates (PM10 and PM2.5) from construction vehicles and mobile plant and potential subsequent impact on human health.	
	★ Air Quality will be affected in the communities due to anticipated increase in vehicular traffic.	★ Traffic and Vehicle Management Plan
	★ Increase in Green House Gas emissions from vehicular movement during the operational phase of the project	★ Air Quality and Dust Control Management Plan
	★ Inefficient use of energy with implicit carbon dioxide emission	★ Management Of Construction Air and Gas Emission
	★ Emissions of NOx and other chemicals, PM10 and PM2.5 from operational vehicles and subsequent impact on human health.	
6) Impact from Waste Generation and Management		
Construction	★ Generation of solid waste during construction of the gully channel may contribute to increased waste volumes in the affected communities.	★ Construction Waste Management Plan
	★ Demolition and removal of structures	★ Demolition Management Plan ★ Waste Management Plan for demolished Structures
	★ Potential contamination of water and ground through negligent handling, storage, and disposal of wastes.	★ Storage Of Fuel and Toxic Material Management Plan
	★ Increased volumes of traffic to take waste off the site; and	★ Construction Noise and Traffic Management Plan
	★ Increase in waste produced during operation because of surge in population in the affected communities,	★ Waste Management Plan.

	may contribute to increased waste volumes going to landfill.	
	★ Potential contamination of water and ground through negligent handling, storage, and disposal of wastes	★ Storage Of Fuel and Toxic Material Management Plan ★ Waste Management Plan
	★ Increased volumes of traffic to take waste off the site.	★ Traffic Control Management Plan.
7) Impact on Socio-economy		
Phase	Impact	Mitigation
Pre-construction, Mobilization	★ Grievance/conflict due to resettlement and compensation issues.	★ GRM, RAP
	★ Displacement and exposure of vulnerable persons e.g., women, children and people living with disability to effects of involuntary resettlement and relocation.	★ RAP
	★ Impacts on increased construction traffic, associated accidents and inconveniences	★ Construction Traffic Management Plan.
	★ Presence of arm security personnel	★ Security Management Plan (SMP) ★ Raising Awareness ★ SMP Base GRM
	★ Demolition and removal of structures will encourage community members to scavenge for leftover building materials like roofing sheets, iron, tiles, electrical and other household fittings etc., which might cause injuries and accidents if not properly handled.	★ Demolition Management Plan ★ Debris Evacuation / Removal Management Plan ★ Waste Management Plan ★ OHS/CHS
Construction	★ Potential change in the size of the local population, its ethnic make-up and religious make-up due to labor influx.	★ Labor Management Plan ★ Stakeholder Engagement Plan
	★ Gender Equity and Mainstreaming in employment.	★ Labor Management Plan ★ Gender Inclusiveness Plan
	★ Influx of workers and in-migration could put pressure on the already limited social infrastructure e.g., schools, health facilities, village roads, water supplies, etc.	★ Labor Management Plan
	★ Threat of armed insurgence and kidnapping	★ Security Management Plan
	★ Increased local traffic and delays due to increased construction plant and vehicles moving to and from site, may affect pupils' movement to schools and sometimes religious activities due to blockage of roads.	★ Traffic and Journey Management Plan

	★ Presence of construction workers and in-migration could place pressure on already limited social infrastructure e.g., schools, health facilities, village roads, water supplies, etc.	★ Labor Management Plan ★ Stakeholder Engagement Plan ★ Awareness Creation
	★ Increase in the prices of goods and services in the community	
	★ GBV/SEA/SH, especially due to interaction between girl child as Leisure and social activities may be halted, especially as some viewing centers and football pitches around and within the gully erosion site and construction workers.	★ GBV/SEA/SH Risk Management Plan
	★ Child Protection, Sexual exploitation, and abuse (SEA) of under-age girls	
	★ Weak structures like houses and properties may developed cracks or damaged due to movement of heavy machineries and vibration.	★ Noise and Vibration Management Plan
	★ Possible change in the size of the local population, ethnic composition, and religious structure.	★ Public/Stakeholder Engagement Plan
	★ Phobia of losing properties due to accelerated expansion of the gully.	★ Awareness Creation and Sensitization
	★ Labor influx and Social Change, the large number of outside workers required could have negative impact on social and cultural values among the residents	★ Labor Management Plan ★ Contractor Code of Conduct
	★ Gender Based Violence (GBV), Rape and Sexual harassment, Alcohol, and drug abuse.	★ GBV/SEA/SH Risk Management Plan
	★ Conflicts between construction workers and local communities	★ GRM ★ Contractor Code of Conduct
	★ Disruption of Public Utilities when triggered by construction work,	★ Raising Awareness and Public Engagement.
	★ Impacts on increased construction traffic, associated accidents and inconveniences.	★ Traffic Management Plan ★ Training on alternative jobs
Operation and Decommission Phase	★ Loss of employment for laborers after completion of the rehabilitation work.	★ Pay-Off and Bonuses
	★ Complaints and Grievances / Social Conflicts between laid off workers, community, and company	★ GRM ★ Contractor Code of Conduct
8) Impact On Community Health and Safety		
Phase	Impact	Mitigation

Pre-Construction	★ Demolition and removal of structures will encourage community members to scavenge for leftover building materials like roofing sheets, iron, tiles, electrical and other household fittings etc., which might cause injuries and accidents if not properly handled.	★ Demolition Management Plan ★ Debris Evacuation / Removal Management Plan ★ Waste Management Plan - OHS/CHS
Construction	★ Inhabitant of communities along the gully alignment will be exposed to dust and hazardous materials that may be present in hazardous construction waste materials and physical hazards associated with the use of heavy equipment may lead to respiratory diseases. ★ Worker's welfare and Community Health and Safety. ★ Spread of Communicable diseases, HIV/AIDS, STDs and other infectious disease among workers and community members. ★ Exposure to noise and traffic accidents. ★ Exposure of vulnerable people like women, children and people living with disability to access restriction and accidents. ★ GBV/SEA/SH incidents against women and children. ★ Security Threat (banditry, kidnapping robbery etc.) from thugs and bandits. ★ Crime Threat, Absenteeism in schools, ★ Occupational Safety and Health Hazards ★ Contamination by liquid waste and hydrocarbon spills (diesel, oil etc.), ★ Workmen's and Storage, Camp Excessive Noise, and vibration. ★ Construction dust and air quality. ★ Exposure to flying rock materials during blasting.	★ Air Quality and Dust Control Management Plan ★ Community Health and Safety ★ Occupational Health and Safety ★ Management Of Construction Traffic and Noise. ★ Restriction and Accessibility Management Plan. ★ GBV/SEA/SH Risk Management Plan ★ Security Management Plan ★ Stay In School Management Plan for Children ★ Occupational Health and Safety ★ Management Of Construction Waste. ★ Storage Of Fuel and Other Toxic Materials Management Plan. ★ Air Quality and Dust Control Management Plan ★ Rock Blasting Management Plan.

Table 5.11 Potential Positive Impacts

1) Impact on Geology, Soils and Land		
Phase	Impact	Mitigation
Pre-Construction	★ Create employment opportunity for people in the area	No mitigation required
Construction	★ Create skill acquisition and development	
	★ Opportunity for understanding the geology and soil profile of the area for research students from FCE(T) and environ.	
2) Impacts on Terrestrial Ecology		
Phase	Impact	Mitigation
Construction	★ Construction of green buffers would improve the micro-ecology of the area by providing habitat for small organisms.	No mitigation required
Operation and Decommission	★ Creation of new habitats and sanctuary for small animals like rats, snakes etc within the protected buffers along the drainage channel.	
3) Impact on Waste Generation and Management		
Phase	Impact	Mitigation
Construction	★ Development of different waste management skills and strategies	No mitigation required
Operation and Decommission	★ Community Associations and Community Interest Group could benefit from Contractor's waste management equipment during decommissioning.	
4) Impact on Socio-Economic		
Phase	Impact	Mitigation
Pre-Construction	★ Opportunities for income generation through land acquisition.	No mitigation required
	★ Benefit from scavenged materials from demolished structures such as roofing sheets, electrical and household fittings, blocks, iron, window frames etc.	
	★ Community members would get firewood from the fallen (cleared) tree and shrubs. Economic activities will thrive in the affected communities.	
	★ Economic activities will thrive in the affected communities.	
	★ Improved livelihood and activities affected communities from RAP compensation and livelihood support.	
Construction	★ Provision of employment for both skilled and unskilled workers.	
	★ Construction activities will encourage economic activities, especially for women since there would be large workforce, petty traders and food-spots owners will benefit from demand on the site.	
	★ Potential positive impact on the local economy as workers will need to stay in the local area during rehabilitation of the gully.	
	★ Rehabilitation of the erosion menace in the 8 affected communities.	

	★ Promotion of goodwill and community appreciation for ACREsAL in the affected communities and the entire Gombe State. ★ Connection and restoration of access to houses and communities already cut off by the gully. ★ improve communication network (roads with more linkages) ★ Business activities will increase due to the inherent opportunities the intervention project will stimulate for local suppliers and service providers	No mitigation required
Operation and Decommission	★ People would have opportunity to reclaim their land back (legacy land-land lost to erosion) after government has taken its 15m setback on both sides of the channel. ★ No more fear of threat of losing homes and properties to erosion during raining season or flash flood. ★ The FCE(T) would have additional land area (space) to develop on due to reclaiming of land lost to erosion. ★ Economic activities will thrive in the affected communities. ★ Gully will no longer serve as safe-heaven for criminals' hideout as there would be securities and workers around the sites ★ Aesthetic beautification from green area development of the 5m buffer on both sides of the channel with trees and grasses. ★ increase the value of land,	No mitigation required
5) Impact on Community Health and Safety.		
Phase	Impact	Mitigation
Pre-Construction	★ Stakeholder Engagement and community sensitisation of the project	No mitigation required
Construction	★ Medical support to community members through contractor's medical facility.	
Operation and Decommission	★ Community might benefit from contractor's social cooperate responsibility.	
	★ Reduction in mortality and morbidity from landslide and gully erosion induced accidents	

Table 5. 2: Summary of Activity Specific Risks and Impacts.

Project Phase	Activities	Associated and Potential Impacts	Mitigation
Pre-Construction	Land acquisition and demolition of existing buildings	★ Reduction in access to land resources and anxiety on the part of the communities. ★ Opportunities for income generation ★ Economic activities may thrive in the affected communities. ★ Grievance /conflict due to resettlement and compensation issues ★ Work related accidents leading to injury /death of workers. ★ Accidents and injuries to scavengers or community members during demolition and removal of structures	★ Stakeholder Engagement Plan. ★ RAP-GRM ★ Occupational Health and Safety Management Plan. ★ Demolition Management Plan
	Mobilization of equipment and personnel	★ Increase traffic and delays. ★ Noise from heavy duty vehicles ★ Gas emission from vehicles and machines	★ Traffic and Vehicle Management Plan. ★ Noise and Vibration Control Management Plan. ★ Air Quality and Dust Control Management Plan
	Site clearing and preparation	★ Loss of species diversity and abundance ★ Potential increase in erosion of area(s) cleared. ★ Increased generation of solid and liquid waste ★ Dust generation and emissions from vehicles and machines	★ Vegetation Clearing and Biomass Management Plan. ★ Waste and Chemical Management Plan. ★ Air Quality and Dust Control Management Plan
	Recruitment of local labor	★ Employment opportunities for the local populace ★ Increase in economic activities. ★ Increase in the price of commodities (High demand for food, fuel etc.) ★ Influx of people in search of jobs, which may lead to population / demographic change. ★ Increase in the spread of communicable and sexually transmitted diseases (e.g., HIV, Hepatitis) ★ Cultural conflict between migrants and local people. ★ Increase demand for housing	★ Occupational/Public Health and Safety Management Plan. ★ Labour Management Plan. ★ GRM and Stakeholder Engagement Plan
Construction	Excavation for drainage/gully route	★ Change to local topography of the area. ★ Work related accidents leading to injury /death of workers. ★ Soil and surface water pollution because of accidental spill of fuel and lubricant ★ Noise and ground vibration from heavy equipment	★ Occupational Health and Safety ★ Storage of fuel and toxic material management plan. ★ Control of Noise and Vibration Management Plan

Project Phase	Activities	Associated and Potential Impacts	Mitigation
		★ Respiratory effects on the health of the workers because of dust	★ Waste Management Plan.
	Construction of drain canal	★ Creation of deviation/diversion routes that will likely take up land and cause traffic delay. ★ Hinder access to homestead during drainage construction due to depth of ditches created along the gully route. ★ Noise pollution from equipment and workers may create nuisance in the communities. ★ Concerns over oil/fuel spills from fuel dump areas and workshop at the project sites. ★ Generation of waste from camp sites and sites where works are undertaken. ★ Work related accidents leading to injury /death of workers.	★ Traffic and Vehicle Management Plan. ★ Control of Noise and Vibration Management Plan. ★ Storage of fuel and toxic material management plan. ★ Waste Management Plan. ★ Occupational Health and Safety
	Backfilling	★ Noise and vibrations from heavy machineries ★ Alteration of soil profile / gully bathymetry ★ Fugitive emission of hazardous dusts with potential impact on human health and the ecosystems ★ Work related accidents leading to injury /death of workers.	★ Control of Noise and Vibration Management Plan. ★ Air Quality and Dust Control Management Plan. ★ Occupational Health and Safety
Operation	Flow of storm water	★ Possibility of flooding from blocked drain channel or poorly constructed drain.	★ Flash flood Emergency Preparedness Plan. ★
	De-silting	★ Exposure of workers, motorist, and nearby community residents to odour ★ Waste nuisance within the community work area and material transport route ★ Traffic obstruction around the desilting work area ★ Work related accidents leading to injury /death of workers.	★ Waste Management Plan ★ Traffic and Vehicle Management Plan ★ Occupational Health and Safety (OHS). ★ Community Health and Safety (CHS)
Demobilization	Dismantling and Removal of Equipment and vehicles	★ Noise and vibration ★ Traffic congestions	★ Control of Noise and Vibration Management Plan.
	Land Restoration	★ Restoration of aesthetic value to the environment. ★ Leisure and social activities may resume in the affected communities	★ Bioremediation and establishment of green area on 5m buffer of both sides of the rehabilitated channel.

5.4 Impact Characterization

The impact characterization was determined by accessing the nature of an impact on the pertinent environmental and socials component to determine the nature of an impact as either i.e., i) beneficial or adverse, ii) reversible or irreversible, iii) direct or indirect, and iv) residual or non-residual (refer to Annex 17).

5.4.1 Pre-Construction /Mobilization

- a) Land acquisition and demolition of existing structures is a major activity initiated before commencement of work, and is linked to the following impacts, i.e. (Annex 17)
 - i) Causing reduction in access to land resources and anxiety among community members, which could have an adverse and direct impact, but it is reversible and does not have residual effects.
 - ii) Loss of structures close to the gully due to acquisition for construction of drain canals and accessibility, the effect of this impact is adverse, direct, irreversible and has residual effects.
 - iii) Opportunities for income generation through land acquisition is beneficial, irreversible, direct with no residual effects.
 - iv) Economic activities may thrive in the affected communities with various degrees of direct benefits with no residual effects, but it is reversible.
 - v) There is tendency for Grievance /conflict to ensue due to resettlement and compensation issues, this impact adverse, direct with serious residual effects, but it is reversible.
- b) The Impact of mobilization of equipment and personnel can cause impact i.e.
 - i) Increase traffic and delays, this impact is adverse, direct, with no residual effect and easily reversible.
 - ii) Noise from heavy duty vehicles can be generated causing direct, adverse, and non-residual effects but reversible.
 - iii) Gas emission from vehicles and machines, this impact is adverse, irreversible, direct and with residual effect.
- c) The impact of site clearing, and preparation include,
 - i) Loss of species diversity and abundance has direct and adverse impact with non-residual effect that is reversible.
 - ii) Potential increase of erosion on the area(s) cleared; although reversible and adverse, the impact is direct without residual effect.
 - iii) Increased generation of solid and liquid waste; is adverse, reversible, direct with non-residue.
 - iv) Dust generation and emissions from vehicles and machines are adverse, irreversible, direct with non-residue.
- d) The impact of recruitment of local labor
 - i) Employment opportunities to the local populace will bring direct benefits to the community, although reversible the impact is non-residue.
 - ii) Increase in economic activities will also be beneficial, the impact is indirect, reversible, and non-residue.
 - iii) Increase in the price of commodities (High demand for food, fuel etc. will have an adverse and non-residue effect, but it is reversible and indirect.
 - iv) Influx of people in search of jobs which may lead to population / demographic change; this has an adverse and non-residue effect, but it is reversible, and the impact is indirect.

- v) Increase in the spread of communicable and sexually transmitted diseases (e.g., HIV, Hepatitis) has serious adverse, indirect, and non-residue effect, which is reversible.
- vi) Cultural conflict between the migrant workers and the local people can have an adverse, reversible, and indirect impact with non-residue effect.

5.4.2 Construction Phase

- a) The impact of excavation for drainage/gully route alignment/realignment and construction of canal on.

➤ Physical

1) Land use can.

- i) Change on the local topography of the area can have an adverse effect that is direct and irreversible direct with associated residual impact.
- ii) Creation of deviation routes/diversion that will likely take up land and cause traffic delay, the effect can be adverse, irreversible with non-residue and direct.
- iii) Hindered access to homesteads during drainages construction due to depth of ditches created along the gully route can cause a direct. Adverse effects are reversible and non-residue.

2) Drainage and hydrology

- i) Change in drainage pattern along the gully alignment can cause an adverse effect that is direct, irreversible with associated residual impact.

3) Water quality

- i) Soil erosion and siltation can have a direct, irreversible, and adverse effect on water quality with non-residual effect.
- ii) Pollution of surface and ground water system through oil spillage and indiscriminate disposal of used lubricants can lead to impacts that are adverse, irreversible, direct and with residue.

4) Noise

- i) Noise and ground vibration from heavy duty construction equipment has been determined to have an adverse and direct impacts that is reversible with non-residue.

5) Air quality

- i) Emission of Nitrogen Oxide from vehicles and machines leading to increase in Green House Gas emissions is adverse, irreversible, direct with non-residue.
- ii) Dust generation from vehicles and machines and its attendant effect on the health of workers and people of the communities is adverse, irreversible, direct with non-residue.
- iii) Emission of Nitrogen Oxide from vehicles and machines leading to an increase in Green House Gas emissions is adverse, irreversible, direct with non-residue.

6) Soil

- i) Contamination because of accidental /improper discharge of fuel and lubricant is adverse, irreversible, direct with non-residue.
- ii) Alteration of soil profile / gully bathymetry is adverse, irreversible, direct with non-residue.

➤ Biological

1) Terrestrial flora

- i) Loss of species diversity and abundance is adverse, irreversible, direct, non-residue.
- ii) Habitat fragmentation is adverse, irreversible, direct, residue.

2) Terrestrial fauna

- i) Degradation and removal of habitats can be adverse, irreversible direct with residue.
- ii) Migration of wildlife to other areas can be adverse, irreversible, direct with residue.
- iii) Disturbance of faunal species through construction noise and vibration can cause an adverse effect that is irreversible, it is also direct with residue.

3) Human and social

- i) Economic activities will thrive in the affected communities which is a beneficial, reversible, and indirect effect, the effect is non-residue.
- ii) Provision of employment for both skilled and unskilled workers is beneficial, reversal, indirect, and non-residue.
- iii) Improved livelihood enhancing activities in affected communities is beneficial, reversal, indirect, non-residue.
- iv) Potential change in the size of the local population, its ethnic and religious make-up is beneficial, irreversible, indirect, and non-residue.
- v) 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 site is beneficial, reversible, indirect, and non-residue.
- vi) Gully may no longer be a haven for criminals as there would be security and workers around the gully sites is beneficial, reversible, direct, with non-residue.
- vii) The large number of outside workers required could have a negative impact on social and cultural values among the residents (adverse, reversible, indirect, non-residue)
- viii) Influx of workers and in-migration could place pressure on the already limited social infrastructure e.g., schools, health facilities, village roads, water supplies, etc. (adverse, reversible, indirect, non-residue)
- ix) Increased local traffic and delays due to increased construction plants and vehicles moving to and from site which may affect pupils' movement to schools and sometimes religious activities due to blockade of roads (adverse, reversible, indirect, non-residue).
- x) Gender Based Violence, especially due to interaction between girl child hawkers and construction workers (adverse, reversible, indirect, non-residue)
- xi) Weak structures like houses may develop cracks due to movement of heavy machinery (adverse, reversal, direct, non-residue).
- xii) Leisure and social activities may be halted, especially as some viewing centers and football pitches are found around and within the gully erosion site (adverse, reversible, indirect, non-residue).

4) Health and Safety

- i) Occupational Health and safety concerns for the workforce (adverse, reversible, direct, non-residue)
- ii) Air pollution and subsequent impact on human health (adverse, irreversible, direct, residue)
- iii) Increase accident potential and emergency response (adverse, irreversible, direct, non-residue)
- iv) The potential spread of HIV/AIDS and other STDs is due to influx of migrants' workers (adverse, irreversible, indirect, residue).

b) Impact of flow of storm water and desilting on.

1) Physical

- i) Change to local topography along the alignment of the gully is adverse, irreversible, direct, with residue.
- ii) Alteration of natural drainage pattern could cause an adverse effect that is irreversible and direct with residue.
- iii) An indirect effect on terrestrial faunal species could occur relating to the continued storm water flow and increase in human activity. The effect is adverse, irreversible, and direct with residue.
- iv) Noise pollution due to increase in vehicular movement is (adverse, irreversible, direct with residue).
- v) Air Quality will be affected in the communities due to the anticipated increase in vehicular traffic in the area is (adverse, irreversible, direct with residue).
- vi) Increase in domestic waste generated during operation because of surge in population in the affected communities may contribute to increased waste volumes going to landfill. This is an adverse effect that is irreversible and direct but with residue.

2) Human and Social

- i) Rehabilitation of the erosion menace in the 8 affected communities would be beneficial, irreversible, direct with residue.
- ii) Promotion of goodwill and community appreciation of the ACREsAL project in the affected communities would be beneficial, irreversible, direct and with residue.
- iii) Connection and restoration of access to houses and communities cut off by the gully is beneficial, irreversible, indirect with residue.
- iv) Potential change in the size of the local population, its ethnic and religious make-up could be beneficial, irreversible, indirect with residue)
- v) Reduced fear of loss of properties due to the accelerated expansion of the gully would be beneficial and irreversible, but such effect would be indirect with residue.
- vi) Reduction in injuries, mortality, and morbidity from landslide is beneficial, irreversible, direct, and with residue.
- vii) Loss of employment for laborers after completion of the rehabilitation work can be adverse, irreversible, and direct.

5.4.3 Decommissioning

1) Dismantling and demobilization of equipment

- i) Noise and vibration, the effects from this are adverse, irreversible, and direct.
- ii) Traffic congestion can cause an adverse effect that is irreversible, direct with non-residue.

2) Land restoration

- i) Restoration of aesthetic value of the environment would be beneficial, irreversible, direct with residue.
- ii) Leisure and social activities may resume in the affected communities with a beneficial effect that is irreversible and indirect with residue.

5.5 Rating of Impact according to significance

Having identified and characterized all possible environmental and social risks and impacts associated with the FCE(T) intervention work, the impacts were further analyzed and rated according to consequence and likelihood of occurrence (see details in Annex 18). The criteria for consequence considered i.e., i) level of severity/benefit of the impact, ii) spatial scope of the impact, and iii) the duration of the impact. For the likelihood on the other hand, i) frequency of activity, and ii) frequency

of impact were evaluated to determine the significant rating of each impact in to i.e., low, medium, and high. The activities considered are i.e.,

- i) Land acquisition and demolition of existing buildings,
- ii) Excavation for drainage/gully route and construction of drain canal,
- iii) Flow of stormwater and desilting,
- iv) Dismantling and demobilization of equipment, and
- v) Land restoration.

1) **Impacts associated of land acquisition and demolition of existing buildings** i.e., i) reduction in access to land resources and anxiety on the part of the communities, ii) economic activities may thrive in the affected communities, and iii) increased generation of solid and liquid waste were rated with **low – medium impact significance**. While iv) loss of structures closed to the gully due to acquisition for construction of drain canals, v) opportunities for income generation due to land compensation, vi) grievance /conflict due to resettlement and compensation issues, vii) loss of species diversity and abundance, and viii) potential increase in erosion of area(s) cleared were rated as being of **low impact significance**.

2) **Impacts relating to excavation for drainage/gully route and construction of canal** on i.e.,

a) Physical components i.e.,

- ✓ For Land use, i) change to local topography of the area, ii) creation of deviation routes that will likely take up land and cause traffic delay, and iii) hindered access to homestead during drainages construction due to depth of ditches created along the gully route were all adjudged to have **low impact significance**.
- ✓ For Drainage and Hydrology, i) Change in drainage pattern along the gully alignment is rated with **low impact significance**.
- ✓ For Water Quality, i) soil erosion and siltation, and ii) pollution of surface and ground water system through oil spillage indiscriminate disposal of used lubricants both are rated with **low impact significance**.
- ✓ For Noise, i) noise and ground vibration from heavy duty construction equipment is rated **low impact significance**.
- ✓ For Air quality, i) emission of Nitrogen Oxide from vehicles and machines leading to increase in Green House Gas emissions, and ii) dust generation from vehicles and machines and its attendant effect on the health of workers and people of the communities were both rated with **low impact significance**.
- ✓ For Soil, i) Contamination because of accidental /improper discharge of fuel and lubricant, and ii) Alteration of soil profile / gully bathymetry has **low impact significance** level.

b) Biological component (Terrestrial flora)

- ✓ Noise, i) Noise and ground vibration from heavy duty construction equipment has **low impact significance**.
- ✓ Air quality, i) Emission of Nitrogen Oxide from vehicles and machines leading to increase in Green House Gas emissions, and ii) Dust generation from vehicles and machines and its attendant effect on the health of workers and people of the communities are rated with **low impact significance**.

- ✓ Soil, i) Contamination because of accidental /improper discharge of fuel and lubricant, and ii) Alteration of soil profile / gully bathymetry is both of low impact significance.
- c) **Terrestrial flora**
 - ✓ i) loss of species diversity and abundance, and ii) habitat fragmentation is of low to medium impact significance.
- d) **Terrestrial fauna**
 - ✓ i) Degradation and removal of habitats, ii) Migration of wildlife to other areas, and iii) Disturbance of faunal species through construction noise and vibration are all low to medium impact significance.
- e) **Human and social component,**

Impacts like i) Opportunities for income generation through land acquisition, ii) Risks of Gender-based violence, including sexual abuse, harassment, and exploitation, and iii) 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 site are rated with high impact significance.

Those rated medium to high impact significance are i) Provision of employment for both skilled and unskilled workers, ii) Potential change in the size of the local population, its ethnic make-up and religious make-up, iii) The large number of outside workers required could have a negative impact on social and cultural values among the residents, and iv) Occupational Health and safety concerns for the workforce.

Low to medium impact significance include i) Grievance/conflict due to resettlement and compensation issues, ii) Gully may no longer be a safe haven for criminals as there would be securities and workers around the gully sites, iii) Gender Based Violence, especially due to interaction between girl child hawkers and construction workers, and iv) Increased local traffic and delays due to increased construction plant and vehicles moving to and from site which may affect pupils' movement to schools and sometimes religious activities due to blockade of roads, and v) Potential spread of HIV/AIDS and other STDs due to influx of migrants' workers.

Low impact significance is i) Influx of workers and in-migration could place pressure on the already limited social infrastructure e.g., schools, health facilities, village roads, water supplies, etc., and ii) Air pollution and subsequent impact on human health due to increase traffic.

3) The impact of Flowing stormwater and de-silting

- a) On Physical component,

Impacts with Low to medium impact significance are i) An indirect effect on terrestrial faunal species could occur relating to the continued storm water flow and the increase in human activity, ii) Noise pollution due to vehicular movement, iii) Air Quality will be affected in the communities due to anticipated increase in vehicular traffic in the area, and iv) Increase in waste produced during operation because of surge in population in the affected communities may contribute to increased waste volumes going to landfill.
- b) On Human and Social Components

impacts with **very high impact significance** include i) Promotion of goodwill and community appreciation of the ACREsAL in the affected communities and the entire Gombe State, ii) Rehabilitation of the erosion menace in the 12 affected communities.

4) Impact of Dismantling and demobilization of equipment

Impacts with **medium to high impact significance** are i) Connection and restoration of access to houses and communities already cut off by the gully, ii) Potential change in the size of the local population, its ethnic and religious makeup, iii) Reduced fear of loss of properties due to the accelerated expansion of the gully, iv) Reduction in mortality and morbidity from landslide, and v) Loss of employment for laborers after completion of the rehabilitation work. While the traffic congestion was rated **low impact significant**.

5) The impact of Land restoration

i) Leisure and social activities may resume in the affected communities is rated **low to medium impact significance**, while ii) Restoration of aesthetic value of the environment was rated **medium to high impact significance**.

CHAPTER SIX: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

6.0 Introduction

Several possible impacts that could arise from the implementation of the FCE(T) gully erosion and flood control intervention in Gombe, Gombe State have been identified in Chapter Five and mitigation measures developed. This Environmental and Social Management Plan (ESMP) addresses the proposed mitigation measures to be implemented to minimize, eliminate, or control the potential negative environmental and social risks and impacts associated with civil work.

The ESMP provides monitoring plans, frequency of monitoring, key indicators, roles and responsibilities of agencies and the necessary capacity building required to facilitate its implementation. The cost/budget for the ESMP implementation, mitigation measures, monitoring and supervision schedules are also provided. The cost/budget of this ESMP implementation shall form an integral part of the costs of the construction work, covering the entire project implementation phases (i.e., Pre-construction, construction, and operation/demolition).

Environmental monitoring requires effective monitoring of the mitigation measures and reported to avoid any avoidable adverse impacts from the construction would be prevented. Details of the mitigation and enhancement measures the Gombe State ACRoSAL, the authorizing environment and the Contractor shall commit to, throughout the project intervention are provided. This is necessary to achieve environmental, health and safety compliance for the intervention.

6.1 Mitigation/Action Plan

The strategy for implementing and managing the proposed mitigation measures is built around the capacity of the participating institutions (MDAs), the Gombe ACRoSAL team and the Contractor to deliver on their expected responsibilities in the ESMP implementation; their roles and responsibilities are discussed in the sections that follow. The project is a high-risk project that runs through residential areas and legacy land (Section 5.1 The Potential Risks and Impacts Analysis.), these are lands that are already lost to the devastating effects of gully erosion. The rehabilitation of the gully would recover most of them (legacy land), thereby subjecting same to potential conflicts of ownership. Management of Community/Occupational Health and Safety, Construction Waste, Noise, Vibration, Traffic, Pollution, GBV/SEA/SH, Security etc., are among several mitigation measures to be implemented in managing the impacts. Consequently, measures the Contractor would implement, how, where, and when, who supervises and monitors what and when, and the funding area all presented in the following sections and sub-section.

6.2 Institutional Arrangement for Implementation and Monitoring

The mitigation measures for every possible impact are presented in Chapter five, therefore, implementation (action plan) would be executed by three parties i.e., the MDAs, the Gombe ACRoSAL team (representing the WB and FPMU), and the Contractor in accordance with their specific responsibilities. Because the successful implementation of this ESMP will depend on the commitment and capacity of the Gombe State ACRoSAL Project Management Unit (SPMU), the Contractor and relevant institutions (MDA's) involved in the implementation program. Their roles and responsibilities are described in

Table 6. .

Table 6. 1: Institutional Arrangement for Implementation and Monitoring E&S.

S/N	Category	Roles & Responsibilities
1	Federal Ministry of Environment	- Approve disclosure of the ESMP in country - Environmental monitoring to ensure country standards is complied with
2	Gombe State Ministry of Environment	- Environmental monitoring and compliance overseer at the State level - Site assessment and monitoring of ESMP implementation.
3	Gombe ACRoSAL SPMU	- Ensure approved fund for Environmental and Social safeguards unit and M&E implementation and monitoring functions. - Ensure that the ESMP is disclosed to the public. - Responsible for coordination to ensure that parties to implementation carry out their responsibilities as and when due. - Ensure that World Bank safeguards policies and country standards are adhered to by Contractor and workers through supervision and funding of mitigation measures and monitoring of the ESMP. - Ensure that the project design and specifications adequately conform with the recommendations of the ESMP. - Coordinate application, follow up processing and obtain requisite clearances required for the project on behalf of the Contractor if required. - Develop, organize, and deliver training programs for the State Project Management Unit (SPMU) staff, the Contractors and others involved in the implementation of the ACRoSAL intervention. - Review and approve the Contractor's Implementation Plan (Contractors Environmental and Social Management Plan - C-ESMP) for the impact mitigation measures as documented in the ESMP and any other supplementary environmental studies that may need to be carried out by the SPMU. - Liaise with the Contractor on the implementation of the ESMP/RAP. - Liaise with various Federal and State Government agencies on environmental, resettlement and other regulatory matters. - Interact consistently with NGOs and CBOs that are involved in the project.
4	Environmental & Social Safeguard Units	<u>Environmental Safeguards Officer</u> - Carry out supervision functions during construction to ensure that Contractor and workers adhere to mitigation measures in the ESMP. - Collate environmental baseline data on relevant environmental characteristics for monitoring and auditing. - Ensure that project activities are implemented in accordance with good practices and guidelines set out in the site specific ESMP. - Identify and liaise with all stakeholders involved in environmentally related issues in the project; and be responsible for the overall monitoring of mitigation measures and the impacts of the project during implementation. <u>Social Safeguards</u> - Coordinate and ensures the implementation of the social aspects of the ESMP.

S/N	Category	Roles & Responsibilities
		- Identify and liaise with all stakeholders involved in social related issues in the project. - Conduct impact evaluation and beneficiary's assessment; and - Establish partnerships & liaise with organizations, Community Based Organizations (CBOs), Civil Society Organizations (CSOs).
5	Contractor	- Compliance with BOQ specification in procurement of material and construction. - Implement ESMP during project implementation. - Ensuring staff good behavior/ practices including the use of PPEs and zero gender violence - Hire Safeguards personnel to implement ESMP during project implementation. - Mitigate environmental and social Impacts. - Implementation of Code of Conduct (CoC) for all staff - Develop Contractor ESMP (C-ESMP) - Preparation of work plans for environmental and social management in line with the ESMP - Ensure any changes during the construction process that may have a significant environmental and social impact are communicated to the Environment and Safeguard Officer (ESO) in time and managed accordingly. - Maintain records of environmental incidents as well as corrective and preventive actions taken - Supervision of implementation of all the measures and preparation of required Monitoring report - Contractors should ensure that the safety officer conducts a Job Hazard Analysis (JHA) prior to the commencement of work to identify the hazards associated with the job activities. - Ensure all contractors and workers sign the Code of Conduct (CoC) and are routinely trained on the contents of the CoC. - Provide adequate basic amenities and PPEs to workers and ensure that the PPEs are worn by workers during work. - Prepare and maintain records and all required reporting data as stipulated by the ESMP, for submission to the Supervising Consultant
6	Supervising Consultant	- Supervise the implementation of the ESMP by the Contractors. - Review the Contractors Environmental and Social Management Plans (C-ESMP) to ensure compliance with the ESMP. - Review site-specific environmental enhancement/mitigation designs worked out by the Contractor. - Development of good practice construction guidelines to assist the Contractors in implementing the ESMP. - Prepare and submit regular environmental monitoring and implementation progress reports. - Continuous interaction with the Engineer/ESSU regarding the implementation of the environmental/social provisions in the ESMP - Provides an independent oversight ensuring the Contractor adhere strictly to the engineering specifications and provide frequent reports on Contractor/ Client's compliance.

S/N	Category	Roles & Responsibilities
		- Preparation and implementation of the Environmental and Social Monitoring Plan during construction - Supervision of contractor performance of implementation of the Construction and Work Camp Management Plan - Hire Safeguards personnel to implement the ESMP. - Thorough supervision of the mitigation of the environmental and social impacts such as labor influx and GBV/SEA/SH - Reporting any incidents or non-compliance with the ESMP to the SPMU - Ensuring adequate training and education of all staff involved in environmental supervision. - Making recommendations to the SPMU regarding ESMP performance as part of an overall commitment to continuous improvement - Supervise Contractor performance of implementation of the Construction Campsite/Staging area Camp Management Plan/C-ESMP - Prepare monthly safeguards report including recommendations to the SPMU regarding ESMP performance as part of an overall commitment to continuous improvement
7	Gombe State Environmental Protection Agency (GOSEPA)	- Inspection of project premises to ensure strict compliance with sanitation and waste management standards. - Collaboration with other MDAs at the State and Federal level, NGOs and Donor Agencies in environmental protection and management especially in areas of waste recycling etc.
8	Gombe LGA	- Provision of oversight function across project within its jurisdiction for ESMP compliance. - Monitoring of activities related to public health, sanitation, waste management amongst others.
9	Affected Community and Public	- Promote environmental awareness. - Review environmental and social performance report made available by the SPMU. - Provide comments, advice and/or complaints on issues of nonconformity. - Attend public meetings organized by the SPMU to disseminate information and receive feedback. - Identify issues that could derail the project and support project mitigation measures and awareness campaigns.
10	CDA	Ensure community participation by mobilizing and sensitizing community members;
11	NGOs/CSOs	Assisting in their respective ways to ensure effective response actions, conducting scientific research alongside government groups to evolve and devise sustainable environmental strategies and techniques.
12	World Bank	- Overall supervision and provision of technical support and guidance. - Disclosure of ESMP at World Bank external site - Oversight mission to monitor SPMU's implementation and performance of the ESMP. - Ensure that the Safeguard Policies of the World Bank are complied with in the implementation of the ESMP.

S/N	Category	Roles & Responsibilities
		Recommend additional measures for strengthening the ESMP and implementation performance.

6.2.2 Training and Capacity Building.

To achieve an effective implementation of this ESMP, the deriving agency and actors must possess the requisite capacity and competence on environmental and social management at all levels. Strengthening capacity is sacrosanct to improve available knowledge and technical skills, develop new systems, or improve standards and behavioral change/mindset towards achieving set goals, which compliance with established environmental and social standard/guideline committed to in the Environmental and Social Commitment Plan (ESCP) of the ACRoSAL project.

To this end, training and capacity building on the implementation and management of ESMP will equip personnel with the requisite understanding, skills, information, and knowledge that will enable them to perform effectively. Although the Safeguard team of the Gombe State SPMU can be said to demonstrate good understanding of the contents and purpose of an ESMP, deep dive training and capacity development on this ESMP is necessary. The training should target the following:

- SPMU Safeguard Officers, Grievance Redress Officer, and Project Engineers.
- Contractor's personnel.
- Supervision Firm personnel; and,
- Select members of the community site committee.
- Staff of relevant MDAs

The SPMU's Environmental and Social safeguard Officers and Contractors must be familiar with every stage of the implementation, taking cognizance of the environmental and social standards and how to interface these in project planning, design, and management. The capacity requirements should cover areas of E&S monitoring and reporting, while adhering strictly to the requirements and principles of the ESF. The construction workers, supervision firm and select members of the community project site committees should be trained on public awareness creation/educational techniques (on environmental, social and health issues) and first aid procedures, GBV and grievance management.

Table 6. provide the breakdown of the estimated cost for the capacity building and training needs.

Table 6. 2: Activities and estimates for Institutional Capacity building and Training Needs.

Stage	Description	Participants	Duration	Training Agency	Est. Cost (₦)
Scope of the Intervention Projects	- Environmental & Social Impacts under the ESS (ESMP Training). - Engineering Design and Associated ESMP. - Coordination with Other MDAs and the Communities.	Officials of SMEnv, SEPA, SMOW, SPMU, All Contractor Workers, Community Leaders, Focal NGO, CBOs, ESO, SLO, GRM Officer & Other Relevant Groups	1 Day	World Bank Environmental & Social Specialist/ External Agency for capacity building or	1,500,000.00 (Pre-Construction Phase)
Project Implementation	- Civil Works with Bioremediation in the project. - Roles and Responsibilities of Key Actors. - Environmental Monitoring	SPMU Project Engineers and Safeguard Officers, Contractors, SMEnv, SEPA	1 Day	External Agency for capacity building or Environmental & Social Specialist	1,500,000.00 (Construction Phase)
Monitoring and Evaluation and GRM	- ESMP Monitoring and Reporting Strategy. - Stakeholder and Community Participation	Contractor, SPMU Safeguard Officers, Engineers, SMEnv, SEPA & relevant MDAs, Community Leaders, CDOs, & Focal NGO	1 Day	Environmental & Social Specialists; External Agency engaged for capacity building	1,500,000.00 (Construction Phase)
Watershed Protection and Management	- Alternative income generation programme for stakeholders and skills requirements. - Promotion of Agricultural Methods and Technologies for Improving Farm Production and Erosion Prevention;	Safeguards Officers, NRO, Watershed Committee, Community Leaders, LGA Staff, Support Professionals	2 Days	World Bank /External Agency Engaged for Capacity Building/ Environmental & Social Specialists	2,000,000.00 (Post-Construction Phase)
	GBV/SEA/SH awareness, monitoring and reporting	SPMU, Project Community, Contractors	1 Day	World Bank/GBV Specialist	1,500,000
Total ₦8,000,000.00					

The proposed refresher and capacity building shown in Table 6. shall be included in the overall project cost to be funded by the Contractor as part of ESMP implementation. The activity should be completed prior to the contractor's mobilization to site or at least two weeks after.

6.2.1 Training for Contractor and Sub-Contractors

To achieve effective environmental management, it is important that the Safeguard team of the Contractor and sub-contractors are conversant with their responsibilities for the ESMP. This would be achieved through training and re-training of key personnel that will directly be involved in this project (FCE-T intervention). Environmental trainings shall include but not limited to the following:

- ✓ understanding the environmental features of the construction site and the surroundings.
- ✓ be familiar with the requirements of the ESMP and environmental specifications that apply to the rehabilitation work.
- ✓ basic training in identification of archaeological artifacts, rare and endangered species that may be encountered on site.
- ✓ awareness of environmental matters that may be necessary for the smooth execution of the project; and
- ✓ records keeping of completed tasks for monitoring and evaluation purposes.

Training shall be conducted in a written or verbal form in an appropriate language that is understood by all. Where training is done verbally, persons who received the training must indicate in writing that he/she indeed attended such training.

6.2.2 Site Specific Induction

All personnel working on the FCE(T) gully erosion and flood control project shall be formally inducted into the Contractor's Quality, Safety and Environmental Policies. Information that will be discussed at the induction includes:

- ✓ Location of first aid and firefighting equipment.
- ✓ Site contacts and location of facilities including nearest hospital and police station.
- ✓ Discussion of major safety and environmental hazards and risks associated with the construction project.
- ✓ Discussions on controls measures to be implemented to minimize risk to employees, the public and the environment.
- ✓ Emergency Evacuation Procedure, and other emergency response and preparedness plans outlined in this ESMP.

a) Toolbox Meetings

Toolbox meetings shall be conducted fortnightly or as needed to tackle new hazards, risks, or environmental aspects. Toolbox meetings shall be coordinated by the Environmental Officer, minutes shall be recorded daily detailing things discussed along with people responsible for certain actions, and a date by which the actions shall be completed. Minutes of previous meetings shall be reviewed at each Toolbox meeting including the completion of all outstanding action items, the minutes shall be displayed on the site notice board within two days of the meeting.

b) Daily Safety Briefing

This is the daily pre-start meetings in which workers are reminded about health and safety issues, especially relating to proper use of Personal Protective Equipment, work hazards and working in an unsafe environment.

Table 6. 3: E&S Mitigation and Management Plan for the FCE(T) Pre-construction.

Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)
ESMP for Pre- Construction phase									
Land acquisition for the gully erosion and flood control	Social Impact:	Grievance and negative community perception about the project	Adequate and timely sensitization of stakeholders in line with the Stakeholder Engagement Plan (Already prepared for the project).	SPMU, Contractor	2,000,000	Project Affected Persons level of Enlightenment and sensitization conducted for the Projects	Monthly	Gombe State Min. of Env., SPMU ACRESAL E&S Team.	1,000,000
	Health and Safety	Conflict from the members of the affected communities to vacate areas allocated for the project	Preparation and implementation of resettlement action plan (RAP) to take care of such issues. Implementation of GRM	SPMU	No additional Cost (RAP)	Measures provided in the prepared RAP. Number of GRM issues recorded and resolved	Before the commencement of the civil work.	Gombe State Min. of Env., SPMU ACRESAL E&S Team., GOSEPA	

Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)
		Injuries and accidents during demolition and removal of structures. Injuries and accidents to community members or scavengers, scavenging for building materials like roofing sheets, blocks, iron, electrical and household fitting etc.	CHS/OHS Monitoring and control of scavenging by implementing Demolition Management Plan	Contractor Supervision Firm Community Site Management Committee. SPMU State Focal NGO	No Cost	No of demolition related accidents or injuries	During demolition exercise	ACReSAL E&S Team State Focal NGO	Nil
Site Mobilization of construction equipment, machinery, heavy duty vehicles	Environnemental Impact : Ambient Air Quality	Deterioration of local air quality due to the emission of dusts & gases	Maintain equipment & machinery to manufacturers' specifications by regular servicing to reduce carbon emissions, Use water to wet active areas for dust suppression.	Contractor	1,000,000	Air quality parameters (CO, NO ₂ , SO ₂ , CO ₂ , SPM) etc., Vehicle Maintenance records.	Weekly at Construction site and nearby communities, Monthly for the SPMU E&S Team, Gombe State Min. of Env.	Gombe State Min. of Env., SPMU ACRESAL E&S Team, GOSEPA, Contractors E&S Team	1,000,000

Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)
	Social Impact: Health and Safety Concerns during the mobilization of equipment's to site	Potential road accident due to frequent haulage using heavy trucks which may pose a danger to the public and road commuters	Prepare and adopt traffic Management plan (TMP), Use of traffic sign boards and raise the level of public awareness on the project, Engage FRSC where necessary.	Contractor	1,000,000	Number of accidents and vehicular infractions	Daily at the construction site, Monthly for the SPMU E&S Team, Gombe State Min. of Env.	Contractor, SPMU E&S Team	1,200,000
Site clearing for staging area & Worker's camp. Mobilization of Machinery, Plant & Equipment	Environmental Impact: Loss of vegetation and habitat destruction Landscape disruption and visual intrusion	Loss of vegetation and habitat destruction, Loss of species diversity and abundance including soil invertebrates and microorganism, Changes in the topography along the alignment of the gully.	Restrict removal of vegetation and trees to the area of need only, Protect all vegetation not required to be removed against damage, Undertake quick re vegetation of exposed soils with indigenous plant species once construction is completed,	Contractor	1,000,000	Clearly defined boundaries of protected areas Evidence of re-vegetation Evidence of Erosion control measures drainage	Weekly at the construction site, Monthly for the SPMU E&S Team, Gombe State Min. of Env.	Contractor, SPMU E&S Team, Gombe State Min. of Env.	1,200,000

Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)
			Ensure construction of effective drainage system and use erosion protection measures, Developed site Reclamation Plan.						
Labor influx for employment on project	Social Impact: Labor influx from employment on project	Cultural diffusion, Risk of GBV/SEA and VAC, safety, and security due to presence of workers.	Sourcing of local workforce from project communities, and implementation of labor management plan All contractors' workers to be sensitized and sign Code of Conduct (CoC), Prepare and adapt a security management plan (SMP).	SPMU, Contractor.	5,000,000	Number of sensitizations, trainings and awareness exercises conducted, Compliance to Ethical and proper behavior as stated in the signed Code of Conducts, Contractors' compliance to SMP Number of sensitization	Daily for the contractor, Monthly for the SPMU E&S Team, Gombe State Min. of Env. Min. of Health, Min. of Women Affairs.	Contractor, SPMU E&S Team, Gombe State Min. of Env. Min. of Health, Min. of Women Affairs.	2,500,000

Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)	
			Implementation of GBV/SEA/SH management plan			and reported incidents. Grievance cases, workers sensitization and awareness of their rights.				
Sub Total:					10,000,000	Sub Total:				6,900,000

Table 6. 4: E&S Mitigation Management Plan for Construction Phase.

ESMP for Construction phase									
Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)
Site clearing and excavation works.	Environmental Impact: Soil	Risk of exacerbating erosion concerns	Ensure excavations are limited to desired areas, filling and compaction in layers must be between 150 - 200 mm thickness as recommended.	Contractor	2,200,000	Contractor's compliance	Weekly at the construction site,	Contractor, SPMU E&S Team, Gombe State Min. of Env.	750,000
Transportation of materials and equipment.		Due to loss of topsoil					Monthly for the SPMU E&S Team, Gombe State Min. of Env.		
Excavation for drainage/gully route and construction of drain canal and other related activities.		Land degradation and soil contamination Due to leakages from the stacked equipment and indiscriminate discharge of used lubricants.	Prepare and implement an Emergency Response Plan to respond to incidents of spillage. Ensure fuel storage tanks are installed in a bonded area and checked daily. Ensure regular maintenance of vehicles to avoid leaks of oil,						

ESMP for Construction phase									
Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)
Site clearing and excavation works.			Prevent unregulated dumping of fuel waste.						
Transportation of materials and equipment.	Air Quality	Air quality deterioration due to movement of heavy equipment operation during constructions.	Haulage trucks carrying sand shall be covered with tarpaulin,	Contractor	1,000,000	Air quality parameters (CO, NO ₂ , SO ₂ , CO ₂ , SPM etc.) Maintenance records and appropriate use of PPE.	Weekly at Construction site and nearby communities,	Contractor, SPMU E&S Team, Gombe State Min. of Env.	550,000
Excavation for drainage/gully route and construction of drain canal and other related activities;			Ensure that all vehicles are regularly service with all the construction equipment and machinery, Fit all heavy equipment and machinery with air pollution control devices.				Monthly for the SPMU E&S Team, Gombe State Min. of Env.		
	Water Quality	Contamination of surface water discharge of sediment laden run-off into drainages,	Discourage or avoid the disposal of sediment-laden run-off into surface water, prepare and adopt site specific waste	Contractor	1,000,000	Contractors' compliance	Weekly at the construction site, Monthly for the SPMU E&S Team, Gombe	Contractor, SPMU E&S Team, Gombe State Min. of Env.	650,000

ESMP for Construction phase									
Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)
		waterways, etc.)	management plan (WMP).				State Min. of Env.		
		Groundwater contamination through seepage because of spills, leakages and accidental discharge of oil, lubricants, and other chemicals.	Provision of impervious base for the storage of lubricants, hazardous and toxic chemicals as well as well and clearly labelled containers.	Contractor	750,000	Contractors' compliance	Quarterly	Contractor, SPMU E&S Team, Gombe State Min. of Env.	500,000
	Waste	Generation of construction waste including spoils, debris, and concrete. Workers Campsite solid waste Generation. Possibility of open defecation by the laborer's that may lead	Prepare, adopt, and implement site specific Waste Management Plan, Avoid accumulation of solid wastes to uncontrolled levels, Ensure adequate provision of well coded waste bins, Ensure the collection and disposal of the wastes is done	Contractor	1,000,000	Contractors' compliance to site specific WMP	Daily at the construction site by the contractor, Monthly for the SPMU E&S Team, Gombe State Min. of Env.	Gombe State Min. of Env., SPMU ACREsAL E&S Team., GOSEPA, Contractors E&S Team	700,000

ESMP for Construction phase									
Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)
		to sanitation and hygiene concerns.	regularly and appropriately, and provision of on-site sanitary facilities.						
	Noise	Noise pollution. Noise and vibration disturbances from operation of heavy-duty vehicles and equipment's.	Select and use vehicles/equipment with lower sound power levels, Install suitable mufflers on engine exhausts and compressor components, Maintain maximum sound levels not exceeding 80 decibels (dba) when measured at 10m or more from vehicles, Enforce appropriate speed limit to reduce vehicle noise levels,	Contractor	1,000,000	Noise level Usage of appropriate PPE	Weekly at Construction site and nearby communities, Monthly for the SPMU E&S Team, Gombe State Min. of Env.	Gombe State Min. of Env., SPMU ACREsAL E&S Team., Contractors E&S Team	800,000

ESMP for Construction phase									
Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)
			Restrict noise-generating activities strictly to normal working hours (i.e., 9am - 5pm), Avoid work during high traffic, where not possible provide appropriate alternative route. Respond promptly to noise complaints, Provide and enforce the usage of hearing protection devices (ear plugs/muffs) for workers.						
Construction activities.	Social Impact:	Transportation of materials and the movement of equipment to the project site may potentially	Inform local communities in advance of road diversions & major activities likely to affect traffic. Alternative traffic routing shall be	Contractor	1,000,000	Contractor's compliance to the provisions of TMP.	Daily at Construction site and nearby communities.	Gombe State Min. of Env., SPMU ACREsAL E&S Team., Contractors E&S Team	700,000
Construction of drainage canal and other associated activities	Disruption and disturbances to socio-						Monthly for the SPMU E&S		

ESMP for Construction phase									
Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)
	economic activities	disrupt traffic especially at junctions and public areas. Disruption of resident activities due to blockages and diversions of roads, Loss of travel time due to heavy concentration of project vehicles on and off the project sites.	mapped out and provided if there will be complete closure of the road, Traffic officers and appropriate road diversion signage(s) shall be deployed to ensure diversions routes are properly identified and traffic is directed along the mapped route, Enforce road safety standards, traffic rules including speed limits, Schedule large and slow moving vehicles for off peak period, Have in place and implement a				Team, Gombe State Min. of Env.		

ESMP for Construction phase									
Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)
			traffic Management Plan (TMP).						
	Interactions between Contractors and community	Child labor and out of school children	Ensuring that children and minors (within the stipulated years recognized by law) are not employed directly or indirectly on the project, Ensure the enforcement of legislation on child labor, Ensure periodic meetings with vulnerable groups to ensure they are not marginalized.	Contractor	No additional cost	Contractor's compliance	Daily at Construction site by the contractor, Monthly by the SPMU E&S Team, Gombe State Min. of Env. Min. of Women Affairs.	Gombe State Min. of Env., Min. of Women Affairs, SPMU ACRoSAL E&S Team., Contractors E&S Team	1,000,000
Construction activities; Construction of drainage canal and other associated activities	Occupational Health and Safety	Risks of occupational accidents and injuries to workers,	Develop & implement a site-specific Occupational Health and Safety Plan (OHSP),	Contractor	1,000,000	Contractor's compliance to the provisions of OHSP.	Daily at Construction site and nearby communities,	Contractor, SPMU E&S Team, Gombe State Min. of Env.	1,000,000

ESMP for Construction phase									
Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)
		Potential accidents and risk of injuries to the community members.	Provide adequate first aid, first aiders, PPE, and signages, Restriction of unauthorized access to all areas of high risk activities, Provision of specific personnel training on worksite OHS management, Ensure that staging areas for contractor equipment's are adequately delineated and cordoned off with reflective tapes and barriers, Workers should get a daily induction/toolbox before going on the site and a			Provision and Usage of appropriate PPE's	Monthly by the SPMU E&S Team, Gombe State Min. of Env.		

ESMP for Construction phase										
Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutions Responsible for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutions Responsible for Monitoring	Cost for Monitoring (₦)	
			refresher of what happened on site a day before, lighting and/or reflective tapes and signages integrated in all worksites for safety at night. Prepare and implement blasting management plan to prevent flying rocks and vibration during excavation.							
Sub Total:					8,950,000	Sub Total:				7,100,000

Table 6. 5: E&S Mitigation and Management Plan for Post Construction/Demobilization Phase

ESMP for Post- Construction/Demobilization phase									
Activity	Type of impact	Potential Risks & Impacts	Mitigation Measures	Institutional Responsibility for Mitigation	Cost of Mitigation (₦)	Monitoring Indicators	Frequency of Monitoring	Institutional Responsibility for Monitoring	Cost for Monitoring (₦)
Demobilization of facilities, plant & equipment	Social Impact: Occupational Health and Safety	Risks of occupational accidents and injuries to workers.	Compliance to the provisions of OHSP,	Contractor	1,500,000	Compliance to the provisions of OHSP,	Daily for the contractor's E&S team,		1,000,000
						No of trained first Aiders	Once by the SPMU E&S Team, Gombe State Min. of Env.		
						Usage of appropriate PPE			
						Usage of signage			
Sub Total:					1,500,000	Sub Total:			1,000,000
Grant Total:					20,450,000	Grant Total:			15,000,000

Table 6.6: Summary E&S Mitigation and Management

S/N	Activity/Phase	Cost of Mitigation	Cost of Monitoring
1	Pre-construction	10,000,000	6,900,000
2	Construction	8,950,000	7,100,000
3	Post-construction / Demolition	1,500,000	1,000,000
Total		20,450,000	15,000,000
Grant Total		35,450,000	

6.3 Environmental and Social Management Obligations of the Contractor

The Contractor shall meet the specific E&S obligations provided in this ESMP, which shall be incorporated into the contract specifications for the project. The Contractor shall develop a field work guideline explaining how the recommended mitigation measures in this ESMP will be implemented during the project. The Contractor shall be provided with a copy of this ESMP to guide the preparation of the Contractor Environmental and Social management Plan for safe implementation of the project.

6.3.1 Contractor's Environment and Social Management Plan (C-ESMP)

The contractor shall within 6 weeks of signing the Contract, prepare a work plan to ensure the adequate management of the E&S aspects of the works, including implementation of the specific requirements of the E&S safeguards at works. The Contractor's E&S document shall describe i) the procedures and methods for complying with the environmental and social conditions specified in the ESMP, ii) the mitigation measures to be implemented against adverse impacts, iii) the likely impacts, monitoring activities and reporting; and iv) the internal organizational, management and reporting mechanisms put in place for the E&S management.

Thus, before commencement of construction, the Contractor is required to submit a site-specific Contractor's Environmental and Social Management Plan (C-ESMP) for the work, which will be reviewed and approved by the Environment and Safeguard Officer (ESO) of GM-ACReSAL. The EMP as a minimum shall have a campsite plan that includes the following:

- i) Worker's accommodation where applicable.
- ii) Fuel containment area and refueling locations.
- iii) Equipment maintenance area.
- iv) Material storage area
- v) Demolition and Removal of Structure Management Plan
- vi) Waste Management Plan.
- vii) Noise and Dust Control Plan.
- viii) Chemical/Fuel Spill Response Plan.
- ix) Gender based Violence (GBV), Sexual Exploitation and Abuse (SEA) Plan etc.
- x) Stakeholder Engagement Plan
- xi) Occupational/Community Health Safety Management Plan
- xii) Traffic Control and Transport Management Plan
- xiii) Emergency Preparedness and Response Plan

- xiv) Flood Risk Management Plan
- xv) Flash Flood Emergency Response Preparedness
- xvi) Rock Blasting Management Plan
- xvii) Labor and Working Conditions (includes Worker code of conduct included on Labor and working conditions and Occupational Health, Safety and Security Management Plans)
- xviii) Channel /gully Crossing Plan
- xix) Biodiversity Management Plan
- xx) Hazardous Materials Management Plan
- xxi) Reinstatement Management Plan
- xxii) Security Management Plan

6.3.2 Contractor's HSE Officer

The HSE officer of the Contractor(s) shall be responsible for the overall on-site implementation of this ESMP alongside other environmental and social requirements prepared for the Project for the duration of the contract. The HSE officer must be well equipped and grounded with requisite experience to handle such a high-risk project, in this regard he/she must have in the minimum basic HSE training. The Contractor(s) HSE officer shall:

- Make sure that all personnel are informed of the requirements of this ESMP, and the associated responsibilities and implications.
- Produce, provide, and present on request relevant records required to demonstrate compliance with requirements of this ESMP for inspection by relevant officers.
- Consult with the Client's HSE Officer regarding interpretation of the ESMP and any other aspects of the contract that may impact significantly on the environment.
- Ensure that all personnel demonstrate respect and care for the environment in which they are operating.
- Act as point of contact for residents and community members.

It is the responsibility of the construction Contractor(s) to ensure compliance with every provision in the engineering design of the intervention work. Therefore, the Gombe State ACREsAL SPMU shall not be liable for any property damaged by the Contractor in the process of executing the gully rehabilitation activities. In the event of such damage occurring, the Contractor shall be liable for the cost of such damage (if the affected asset is not part of the RAP).

6.3.3 Site Establishment

The contractor shall locate the camp away from the communities. A layout plan for construction activities at the camp site shall be developed and approved by the SPMU.

Requirement for Camp Site establishment

- ✓ The contractor should provide appropriate and safe quarters for the workers.
- ✓ Independent and sufficient toilet facilities (toilet and shower) should be provided on the camping site for male and female workers, respectively.
- ✓ The toilet facilities should be accessible, clean, and indicated with "Male" or "Female."
- ✓ The domestic sewage of the camping site should be treated in the septic tank at least and should not be directly discharged into any waterbody; and
- ✓ The camping site should provide emergency medical facilities. A first-Aid kit should be provided and managed by specially assigned people who should have full first aid training and qualification and could send the injured or the diseased to local hospital in time.

6.3.4 Labor Employment and Code of Conduct

The Contractor shall adhere to the following on the matters of labor employment:

- ✓ Where appropriate, the employment of labor should give priority to the local people.
- ✓ The contractor should publicize appropriate work positions to the communities along the stretch of the gully.
- ✓ The recruited workers and staff members should have a legal contract of employment.
- ✓ The contractor should provide the workers with educational training in environmental protection and occupational health and safety.

A Code of Conduct will be established for the workers with emphasis on appropriate behavior, refusing drug abuse and alcohol and conforming to the relevant laws and regulations to reduce the influence on society. Each worker should be informed of the Code of Conduct at the point of employment. The Code of Conduct for workers should also be known to the local communities. Failing to obey the code of conduct, disciplinary action should be enforced. A sample of the Code of Conduct is provided in ANNEX 9: Sample Code of Conducts.

The workers should obey the relevant code of conduct when visiting the neighborhood as well as the local people. The following activities shall be prohibited on the construction site or nearby:

- ✓ Injury to wild animals.
- ✓ Capture of protected animals and endangered species.

- ✓ Drinking during working hours.
- ✓ Mechanical maintenance (replacement of engine oil and lubricant) outside the specified area.
- ✓ Dumping of waste outside the specified area.
- ✓ Driving in danger on local road.
- ✓ Working without safety clothing.
- ✓ Causing interference to people nearby.
- ✓ Leakage of pollutants, e.g., oils; and
- ✓ Burning of refuse.

Any subcontractor, employee or other staff member found breaking these regulations should be discipline.

6.4 E&S Specific Management Plans

As part of the construction approval process for the project, a set of environmental and social management plans shall be developed and presented to the SPMU for approval, these management plans shall address specific issues identified in this ESMP that may arise during the project e.g., flash flood incidence, vibration, noise, blasting and flying rocks, GBV/SEA/SH issues, land acquisition and right of way, waste generation, air pollution, security, excavation and trenching, oil and chemical spill contamination etc. (see Section 6.3.1 Contractor's Environment and Social Management Plan (C-ESMP)).

These management plans are briefly described in the following sub-sections, there implementation is part of the overall Environmental and Social Management Strategy and Implementation Plan (ES-MSIP) for the FCE(T) Gombe erosion and flood intervention project to be financed by the Contractor (Bill of Engineering Measurement and Estimate-BEME).

6.4.2 Public/Stakeholder Consultation Plan

The key element of sustaining stakeholders' support in a project is the establishment and sustenance of consultation and communication process already put in place during the preparatory stages of the design and development of the project. Stakeholder engagement is essential in achieving the major objectives of a project, hence participatory approaches in project planning and implementation enhances project policy, ownership, sustainability and empower targeted beneficiaries. The objectives for stakeholder engagement include but are not limited to the following.

- create public awareness and understanding of the project and ensure its acceptance.
- develop and maintain means of communication between the project proponents, stakeholders, and PAPs, to ensure their views and concerns are incorporated into the project design and implementation, with the objectives of reducing, mitigating, or offsetting negative impacts and enhancing benefits from the project.

- inform and discuss about the nature and scale of possible adverse impacts of the rehabilitation work, identify and prioritize the mitigation measures for the impacts in a transparent and direct manner.
- document the concerns raised by stakeholders and PAPs so that their views and proposals are integrated into the mitigation and benefit enhancement measures.
- sensitize MDAs, Local Authorities, Non-governmental Organizations (NGOs) and Community Based Organizations (CBOs), Faith Based Organizations (FBOs) about the project, and solicit their views and discuss their share of responsibility for the smooth functioning of the overall project operations; to reduce conflict between stakeholders, project proponents and PAPs.

Stakeholder engagement must be enhanced and managed efficiently through a well-defined strategy. Table 6. provides a summary of activities to be considered in stakeholder engagement plan. Public sensitization and consultation will continue throughout the project implementation; hence the Contractor shall prepare and submit for approval, a comprehensive Stakeholder Engagement Plan (SEP). The Plan will identify all categories of stakeholders in the community and create opportunities for their involvement in the project implementation process.

The communities in the area are grouped into eight (8) according to the existing traditional institutions (Londom maidoruwa, Jauro Abare, Jauro Kuna, Wuro ladde, Alkahira, Arawa, Mallan Inna and Kagarawal), the FCE(T) community and others are allocated the sum of one million (N1,000,000) naira each for this purpose, making a total sum of ten million (N10,000,00) naira only (i.e. 1,000,000 x 10). The amount shall cater for logistics and refreshments for convening meetings across the 12 communities in the intervention area (Table 6.).

Table 6. 7: Phase Specific Activities for the Stakeholder Consultation Plan.

Stage	Activity	Stakeholders / Community	Timeline
1	Pre-Construction / Prior to Project Commencement		
	Project briefings, site tours, personal meetings, community sessions, consultation meetings	State Government, Local Government, Site committee, Residents of affected areas/ Community and interest groups	As required, subject to project updates and feedback from the community
	Development/dissemination of feedback and complaints	State Government, Local Government, Site	As required, subject to updates on the project

	mechanism and communications procedures	committee, Residents of affected areas/ Community and interest groups	
	Briefings, Site Tours and Community Sessions for flood control and intervention works	Government authorities, Local communities, Key/ relevant stakeholders	Prior to Work Plan approval
2	Construction and Operations		
	Responding to issues and inquiries as per feedback and complaints mechanism	All stakeholders	Ongoing / as required
	Monthly/Quarterly reporting on status of project	All stakeholders	Monthly/quarterly/as required.
	Briefings, site tours and community sessions for flood control and intervention works closure plan	Government authorities, Local communities, Key/ relevant stakeholders	Prior to project completion
3	Prior to Project Closeout/Post-Construction		
	Project briefings, site tours, personal meetings, community sessions, consultation meetings with stakeholders	All stakeholders, State Govt, Local Govt, Site committee, Affected residents/ Community/ interest groups	As required, subject to approvals and feedback from the community

6.4.3 Chance Find/Cultural Heritage Management Plan (CHMP)

The Contractor shall prepare and submit for approval the necessary CHMP for the project. The CHMP shall set out a formal system for carrying out mitigation measures by the Contractor that will reduce or eliminate risks and impacts to the Cultural Heritage. Additionally, the CHMP should provide details for implementing avoidance, mitigation and management measures for chance find or impact to cultural heritage. The Chance Find/Cultural

Heritage Management Plan (CHMP) is required to address impacts that may occur because of chance finding or existence of cultural heritage during construction works. It is anticipated that some construction activities may impact cultural heritage.

Even though there is no cultural heritage identified in the project area, the possibility of a chance being found during excavation work should not be ruled out. In the event of a chance find occurring on account of the project, the local people, community leaders, NGOs and responsive Stakeholders should be notified, and consensus reached. The local people must be involved while the Contractor activates the following process:

- notify relevant departments of the find,
- request a site inspection,
- immediately halt ongoing work until inspection results are received, and
- decide whether to proceed with the work or not.

The CHMP should cover pre-construction, construction, and post construction phases of the Project. An estimated sum of Two Million Naira (N2,000,000) is hereby budgeted for the implementation of the CHMP plan.

6.4.4 Occupational/Public Health and Safety Management Plan

The Contractor shall be required to develop and implement an occupational/community health and safety (OHS/CHS) plan for the workforce and local community. The OHS/CHS plan shall be submitted for approval prior to mobilisation. When developing the Plan, the Contractors consider impacts identified in this ESMP i.e., flood risk emergency preparedness against heavy downpour during construction work, physical/mechanical hazards due to movement of materials and mechanical equipment, safety of mechanical equipment, hazards resulting from soil contamination, excavation and trenching to avoid collapse or failure, construction waste of all types including hazardous and nonhazardous, security etc., related to the different phases of the project.

The Contractor(s) shall identify in the plan, responsibility and activation strategy should an event occur. Consideration should be given to environment (water, soil, and biota), humans (life, health and living conditions), and economic losses (Damage to infrastructure, property) Section 5.3 Impact Identification and Rating Process. Cooperation between the Contractor, the SPMU and the local community is recommended for emergency planning, hence the Stakeholder Management Plan would come in handy.

6.4.4.1 Objectives

To ensure the project conform with the World Bank Group Environmental, Health and Safety Guideline (WBG-EHSG), national and local safety regulations and measures put in place for the avoidance of injury to workers, community members or damage to plant and machinery.

6.4.4.2 Management Strategy

Provide safety equipment, training, and awareness to workers before commencement of construction and assign responsibility experienced HSE personnel implementation and monitoring.

6.4.4.3 Control Measures

- ✓ Work should be carried out under sufficient daylight and night illumination should be provided if would be done at night.
- ✓ Fencing of the site to prevent unauthorized access.
- ✓ Unauthorized persons are not allowed into the camp site without approval.
- ✓ The camp site should be equipped with fire-protection equipment and extinguishers.
- ✓ Provision personal safety protective to workers e.g., protective glasses, gloves, protective mask, dusk cover, safety helmet, ear protectors, helmet and so on, and ensure usage on the construction site.
- ✓ Safety rules and emergency contact information should be indicated on the bulletin board on construction sites.
- ✓ Safety/warning signs should be placed at appropriate points to warn people.
- ✓ Conduct regular training on basic personal hygiene, epidemic prevention, infectious diseases and basic OHS/CHS issues.
- ✓ Carry out awareness campaigns on disease prevention and cure, especially on protection against HIV/AIDS and other venereal diseases to both workers and community members.

6.4.4.4 Performance Criteria

Record of accidents, frequency and incidents occurring on site.

A sum of fifteen million (N15,000,000) naira only is proposed for the implementation of this OHS/CHS plan by the contractor. This is by no means exhaustive, the Contractor can augment where, when and if required.

6.4.5 Gender Based Violence/Sexual Exploitation and Abuse Risk Management Plan

The Gender Based Violence/Sexual Exploitation and Abuse Management Plan (GBV/SEA MP) would be used to identify and assess key risks, develop mitigation measures for prevention and respond to sexual exploitation, abuse, and Gender Based Violence (GBV). Intimate Partner Violence (IPV), public harassment, verbal insults, physical abuse, harmful widowhood practices and women, and child trafficking. The Contractors shall prepare and submit for approval the necessary GBV/SEA/SH MP to be implemented for the projects.

The GBV/SEA/SH MP defines the procedure which the Contractor would follow in carrying out the mitigation measures that will reduce or eliminate impacts relating to Gender Based Violence.

6.4.5.1 Objectives

Protection of vulnerable women, girls, and boys from exposure to violence and exploitation.

6.4.5.2 Management Strategy

GBV/SEA/SH will guarantee the survivor centered approach to provide psychosocial, health, legal and shelter services through the Gombe State Ministry of Health and Women Affairs referral pathway. Survivors will channel complaints through the GBV Focal person in the community. The SPMU will sensitize the project communities on GBV/SEA/SH prevention and train GBV Focal persons on the survivor centered approach.

6.4.5.3 Control Measures

- ✓ mandatory signing of Contractors' Code of Conduct for Contractor, sub-contractor workers.
- ✓ state FNGO to supervise and monitor GBV/SEA/SH.
- ✓ community and workers' sensitization on GBV/SEA/SH.
- ✓ provision of referral units for survivors of GBV/SEA/SH.
- ✓ provisions in contract for dedicated payments to contractor for GBV/SEA prevention activities on evidence of completion.
- ✓ Hiring of dedicated GBV specialist or retraining the SLO for the assignment,

6.4.5.4 Performance Criteria

- ✓ GBV/SEA/SH assessment for the intervention project.
- ✓ Assessment of "Reporting and Response Protocol" of GBV/SEA incidents,
- ✓ Assessing the effectiveness of the survival centered approach.
- ✓ Record of reported GBV cases.

The Contractor GBV/SEA management plan shall provide details on implementing, mitigating, and managing risks likely to lead to GBV. The scope of this plan shall cover the pre-construction, construction, and operation/demolition phases of the Projects. Fifteen million naira (N15,000,000) is only proposed for the Contractor to set aside for GBV/SEA management plan, the Contractor may supplement if the need arise.

6.4.6 Vegetation Clearing and Biomass Management Plan

The Contractor shall prepare and submit for approval a comprehensive Vegetation Clearing and Biomass Management Plan (VCBMP) for native vegetation and shrubs. Although field investigation revealed sparse vegetation cover along the FCE(T) gully stretch, effort must be made to ensure the intervention does not destroy existing sparse vegetation cover but should provide opportunity for enrichment and propagation.

6.4.6.1 Objectives

- minimize impact on fauna and flora.
- prevent the spread or introduction of alien and evasive species.
- ensure compliance with provisions of National Environmental (Protection of Endangered Species in International Trade) Regulations 2010. S.I. No. 16.
- ensure compliance with provisions of National Environmental (control of Bush/Forest Fire and Open Burning) Regulations, 2010. S.I. No. 14

6.4.6.2 Management Strategy

Minimize impacts on fauna outside the disturbance zone, on native vegetation inside the zone by using appropriate management plan to control disposal of removed vegetation spoil.

6.4.6.3 Control Measures

- no activities outside the works zone, clearly delineate works area.
- contact wildlife vet for injured fauna.
- avoid excavations that can trap fauna, excavation must be checked before backfilling.
- Restrict traffic on established animal tracks and apply speed limits.
- Cleared vegetation must be retained at designated points for composting, and
- avoid bush burning to reduce emission.

6.4.6.4 Performance Criteria

- No injury or death of fauna by vehicles or excavations work,
- No noticeable disturbance of vegetation covers outside work zone.

The VCBMP shall define activities to be carried out for protecting natural biodiversity of the area. The sum of seven million, five hundred thousand naira (N7,500,000) is estimated for this plan.

6.4.7 Air Quality and Dust Control Management Plan

The Air quality plans shall state the control measures and strategies, including rules and regulations for reducing air pollutant, dust, and gas emission from construction work, including on and off-road vehicles.

6.4.7.1 Objectives

- minimize impact of dust on adjacent areas and the community.
- avoid health risks or loss of amenity due to emission of dust in the environment.
- avoid health risk or loss of amenity due to emission of exhaust gas.
- compliance with provisions of National Environmental (Control of Vehicular Emissions from Petrol and Diesel Engines) Regulations, 2010 S.I. No. 20.

6.4.7.2 Management Strategy

Dust and gas emission will be managed by emission control at source, and administrative controls during works.

6.4.7.3 Control Measures

- vehicle movements control on established major tracks and haulage roads.
- implement dust suppression measures e.g., sprinkling of water regularly.
- regular maintenance and service of construction vehicles and machinery to manufacturer's specifications.
- Fit all vehicles, plants & machineries with emission control equipment, and
- store stockpiles where they are protected from wind.

6.4.7.4 Performance Criteria

Record of complaints and absence of smothering on surrounding structures and vegetation cover.

The Air Quality Management Plan (AQMP) shall provide rules and regulations, public education and outreach, and partnerships with relevant agencies and stakeholders. The sum of two million five hundred thousand naira (N2,500,000) only is proposed for this plan.

6.4.8 Emergency Response and Incident Prevention Management Plan

The Contractors shall prepare and submit for approval comprehensive Emergency Response and Incident Plan (ERIPMP), describing the actions or measures for responding to emergencies and hazardous conditions, including mitigation, preparedness, response, and recovery during project implementation. An emergency is any unplanned occurrence caused by natural or man-made events that can lead to death, injuries, cessation of project

work, physical or environmental damage and economic loss. The ERIPMP procedures should address response by workers and community members to emergencies.

The ERIPMP shall provide guidance on organizing assets for responding to emergencies like fire, floods, structural failure, civil disturbance, security threats (insurgency attack, kidnapping etc.), and provide the means of documenting facilities, equipment, personnel, procedures, and communications system available in the Contractor's organization to do so, and the structure for managing the assets during incident response.

6.4.8.1 Objectives

Develop well defined, well-coordinated, well-rehearsed emergency response procedure for the Contractor and communities.

6.4.8.2 Management strategy

- regular training of project personnel.
- periodic desktop and field exercises to uncover workplace risks and hazards.
- regular auditing of construction activities.
- continue liaison with Emergency Service providers.
- identify key roles, responsibilities, and effective methods of communication.
- monitor activities, documentation and compliance with statutory Occupational Health and Safety (OHS) and Environmental requirements.
- Provision and maintenance of accident/incidence register at the site.

6.4.8.3 Control measures

- effectively respond to emergencies and critical incidents in the project area to reduce risk of injury.
- limit potential harm to people.
- minimize disruption to the community and surrounding businesses through effective implementation of the ERIPMP procedures.
- effective spill containment and management, firefighting, and response to emergencies and critical incidents

6.4.8.4 Performance criteria

- Number of and response to incidents
- Number of near misses

The sum of seventeen million naira (N17,000,000) is proposed for this plan. This may however be supplemented by the contractor in the event of a major incident.

6.4.9 Waste Management Plan and Chemical Management Plan

A waste management plan (WMP) and Chemical Management Plan (CMP) shall be prepared to detail how to protect the community and workforce from the hazards of indiscriminate waste disposal during construction. The WMP will provide specific and general guidance on management of solid and liquid (hazardous and nonhazardous) construction waste like i.e., bricks, concrete, iron/metal, timber, masonry, oil (lubricating and grease), tyre, sanitary, etc., and procedures for salvage, reuse, and recycling of materials,

The CMP shall provide guidance on storage, use and disposal of chemicals associated with the project activities. The aim of the CMP is to protect human health and the environment by restricting harmful chemicals from being released into the community to pose risk to the environmental and human health.

The implementation of the WMP is estimated at twelve million naira (N12,000,000), while the CMP is estimated at five million naira (N5,000,000) only to be allocated by the contractor for implementation.

6.4.9.1 Objectives

- ✓ Reduce waste volume, maximize recycling, reuse, recovery, and prevent any construction waste/litter entering the environment.
- ✓ Waste management activities undertaken in accordance with National Environmental (Sanitation and Wastes Control) Regulations, 2009. S.I. No. 28.
- ✓ To ensure compliance with the provisions of National Environmental (Construction Sector) Regulations, 2010. S.I. No. 17.

6.4.9.2 Management Strategy

Minimize environmental impacts through appropriate controls and site inductions of employees and subcontractors.

6.4.9.3 Control(s) Measures

The Contractor shall ensure removal of waste from site to permitted waste disposal facility. The accumulation of construction waste materials must be avoided by ensuring that:

- ✓ All waste generated is stored in refuse bins and emptied on a regular basis.
- ✓ No litter must be left in the work areas or contractor's camp.
- ✓ Construction waste is stockpiled in the contractor's camp and disposed of properly by an accredited waste vendor. Contaminated construction waste must be dealt with separately.
- ✓ Soils that have been contaminated by diesel, petrol, oil, or other substances that inhibit plant growth must be removed and disposed of.

- ✓ The burning of waste on site is prohibited.

6.4.9.4 Performance Criteria

All construction waste is managed and disposed of appropriately in compliance with legislative requirement. Chemical waste is properly stored, managed, used, and restricted.

6.4.10 Erosion and Sedimentation Management Plan

6.4.10.1 Objectives

Minimize or eliminate the effects of erosion and sedimentation on the environment and biological communities. Manage soil disturbance, degradation, and erosion and ensure compliance with the provisions of the National Environmental (Soil Erosion and Flood Control) Regulations, 2010. S.I. No. 12.

6.4.10.2 Management Strategy

Ensure that direct impacts (land disturbance) are limited to the works area, and that secondary impact does not occur on adjacent areas.

6.4.10.3 Control(s) Measures

- ✓ Wastewater from the camp is not directly discharged into surface water.
- ✓ Implementation of measures to dissipate the energy of storm water before it is released into drainage area; and
- ✓ The distribution of storm water runoff as evenly as possible.
- ✓ Works will only be conducted within the work zone.
- ✓ Where possible, work areas will be designed to ensure storm water runoff drains properly off the site.

6.4.10.4 Performance Criteria

No evidence of significant sediment deposition outside work areas. No evidence of significant riling, gullies formation, or other instances of run-off erosion.

The Erosion and Sedimentation Management Plan shall provide specific activities to be carried out to protect the environment from erosion and sedimentation. The plan should be effective in preventing erosion and sedimentation considering identifying potential problems relating to the project area's slopes, drainage patterns, and soil types (see soil study in section 3.10 Soils Study. The sum of twelve million five hundred naira (N12,500,000) is estimated for the implementation of this plan.

6.4.11 Traffic and Vehicle Management Plan

Managing traffic at a construction workplace is an important aspect of workplace health and safety risks management. Vehicles and heavy-duty machines move in and around the workplace, reversing, loading, and unloading which can easily cause accidents, death and injuries to workers and the public. To eliminate traffic hazards, a Traffic and Vehicle Management Plan (TVMP) shall be developed to safeguard the public and contractor staff. The traffic and vehicle management plan shall mitigate against the effect of high traffic and related vehicular accidents. The plan shall ensure:

- training of vehicle and equipment operators.
- Vehicle and equipment routes are strictly followed.
- Creation of single lane for users before completion of works with a traffic warden stationed to control traffic at the entry and exit points.
- Use of traffic signs at or about critical points along the project site.
- Barricades fitted with night visibility marking should be placed for the safety of pedestrians, vehicles, and workers.
- Drivers or operators of construction vehicles should possess a valid driver's license, with their schedule properly designed to eliminate fatigue and unnecessary speeding.

Other measures include the use of i.e., Incident Report sheet, Traffic Control and Public Safety, Communication, Consignation and Journey management plan.

6.4.11.1 Objective of the Traffic Management Plan

To minimize the adverse effects of traffic directly generated by construction activities on the environment, where practicable.

6.4.11.2 The objective strives.

- To avoid incidents and accidents while vehicles are being driven to transport personnel, materials, and equipment to and from project sites.
- To raise safety training, education, and awareness in collaboration with the Federal Road Safety Commission to each driver and operator, to ensure compliance with the safe driving provisions and respect for traffic regulations and legislation of the government and on-site traffic signs.
- The personnel should be equipped with personal protective equipment and enforce its appropriate usage (high visibility clothing, helmet, gloves, boots, goggles, ear protectors, when and where necessary). The protective clothing shall be checked periodically to guarantee fit for purpose.
- Avoidance of pollution and deterioration of access roads.

6.4.11.3 Measures to Implement the Traffic Objective.

Construction activities should take place during the daytime. This means every operational activity associated with dispatch will occur at the site during daytime hours. These daytime operations are a critical component of the construction activities.

- ✓ Vehicles should be regularly maintained and checked to ensure that appropriate noise suppression devices are installed and operating effectively.
- ✓ Customers whose vehicles are noted to be emitting excessive emission due to lack of maintenance will be requested to rectify the problem or warned not to be allowed entry into the site/premises if the problem persists.
- ✓ Loader drivers should be trained to ensure that trucks are loaded securely. All trucks leaving the site with loads of materials will be checked for insecure loads. This will also help reduce the risk of material spill on public properties or in transit. The truck driver would be made to understand that it is the driver's responsibility to ensure that the load they carry is properly secured before driving away.
- ✓ Where applicable, a wheel wash should be installed to spray truck wheels as they leave the site, this will reduce the risk of dust being carried around or dirtying the road with mud.

The Contractors shall therefore prepare and submit for approval Traffic and Vehicle Management Plan (TVMP). The TVMP will provide specific and general guidance for vehicular movements to protect the community and workforce from accidents and safety hazards during construction work. The Contractor shall provide information, training, instruction, or supervision where necessary to protect all persons from health and safety risks. The Contractor shall ensure that construction induction training is provided to workers working on the construction site. The Sum of fifteen million naira (N15,000,000) only is proposed for implementing this plan by the contractor.

6.4.12 Storage of Fuel and other Toxic Materials

6.4.12.1 Objectives

- To minimize potential for spills of oils and other noxious substances to as low as possible.
- To ensure that chemicals and hydrocarbon are stored and handled appropriately to prevent contamination of ground water or soil.
- To ensure compliance with the provisions of the National Guidelines and Standards for Environmental Pollution Control in Nigeria (1990) (sub-section 2.2.3 National Guidelines and Standards for Environmental Pollution (March 2001)20).

6.4.12.2 Management Strategy

Reduce quantity of hydrocarbons stored to that required, implement appropriate controls, and provide appropriate training and resources for a spill response.

6.4.12.3 Control Measures.

- ✓ All fuels are to be stored on site in bulk fuel storage container. The fuel storage area must not be located near any water resource.
- ✓ Hazardous materials should also be stored in specifically designed storage facilities which could be stored in a well-ventilated area.
- ✓ Access to storage of hazardous materials should only be limited to relevant staff.
- ✓ Machine and equipment repairs must only take place within the confines of the contractor's camp. An appropriate work surface (i.e., a concrete floor) must be provided that can collect oils, fuels, and the like and these must be collected into an appropriate bin. Where there have been oil/fuel leakages, contaminated soil must be removed and disposed of at the appropriate permitted site.
- ✓ Precautionary measures must always be taken to prevent the pollution or contamination of the soil and water by grease, oil, fuels, solvents, and other chemicals.
- ✓ Performance Criteria
- ✓ Minor spills to land contained, controlled and all contamination removed and cleaned-up within 24 hours.
- ✓ No noticeable contamination of soil or surface / ground waters; and
- ✓ No spills that require an emergency response.

6.4.13 Control of Noise and Vibration

6.4.13.1 Objectives

To minimize the impacts of noise on the vicinity of the surrounding areas.

To ensure that noise and vibration does not adversely impact nearby residents.

Ensure that construction activities are conducted in accordance with National Environmental (Noise Standards and Control) Regulations, 2009. S.I. No. 35.

6.4.13.2 Management Strategy

Construction noise should be managed primarily through administrative and equipment controls during the construction phase.

6.4.13.3 Control Measures

- Limit the construction times to the daytime.
- All equipment used during construction phases is to be regularly maintained to ensure efficient operation.
- Pre-start checks and maintenance schedules to ensure equipment performance is as required.
- Noise dampening equipment to be used on equipment with excessive noise generating characteristics.
- Personnel, visitors, and workers on site must always be equipped with appropriate hearing protection measures to ensure noise impacts do not damage the person's hearing.

6.4.13.4 Performance Criteria

No noise and vibration complaints from nearby residents during construction

6.4.14 Child Labor Prevention Plan

While the project is committed to promoting the use of local labor, the following procedures will be adopted to prevent child labor in addition to the Code of Conduct. The following shall apply.

- The SPMU will introduce the Contractor(s) to the community leaders/ relevant groups.
- Contractor(s) will discuss with community leaders the number and requirement of community labor for the project and receive a list of such persons as nominated by the community leaders (persons must not be below the age of 18).
- Contractors will only engage individuals at the minimum age of eighteen (18) and this will be enforced at recruitment and monitored by the SPMU, Supervision Consultants and Contractor(s).
- Contractor(s) will liaise with the community leaders/liaison officers to verify the identity and age of all local workers. This will require workers to provide official documentation, which could include a birth certificate, national identification card, passport, or medical or school record, where these are not available the community leader/representative can conduct personal identification of proposed workers. The Contractor(s) will liaise with community leaders to attest to the age and conduct of all local hires.
- Adequate documentation of the names, age, job function and remuneration will be prepared, and copies will be kept with the community leaders, contractors, and supervision consultants.
- Hired project workers above 18 will conduct their activities in ways that are not detrimental with respect to education or be harmful to the child's health or physical, mental, spiritual, moral, or social development.
- If a child under the minimum age is discovered working on the project, measures will be taken to immediately terminate the employment or engagement of the child in a responsible manner, considering the best interest of the child. This will also be reported immediately to the SPMU.

The cost for implementing this plan is covered under the Stakeholder Consultation Plan.

6.4.15 Water management plane

The Contractor shall prepare and submit a Water Management Plan that will provide information on current water utilization and provision for water efficiency improvements, conservation activities, and water-reduction goals by creating a water balance for the project to allow for the management of water supply, wastewater, and storm water, in an efficient Best Management Practices (BMPs). This should be done prior to the commencement of the construction works. Contingency plans should describe how to meet minimum water needs during emergencies or water shortage. The budget for implementing this plan by the contractor is estimated at three million five hundred naira (N3,500,000).

6.5 Grievance Mechanism and Procedures

It is for the benefit of the Gombe State Government and the State Ministry of Environment, the ACREsAL project, Communities, and the PAPs/PAHs to implement a mechanism for resolving complaints and disagreements that may arise from the implementation of the FCE(T) Gombe erosion and Flood control site. A Grievance Redress Mechanism (GRM) is necessary to prevent and address community issues, reduce exposure to risks and provide platform for the optimization of environmental and social benefits of the project. The grievance procedure shall consist of steps that ensure proper documentation of grievances, a discussion mechanism for hearing and resolving grievances, and provisions for appeals in the event of dissatisfaction by any affected persons.

Aside from the traditional structure, the project provides a secondary mechanism for grievance resolution using the Grievance Redress Committee (GRC). The proposed GRM will help to achieve the following:

- Serve as a channel for effective two-way communication and identification of emerging environmental and social concerns from the project.
- Prevent and mitigate potential adverse environmental and social impacts throughout the life cycle of the project implementation.
- Promote cordial relationship and respect among stakeholders; and,
- Ensure trust and community acceptance of the project.

6.5.1 Formation of Grievance Redress Committee (GRC)

The objective of the GRC is to respond to the complaints relating to the project in a timely and transparent manner and to provide a mechanism for conflicts mediation and cut down on lengthy litigation, that could lead to project delays. It also provides people with concerns the medium to raise their opinions and through conflict resolution, address issues appropriately. The committee will provide enough opportunity to redress complaints

informally, provide the option to seek formal administrative and legal procedures if not satisfied with the GRC outcome. The major grievances that might require mitigation include:

- ✓ PAPs/PAHs not listed or captured.
- ✓ Use of local workforce.
- ✓ GBV/SEA issues.
- ✓ Inadequate assistance.
- ✓ Dispute on ownership.
- ✓ Delay in disbursement of assistance and improper distribution of assistance.

The ACREsAL SPMU shall establish necessary levels of Grievance Redress Committee (GRC) to be overseen by the Gombe State ACREsAL team for the FCE(T) Gombe project, to address complaints from this ESMP implementation. The Grievance Redress Committees shall be established in the communities of intervention, the local Government Areas, state and the Regional. The selection process would be done through a gender sensitive and transparent/non-biased manner. Each GRC shall provide specific necessary support and resolution to the potential PAP related grievances in accordance with provisions of this ESMP. The Committee will be coordinated as provided for at each level with the compositions of each GRC level comprising of the following:

6.4.1.1 Community Level Grievance Redress Committee (C-GRC)

The first stage of the GRC in the grievance process shall be the community based GRC (Community GRC), which shall be coordinated by the Focal NGO (FNGO), membership shall consist of the following:

- | | |
|--|-----------|
| i) The Village Head | Chairman |
| ii) Representatives of PAPs (2) | Member |
| iii) Local Government Desk Officer | Member |
| iv) Representative of Women Group | Member |
| v) Representative of People with special needs | Member |
| vi) Representative of CBO | Member |
| vii) SPMU Environment Officer | Member |
| viii) SPMU Communication Officer | Member |
| ix) SPMU Social/Livelihood Officer | Secretary |

This C=GRC shall be the first point of call for persons with grievances related to the site, the timeline for resolving grievances at this level shall be 15 days.

6.4.1.2 Local Government Level Grievance Redress Committee (LG-GRC)

Where the C-GRC is unable to resolve the matter, the complainant may seek redress from the Local Government - Grievance Redress Committee (LG-GRC). This committee shall be made up of the following:

i) District Head	Chairman
ii) Representatives of PAP	Member
iii) Local Government Desk Officer	Member
iv) Representative of Women Group	Member
v) Representative of People with special needs	Member
vi) Representative of Community Base Organization	Member
vii) SPMU Environment Officer	Member
viii) SPMU Communication Officer	Member
ix) SPMU Social/Livelihood Officer	Secretary

This committee shall be the second level of grievance resolution on matters relating to the site activities. The timeline for resolving issues at this level shall be 15 days from the day complaints submission was made following the inability of the C-GRC to resolve the matter.

6.4.1.3 ACREsAL Steering/Technical Committee (State-GRC)

Where LG-GRC is unable to resolve the matter, the complainant may seek redress from the ACREsAL Steering and Technical Committee GRC (STATE-GRC). This Committee will be coordinated by the Chairman of the Steering Committee, who shall be the Honorable Commissioner of the Ministry of Environment. The composition of this Committee shall be as follows:

i) Commissioner Ministry of Environment	Chairman
ii) Ministry of Agriculture	Member
iii) Ministry of Water Resources	Member
iv) Ministry of Women Affairs	Member
v) Ministry of Justice	Member
vi) State Project Coordinator ACREsAL	Secretary

vii) SPMU Social/Livelihood Officer

Member

The timeline for resolving issues raised at the STATE-GRC level shall be 15 days from the day complaints were submitted following the inability of the LG-GRC to resolve the matter.

6.4.1.4 Regional GRC

Where the Complainant is not satisfied with the decisions of the STATE-GRC, he/she may seek redress at the fourth level GRC. This committee shall comprise of the following:

- | | |
|---|-----------|
| • Chairman Gombe State ACREsAL Steering committee | Chairman |
| • Ministry of Agriculture | Member |
| • Ministry of Water Resources | Member |
| • Project Coordinator ACREsAL | Secretary |
| • Reps from two ACREsAL states (SLO/GRM) | Member |
| • SPMU Social/Livelihood Officer | Member |

All grievances will first be addressed at the First and moved to the Second Level if resolution is not accepted by the party involved, then to the third and fourth levels respectively. The GRM procedure should be included in the community engagement plan to ensure that all PAPs/PAHs know, understand the process, and can access it freely and easily. The effectiveness of the GRM will be a monitoring indicator.

6.4.1.5 Training of the Grievance Redress Committee

The various Grievance Redress Committees shall be provided with training to enable them to effectively perform their responsibilities. The training shall be organized by the SPMU who shall provide logistics, writing materials, per diem, transportation, training venue and time. The details of the training, including time and date, shall be communicated to all members for their attendance. At the end of the training, members of the intervention community shall be sensitized on the procedure for submission of complaints and grievances. The sum of ten million naira is budgeted for this activity.

6.6 Environmental and Social Awareness, Induction and Competence

It is very important to ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and continuous minimization of environmental risks and impacts. Such awareness can be achieved through staff training, site specific induction, toolbox meetings and daily safety briefings which are briefly elaborated below:

6.6.1 Labor Influx

The project will certainly face an influx of foreign labor due to the size of the proposed project, thus the skilled laborers may not be available in the communities around the project site. The project shall take concrete steps to mitigate possible labor related risks, such as workers' sexual relations with minors and resultant pregnancies, increase in sex workers, spread of HIV/AIDS, sexual harassment of female employees, child labor and abuse, increased dropout rates from school, failure to ensure community participation, exploitative labor practice etc. These risks require careful consideration to improve social and environmental sustainability, resilience, and social cohesion. Therefore, the project will include mitigation measures to address:

- ✓ living conditions of workers' camps and ensuring appropriate living conditions.
- ✓ establishment and enforcement of mandatory Code of Conduct with effective Action Plan for implementation.
- ✓ appropriate location for these camps to reduce the impact of labor influx on the public services; and,
- ✓ strategy for maximizing employment opportunities for the local population, including women.

The following guidelines provide the principles for properly assessing and managing the risks of adverse impacts on the communities, which may result in temporary induced labor influx by ACRoSAL. The Contractor will hire skilled and unskilled workers from communities in the project area. The SPMU will adopt or implement all possible measures to minimize labor influx into the project area. The SPMU will assess and manage labor influx risk based on appropriate instruments for risk management identified in the ESMP and Bank's sector-specific experience in the country.

Depending on the risk factors and their level, appropriate mitigation instruments should be developed including as in the ESMP, site-specific Labor Influx Management Plan and/or a Workers' Camp Management Plan¹. Risk factors to be considered by the SPMU are,

- ✓ weak institutional capacity of the implementing agency.
- ✓ predominant presence of Contractors without strong worker management and health and safety policies.
- ✓ anticipated high volumes of labor influx.
- ✓ pre-existing social conflicts or tensions.
- ✓ weak local law enforcement.
- ✓ prevalence of gender-based violence and social norms towards /it in the community (acceptance of gender-based violence).
- ✓ prevalence of transactional sex.

¹ A Labor Influx Management Plan addresses specific activities that will be undertaken to minimize the impact on the local community, including elements such as worker codes of conduct, training programs on HIV/AIDS, etc. A Workers' Camp Management Plan addresses specific aspects of the establishment and operation of workers' camps.

- ✓ local prevalence of children and forced labor.
- ✓ existing conflict situation between communities.
- ✓ absorption capacity of workers to the community

The SPMU will be required to incorporate social and environmental mitigation measures into the civil works contract and responsibilities for managing these adverse impacts. This will be a binding contractual obligation on the SPMU, with appropriate mechanisms for addressing non-compliance.

The Supervision Consultant shall be responsible for monitoring the contractor performance and adherence to the labor influx guideline and that of its Sexual Exploitation and Abuse (SEA) obligations, with a protocol in place for immediate, timely, mandatory, and confidential reporting in case of incidents to project community.

Thus, while the Bank reviews and clears project-level safeguard instruments like the ESMP, it is the SPMU's responsibility to ensure the safeguard instruments are reflected in the contractor's ESMP (C-ESMP) and ensure its implementation in accordance with the C-ESMP, safeguard instruments and other relevant contractual provisions.

6.6.2 Gender Based Violence

Nigeria acceded to the international human rights treaties and hence a party to the regional human rights instrument, which obliged States to respect, protect and fulfill human rights of all persons within their territory without discrimination. Rape violates several human rights obligations enshrined in the instruments that was ratified by Nigeria, which is globally equated as a form of gender-based violence and violence against women (sub-section 2.2.15 National Gender Policy (Revised 2022)23). As a State party to the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) and the Protocol to the African Charter on Human and Peoples' Rights, Rights of Women in Africa (the "Maputo Protocol"), it is therefore a legally binding commitment in Nigeria to exercise due diligence in combating gender-based violence and discrimination. As a result, Nigeria requires that special measures are taken to protect the rights of individuals who are vulnerable to sexual violence i.e., women, children, and persons with disabilities etc.

6.6.3 Social Investment Plan

Social investment refers to philanthropy, charitable giving, corporate social responsibility, community programs and social contributions to society that is not primarily motivated by generating a direct financial return. ACRoSAL should employ a 3-phase approach strategy which includes community investment, social investment, and philanthropy to support the communities. A tailored livelihood needs assessment (LNA) can be done to identify viable areas to support vulnerable PAPs in the area.

The potential benefit of ACREsAL's social investments to the community will create significant opportunities for businesses, including enabling them to meet regulatory requirements, secure social license to operate, improve reputation, attract talented employees, increase workforce engagement, and develop new products and markets. The areas for social investment include education, health, disaster relief, environment, community welfare, housing, infrastructure & energy, sports & recreation, food, and agriculture. ACREsAL should work in conjunction with existing community NGOs/CBO in achieving the investment plan. This social investment plan shall be further delineated in the livelihood need assessment (LNA) for this subproject.

6.6.4 Covid-19 Pandemic and Infectious Diseases

Gombe state, like other states in the country, is battling to prevent the spread of the COVID-19 virus. Thus, the SPMU and the Contractor should ensure greater awareness on the spread of the virus, this should be done by working in tandem with the NCDC and the relevant state task force on COVID-19; to develop or promote adoptable methods for preventing the spread of the virus. This shall also cover infectious diseases, the contractor should prepare and be ready to activate the relevant response system in collaboration with the Gombe State Ministry of Health, where it is an epidemic, guidance from the government shall sought while work will stop until it is safe to return. The required medical needs shall be provided by the contractor and the client informed accordingly.

Intensive campaign and enlightenment are needed to minimize the risk of exposure to the virus. Workers should therefore be provided with the necessary preventive gadgets like face masks, hand sanitizers, surface disinfectants etc. free of charge. An appropriate protocol should be established for spotting, tracing, reporting, and attending to infected patients in line with approved procedure/protocol to prevent community spreading on site. Discrimination and stigmatization against covid-19 patients shall be discouraged.

6.7 ESMP Monitoring, Evaluation and Reporting.

The objectives of the ESMP monitoring and evaluation program are:

- To ensure that the measures suggested herein are carried out accordingly during project implementation.
- To evaluate the efficiency of the proposed mitigation and enhancement measures.
- To investigate the adequacy of the ESMP as well as suggest improvements to it.
- To generate data that could be incorporated in future ESMPs.
- To evaluate what additional enforcement is required for the effective project implementation.

For effective implementation of the ESMP, a monitoring programme has been designed. The monitoring plan indicates the operational links between the impacts identified, indicators to be measured, the methods to be used, frequency of measurements and definition of thresholds. The necessary costs and responsibilities for all aspects of the monitoring arrangements are also identified.

Project performance monitoring has the overall objective of achieving the desired outcomes through reporting of measurable parameters that can be monitored and verified. The following monitoring and reporting sequence is proposed for the duration of the ESMP implementation.

- The Contractor shall submit monthly reports on monitoring compliance with this ESMP to the SPMU,
- The SPMU shall prepare and submit monthly ESMP monitoring reports to the FPMU and the World Bank.

The reporting cycle should accommodate feedback from key players consisting of the affected stakeholders, site committee, Focal NGO, CBOs/CDOs, Contractors, SPMU, etc.

6.7.1 Post Construction Monitoring

In the post-construction phase of the project, the respective Site Committee shall be required to maintain continuous monitoring of the project beyond the decommissioning phase. This will ensure that the erosion and flood rehabilitation project and the associated livelihood programmes are sustained beyond the project closing. Since the Site Committee will have a big role in sustaining the post construction (operations and maintenance) phase of the project, necessary capacity building and trainings will be required to provide officers/leaders with requisite capacity for formulating require policies, systems, and procedures for project sustainability. The SPMU and the SMeEnv will be required to ensure that the Site Committee and other CBOs/CDOs are institutionally strengthened. A summary of the risk and impact mitigation and monitoring plan for the preconstruction, construction, and post-construction phases and responsible parties with the associated costs are presented in (Table 6. ,

Table 6. , and Table 6.).

6.7.2 Cost for Managing the ESMP Management

The cost of managing the ESMP for the FCE(T) erosion and flood control intervention, from the preconstruction, construction and post-construction phases of the project is estimated in

Table 6. . This cost shall be captured in the Contractor's BEME for the E&S management plan implementation as in sub-section 6.7.3 Budget and Implementation Schedule for the ES

Table 6. 8: ESMP Management Costs (to be funded by the client)

Institutional Category	Roles & Responsibilities	Associated Management Costs (₦)		
		Pre-Construction	Construction	Post Construction
Gombe State Ministry of Environment (SMEEnv)	Overall oversight, assessment, and monitoring of specific and general project implementation.	1,500,000	2,500,000	2,000,000
SPMU (Safeguard Officers, Project. Engineer)	Oversight of specific activities associated with the ESMP implementation.	1,500,000	2,000,000	1,000,000
Environmental consultant (In-house monitoring Exercise)	Collect and analyze (laboratory); Air, Water and Soil samples at intervals for HSE impacts monitoring reports for regulatory purposes.	1,500,000	2,500,000	1,000,000
FMEnv	ESMP Disclosure/approval, Impact Mitigation Monitoring for EIA Certification.	2,500,000	N/A	N/A
Site Committee	Monitor compliance with ESMP, BEME and implementation quality	1,500,000	2,000,000	1,000,000
ESMP Implementation Audit	Compliance audit of the ESMP mitigation measures including process, documentation, and site audits.	N/A	N/A	2,000,000
TOTAL		₦8,500,000	₦9,000,000	₦7,000,000
Grand Total		₦24,500,000		

Table 6. 9: Estimate for management plan Implementation (to be integrated in BEME).

S/N	Budget for implementing specific management plan	Amt (N)
1	Preparation of C-ESMP	1,200,000
2	Public/Stakeholder Consultation Plan Implementation	10,000,000
3	Chance Find	2,000,000
4	OHS Plan implementation	15,000,000

S/N	Budget for implementing specific management plan	Amt (N)
5	GBV/SEA/SH Prevention Plan Implementation	15,000,000
6	Vegetation and Biomass plan Implementation	7,500,000
7	Air Quality Management Plan Implementation	1,000,000
8	Emergency Response and Incident Prevention Plan Implementation	17,000,000
9	Water Management Plan Implementation	3,500,000
10	Erosion and Sedimentation Management Plan	12,500,000
11	Traffic and vehicle management plan implementation	15,000,000
12	Waste Management Plan Implementation	12,000,000
13	Chemical Management Plan Implementation	5,000,000
14	Grievance Redress Mechanism Implementation	10,000,000
15	Monitoring and Reporting	13,800,000
16	Capacity Building Plan Implementation	4,000,000
17	ESMP Management Costs	35,450,000
	TOTAL	179,950,000

Exchange rate: US\$1.00 = N 784.532 as at 08/09/2023.

Source: <https://www.cbn.gov.ng/rates/ExchRateByCurrency.asp>

6.7.3 Budget and Implementation Schedule for the ESMP

The estimated cost of implementing this ESMP by the Contractor and which shall form an integral part of financing for the FCE(T) erosion and flood control project, is one hundred and seventy-nine million four hundred- and fifty-thousand-naira ~~N~~179,450,000 only, equivalent of two hundred and twenty-eight thousand eight hundred- and ninety-dollar thirty-one cent (\$228,890.31). This is to cater for all the identified specific management plans detailed in section 6.4 E&S Specific Management Plans of this ESMP report and summarized in

Table 6. .

The implementation schedule for this ESMP's in Table 6. , and is factored into the overall construction schedule. This is designed to facilitate management of issues concerning E&S management, the schedule should be strictly adhered to and implemented accordingly to avoid delays in project implementation because of noncompliance to E&S provisions. The implementation shall cover the entire life cycle of the construction work.

6.7.4 ESMP Disclosure

The ESMP report would be subjected to ACREsAL's review processes i.e., from the SPMU, FPMU and the World Bank, after which the Bank may clear the report for disclosure. The disclosure process shall be done through the FMEnv for public scrutiny and comments, copies shall be placed at designated locations i.e., at the Gombe State Ministry of Environment and Forest Resources, Gombe State ACREsAL office, Gombe Local Government Area Secretariat, Office of the District Head of Gombe, the World Bank website etc. The purpose of the disclosure is to keep the public/stakeholders abreast of the project activities, anticipated impacts to arise from the project, the proposed mitigation options to be employed, feedback and comments on the report. After the disclosure and other due diligence by the FMEnv, it shall issue an EIA certificate in fulfillment of the national EIA requirements.

Table 6. 10: Proposed Schedule ESMP Implementation the FCE(T) Gombe Intervention Site

DESCRIPTION OF ACTIVITY	RESPONSIBILITY	DURATION IN MONTHS																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Disclosure of ESMP Report and inclusion of E&S requirement in Bid Document	SPMU																		
E&S Training for SPMU/ Supervision Consultant /Contractor workers	E&S Consultant																		
Mobilisation to site	Contractor																		
Formation and Training of Project Grievance Redress Committee (GRC)	SPMU																		
Contractor and employees Code of Conduct and training	Contractor/SPMU																		
Review and Approval of Contractor's C-ESMP and Health, & Safety Plan etc	SPMU																		
Hold Stakeholders Meetings and Consultations	SPMU																		
Capacity Building Programmes	SPMU/Contractor																		
Implementation of Mitigation Measures	SPMU/Supervising Consultant/Contractor																		
Supervision of ESMP Implementation	SPMU/Supervising Consultant/Contractor																		
Monitoring & Reporting on ESMP Implementation	Supervising Consultant/SPMU																		
Conduct ESMP Implementation Audit	MDAs/Contractor/ E&S Consultant																		
Programme Administration /GRM/ GBV/ SEA/ SH etc	FPMU/SPMU/Supervising Consultant																		

CHAPTER SEVEN: SUMMARY, CONCLUSION AND RECOMMENDATIONS

7.1 Summary

This chapter presents summary of the major findings, conclusion, and recommendations to be undertaken by the SPMU to ensure that the provisions of this ESMP are comprehensively adhered to, as a site specific environmental and social safeguards instrument for addressing the environmental and social risks and impacts of the project.

In accordance with the compliance requirements of the provisions of Nigerian laws on environmental and social impact assessment and the World Bank guidelines especially those relating to E&S, this ESMP was prepared taking cognizance of the ESF requirements as defined in its embodied ESS and others, to identify and assess key environmental and social risks and impacts associated with the implementation of the proposed FCE(T) gully erosion and flood control intervention.

Consultations with stakeholders, review of relevant literature, field inspections and studies underpinned the identification of the projects adverse environmental and social risks and impacts. A monitoring, budget and implementation schedule has also been prepared to help detect changes likely to arise from the predicted adverse risks and impacts. The recommendations outlined in this ESMP will ensure a high level of health, safety, and environmental compliance for the intervention.

The report is organized into seven chapters i.e., the introduction; legal, policy and administrative framework; the description of the biophysical environment; socio-economic characteristics and consultations with stakeholders; assessment of potential impact and analysis of alternatives; environmental and social management plan; and the summary, conclusion, and recommendations.

7.2 Conclusion

The proposed FCE(T) erosion and flood control intervention project conforms with the development and socio-economic aspiration of the Government and people of Gombe State. The project will undoubtedly ease the devastating effects of flood and soil erosion in the project area and create opportunity to return already degraded lands to productivity. Just as the project would bring about many positive socio-economic impacts to the area, it also has its negative impacts. But with the stakeholder consultations conducted during this study, it is apparent that the proposed intervention will have some adverse social and environmental risks and impacts. Although, some of the adverse E&S risks and impacts will be temporary and only during the construction phase of the intervention, this ESMP is prepared to manage it to as low as reasonably possible (ALARP) and ensure that the overall benefits of the project greatly outweigh the adverse risks and impacts.

The critical social issues relating to the intervention revolve around displacement and relocation of project affected parties (PAPs), as well as permanent acquisition of lands, demolition of properties and assets to make way for the project works. Access roads would be impaired or restricted too. The Gombe State ACREsAL shall compensate the PAPs for temporary displacement and disturbance, loss of economic trees and crops, loss of lands and assets in the resettlement action plan (RAP) in line with ESS5.

There is apparent widespread support for the project, this was indicative from the stakeholder engagement and consultations held during this study. The people are eagerly expecting the commencement of the project. According to them the intervention would relieve them from the emotional trauma and restlessness caused by the presence of the gully and the devastating impacts of flood and erosion.

7.3 Recommendations

- i) Community associations should be involved during the pre-construction and construction stages of the intervention, to mediate in resolving grievances or concerns in a manner that is consistent with the GRM setting of the Gombe State ACREsAL.
- ii) The traditional rulers in the communities are to be continuously updated by the Gombe ACREsAL on all aspects of the intervention project on areas that concerns or relate to them.
- iii) The State Focal NGO should be adequately briefed and/or given orientation on the grievance procedure, including whom to contact in the Gombe State ACREsAL.
- iv) The Contractor should make adequate provision for water tanks/drums for wetting of surfaces before and during works, the use of caution signs, tapes, and traffic guide/marshals must be adhered to.
- v) Stalls should be prepared for food hawkers and vendors, and mobile toilets strategically placed especially during the construction phase with care to avoid GBV/SEA/SH issues.
- vi) The community associations and the traditional rulers of the communities in conjunction with the Gombe ACREsAL and the Contractor should collaborate with relevant agencies like the police, civil defense, and local vigilante to provide security on the construction site in line with the Gombe State ACREsAL Security Management Plan.
- vii) Safety helmets, hand gloves, safety boots, general safety kits should be adequately provided, and a fund set aside for compensations in the case of accidents on the job, for victims to access easily.
- viii) To prevent any damage to lives and properties in the project site, inhabitants (PAPs) living along the gully site should be resettled according to the Resettlement Action Plan. Care should be exercised to ensure that the Project Affected Persons are sufficiently compensated before commencement of work, and their livelihood options assured.
- ix) The Contractor should involve local youths for both skilled and unskilled opportunities irrespective of gender. Doing this would promote community involvement in the project in addition to empowering them economically during the project.
- x) Encourage local sourcing of goods and services in the community provided such meets the required standard, this would improve economic activities in the area.
- xi) There would be significant increase in traffic density into and out of the community during the construction stage, proper traffic planning and management should be implemented to reduce road traffic accidents. Thus, the use of suitable traffic warning signs and speed control measures should be enforced. Project drivers should be conversant with defensive and safe driving to avoid accidents.
- xii) A competent Health and Safety officer should be on hand, to ensure the safety of the workers, the project's sub-contractors and visitors to the site. The manager should keep and maintain record of injuries, near-misses, and maintenance of a First Aid Box on site,

- xiii) The project site should be well condoned off with conspicuous caution tape to warn non-project workers and prevent intruders. This is necessary to reduce work site accidents and related hazards.

In conclusion, the proposed erosion reclamation and flood control works can conveniently be executed in an environmentally sustainable, socially responsible, and inclusive manner, and it is most desirable because of the obvious environmental and socio-economic benefits and the easily reversible and low significance of environmental and social risks and impact.

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ANNEX 1: Outline of the ESMP Report

The ESMP Report shall be presented in a concise format containing all studies, processes, analyses, tests, and recommendations for the proposed intervention site. The report shall focus on the findings, conclusions, and any recommended actions, supported by summaries of the data collected and citations for any references used. The ESMP report will include the following topics, organized in a suggested outline that can be adjusted for local needs:

Cover page

Table of contents

List of acronyms, tables, figures

Executive Summary

1.0: Chapter 1: Introduction

- ✓ Background (evolvment of ACRESAL Project)
- ✓ ACRESAL Project Development Objective and Components
- ✓ Description of Sub-project/ Intervention Site (Terrain features, general field observation)
- ✓ Sub-project Activities and Related Specific Works
- ✓ ESMP Rationale, Objective and Preparation Approach
- ✓ Sub-project Phases Covered by the ESMP (Pre-construction Phase, Construction Phase, Post-Construction/ Operations & Maintenance)

2.0: Chapter 2: Institutional and Legal Framework for Environmental Management

1. Discussion of the World Bank Environmental and Social Standards triggered by ACRESAL and the proposed activity.
2. Summary of relevant local and federal policy, legal, regulatory, and administrative frameworks

3.0: Chapter 3: Biophysical Environment

1. Description of the area of influence and environmental baseline conditions

4.0: Chapter 4: Socio-Economic Characteristics and Consultation with Stakeholders

1. Analysis of existing livelihoods opportunities, income, gender characteristics, age profile, health, transport access, and existing community structures - at the watershed, community, household, and individual levels.
2. Analysis of existing formal and informal grievance redress mechanisms in and around the intervention area
3. Presentation of consultations with relevant stakeholders and affected persons.
4. Other topics as relevant (e.g., Gender Based Violence, Sexual Exploitation and Abuse, Child Labour, Gender Discrimination, Security issues, etc.)

5.0: Chapter 5: Assessment of Potential Adverse Impacts and Analysis of Alternatives

1. Methods and techniques used in assessing and analyzing the environmental and social impacts of the proposed project.
2. Discussion of alternatives to the current project and reasons for their rejection, including a short description of likely future scenarios without intervention.
3. Discussion on engineering designs (civil engineering only vs. a combination of civil engineering and biological settings) and the best

4. Discussion of the potentially significant adverse environmental and social impacts of the proposed project.

6.0 Chapter 6: Environmental and Social Management Plan (ESMP), including:

1. Discussion of the proposed mitigation measures - To include Covid-19 Protocols and Management Plan
2. Institutional responsibilities and accountabilities
3. Capacity building plan
4. Description of grievance redress mechanism (in alignment with the ESMF, RPF, RAP, and Project Implementation Manual) to address situations of conflicts or disagreements about some of the project activities.
5. Public consultation plan
6. Monitoring, surveillance, and evaluation plan, including suitable indicators for the proposed project.
7. Costs of implementing the ESMP

7.0: Chapter 7: Summary, Recommendations and Conclusion

References

Annexes include but are not limited to the following:

Annex 1: List of Persons Met

Annex 2: Summary of World Bank Environmental and Social Standards

Annex 3: Sample of Data Gathering Instrument

Annex 4: General Environmental Management Conditions for Construction Contracts/Civil Works.

Annex 5: Summary of the database of information collected for ESMP.

Annex 6: Maps

Annex 7: Photo

ANNEX 2: List of Persons Met

4	Fatih Usman	07088105549	
5	Zainab Umar	08107158925	
6	Justina Umar (JP)	08165738833	
7	Rifkatu Baku	07063700072	
8	Rukayya Usman	08142249604	
9	Fatima Mohammed	08061278387	
10	Ummu Ismail	080633882215	
11	Aishatu Adamu	08137929790	
12	Aishatu Haruna	08168254410	
13	Hajumadiy Adebakgr	08064262975	
14	Huraini Mohammed	07066556437	
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DATE: 11/06/23
RESPONDENTS' RECORD SHEET FOR FCE(T) AND RAILWAY GULLY ESMP 2023

S/N	NAME	PHONE NO.	COMMUNITY/GROUP	SIGNATURE
1	Muhammad Sulaiman	08022906481	Umu Yum Group	
2	Sani Hassan	08036859286	"	
3	Dr. Sami Mikhail Yalwaya	08032925276	"	
4	Hassan Ismael	08062599422	"	
5	Ibrahim Adamu	07066522328	"	
6	Sale Abdullahi	08161628324	"	
7	Rabi'u Babangida	07044024744	"	
8	Adamu Yakubu Sulaiman	08165096137	Maina Adamu Agbani	
9	Sani Danladi	08137770439	Bata Sani	
10	Muhammed Murtaza Usman	07063294655	"	
11	Muhammed Pura Wura	07029156776	"	
12	Muhammed Abdu Musa	08036040093	"	
13	Yusuf Hassan Batisa	08085215822	Batisa	
14	Salimatu Batisa	08085215822	Batisa	
15	Yahaya Batisa	08085215822	Batisa	
16	Muhammed Iselo	09037468916	Batisa	
17	Shehu Ahmad	08162152942	Umu	
18	Sadiq Abdul Cudam	08022655930	"	
19	Sadiq Idris	07038504341	"	
20	Nasir Muhammad	07045179791	"	
21	Ah. Ahmadu	08080554485	"	
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RESPONDENTS' RECORD SHEET FOR FCET AND RAILWAY GULLY ESMP 2023

DATE: 11/06/23

S/N	NAME	PHONE NO.	COMMUNITY/GROUP	SIGNATURE
1	Lamaka Usman	08164684107	Ugwaru Uku / 1 - Leaders	LM
2	Balkisu Abdulahi	07128269802		LM
3	Atsiga Hassan Mohammed	09070226531		LM
4	Asma'u Bello			LM
5	Atsiga Usman Abdulahi	07064727474		LM
6	Umaru Lawan Shaitun	08145020938		LM
7	Zainab Ahmad	09061285288		LM
8	Savaliu Adama			LM
9	Hadiya Adama	09121013959		LM
10	Fahim Abdulahi	08162602971		LM
11	Hadiya Abdulahi	07035784098		LM
12	Muhammad Ahmad Sami	09139711005		LM
13	Raki Abdulkafoir	080		LM
14	Lamaka Umar	08085148335		LM
15	Muhammad Atubale	07039203491		LM
16	Balkisu Muhammad	08039277489		LM
17	Fahim Usman			LM
18	Hadiya Musa	07038650410		LM
19	Muhammad Atubale	07061395354		LM
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DATE: 07/06/23

RESPONDENTS' RECORD SHEET FOR FCE(T) AND RAILWAY GULLY ESMP 2023

Traahmed Keltun

SN	NAME	PHONE NO.	COMMUNITY/GROUP	SIGNATURE
1	Isman Muhammad Bosc	08087317908		
2	Hamudun Baka	08019303410		
3	Hamudun Mah. Bosc	07082440870		
4	Hamudun Baka	08013744436		Adama
5	Mohd. Muhammad Baka	08016801777		
6	Hamudun Baka	080132088922		
7	Hamudun Baka	01064640142		
8	Hamudun Baka	09063665962		
9	Baba Hamudun Baka	08018909023		
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DATE: 10/06/23

RESPONDENTS' RECORD SHEET FOR FCE(T) AND RAILWAY GULLY ESMP 2023

S/N	NAME	PHONE NO.	COMMUNITY/GROUP	SIGNATURE
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2	Abubakar Muhammad	09036188970		[Signature]
3	Abubakar M. Isah	07036883528		[Signature]
4	Amud Hamza	09168776563		[Signature]
5	Usman Muhammad	07065642308		[Signature]
6	Shagari Muhammad	07068616679		[Signature]
7	Hamza A. Isah	09034245665		[Signature]
8	Mohammed Usman	08039807790		[Signature]
9	Babariya Atubakar	07030398612		[Signature]
10	Abdulkadir Abubakar	05060922260		[Signature]
11	Isah A. Umar	07066743770		[Signature]
12	Isah Babayo Ahmad	09033820202		[Signature]
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RESPONDENTS' RECORD SHEET FOR FCEI AND RAILWAY GULLY ESMP 2023

DATE: 10/6/23

S/N	NAME	PHONE NO.	COMMUNITY/GROUP	SIGNATURE
1	Maryam Abdulbaki Mary	07033733064	J/As one woman Group B	
2	Maryam Ibrahim	07164480851		
3	Fathma muhi	08039333861		
4	At-Burns Ali			
5	Jummai Ahmed	09039219952	"	
6	Antela Kumbo	07032878301	"	
7	Aisha MUS	07030682850	"	
8	Maryam Mohammad		"	
9	Bella Sa	08134817823	"	
10	Leahy Gurem	07036234779	"	
11	Una Badell	07067846955	"	
12	Kulima Madamod	08134296495	"	
13	Hefaty Hassan		"	
14	Maryam Muhammed	09064987740	"	
15	Aisha Adanu	081447530586	"	
16	Amira Dauda	09046985517	"	
17	Jummai Mohd Ramola	0814982297883	"	
18	Hadiya Ahmed	08139489561	"	
19	Maryam Balayo	07062984232	"	
20	Hafsa Dauda	08121596313	"	
21	Maryam Mohd Sanyo	09023835561	"	
22	Zainab Ibrahim	07039712187	"	
23	Maryam Usman		"	
24	Zainab Mohd.		"	
25	Aisha Ibrahim		"	
26	Fathma Adamu Abdulbaki	09035248888	"	
27	Hadiya Abdulbaki		"	

RESPONDENTS' RECORD SHEET FOR FCE(T) AND RAILWAY GULLY ESMP 2023

DATE 10/06/2023

Tadahal leaders

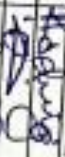
S/N	NAME	PHONE NO.	COMMUNITY/GROUP	SIGNATURE
1	James Mwanza Umama (E-Zaka)	08083213301		
2	Yona Gwanda Jidde (Mwanda)	08063911586		H. M. M.
3	Shelton Akubakar			W. M. M.
4	Mothimwe H.H. Bell-0	08022536525		W. M. M.
5	Hussaini Ziball	09039036152	Shurro Above Kyele Road 8	W. M. M.
6	Mthimu Mthimwe-0	0906394427		W. M. M.
7	Batsafuwa Buba	08048425012	Shurro Above Kyele Road 8	W. M. M.
8	Yakya S. Baka	08108411872	Shurro Above Kyele Road 8	W. M. M.
9	H. Adama Akubakar	09067076360	Shurro Above Kyele Road 8	W. M. M.
10	Umama Abba		Shurro Above Kyele Road 8	W. M. M.
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DATE: 11/06/23 RESPONDENTS' RECORD SHEET FOR FCET AND RAILWAY GULLY ESMP 2023

S/N	NAME	PHONE NO.	COMMUNITY/GROUP	SIGNATURE
1	Muhammad Sulaiman	08023906481	U/wen Youth Group	
2	Sau Hassan	08035859285	u	
3	Dr. Sami Mikhail Yahya	08032925276	u	
4	Hassan Ismael	08062599422	u	
5	Ishtahim Adamu	07066522328	u	
6	Sale Abdullahi	08161628324	u	
7	Rabi'u Babangida	07044004744	u	
8	Adamu Yakubu Sulaiman	08165096137	Mungadama Association	
9	Sani Danjela	08137770439	Baba Sani	
10	Hamidu Mottawmed Usman	07063294655	"	
11	Muhammad Pura Wura	07089156726	u	
12	Muhammad Abdu Musa	08036040093	u	
13	Yusuf Hassan	08085215822	BaBasi	
14	Salmah Baiyasan	08085215822	BaBasi	
15	Yakaya	08085215822	BaBasi	
16	Muhammed Isel	09037468916	BaBasi	
17	Shelma Ahmad	08162152942	u/wen	
18	Sau Hassan	08023906481	u	
19	Sau Hassan	07038504341	u	
20	Naseer Muhammed	07045129271	u	
21	Ali Abubakar	08080554485	u	
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RESPONDENTS' RECORD SHEET FOR FCET AND RAILWAY GULLY ESMP 2023

DATE: 11/08/23

S/N	NAME	PHONE NO.	COMMUNITY/GROUP	SIGNATURE
1	Abdullahi Kadar	08032387420	Dawaki PZ II- Leader	
2	Rubeq Hamina	07030638295	" "	
3	Mohammed Gbede Umar	07083787718	" "	
4	Hammas Umar	09066262192	" "	
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ANNEX 3: Objectives of the WB Environmental and Social Framework

World Bank Environmental and Social Framework

The World Bank Environmental and Social Framework sets out the World Bank's commitment to sustainable development, through a Bank Policy and a set of Environmental and Social Standards that are designed to support Borrowers' projects, with the aim of ending extreme poverty and promoting shared prosperity.

ESS	Title	Objective
ESS1	Assessment and Management of Environmental and Social Risks and Impacts.	• To identify, evaluate and manage the environment and social risks and impacts of the Project in a manner consistent with the ESSs. • To adopt a mitigation hierarchy approach to: (a) Anticipate and avoid risks and impacts. (b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels. (c) Once risks and impacts have been minimized or reduced, mitigate; and (d) Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible. • To adopt differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable, and they are not disadvantaged in sharing development benefits and opportunities resulting from the project. • To utilize national environmental and social institutions, systems, laws, regulations and procedures in the assessment, development appropriation of projects, whenever appropriate. • To promote improved environmental and social performance, in ways which recognize and enhance Borrower capacity.
ESS2	Labor and Working Conditions.	• To promote safety and health at work. • To promote the fair treatment, nondiscrimination, and equal opportunity of project workers. • To protect project workers, including vulnerable workers such as women, persons with disabilities, children (of working age, in accordance with this ESS) and migrant workers, contracted workers, community workers and primary supply workers, as appropriate. • To prevent the use of all forms of forced labor and child labor. • To support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national law. • To provide project workers with accessible means to raise workplace concerns.
ESS3	Resource Efficiency and Pollution Prevention and Management.	• To promote the sustainable use of resources, including energy, water, and raw materials. • To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. • To avoid or minimize project-related emissions of short and long-lived climate pollutants.

		• To avoid or minimize generation of hazardous and non-hazardous waste. • To minimize and manage the risks and impacts associated with pesticide use.
ESS4	Community Health and Safety.	• To anticipate and avoid adverse impacts on the health and safety of project-affected communities during the project life cycle from both routine and nonroutine circumstances. • To promote quality and safety, and considerations relating to climate change, in the design and construction of infrastructure, including dams. • To avoid or minimize community exposure to project-related traffic and road safety risks, diseases, and hazardous materials. • To have in place effective measures to address emergency events. • To ensure that the safeguarding of personnel and property is carried out in a manner that avoids or minimizes risks to the project-affected communities.
ESS5	Land Acquisition, Restrictions on Land Use and Involuntary Resettlement.	• To avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring project design alternatives. • To avoid forced eviction. • To mitigate unavoidable adverse social and economic impacts from land acquisition or restrictions on land use by: (a) providing timely compensation for loss of assets at replacement cost and (b) assisting displaced persons in their efforts to improve, or at least restore, their livelihoods and living standards, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher. • To improve living conditions of poor or vulnerable persons who are physically displaced, • Through provision of adequate housing, access to services and facilities, and security of tenure. • To conceive and execute resettlement activities as sustainable development programs, providing sufficient investment resources to enable displaced persons to benefit directly from the project, as the nature of the Project may warrant. • To ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected.
ESS6	Biodiversity Conservation and Sustainable Management of Living Natural Resources	• To protect and conserve biodiversity and habitats. • To apply the mitigation hierarchy and the precautionary approach in the design and implementation of projects that could have an impact on biodiversity. • To promote the sustainable management of living natural resources. • To support livelihoods of local communities, including Indigenous Peoples, and inclusive economic development, through

		the adoption of practices that integrate conservation needs and development priorities.
ESS7	Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities.	• To ensure that the development process fosters full respect for the human rights, design resource-based, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities. • To avoid adverse impacts of projects on Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities, or when avoidance is not possible, to minimize, mitigate and/or compensate for such impacts. • To promote sustainable development benefits and opportunities for Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities in a manner that is accessible, culturally appropriate, and inclusive. • To improve project design and promote local support by establishing and maintaining an ongoing relationship based on meaningful consultation with the Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities affected by a project throughout the project's life cycle. • To obtain the Free, Prior, and Informed Consent (FPIC) of affected Indigenous Peoples/ Sub-Saharan African Historically Underserved Traditional Local Communities in the three circumstances described in this ESS. • To recognize, respect and preserve the culture, knowledge, and practices of Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities, and to provide them with an opportunity to adapt to changing conditions in a manner and in a timeframe acceptable to them.
ESS8	Cultural Heritage.	• To protect cultural heritage from the adverse impacts of project activities and support its preservation. • To address cultural heritage as an integral aspect of sustainable development. • To promote meaningful consultation with stakeholders regarding cultural heritage. • To promote the equitable sharing of benefits from the use of cultural heritage.
ESS9	Financial Intermediaries.	• To set out how the FI will assess and manage environmental and social risks and impacts associated with the subprojects it finances. • To promote good environmental and social management practices in the subprojects the FI finances. • To promote good environmental and sound human resources management within the FI.
ESS10	Stakeholder Engagement and Information Disclosure.	• To establish a systematic approach to stakeholder engagement that will help Borrowers identify stakeholders and build and maintain a constructive relationship with them, in particular project-affected parties.

		• To assess the level of stakeholder interest and support for the project and to enable stakeholders' views to be considered in project design and environmental and social performance. • To promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life cycle on issues that could potentially affect them. • To ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner and format. • To provide project-affected parties with accessible and inclusive means to raise issues and grievances, and allow Borrowers to respond to and manage such grievances.
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ANNEX 4: Sample of Administered Questionnaire**Communities: Location and Characteristics**

LGA:		
Ward:	Name of Community:	Date of Interview:
Enumerator's Name and Phone No:		
Estimated Number of Community Population	Male:	Name of Project Site
	Female:	Gombe FCE(T) line gully erosion site []

Section A. Socio-Economic & Demographic Characteristics

1. Age (in years):

(a) 18 - 24 []

(b) 25 - 29 []

(c) 30 - 39 []

(d) 40-49 []

(e) 50 -59 []

(f) 60 & above []

Sex:

(a) Male []

(b)Female []

Marital Status:

(a) Single []

(b) Married []

(c) Divorced []

(d) Widowed []

What is the size of the household you belong?

Males

Females

What is the size of the household you belong?

Males

Females

What is your employment status?

Employed []

Unemployed []

Self-employed []

How will you rate youth unemployment in this community?

High []

Moderate []

Low []

What is the dominant nature of houses in this community?

Cement []

Thatch []

Mud []

Educational Level	What is your Primary Occupation?	Estimated Income per Month
Non-formal education []	Farming []	Less than N10,000 []
	Public Service []	b) N10,000 - N20,000 []

Qur'anic []	Private sector work []	c) N20,001 - N30,000 []
Primary []	Artisanship []	d) N30,001 - N40,000 []
Secondary []	Trading []	(e) N40,001 - N50,000 []
Tertiary []	Unemployed []	(f) Above N50,000
None []		

Do you consider yourself vulnerable to the gullies in your community?

Yes [] (b) No []

If yes, which of these groups do you MAINLY belong to? Physically challenged [] Mentally challenged [] Beggars [] Extremely poor [] Others (specify)	Which of the following services are available in this community? Labour/Labourers [] Accommodation [] Hotels/Motels [] Restaurants/Food joints/Eateries [] Telecommunications/mobile networks [] Banks and micro finance institutions [] Major sources of power [] Others (Please Specify)
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Are there official refuse dump sites in this community?

Yes []

No []

What is the most prominent natural disaster in your community/area(s)? Flooding [] Landslide [] Sheet/rill erosion [] No natural disaster [] Other Specify	What is the estimated distance from your house to the gully in your community? a) Less than 50m b) 50m -100m [] c) 101m - 200m [] d) 201m - 300m [] e) Above 300m []
18. What is the average distance from your plot to the gullies? a) Less than 50m [] b) 50m-100m [] c) 101m -200m [] d) 201m -300m [] e) Above 300m [] f) None []	

19. What is the average distance from school to the gully in your community? (a) Less than 50m (b) 50m-100m [] (c) 101m -200m [] (d) 201m -300m [] (e) Above 300m []	20. What is the average distance from your farm to the gully in your community? (a) Less than 50m (b) 50m-100m [] (c) 101m -200m [] (d) 201m -300m [] (e) Above 300m [] (f) None []
--	---

Social and Environmental Issues/Risks Associated with the Existing Conditions

21. What do you think is/are the main reason(s) for the gully erosion in your area? [Multiple Choice Possible] a) Improper erosion control [] b) Poor drainage [] c) Construction along waterways [] d) Clearing of trees and vegetation [] e) Land excavation [] f) Others (Specify)	22. Is there any psychological trauma you are experiencing staying in your house, shop or school due to the gully in your community? Yes [] (b) No [] Is there any increase in prices of goods and services as a result of the situation? Yes [] (b) No []																			
Are the gully erosion sites being used as hideout for criminals? Yes [] (b) No []	Has there been any support by government to improve livelihood of the members of the gully affected community? Yes [] (b) No []																			
If yes, which government provided the support? (If NO skip to question 28) Federal government [] State Government [] Local Government []	What type of livelihood support?																			
28. Do you belong to afforestation or conservation club/association? (a) Yes [] (b) No []																				
29. Are there nurseries available for raising seedlings in the community? (a) Yes [] (b) No []																				
30. If yes number of nurseries that you know ____																				
31. What are the common Diseases in this community? <table border="1"> <thead> <tr> <th>Options</th> <th>YES</th> <th>NO</th> </tr> </thead> <tbody> <tr> <td>(a) Malaria</td> <td></td> <td></td> </tr> <tr> <td>(b) Cholera</td> <td></td> <td></td> </tr> <tr> <td>(c) Typhoid</td> <td></td> <td></td> </tr> <tr> <td>(d) Skin infections and Diseases</td> <td></td> <td></td> </tr> <tr> <td>(e) Others (Specify)</td> <td></td> <td></td> </tr> </tbody> </table>			Options	YES	NO	(a) Malaria			(b) Cholera			(c) Typhoid			(d) Skin infections and Diseases			(e) Others (Specify)		
Options	YES	NO																		
(a) Malaria																				
(b) Cholera																				
(c) Typhoid																				
(d) Skin infections and Diseases																				
(e) Others (Specify)																				
32. Which of the diseases is/are associated with the existence of the gully erosion in this community?																				
33. Has there been a decrease in the number of students attending schools due to the gully in this community? (If NO skip to question 35)	34. If yes, can you rate the decrease in the number of students attending schools due to gully erosion <table border="1"> <thead> <tr> <th>Children</th> <th>Decrease in number by Sex</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> </tbody> </table>		Children	Decrease in number by Sex																
Children	Decrease in number by Sex																			

(a).Yes [] (b) No []		High	Moderate	low
	Male			
	Female			

Does the gully serve as a challenge for women from accessing Health facilities?

(a) Yes [] (b) No []

What is the estimation of the following categories affected by the gullies in your community?

Item	Houses Destroyed	Person (s) Affected	Building Shops at risk
Residential			
Commercial			
Schools			
Farm Land			
Plots			

What is the number of human or animal lives lost because of gully erosion in your community?	38. How many of the following were destroyed by the gully in your community?
--	--

Area	Number of lives lost	Number of Animal lost	Item	Number Destroyed
Residential			Roads	
Mosque/Church			Culverts	
Commercial			Bridges	
Schools			Gutters/Drainages	
Farm				

How will you assess the rate of flooding and landslide in this community? High, medium, low - two questions here separate them please.

What are the measures taken by the community/individuals to prevent/control erosion? (Multiple choice possible)

Residential Areas	Schools	Farm Lands	Plots of Lands
Sand Bag []	Sand Bag []	Sand Bag []	Sand Bag []
Tree planting []	Tree planting []	Tree planting []	b. Tree planting []
Stone Embankment []	Stone embankment []	Stone embankment []	c. Stone embankment []
Others (Specify)	Others(Specify)	Others (Specify)	d. Others (Specify)

Are the gullies used as dump sites in this community? Yes [] No []

42. Which of the following types of pollution is/are common due to the presence of the gully in the community?

a) Air pollution Yes [] No []

Water pollution Yes [] No []

43. Has the gully affected any of your religious activities? Yes [] No []

44. What number of humans or animals are at risk because of gully erosion in your community?

Area		
	Number of Humans at Risk	Number of Animals at Risk
Residential		
Mosque/Church		
Commercial		
School/Farm		

45. What is the estimate number of roads linking to the following locations that are affected by erosion?

Area	Number of Road	
	Destroyed	Closed/No Access
Market		
Mosque/Church		
School		
Health Facilities		
Farm		

What is the increase in transportation fare to the following locations affected by erosion?

Area	Increase in Transportation Fare	
	Estimated Income	
Market School		
Health Facilities		
Farm		
Not Applicable		

Does the gully result in the increase in travel time and cost of travel across or other neighboring communities? Yes [] No []

Has the gully led to the increase in crimes like theft, rape, assault? Yes [] No []

What is the main place for waste disposal in your community?

Incinerators []

Gullies []

Digging and Burying []

Open Lands/Plots []

Uncompleted structures []

50. How many recreation centers exist in the community? _____

Specify the type _____

51. How many skills acquisition Centres exist in the community? _____

Specify the type _____

52. Do you have access to services such as waste management along the gully in your community? (a)Yes [] (b)No []

53. What is the estimated number of people who will benefit from any project on this gully Site? _____

(a)Males _____ (b)Females _____

Are there any communities mobilized to secure livelihoods and watershed services in the gully site? Yes [] (b) No []

Are there people currently receiving any project-supported advisory support services in integrated land/water management practices, planning, and/or monitoring along this gully site?
(If NO skip to question 60)

Yes [] (b) No []

If yes, mention the number

If yes, what estimate of women are receiving any of such supported advisory support services in integrated land/water management practices, planning, and/or monitoring along this gully

58. Are there households that are benefitting from livelihoods enhancement activities under any project along this gully? (a) Yes [] (b) No []

59. If yes indicate number _____

Interview Guide For Community Consultations And Key Informant Interviews (KIIs) For ESMP FCE(T) Line Gombe Gully Site, Gombe State

Section 1: Baseline environmental and social conditions in the subproject area

Most common diseases and health problems in this community:

Explore health seeking behavior and practices; availability of healthcare facilities; levels of satisfaction with healthcare system

Pollution and waste management challenges experienced in the community:

How do you dispose of your garbage?

Explore perception of garbage accumulation on environment and health

Floods, erosion, and landslides

Are floods commonly experienced in this area?

Explore views on the severity, causes and impacts of floods; explore views regarding the relationship between the gully and frequency/severity of flooding.

Livelihood impacts (movement, occupational/job impact, effects on income:

Explore understandings of the impact of gullies on the people.

Socio-cultural impacts (effects on family/kinship, childcare/upbringing, religious etc.)

Explore whether community members and stakeholders consider gully erosion as having negative any impacts on socio-cultural lives.

Activities that impact negatively on the environment

Waste disposal (solid & liquid)

Explore whether there are waste disposal practices that impact negatively on environment and health; explore whether members are aware of the environmental impacts of those practices.

Building construction

Investigate the commonly practiced building practices, compliance with urban planning and building regulations; explore understandings of environmental impact of lack of compliance and violation of planning.

Sand mining/extraction

Determine whether communities obtain sand and mud for building from the main gully; explore understandings of the impacts of sand mining on the environment.

Drainage construction/blockage

Determine whether there are sufficient drainages; explore views on the effects of existing drainages or runoff water on buildings, access roads and so on.

Agricultural practices

Determine whether there are any environmentally damaging agricultural practices

Business activities

Measures taken to cope, adapt to and/or mitigate the adverse impacts

Tree planting

Sandbags

Building barriers

Migration/movement

Community work

Others.

ANNEX 5: General Environmental Management Conditions for Construction Contracts

Contract Specifications for Contractor

1.0 General

- a. All Environmental and Social (E&S) safeguards associated with the contract shall be complied with by the contractor. The Contractor shall also update himself about such issue in the ESMP and prepare his work strategy and plan to fully consider relevant provisions of the ESMP.
- b. The Contractor shall develop a plan of work indicating all Environmental and Social safeguards at the various stages and indicate the period within which site will be maintained to its original state after completion of works to ensure that significant E&S safeguards have been addressed appropriately.
- c. The Contractor shall adhere to the proposed plan implementation schedule and the monitoring plan to ensure effective feedback of monitoring information to the SPMU Project Engineer (PE).
- d. The Contractor shall implement all measures to avoid undesirable adverse environmental and social impacts wherever possible, restore site offices to acceptable standards, and abide by all environmental performance requirements specified in the ESMP

2.0 Dust Mitigation Measures

- a. The contractor shall minimize the effect of dust on the surrounding environment resulting from site clearing, vibrating equipment and temporary access roads.
- b. During the rehabilitation project, the contractor shall carry out proper and efficient measures, such as water dousing, whenever necessary to reduce the dust nuisance, and to prevent dust originating from the operations.

3.0 Noise Due to Construction Activities

The contractor shall ensure the noise levels emanating from machinery, vehicles, and noisy construction activities (e.g., excavation) are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.

4.0 Waste Management

- a) Construction waste shall not be left in stockpiles along the road but removed and disposed of/or reused where needed.
- b) All waste shall be segregated into organic waste and plastic and glass. The organic waste will be composted near the site office to enrich the soil while plastics and glass will be taken to the district dump sites.
- c) All sanitary facilities (e.g. garbage collection and disposal, drinking water facilities, etc.) shall be provided by the contractor in site offices or project sites.

5.0 Water Resource Management

- a) No construction water containing spoils or site effluent, especially cement, oil and fuel, shall be allowed to flow into natural water drainage courses.
- b) The contractor shall take all possible steps to prevent pollution of streams and other water supplies.
- c) Entry of runoff water to the site shall be restricted by constructing diversion channels or culverts to reduce the potential of soil erosion and water pollution.
- d) Wastewater from washing out of equipment shall not be discharged into water courses.

6.0 Material Excavation and Deposit

Vegetation clearing shall be restricted to the area required for safe operation of the rehabilitation work. Vegetation clearing shall not be done more than two weeks in advance of rehabilitation.

7.0 Contractor's Environment and Social Management Plan (ESMP)

- a) Within 6 weeks of signing the Contract, the Contractor shall prepare a work plan to ensure the adequate management of E&S aspects of the works, including implementation of the requirements of these general conditions and any specific requirements of an E&S safeguards for the works. The Contractor's work plan will serve two main purposes:
 - i. For the Contractor, for internal purposes, to ensure that all measures are in place for adequate E&S management, and as an operational manual for his staff.
 - ii. For the Client, supported where necessary by SE, to ensure that the Contractor is fully prepared for the adequate management of all E&S safeguards issues.
- b) The Contractor's E&S document shall provide at least:
 - A description of procedures and methods for complying with these general environmental and social conditions, and any specific conditions specified in the ESMP;
 - A description of specific mitigation measures that will be implemented in order to minimize adverse impacts.
 - A description of all planned monitoring activities and the reporting thereof; and
 - The internal organizational, management and reporting mechanisms put in place.

8.0 Health and Safety

- a) In advance of the construction work, the Contractor shall mount an awareness and hygiene campaign. Workers and residents shall be sensitized on health risks particularly of HIV/AIDS.
- b) Adequate road signs to warn pedestrians and motorists of rehabilitation activities, diversions, etc. shall be provided at appropriate points.

9.0 Reporting

The Contractor shall prepare monthly progress reports to the SPMU on E&S monitoring with these general conditions and the project E&S safeguards. It is expected that the Contractor's reports will include information on:

- E&S management actions/measures taken, including approvals sought from SMENV, PE and FME
- Problems encountered in relation to E&S aspects (incidents, including delays, cost consequences, etc.)
- Lack of compliance with contract requirements on the part of the Contractor.
- Changes of assumptions, conditions, measures, designs, and actual works in relation to E&S aspects; and
- Observations, concerns raised and/or decisions taken regarding E&S management during site meetings.

10.0 Cost of Compliance

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

ANNEX 6: Waste Management Plan

The categories of waste envisaged under the sub-project is as follows:

Vegetal waste - This will be vegetation cleared during site preparation. However, vegetal waste is expected to be minimal considering most of the schools are already existing.

Construction waste - This will include concrete including cement, stones, gravels, wood, metal scraps, etc.

Gaseous emissions - from movement of vehicles, machine operations, site clearing activities, mixing of materials and chemicals such as paints.

Liquid waste - Leakages from vehicles, oil containers, chemicals, adhesives, etc.

Human Waste - from workers onsite, campsite such as domestic sewage, faeces, urine

Table 25 below shows how this waste generated will be managed.

Categories of Waste

S/N	Potential Source	Waste Type	Waste Streams	Management
A PRECONSTRUCTION				
1	Movement of vehicles on unpaved surface and engine exhaust	Emission	COx, SOx, NOx, CO, Dust	• Use water suppression to prevent dust emission. • Maintain vehicles and machineries to reduce emission. • Maintain low speed to reduce dust and gaseous emission.
2	Site Clearing and Installation of temporary workers camp and offices and workshops	Non-Hazardous	• Vegetal Waste • Industrial Waste: Metal scraps, packaging waste	• Vegetal waste shall be supplied to farmers for use as compost. • Woody vegetal shall be supplied to host communities for domestic uses including as fuel wood for cooking. • Segregated and stored on site to be collected at least once a week for reuse or recycle through the Gombe Environmental Protection Agency (GOSEPA) or licensed third party facilities.
3	Workers' camp	Domestic and Human waste	• Food remnant, kitchen wastes. Food packaging etc • Domestic Sewage	• To be transferred to locals for use as compost and animal feed. • Plastic and other packaging to be recycled through licensed recycling third parties or collected by SEPA. • Sewage will be collected in a properly closed constructed septic tank and will be evacuated in conjunction with SEPA at least twice during the 18month period or as required.
B CONSTRUCTION				
1	Movement of vehicles on unpaved surface and engine exhaust	Emission	COx, SOx, NOx, CO, Dust	• Use water suppression to prevent dust emission. • Maintain vehicles and machineries to reduce emission. • Maintain low speed to reduce dust and gaseous emission. • Use of cleaner technologies and modern equipment
2	Civil works	Non-Hazardous /Industrial	• Spoils/demolition • Waste Packaging and Dunnage such as scrap	• Segregated and kept securely in closed containers on site. To be evacuated by GOSEPA

	Workers' camp/offices		wood, scrap metal, steel, glass, plastic, paper and cardboard, empty metal containers, excess concrete, broken equipment, or components • Domestic-type waste: wastepaper and food scraps, metal cans	or transferred to approved recycling third parties for reuse/recycling. • Non-recyclables to be removed by GOSEPA or other approved waste contractor by the state. • To be transferred to locals for use as compost and animal feed. • Plastic and other packaging to be evacuated by GOSEPA or recycled through licensed recycling third parties.
3	Civil Works	Hazardous Waste	Solid Wastes: used batteries, chemical containers, concrete etc Liquid Waste: spent lubricating oils, hydraulic fluids, brake fluids, battery electrolyte, and dielectric fluids, chemical cleaning agents, paints, primers, thinners, and corrosion control coatings; sealants and adhesives etc	Store on site in closed and labelled containers with secondary containment to be evacuated by GOSEPA or registered waste contractor with off-site permitted hazardous waste treatment, storage, or disposal facilities in accordance with GOSEPA policies.
	Civil works	Wastewater	Wastewater from equipment washing and concrete production	Discharged to the ground as only very small quantity is envisaged at this stage.
	Civil works	Electrical and electronic waste (e-waste)	Electrical wirings, cables, damaged computers etc.	This will be sent to Material Recovery Facilities/ recycling facilities in the state for proper management.
C	OPERATION			
1	Movement of vehicles	Emission	CO _x , SO _x , NO _x , CO, Dust	See A1
2	Operations	Solid waste Chemical waste Sewage E-waste	Maintenance of buildings, roofing sheets, iron sheets, paint. Sewage evacuation from constructed toilets	Segregated and kept securely in closed containers on site to be collected by GOSEPA. Non-recyclable solid waste to be sent to approved GOSEPA dumpsites. Recyclable waste to be sent to SMEnv. facilities and recycling facilities, this will be done in liaison with GOSEPA. Liaise with GOSEPA on Sewage management
Cost (Also captured the relevant section of ESMP Matrix Table)				

ANNEX 7: Occupational Health and Safety Plan

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

- **Competency**

All personnel required to operate or work with any equipment or machine must be competent, be tested for each equipment that he/she shall be operating. All personnel who as part of their profession require licensing or certification must obtain the necessary certification before he/she shall be allowed to work on the site.

- **Fitness**

All personnel working on site shall be required to be certified medically fit to do so by an approved medical facility or Medical Doctor (pre-employment medical examination)

- **HSE Training**

1. **Induction/Orientation**

Every new or rehired employee and Subcontractors employees must undergo mandatory OHS orientation / induction. The purpose of the Induction is to educate workers and make them aware of the major potential hazards he or she shall come into contact with while working on the site; also, it is one more opportunity to stress the importance of HSE being the first priority in the operations.

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

- Site safety rules.
- Personnel protective equipment requirements (PPE).
- Environmental sensitivity and protection.
- Preparation and planning of the job (Daily Pre-task talk).
- Emergency plan and muster points.
- SEA/SH and GBV prevention strategies
- COVID-19 prevention strategies

2. **Project Specific HSE Training**

In addition to the HSE orientation /induction, there shall be specific site HSE trainings which shall cover the following topics:

- Manual handling.
- Electrical Safety
- Emergency Prevention, Preparedness and Response
- Work at height training
- First Aid training (for site First Aiders)
- Lifting and Rigging
- Safe Driving techniques (for drivers)

EMERGENCY PREPAREDNESS AND RESPONSE

Emergency procedures and evacuation plan shall be developed by the HSE Department and displayed on the notice board. These procedures shall be communicated to all staff. Also, each section/department shall have always at least a trained first aider.

The contractor team should always have a trained first-aider present with well-equipped first aid box. For accidents which are beyond first aid/require medical attention, ill-health, disease outbreaks, health emergencies the contractor to liaise with the Primary Healthcare Centers present in each Ward and registered hospitals in the project areas to ensure timely medical

attention (list of health facilities - <https://hfr.health.gov.ng/facilities/hospitals-list?page=1055>). The emergency numbers for the Gombe State ACRéSAL Environment and Safeguard Officer can be contacted as well: 08117217699.

HSE IMPLEMENTATION AND PERFORMANCE MONITORING

1. HSE Meetings

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

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

2. HSE Reporting

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

3. HSE Inspection and Audits

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

4. Corrective and Preventive Actions and Non-Conformities

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

5. Project HSE Rules

The project HSE rules shall be developed, and supervision shall develop specific rules and procedures when necessary. The following site rules shall be always implemented. The Site Manager shall draw these rules to the attention of their own workmen or staff. All sub-contractors must ensure that these rules are drawn to the attention of their workmen and staff. The Principal Contractor may implement additional site rules during the contract programme. Any such additional rules shall be notified to all personnel engaged on the project prior to their implementation. The HSE rules shall include but not limited to:

- Personal Protective Equipment must be always worn.
- All instructions issued by the Site Manager regarding the storage, handling or cleaning of materials, plant and equipment must be followed.
- All vehicles must be parked in the designated areas.
- Any workman suffering from a medical condition that might affect his work and/or that could require specific medical treatment must inform the supervisor before commencing work.
- All site tools shall either be battery operated or 110 volts.
- No one shall be permitted on site if it is believed that they are under the influence of alcohol or drugs.
- Vehicles must not reverse without a banksman in attendance.

- All visitors to site must undergo a site-specific induction and operative Identity badges must be worn at all times.
- All excavations must be secured.
- Smoking and eating shall only be permitted in the designated area. This area shall be identified during induction.
- No hot works operations are permitted without a hot work permit in place.
- There shall be no radios or other music playing devices on site.
- Good housekeeping practices to be adopted.
- Compliance with all Ethical Power Permit to Work systems.
- The site keyed access procedure must be strictly adhered to.
- All Contractors must comply with Site Health & Safety Guidelines / Site Safety Method Statement
- No untrained worker shall be permitted to operate heavy machineries.
- COVID-19 protocols to be adhered to including frequent handwashing, use of nose masks when in crowded spaces, timely reporting of any symptoms to HSE officer and immediate isolation.

6. Safe Work Practices/Personal Protective Equipment (PPE)

The basic PPE required for the project shall be Safety Glasses, Safety Boots, Hand Gloves, Hard Hat, ear plugs and Coverall. Any other PPE shall be used as applicable. Management is responsible for the provision of PPE and usage shall be always enforced.

PPE shall be provided in circumstances where exposure to hazards cannot be avoided by other means or to supplement existing control measures identified by a risk assessment. An assessment shall be made to ensure that the PPE is suitable for purpose and is appropriate to the risk involved. Information, instruction & training shall be given to all employees on safe use, maintenance, and storage of PPE. Employees shall, in accordance with instructions given, make full use of all PPE provided and maintain it in a serviceable condition and report its loss or defect immediately to the maintenance department where it shall be replaced.

PPE shall be replaced when it is no longer serviceable and returned on a new for old basis. Employees shall sign to state that they have received PPE when issued.

✓ Welfare Facilities

The provision of welfare facilities on the site shall be communicated to all operatives at site induction.

A cleaning regime shall be implemented and maintained for the duration of the construction phase to ensure the site welfare facilities remain in a clean and tidy condition.

If mains drinking water becomes unavailable during the construction phase bottled water shall be brought to site for all operatives for the necessary, period.

✓ Signage

Adequate provision for warning and directional signs shall be made.

ANNEX 8: Traffic Management Plan

The objective of this TMP is to provide safe passage for community members, pedestrians, motorcyclist, cyclists, and vehicular traffic in the project areas during the construction. The Contractor should designate a TMP Supervisor who will oversee traffic management along major roads within the project corridors.

The following are the minimum requirements for traffic management on the project:

Design and layout of Road Systems

The contractor in conjunction with the community, SPMU and FRSC must: -

- a) Plan traffic routes to give the safest route between places within the project route
- b) Make traffic routes wide enough for safe movement of the largest vehicle using them.
- c) Ensure all drops and falls are adequately protected.
- d) Avoid traffic routes passing close to vulnerable areas such as fuel tanks.
- e) Ensure there are designated safe areas for loading, unloading and plant maintenance.
- f) Avoid sharp corners or blind bends if these cannot be avoided install mirrors.
- g) Road crossings and junctions should be clearly signed and marked.
- h) Make entrances and gates wide enough.
- i) Set speed limits and clearly mark on traffic routes; (5mph).
- j) Give prominent warning of limited headroom and overhead cables.

Liaisons with Government Traffic Agencies

The TMP will ensure liaisons with the FRSC at the State level. In situations where heavy traffic impacts are envisaged, the Contractor will liaise with the FRSC to ensure traffic coordination and mitigate adverse traffic impacts.

Pedestrians

- a) Provide separate routes for pedestrians and where needed provide suitable barriers.
- b) If traffic routes are used by both pedestrians and vehicles, they should be wide enough.
- c) Provide suitable well marked crossing points.

Aspects	Descriptions	Responsible Party
Traffic/Safety Signage	Safety signage should be put at strategic locations to warn road users of the ongoing construction activities. Signages should also be located along burrow pits, engineering yards and workers' camp.	Contractor
Movement of Vehicles and Equipment	Mobilization of equipment and materials should be done at off-peak period (10am - 4pm), mainly on weekends, holidays. Enforce speed limit. Ensure vehicles and equipment are parked at Camp site and designated areas ONLY. Untarred access roads shall be sprinkled with water frequently to suppress dust emissions. The contractor must ensure that trucks carrying sand/soil to and from the sites are well covered in order not to cause injury to the public. Station flagmen at junctions, diversion points, near public crossings such as schools and speed bumps will be installed in built up areas and near public facilities such as schools, mosques, churches to reduce speed and dust. During peak periods, such as market days FRSC will also be involved in assisting traffic and road safety management. Furthermore, the contractor will engage the services of FRSC to train all project drivers.	Contractor

Training	Hire drivers with appropriate driver's license. Liaise with FRSC to train drivers. As part of refresher course for construction workers, train drivers on defensive driving and enforce speed limits	Contractor
Communication	All Traffic and Safety signages should be boldly written in English & local languages. Any incident/ accidents should be reported immediately to the SPMU within 24hrs. The SPMU will also report to the NPCU/WB within 48hrs including immediate action taken	Contractor SPMU
Cost	All actions and costs have been embedded in the ESMP Matrix Table	

ANNEX 9: Sample Code of Conducts

Individual Code of Conduct Preventing Gender Based Violence and Violence Against Children

Definitions:

Gender Based Violence (GBV) - is an umbrella term for any harmful act that is perpetrated against a person's will, and that is based on socially ascribed (gender) differences between males and females. It can be sexual, physical, psychological and economic in nature, and includes acts, attempted or threatened, committed with force, manipulation, or coercion and without the informed consent of the survivor. A SURVIVOR is a person who has experienced GBV.

Sexual Exploitation and Abuse (SEA) is the actual or attempted abuse of a position of vulnerability, power, or trust for sexual purposes including but not limited to profiting monetarily or socially from sexual exploitation of another.

Sexual harassment (SH) is the unwanted behavior of a sexual nature.

Violence Against Children (VAC) is both physical and non-physical forms including neglect, maltreatment, exploitation and sexual abuse.

I, _____, acknowledge that preventing gender-based violence (GBV) and violence against children (VAC) is important. The company considers that GBV or VAC activities constitute acts of gross misconduct and are therefore grounds for sanctions, penalties or potential termination of employment. All forms of GBV or VAC are unacceptable be it on the work site, the work site surroundings, or at worker's camps. Prosecution of those who commit GBV or VAC may be pursued if appropriate.

I agree that while working on the project I will:

Consent to police background check.

- ✓ Treat women, children (persons under the age of 18), and men with respect regardless of race, colour, language, religion, political or other opinion, national, ethnic, or social origin, property, disability, birth or other status.
- ✓ Not use language or behaviour towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
- ✓ Not participate in sexual contact or activity with children—including grooming or contact through digital media. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not a defense or excuse.
- ✓ Not engage in sexual favours—for instance, making promises or favourable treatment dependent on sexual acts—or other forms of humiliating, degrading or exploitative behaviour.
- ✓ Unless there is the full consent² by all parties involved, I will not have sexual interactions with members of the surrounding communities. This includes relationships involving the withholding or promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex—such sexual activity is considered “non-consensual” within the scope of this Code.
- ✓ Attend and actively partake in training courses related to HIV/AIDS, GBV and VAC as requested by my employer.
- ✓ Consider reporting through the GRM or to my manager any suspected or actual GBV or VAC by a fellow worker, whether employed by my company or not, or any breaches of this Code of Conduct.

² **Consent** is defined as the informed choice underlying an individual's free and voluntary intention, acceptance or agreement to do something. No consent can be found when such acceptance or agreement is obtained using threats, force or other forms of coercion, abduction, fraud, deception, or misrepresentation. In accordance with the United Nations Convention on the Rights of the Child, the World Bank considers that consent cannot be given by children under the age of 18, even if national legislation of the country into which the Code of Conduct is introduced has a lower age. Mistaken belief regarding the age of the child and consent from the child is not a defense.

Regarding children under the age of 18: Wherever possible, ensure that another adult is present when working in the proximity of children.

- ✓ Not invite unaccompanied children unrelated to my family into my home unless they are at immediate risk of injury or in physical danger.
- ✓ Not sleep close to unsupervised children unless necessary, in which case I must obtain my supervisor's permission, and ensure that another adult is present if possible.
- ✓ Use any computers, mobile phones, or video and digital cameras appropriately, and never to exploit or harass children or to access child pornography through any medium (see also "Use of children's images for work related purposes" below).
- ✓ Refrain from physical punishment or discipline of children.
- ✓ Refrain from hiring children for domestic or other labour which is inappropriate given their age or developmental stage, which interferes with their time available for education and recreational activities, or which places them at significant risk of injury.
- ✓ Comply with all relevant local legislation, including labour laws in relation to child labour.

Use of children's images for work related purposes

When photographing or filming a child for work related purposes, I must:

- ✓ Before photographing or filming a child, assess and endeavor to comply with local traditions or restrictions for reproducing personal images.
- ✓ Before photographing or filming a child, obtain informed consent from the child and a parent or guardian of the child. As part of this I must explain how the photograph or film will be used.
- ✓ Ensure photographs, films, videos, and DVDs present children in a dignified and respectful manner and not in a vulnerable or submissive manner. Children should be adequately clothed and not in poses that could be seen as sexually suggestive.
- ✓ Ensure images are honest representations of the context and the facts.
- ✓ Ensure file labels do not reveal identifying information about a child when sending images electronically.

Sanctions

I understand that if I breach this Individual Code of Conduct, my employer will take disciplinary action which could include:

- ✓ Informal warning.
- ✓ Formal warning.
- ✓ Additional Training.
- ✓ Loss of up to one week's salary.
- ✓ Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months.
- ✓ Termination of employment.
- ✓ Report to the police if warranted.

I understand that it is my responsibility to avoid actions or behaviors that could be construed as GBV or VAC or breach this Individual Code of Conduct. I do hereby acknowledge that I have read the foregoing Individual Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to GBV and VAC. I understand that any action inconsistent with this Individual Code of Conduct or failure to take action mandated by this Individual Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____

Printed Name: _____

Title: _____

Date: _____

Contractor's Code of Conduct Preventing Gender Based Violence (GBV) and Sexual Exploitation & Abuse (SEA)

Definitions:

Gender Based Violence (GBV) - is an umbrella term for any harmful act that is perpetrated against a person's will, and that is based on socially ascribed (gender) differences between males and females. It can be sexual, physical, psychological, and economic in nature, and includes acts, attempted, or threatened, committed with force, manipulation, or coercion and without the informed consent of the survivor. A SURVIVOR is a person who has experienced GBV.

Sexual Exploitation and Abuse (SEA) is the actual or attempted abuse of a position of vulnerability, power, or trust for sexual purposes including but not limited to profiting monetarily or socially from sexual exploitation of another.

Sexual harassment (SH) is the unwanted behavior of a sexual nature.

Violence Against Children (VAC) is both physical and non-physical forms including neglect, maltreatment, exploitation, and sexual abuse.

- ✓ The company is obliged to create and maintain an environment which prevents Gender Based Violence (GBV) and Sexual Exploitation & Abuse (SEA) issues. The company is also required to maintain an environment where the unacceptability of GBV and actions against children are clearly communicated to all those involved in the project. In order to prevent GBV and SEA, the following core principles and minimum standards of behaviour will apply to all employees without exception:
- ✓ GBV/SEA constitutes acts of gross misconduct and are therefore grounds for sanctions, penalties and/or termination of employment. All forms of GBV/SEA including grooming are unacceptable, be it on the work site, the work site surroundings, project neighbourhoods or at worker's camps. Prosecution of those who commit GBV or SEA will be followed.
- ✓ Treat women, children (persons under the age of 18), and men with respect regardless of race, colour, language, religion, political or other opinion, national, ethnic, or social origin, property, disability, birth or other status.
- ✓ Do not use inappropriate language or behaviour towards women, children, and men. This includes harassing, abusive, sexually provocative, derogatory, demeaning or culturally inappropriate words, gestures, or actions.
- ✓ Sexual activity with children under 18—including through digital media—is prohibited. Mistaken belief regarding the age of a child and consent from the child is not a defence.
- ✓ Sexual favours or other forms of humiliating, degrading or exploitative behaviour are prohibited.
- ✓ Sexual interactions between contractor's and consultant's employees at any level and member of the communities surrounding the workplaces that are not agreed to with full consent by all parties involved in the sexual act are prohibited. This includes relationships involving the withholding/promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex - such sexual activity is considered "non-consensual" within the scope of this Code.
- ✓ All employees are required to attend an induction training course prior to commencing work on site to ensure they are familiar with the GBV/SEA Code of Conduct.
- ✓ All employees must attend a mandatory training course once a month for the duration of the contract starting from the first induction training prior to commencement of work to reinforce the understanding of the institutional GBV and SEA Code of Conduct.
- ✓ All employees will be required to sign an individual Code of Conduct confirming their agreement to support GBV and SEA activities.

I do hereby acknowledge that I have read the foregoing Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and

respond to GBV and SEA. I understand that any action inconsistent with this Code of Conduct or failure to take action mandated by this Code of Conduct may result in disciplinary action.

FOR THE COMPANY

Signed by _____

Title: _____

Date: _____

Manager's Code of Conduct Preventing Gender Based Violence (GBV) and Sexual Exploitation & Abuse (SEA)

Definitions:

Gender Based Violence (GBV) - is an umbrella term for any harmful act that is perpetrated against a person's will, and that is based on socially ascribed (gender) differences between males and females. It can be sexual, physical, psychological, and economic in nature, and includes acts, attempted or threatened, committed with force, manipulation, or coercion and without the informed consent of the survivor. A SURVIVOR is a person who has experienced GBV.

Sexual Exploitation and Abuse (SEA) is the actual or attempted abuse of a position of vulnerability, power, or trust for sexual purposes including but not limited to profiting monetarily or socially from sexually exploitation of another.

Sexual harassment (SH) is the unwanted behavior of a sexual nature.

Violence Against Children (VAC) is both physical and non-physical forms including neglect, maltreatment, exploitation, and sexual abuse.

Managers at all levels have responsibilities to create and maintain an environment that prevents GBV and SEA. They need to support and promote the implementation of the Company Codes of Conduct. To that end, Project Managers are required to sign up to Codes of Conduct applicable to their managerial duties within the context and sign the Individual Codes of Conduct. This commits them to support and develop systems that facilitate the implementation of this action plan and maintain a GBV-free, child-safe, and conflict-free work environment. These responsibilities include but are not limited to:

Mobilization

- ✓ Establish a GBV/SEA Compliance Team from the contractor's and consultant's staff to write an Action Plan that will implement the GBV and SEA Codes of Conduct.
- ✓ The Action Plan shall, as a minimum, include the
- ✓ Standard Reporting Procedure to report GBV and SEA issues through the project Grievance Redress Mechanism (GRM);
- ✓ Accountability Measures to protect confidentiality of all involved; and,
- ✓ Response Protocol applicable to GBV survivors/survivors (including access to support coping and post-trauma management strategies) and perpetrators.
- ✓ Engagement of the services of social service providers (NGOs) with requisite skill in the prevention and management of GBV and SEA.
- ✓ Coordinate and monitor the development of the Action Plan and submit for review to the RAMP-PIU safeguards teams, as well as the World Bank prior to mobilization.
- ✓ Update the Action Plan to reflect feedback and ensure the Action Plan is carried out in its entirety.
- ✓ Provide appropriate resources and training opportunities for capacity building so members of the compliance team will feel confident in performing their duties. Participation in the Compliance team will be recognized in employee's scope of work and performance evaluations.

- ✓ Ensure that contractor, consultant, and client staff are familiar with the RAMP GRM and that they can use it to anonymously report concerns over GBV and SEA.
- ✓ Hold quarterly update meetings with the compliance team to discuss ways to strengthen resources and GBV/SEA support for employees and community members.
- ✓ In compliance with applicable laws and to the best of your abilities, prevent perpetrators of sexual exploitation and abuse from being hired, re-hired, or deployed. Use background and criminal reference checks for all employees.
- ✓ Ensure that when engaging in partnership, sub-grant or sub-recipient agreements, these agreements.

a) incorporate this Code of Conduct as an attachment.

b) include the appropriate language requiring such contracting entities and individuals, and their employees and volunteers to comply with this Code of Conduct; and

c) expressly state that the failure of those entities or individuals, as appropriate, to take preventive measures against GBV and SEA, to investigate allegations thereof, or to take corrective actions when GBV/SEA has occurred, shall constitute grounds for sanctions and penalties.

Training

- ✓ All managers are required to attend an induction manager training course prior to commencing work on site to ensure that they are familiar with their roles and responsibilities in upholding the GBV/SEA Codes of Conduct.
- ✓ Provide time during work hours to ensure that direct recruits attend the mandatory induction training which covers GBV/SEA training required of all employees prior to commencing work on site.
- ✓ Managers are required to attend and assist with the NGO-facilitated monthly training courses for all employees. Managers will be required to introduce the trainings and announce results of consequential evaluations.
- ✓ Collect satisfaction surveys to evaluate training experiences and provide advice on improving the effectiveness of training.
- ✓ Prevention
- ✓ All managers and employees shall receive a clear written statement of the company's requirements with regards to preventing GBV/SEA in addition to the training.
- ✓ Managers must verbally and in writing explain the company and individual codes of conduct to all direct recruits.
- ✓ All managers and employees must sign the individual 'Code of Conduct for GBV and SEA, including acknowledgment that they have read and agree with the code of conduct.
- ✓ To ensure maximum effectiveness of the Codes of Conduct, managers are required to prominently display the Company and Individual Codes of Conduct in clear view in public areas of the workspace. Examples of areas include waiting, rest and lobby areas of sites, canteen areas, health clinics.
- ✓ Managers will explain the GRM process to all employees and encourage them to report suspected or actual GBV/SEA
- ✓ Managers should also promote internal sensitization initiatives (e.g. workshops, campaigns, on-site demonstrations etc.) throughout the entire duration of their appointment in collaboration with the compliance team, service providers and in accordance to the Action Plan.
- ✓ Managers must provide support and resources to the compliance team and service provider NGOs to create and disseminate the internal sensitization initiatives through the Awareness-raising strategy under the Action Plan.

Response

- ✓ Managers will be required to provide input, final decisions and sign off on the Standard Reporting Procedures and Response Protocol developed by the compliance team as part of the Action Plan.
- ✓ Once signed off, managers will uphold the Accountability Measures set forth in the Action Plan to maintain the confidentiality of all employees who report or (allegedly) perpetrate incidences of GBV/SEA (unless a breach of confidentiality is required to protect persons or property from serious harm or where required by law).
- ✓ Once a sanction has been determined, the relevant manager(s) is/are expected to be personally responsible for ensuring that the measure is effectively enforced, within a maximum timeframe of 14 days from the date on which the decision was made.
- ✓ Managers failing to comply with such provision can be in turn subject to disciplinary measures, to be determined and enacted by the company's CEO, Managing Director or equivalent highest-ranking manager. Those measures may include:
- ✓ Informal warning.

ii. Formal warning

- ✓ Additional Training
- iv. Loss of up to one week's salary.
 - ✓ Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months.
- vi. Termination of employment.

I do hereby acknowledge that I have read the foregoing Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to GBV and SEA. I understand that any action inconsistent with this Code of Conduct or failure to take action mandated by this Code of Conduct may result in disciplinary action.

FOR THE EMPLOYER

Signed by _____

Title: _____

Date: _____

ANNEX 10: Child Labor Prevention Plan

While ACRoSAL is committed to promoting the use of local labour, the following procedures will be adopted to prevent child labour in addition to the Code of Conduct the following shall apply.

- ✓ The SPMU will introduce the contractors to the community leaders/ relevant groups.
- ✓ Contractors will discuss with community leaders on the number and requirement of community labour for the project and receive a list of such persons as nominated by the community leaders (persons must not be below the age of 18).
- ✓ Contractors will only engage individuals at minimum age of eighteen (18) and this will be enforced at recruitment and monitored by the SPMU, Supervision Consultants and contractors.
- ✓ Contractors will liaise with the community leaders/liaison officers to verify the identity and age of all local workers. This will require workers to provide official documentation, which could include a birth certificate, national identification card, passport, or medical or school record, where these are not available the community leader/representative can conduct personal identification of proposed workers. Contractors will liaise with community leaders to attest to the age and conduct of all local hires.
- ✓ Adequate documentation of the names, age, job function and remuneration will be prepared, and copies will be kept with the community leaders, contractors and supervision consultants.
- ✓ Hired project workers above 18 will conduct their activities in ways that are not detrimental with respect to education or be harmful to the child's health or physical, mental, spiritual, moral or social development.
- ✓ If a child under the minimum age is discovered working on the project, measures will be taken to immediately terminate the employment or engagement of the child in a responsible manner, considering the best interest of the child. This will also be reported immediately to the SPMU.

ANNEX 11: Burrow Pit Management Plan

In general, the contractor will be expected to carry out the construction works in a manner that will minimize the need for the use of borrow materials where technically feasible.

The Contractor shall identify potential borrow pits in collaboration with the SPMU/ Gombe State Ministry of Environment, with materials that possess suitability for the construction works. The Contractor shall carry out requisite engineering tests on samples of the materials for the construction. The SPMU will ensure that the contractors comply with the following criteria to establish borrow pits:

- Inform and agree on location of borrow pits with the SPIU (Project coordinator, engineers, E&S officers) prior to civil works.
- The proposed locations not to be in agricultural fields.
- Locations should not be near schools or other public facilities.
- Locations not along the proposed road (at least 20m from the shoulder of the road).
- Sufficient quality of soil and suitable earth as adjudged to be available by material quality test to be submitted to the SPMU engineers.
- The coordinates, pictures, borrow pit management and reclamation plan for each borrow pit to be submitted to the SPMU.
- The SPMU to confirm reclamation of pits after use to close to pre-use state as much as possible including proper documentation and pictures. Contractors should have a plan and budget in place for reclamation and should be duly included in their bid documents. A sample borrow pit management plan is provided in annex 12 of this ESMP.
- The SPMU will ensure adequate and documented transactional agreement between the contractor and the landowners.

The contractor is also required to prepare a borrow pit management plan which takes account of these activities and follows them through to handing over. These plans need to take account of the potential environmental & social impact and health & safety hazard, including drowning hazards, water-borne disease vectors, impact on local land holdings, land-use and visual impacts.

The borrow pit management plan will include restoration measures for the site after decommissioning, such as removal and stockpiling of topsoil layers. Where borrow pits are to be left open, for their use in regular maintenance programs, the responsibility for their management should be assigned to the government entity / local authority in charge of road maintenance and compliance with the borrow pit management plan monitored.

Stage	Activities and features	Measures/mitigation	Responsibility
Site selection	Complete preliminary site assessment prior to undertaking excavation	Outreach to the community leadership (e.g., operation, hazards, restoration) Written approval from community leadership for use of the proposed site Liaise with the local community on the option of retaining quarry pits as water collection ponds for watering cattle, irrigating crops, or similar uses. Highlight issues of disease transmission and the need	Contractor

Stage	Activities and features	Measures/mitigation	Responsibility
		to prohibit its use for drinking, bathing, and clothes washing	
		When siting burrow pit areas, avoid using sensitive areas or sites that drain directly into a sensitive area, Burrow pits will not be in wetland or densely vegetated areas	Contractor
		Test pits/excavations to confirm the quantity and quality of material in the proposed site. Determine presence of any groundwater	Contractor
		Map of the location and a plan of the site, including buffer zone, perimeter berm, stockpiles, operational area Burrow pit design must comply with standards defined (above), Photographic record of the site in its undisturbed state	Contractor
Excavation Operation	Excavation will consider the following measures	Ensure that excavation is accompanied by well-engineered drainage. Topsoil is stripped and stockpiled away from other materials and is to be used only for reinstatement, once pit operations are complete. Overburden soil (layer between topsoil and material of interest) to be used as a perimeter berm to direct drainage or stockpiled separately to backfill the pit Pit excavations maximum 6 meters in depth, with a vertical slope of 2:1 Excavation below the water table is not permitted. Heavy machinery access and operation Carry out necessary preliminary geotechnical investigation to confirm the quality and extent of materials. Carry out hydrological assessment to determine the presence and depth of aquifer. The contractor shall ensure that topsoil (150m-500m) is stripped and stockpiled at a separate location and preserved for future reclamation activities.	Contractor
	Site access and safety	Barrier (e.g., warning tape, perimeter berms, fencing) to control or discourage public access to the pit. Install signposts warning of danger and no trespassing, at no more than 50 meters' distance from the pit. Community awareness and outreach on the dangers of burrow pits and that trespassing is prohibited.	Contractor

Stage	Activities and features	Measures/mitigation	Responsibility
	Vegetation	Avoid or reduce to a minimum vegetation clearance. Existing vegetation within the buffer area should provide some visual and physical screening of the pit operations	Contractor
	Water	If water is required for burrow pit operation, a water extraction point (e.g., borehole) will be established within the site and will be planned for use by the community once the site is reinstated. Drainage structures or pumping will remove any standing water in the burrow pit. Alternatively, any pits with 0.75 meters or more of standing water will be fenced. Overburden soil can be used as a perimeter berm to direct water drainage away from the site. Use drainage features in flatter areas, such as miter drains and sumps, to remove water from around the road ditches. Community members are not allowed to use water at an active burrow pit, for any purpose	Contractor
	Erosion	Erosion control measures undertaken in all aspects of the burrow-pit operation, including reduced slopes, seeding, etc. Protect topsoil stockpiles from wind and water erosion by reducing slopes, using a cover, and/or spraying with water	Contractor
	Dust and noise	If a rock crusher is used, dust control measures shall be put in place (water truck or sprinklers on crushing equipment) Vegetation within the buffer area will screen noise of pit operations	Contractor
Reinstatement of Burrow Pits	Reinstatement of burrow pits will be completed prior to handover of the site	Fill excavated site with suitable materials. Spread topsoil on top of the overburden	Contractor
		Develop/construct suitable surface slopes, drainage ditches and conduits to prevent water from collecting at the sites. Scarify the burrow pit operational site to encourage vegetation cover. Establish a vegetation cover corresponding to at least 75% of the cover present prior to excavation (supporting photographs) and maintain following the first rains after reinstatement. Minimize erosion by focusing vegetation cover on side slopes of the excavated area.	Contractor

Stage	Activities and features	Measures/mitigation	Responsibility
		Any required seeding will make use of local plant varieties	
Review	Ensure the Burrow pit management plan implementation	Review burrow pit management / monitoring reports Review reinstated burrow pit areas prior to handover of completed sections. Engage local community authorities to take responsibility for long-term burrow pits in their areas. Ensure that the responsibility for management of burrow pits left open is assigned to the government entity / local authority. Verify conformance with Burrow Pit Management Plan	SPMU/ FPMU

ANNEX 12: Results of Samples Analysis



DEPARTMENT OF GEOGRAPHY

FACULTY OF EARTH AND ENVIRONMENTAL SCIENCES, BAYERO UNIVERSITY, KANO

HOD'S OFFICE

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Soil and Water
Laboratory,
Dept. of Geography,
Bayero University, Kano
18th June 2023.

The Managing Director,
Envformatics Consults Ltd,
No. 589 Gwarzo Road,
Opp. Dorawar Yan Kifi,
Rijiyar Zaki, Kano.

ANALYSIS RESULT OF WATER AND SOIL SAMPLES

Please find attached to this letter, the result of the above subject.

Note that samples I.D's with R represent samples from Railway Gully Erosion sites, whereas those with F and A represent samples from F.C.E Gully Erosion sites.

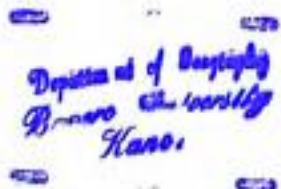
Also, values in bold represents the actual results of each parameter.

Thank you for your patronage. We hope to see you again.

Yours faithfully,

 18/06/2023

A.M. Hashim
Analysis/LabTech.


Department of Geography
Bayero University
Kano.

SOIL SAMPLE													
sample ID	Cu	Cd	Fe	Pb	Zn	Mn	Ni	Na	Mg	Ca	Co	Cr	Cu
A1	0.001	0.00000091	0.005	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A2	0.002	1.81818182	0.004	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A3	0.001	0.90909091	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A4	0.001	0.90909091	0.007	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A5	0.001	0.90909091	0.005	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A6	0.001	0.90909091	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A7	0.001	0.90909091	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A8	0.001	0.90909091	0.006	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A9	0.001	2.72727273	0.005	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A10	0.001	0.90909091	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
B1	0.001	2.72727273	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
B2	0.002	1.81818182	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
B3	0.001	2.72727273	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
B4	0.001	1.81818182	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
B5	0.001	2.72727273	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
B6	0.001	0.90909091	0.006	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
B7	0.001	0.90909091	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
B8	0.001	1.81818182	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
B9	0.001	0.90909091	0.009	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
B10	0.001	0.90909091	0.008	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
WATER SAMPLE													
Sample ID	Cu	Cd	Fe	Pb	Zn	Mn	Ni	Na	Mg	Ca	Co	Cr	Cu
R2-S	0.006	0.76181818	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
R6-S	0.026	0.21636364	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
R1-S	0.01	0.09090909	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
R4-S	0.015	0.13636364	0.002	0.001	0.005	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A-S	0.003	0.02727273	0.002	0.001	0.005	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
A-S	0.026	0.21636364	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
F3-S	0.018	0.16363636	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
R9-S	0.002	0.01818182	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
R3-S	0.002	0.01818182	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
R3-S	0.003	0.02727273	0.001	0.001	0.005	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
R10-S	0.002	0.01818182	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
R5-S	0.002	0.02727273	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
R3-S	0.002	0.01818182	0.002	0.001	0.004	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
R2-S	0	0	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
F6-S	0.001	0.00909091	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
R8-S	0.002	0.01818182	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
F3-S	0.001	0.00909091	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
F4-S	0.003	0.02727273	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
F4-S	0.002	0.01818182	0.002	0.001	0.004	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
F1-S	0.001	0.00909091	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
R5-S	0.001	0.00909091	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
F8-S	0.006	0.05454545	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
R1-S	0.002	0.01818182	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
F9-S	0.003	0.02727273	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001



 18/06/2023

 Department of Geography

 University of Lagos

 Lagos

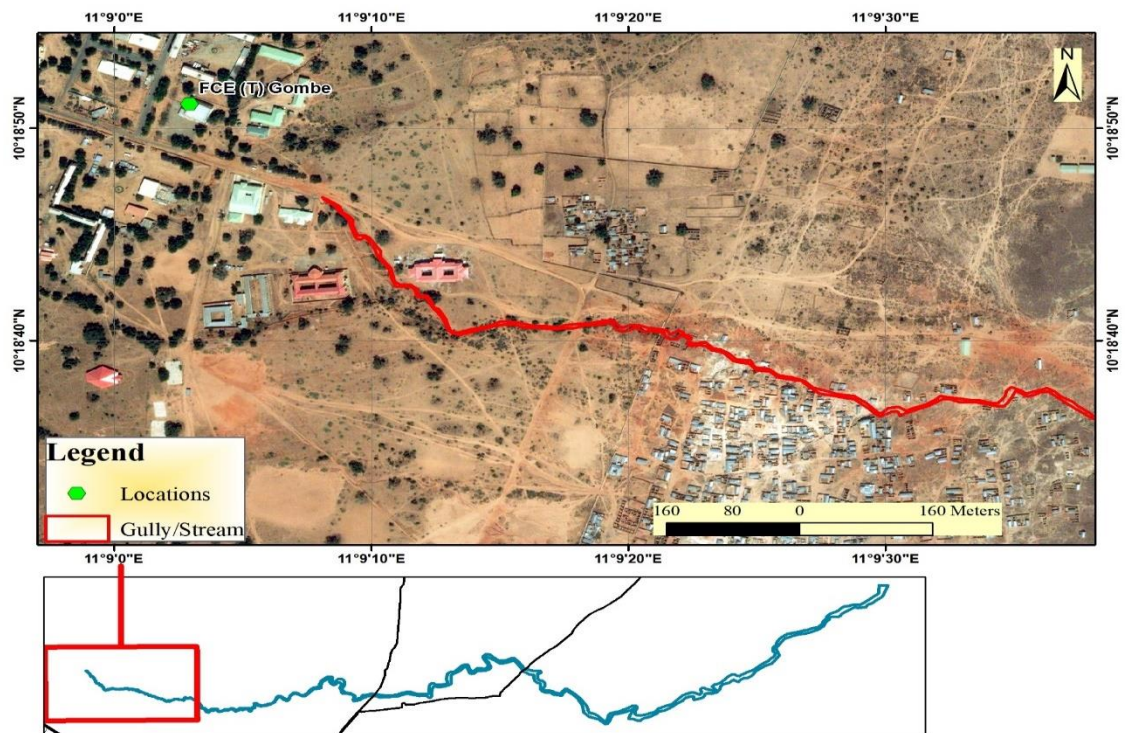
SOIL SAMPLE													
sample ID	R1	R2	T1	T2	R	CR1	CR2	CR2	%CLAY	%SIL.T	%SILT	%SAND	PH
A1	1	2	1	30	30	1	4.6	0	9.2	7.2	2	88.8	6.47
A2	2	3	1	30	30	1	5.6	0	11.2	7.2	4	84.8	6.78
A3	12	13	8	30	30	1	15.6	7	31.2	21.2	10	58.8	6.29
A4	2	3	1	30	30	1	5.6	0	11.2	7.2	4	84.8	6.68
A5	9	10	3	30	30	1	12.6	2	25.2	11.2	14	60.8	7.55
A6	2	3	1	30	30	1	5.6	0	11.2	7.2	4	84.8	7.07
A7	9	10	6	30	30	1	12.6	5	25.2	17.2	8	66.8	6.88
A8	2	3	1	30	30	1	5.6	0	11.2	7.2	4	84.8	6.75
A9	3	4	2	30	30	1	6.6	1	13.2	9.2	4	82.8	7.59
A10	6	7	2	30	30	1	9.6	1	19.2	9.2	10	70.8	6.61
R1	4	5	1	30	30	1	7.6	0	15.2	7.2	8	76.8	6.71
R2	1	2	1	30	30	1	4.6	0	9.2	7.2	2	88.8	6.98
R4	4	5	1	30	30	1	7.6	0	15.2	7.2	8	76.8	6.92
R5	9	10	1	30	30	1	12.6	0	25.2	7.2	18	56.8	6.32
R6	5	6	3	30	30	1	8.6	2	17.2	11.2	6	76.8	6.46
R7	5	6	1	30	30	1	8.6	0	17.2	7.2	10	72.8	7.28
R8	3	4	1	30	30	1	6.6	0	13.2	7.2	6	80.8	7.26
R9	1	2	1	30	30	1	4.6	0	9.2	7.2	2	88.8	7.73
R10	2	3	1	30	30	1	5.6	0	11.2	7.2	4	84.8	7.38


 18/06/2023
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 Bureau of Survey
 Gaborone

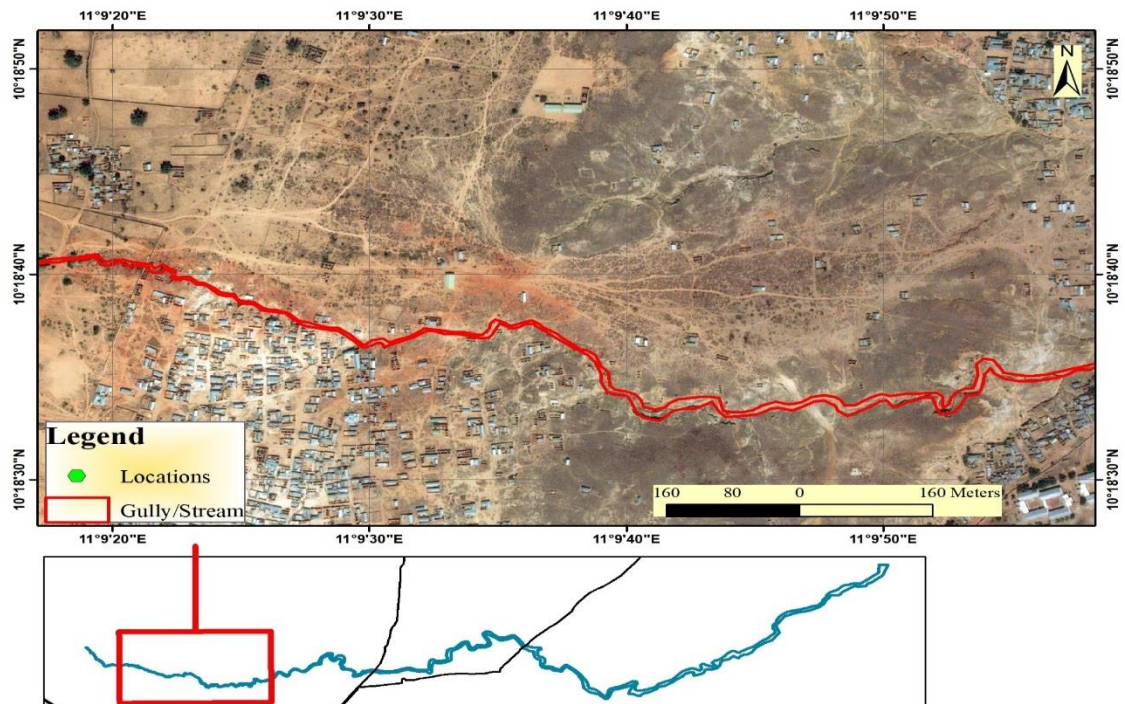
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0.13	7.921875		5.5	23.8	18.3	19.4	1.1	0.4389	0.7566636	50.27	67	0.7502985
0.12	7.3125		23.8	41.4	17.6	19.4	1.8	0.7182	1.2381768	44.82	67	0.6689552
0.126	7.678125		5.2	22.6	17.4	19.4	2	0.798	1.375752	55.29	67	0.8252239
0.16	9.75				0		0	0	0	45.97	67	0.6861194
0.12	7.3125		7.3	25.6	18.3	19.4	1.1	0.4389	0.7566636	51.23	67	0.7646269
0.15	9.140625		25.6	43.4	17.8	19.4	1.6	0.6384	1.1006016	45.12	67	0.6734328
0.16	9.75		11	28.4	17.4	19.4	2	0.798	1.375752	55.32	67	0.8256716
0.25	15.234375		21.4	39.6	18.2	19.4	1.2	0.4788	0.8254512	49.05	67	0.7320896
0.16	9.75				0		0	0	0	46.94	67	0.700597
0.16	9.75		7	14.6	7.6	19.4	11.8	4.7082	8.1169368	51.11	67	0.7628358
0.15	9.140625		14.6	23.2	8.6	19.4	10.8	4.3092	7.4290608	50.07	67	0.7473134
0.17	10.359375		23.2	33.2	10	19.4	9.4	3.7506	6.4660344	50.06	67	0.7471642
1.32	80.4375		33.2	34	0.8		0	0	0	24.9	67	0.3716418
0.18	10.96875		34	44.1	10.1	19.4	9.3	3.7107	6.3972468	45.33	67	0.6765672
0.16	9.75		44.1	60.4	16.3	19.4	3.1	1.2369	2.1324156	47.87	67	0.7144776
0.35	21.328125		11	18.4	7.4	19.4	12	4.788	8.254512	55.01	67	0.8210448
0.18	10.96875		18.4	28.6	10.2	19.4	9.2	3.6708	6.3284592	55.68	67	0.8310448
0.19	11.578125		28.6	39.3	10.7	19.4	8.7	3.4713	5.9845212	47.63	67	0.7108955


 18/06/2023
 Director of Environment
 Gombe State
 Kano.

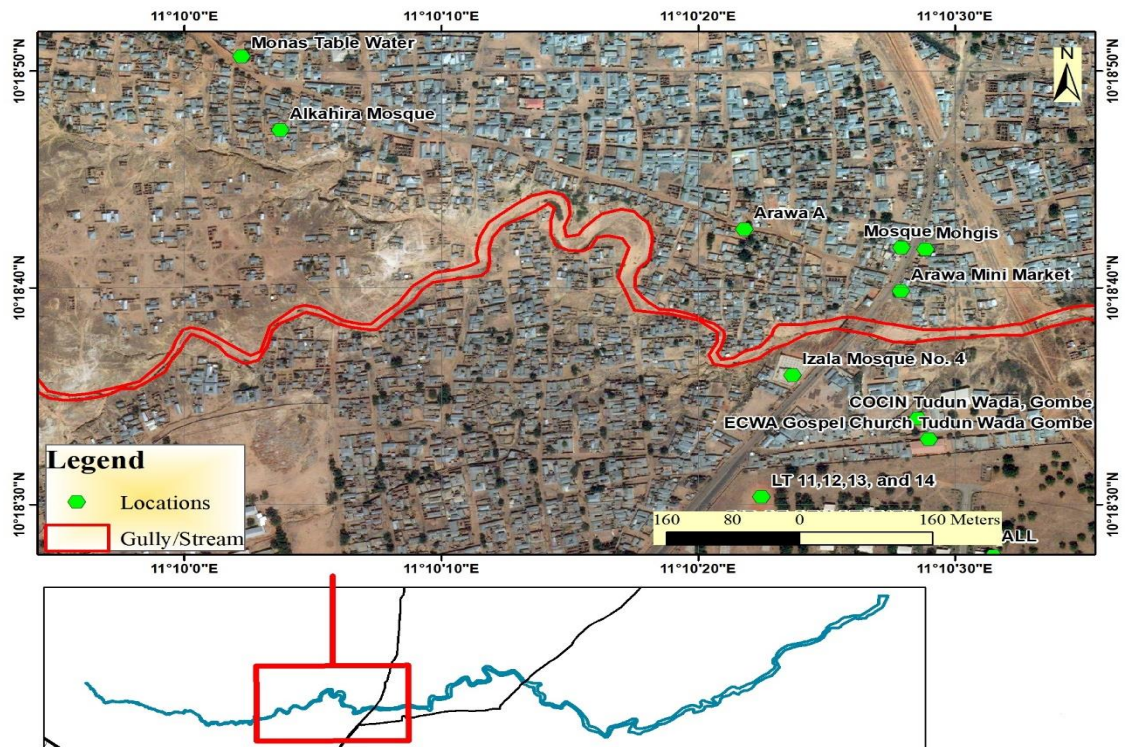
ANNEX 13: Satellite Imageries of the FCE(T) Gully



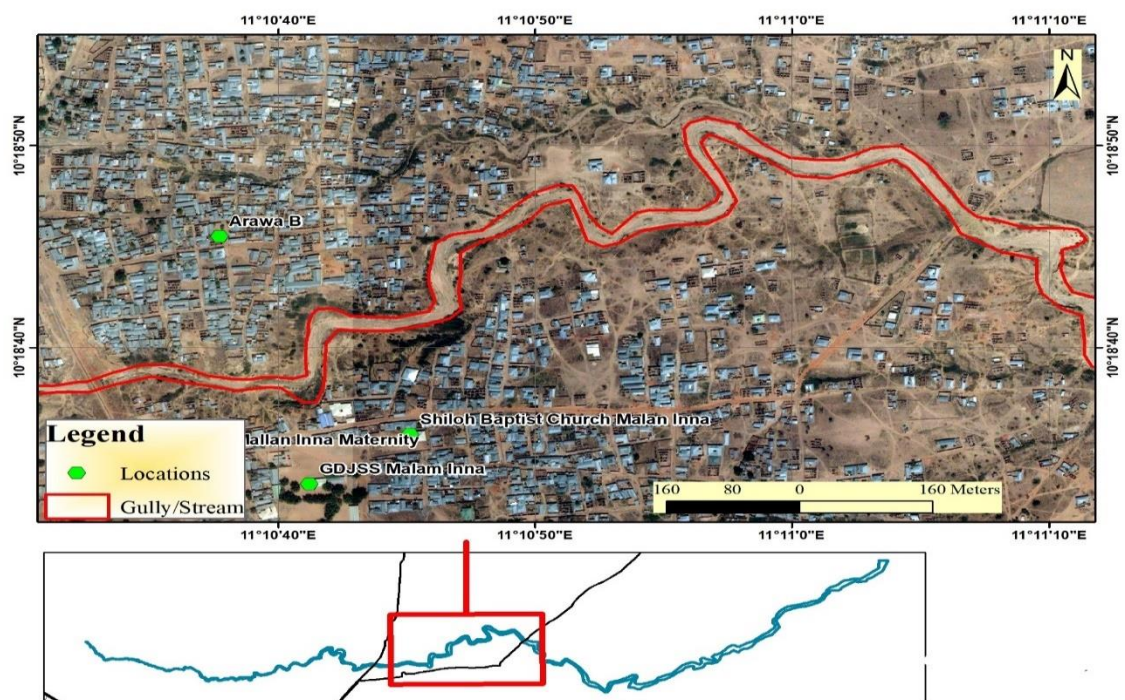
CATCHMENT 1 - GULLY HEAD AT FCE(T) STAFF SCHOOL



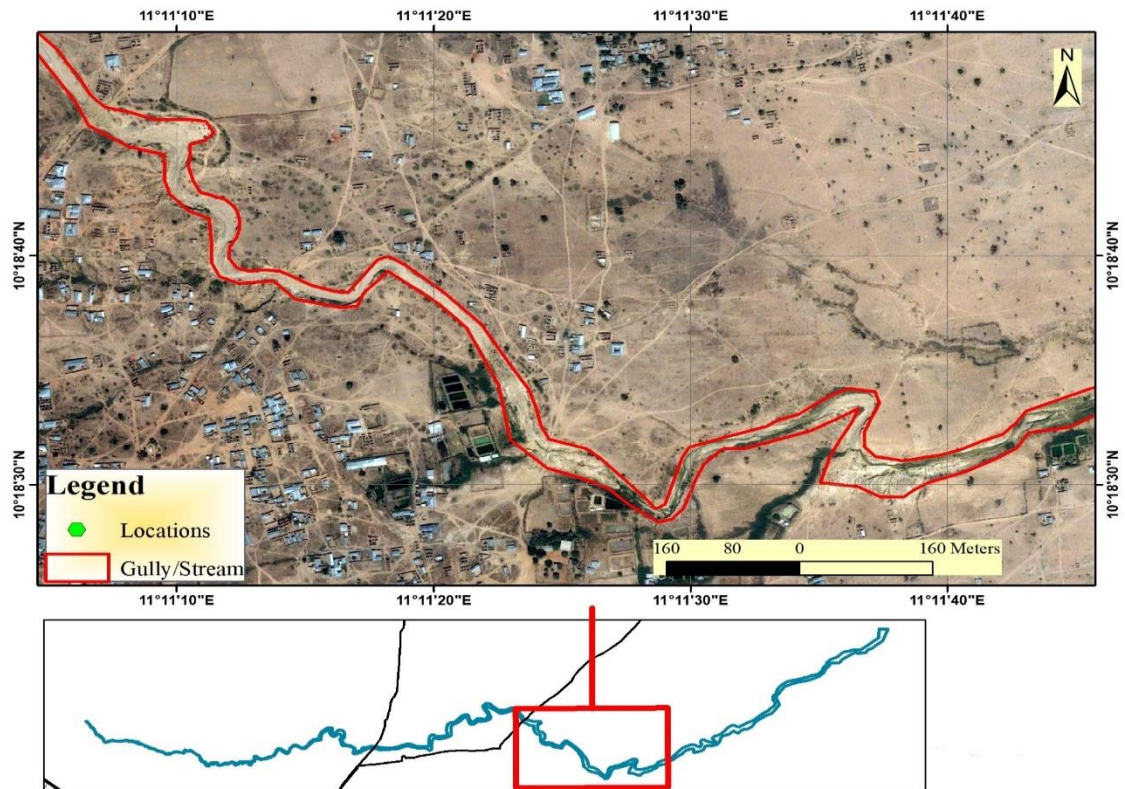
CATCHMENT 2- LONDON MAI DOROWA



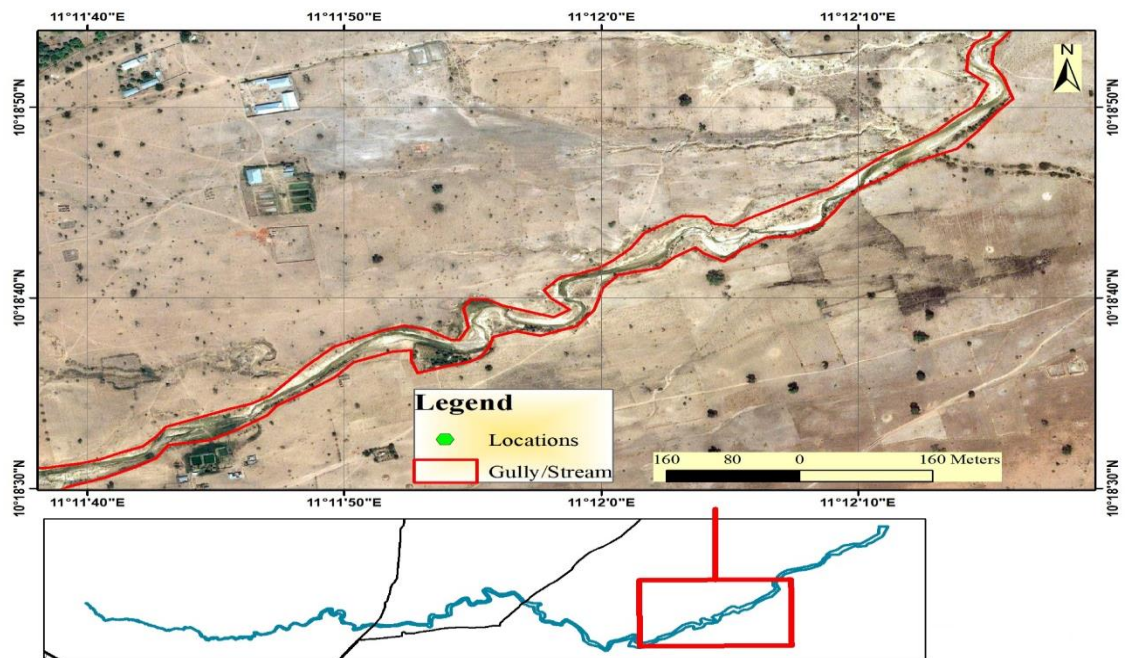
CATCHMENT 3- ARAWA 'A' / JAURO ABARE



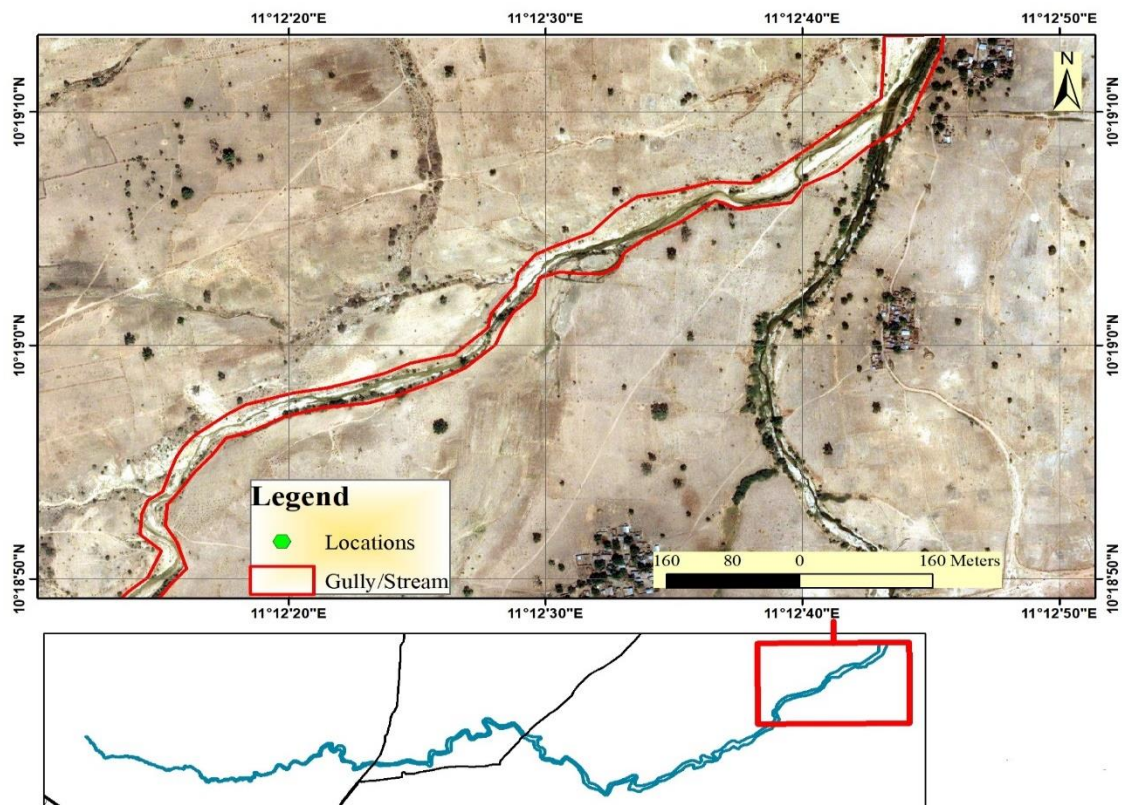
CATCHMENT 4- ARAWA 'B' / WURO LADDE



CATCHMENT 5 -JAURO KUNA / MALLAM INNA



CATCHMENT 6-MALLAM INNA



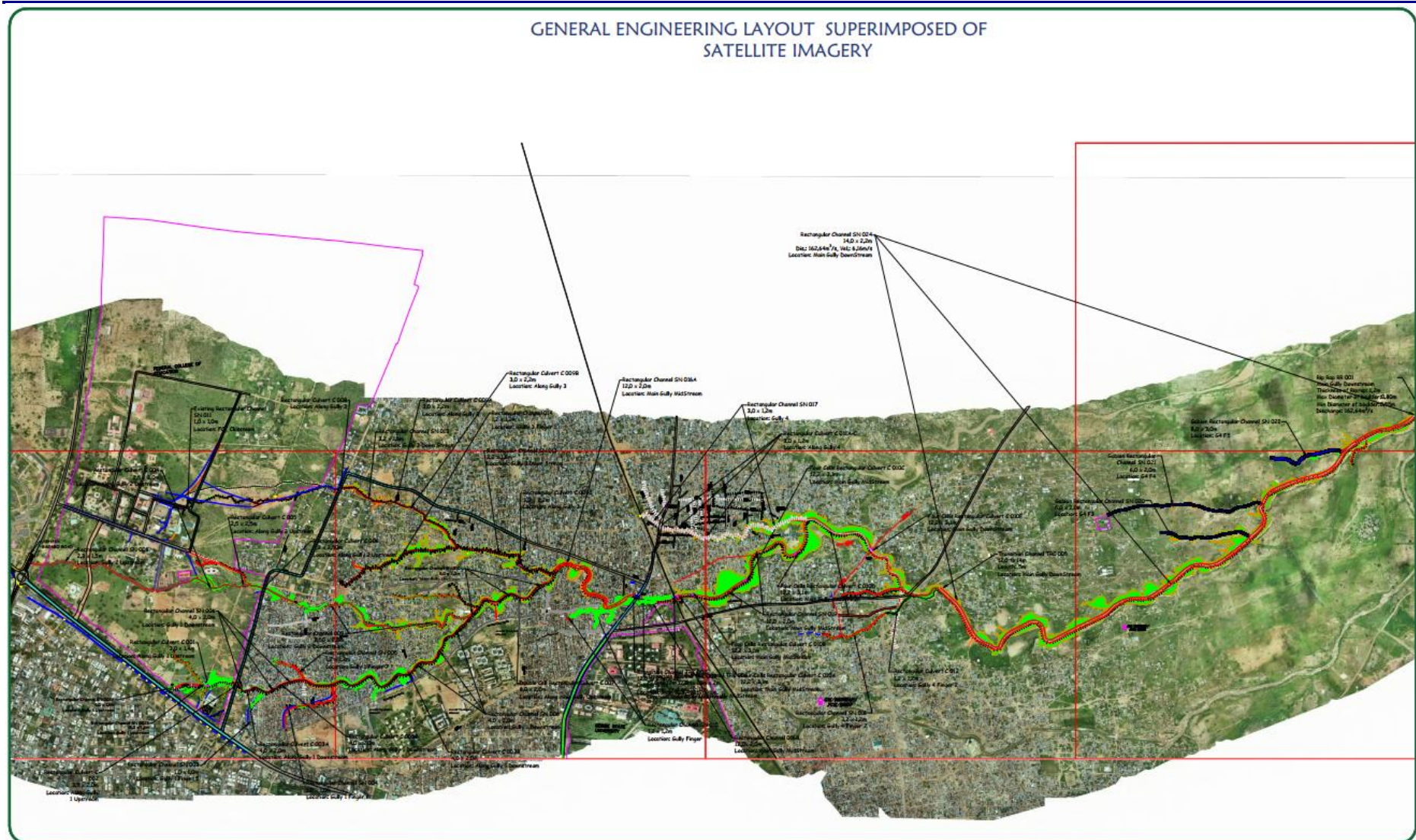
CATCHMENT 7 - MALLAM INNA DOWNSTREAM

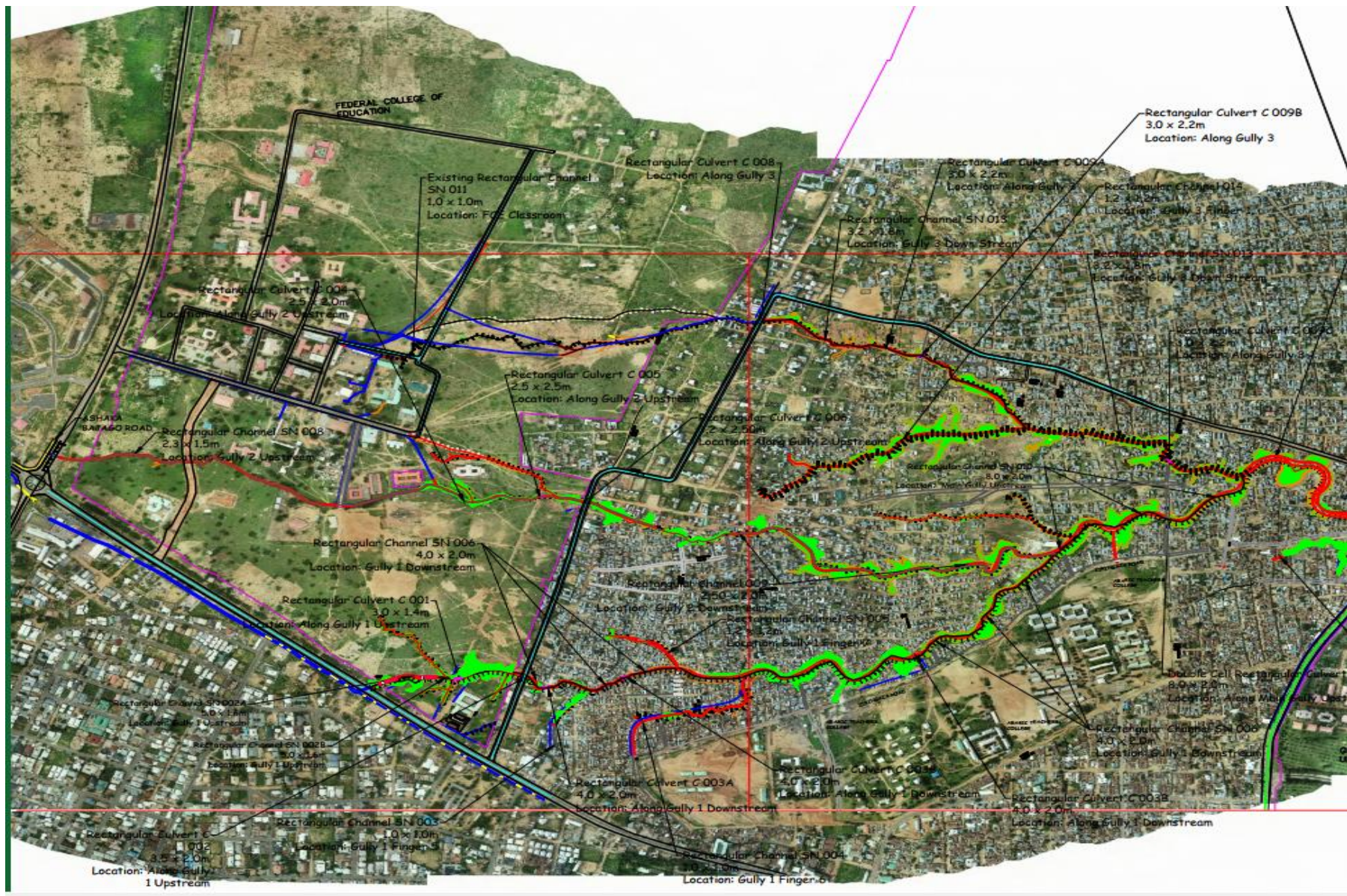
ANNEX 14: Photographs of Community Consultations

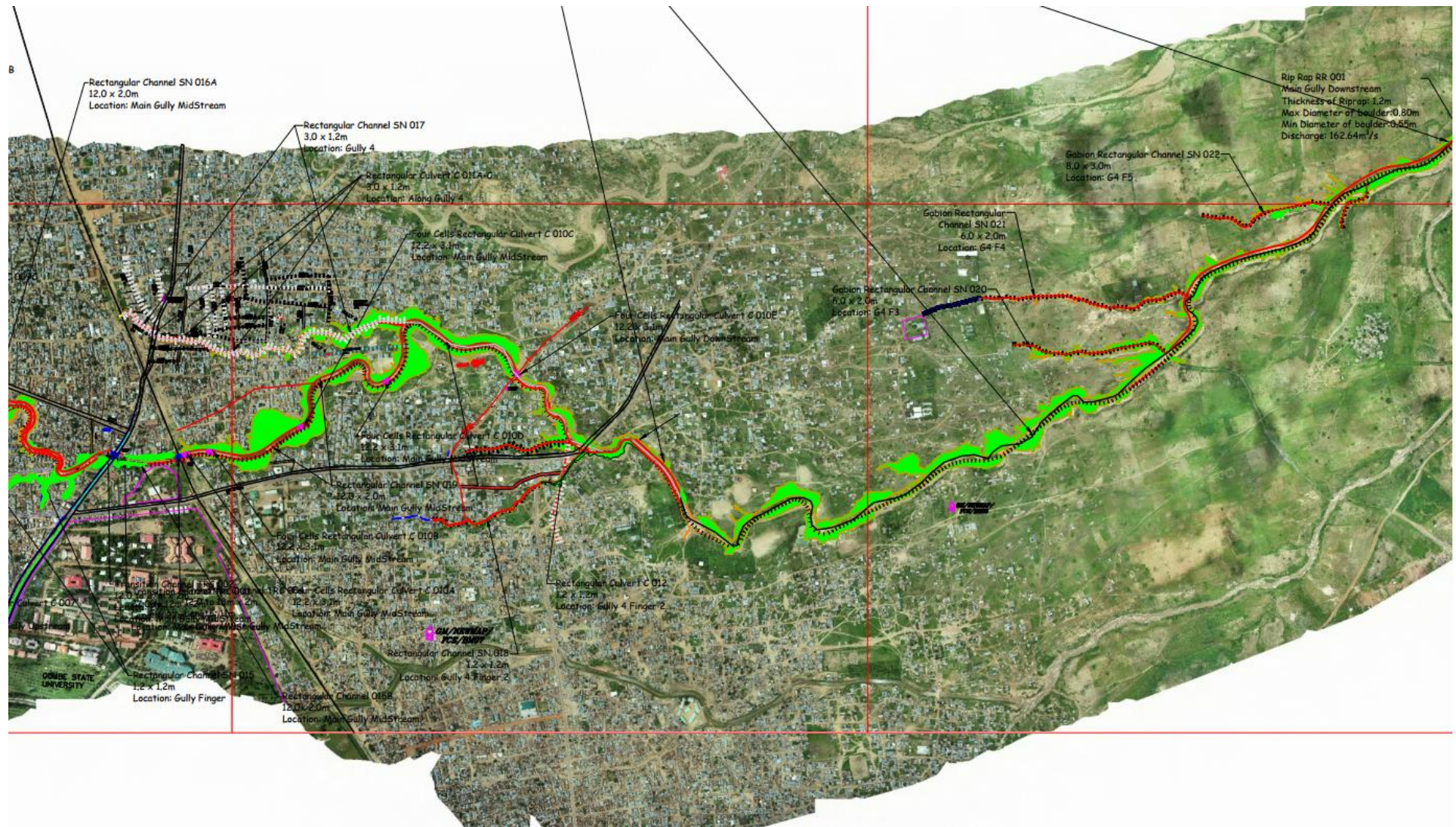




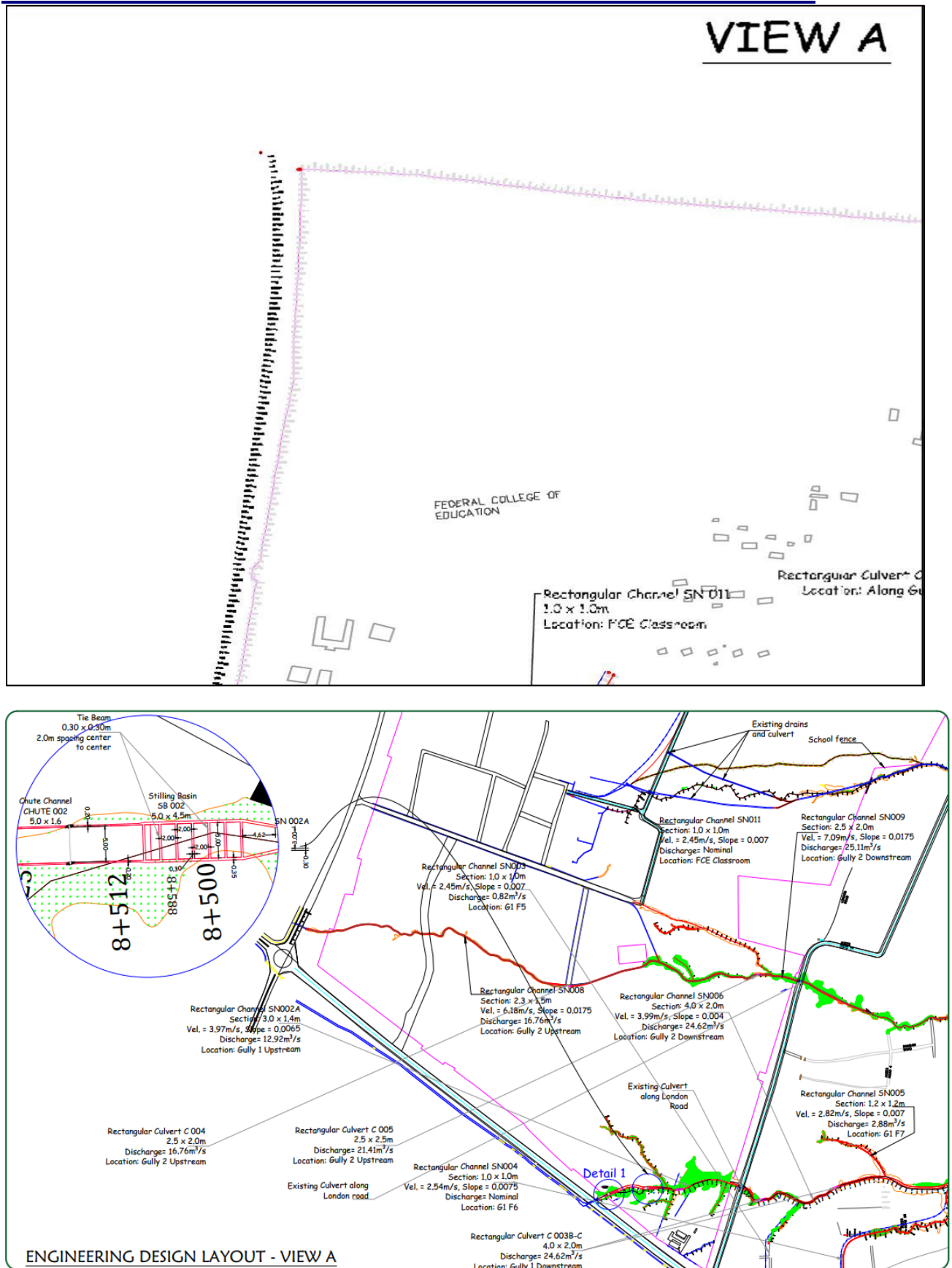
ANNEX 15: ENGINEERING DESIGN AND LAYOUT

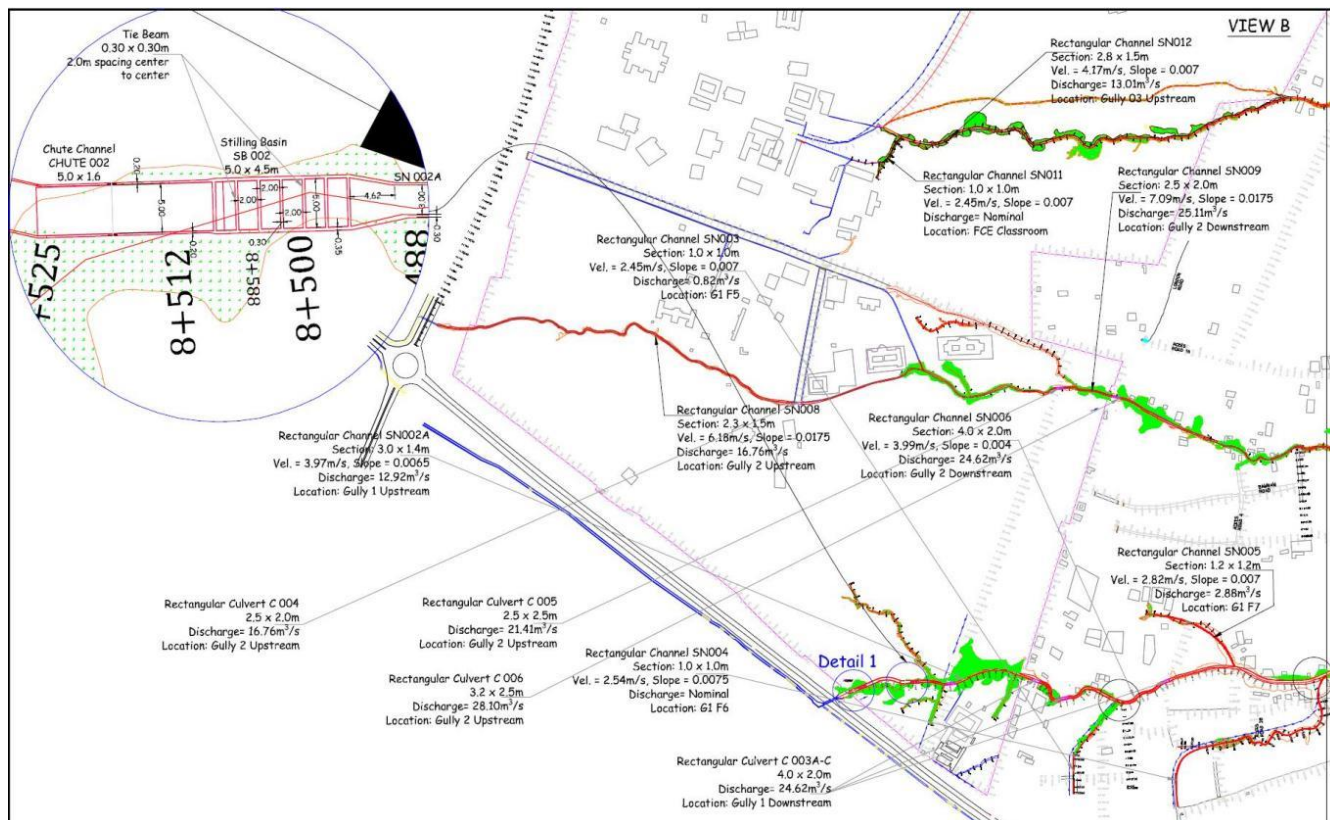
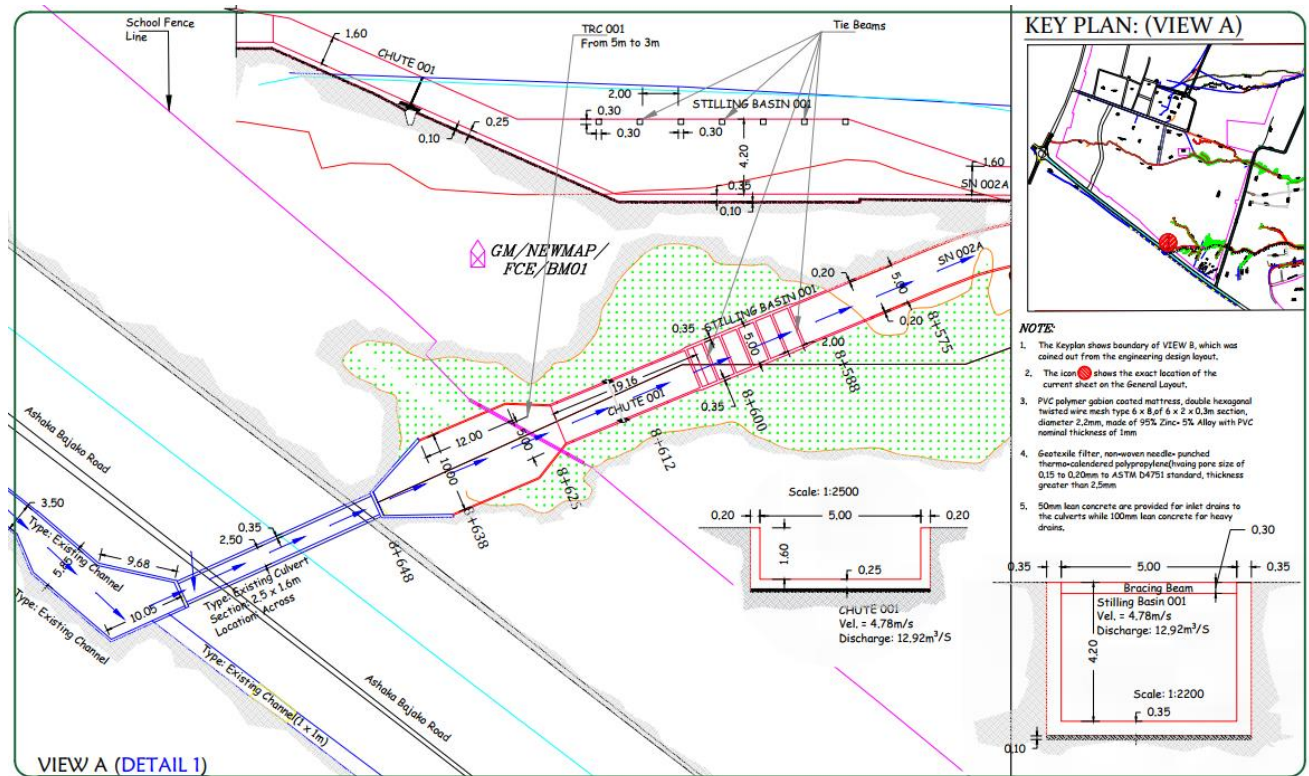


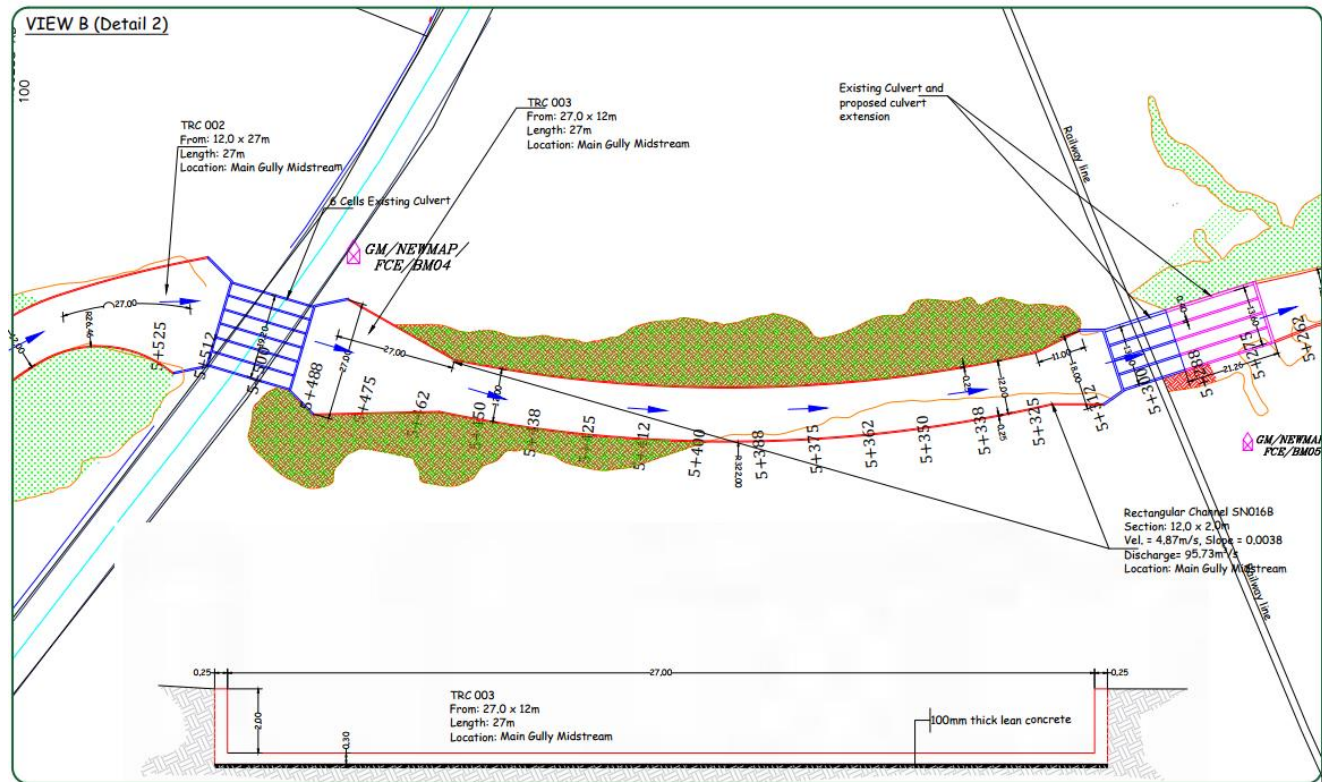




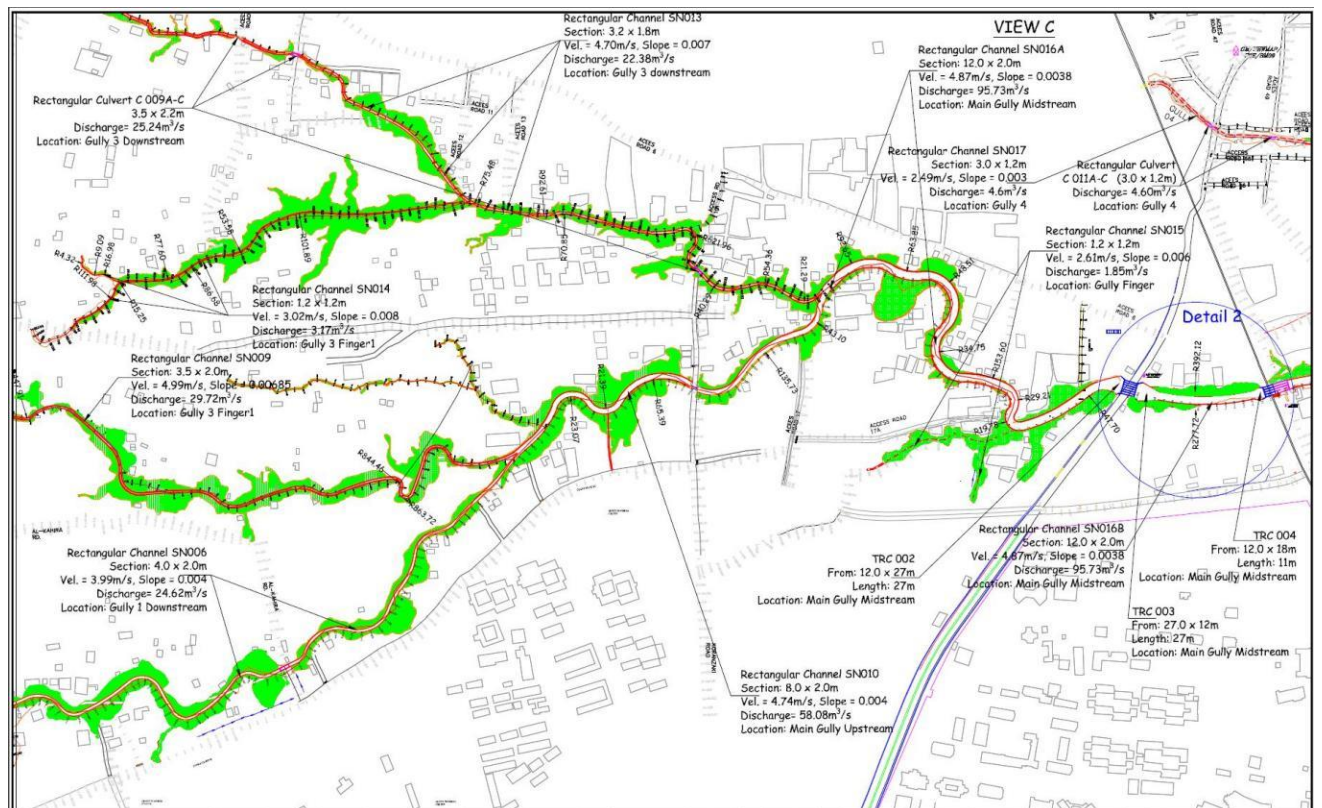
ANNEX 15A: SECTIONAL DRAWINGS/VIEWS OF ENGINEERING DESIGN

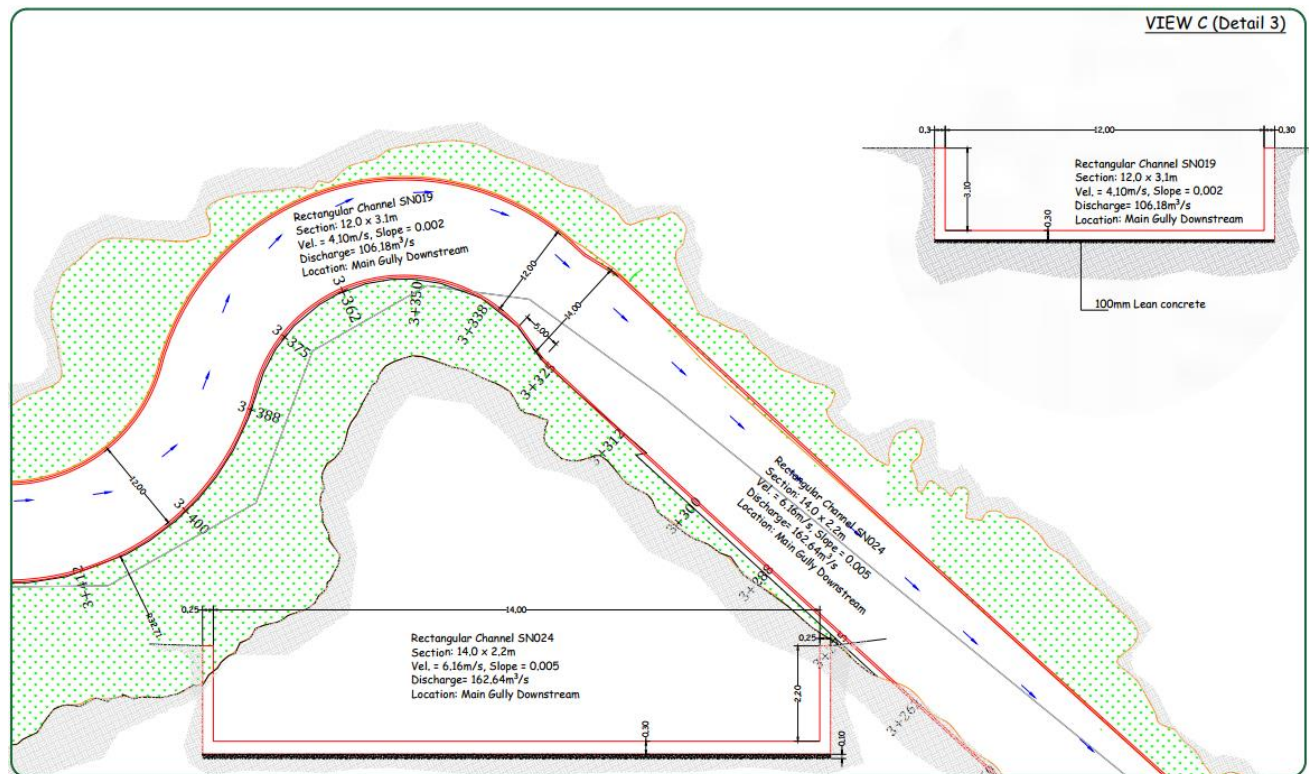




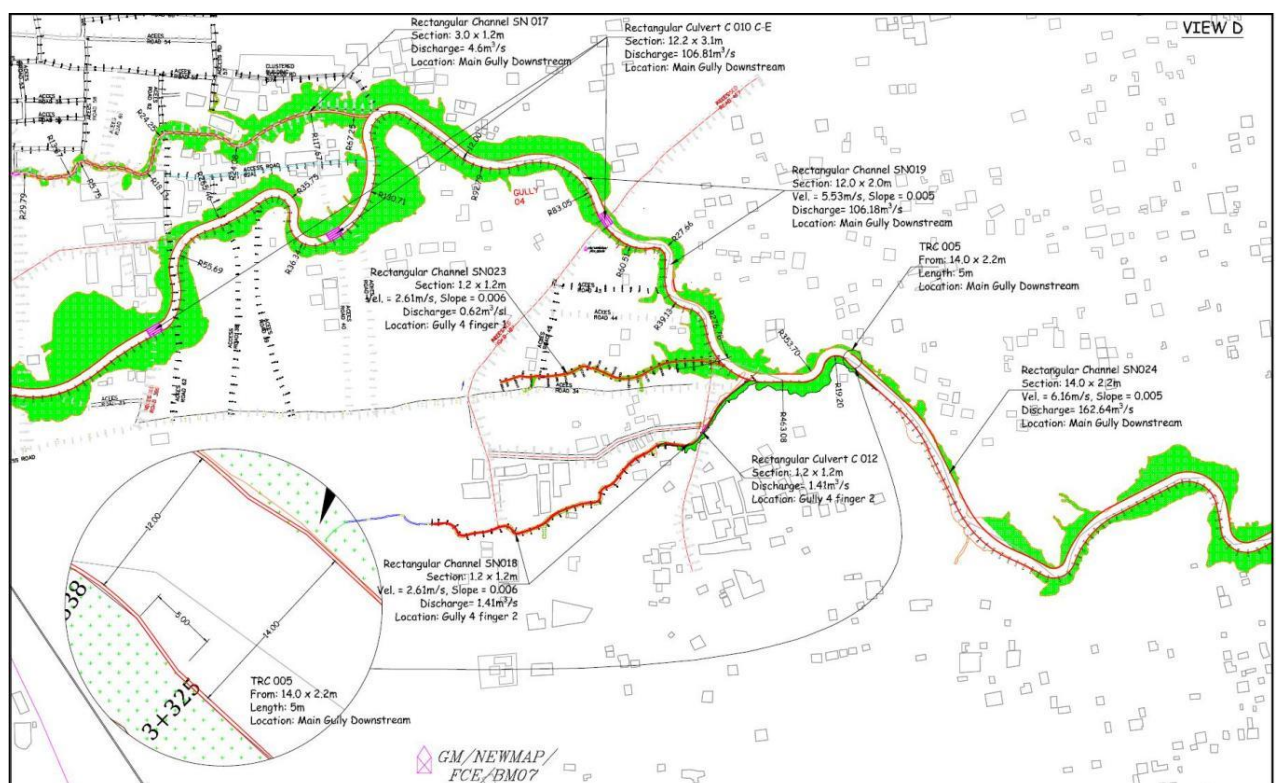


View A and B of the intervention site from the Engineering Drawing Report





Sketch drawing of Proposed Intervention at View C; Source: Gombe ACRsAL Engineering Drawing Report



Sketch drawing of Proposed Intervention at View D; Source: Gombe ACRsAL Engineering Drawing Report

VIEW F

RipRap RR 001
 Discharge: 162.64m³/s
 Thickness of Riprap: 1.2m
 Max Diameter of boulder: 0.80m
 Min Diameter of boulder: 0.55m
 Location: Main Gully Downstream

RipRap RR 001
 Discharge: 162.64m³/s
 Thickness of Riprap: 1.2m
 Max Diameter of boulder: 0.80m
 Min Diameter of boulder: 0.55m
 Location: Main Gully Downstream

Rectangular Channel SN024
 Section: 14.0 x 2.2m
 Vel. = 6.16m/s, Slope = 0.005
 Discharges 162.64m³/s
 Location: Main Gully Downstream

Trapezoidal Gabion Channel SN022
 Section: 8.0 x 2.0m
 Vel. = 4.19m/s, Slope: 0.004
 Discharge: 3.09m³/s
 Location: Gully 4 Finger 5

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ANNEX 16: METHODOLOGY

Methodology

The Leopold matrix method for environmental and social risks and impacts prediction and evaluation were employed in this study. The Leopold matrix is a known tool used for predicting the impact of a project on both the environmental and social components. It is a two-dimensional matrix that cross-references the activities of a project and their link to presumed risks and impacts on the existing environmental and social conditions of a place.

When conducting an impact assessment, the first step is to develop a checklist for the project's activities and actions that are likely to cause environmental and social risks and impacts at one or more stages of the project implementation, the checklists of environmental components or elements that may be affected by the project activity. The definitions used in the impact assessment are as follows:

- **Activity** is a distinct process or task undertaken in performing specific assignment.
- **Environmental aspect** is an element or condition of a place or environmental medium.
- **Environmental impacts** are the consequences of actions on the environmental medium or resources.
- **Receptors** comprise, but not limited to people or man-made structures.
- **Resources** include components of the biophysical environment.
- **Frequency of activity** refers to how often the proposed activity takes place.
- **Frequency of impact** refers to the frequency (number of times in each period) with which a stressor (aspect) impacts the receptor.
- **Severity** refers to the degree of change to which the status of the environmental medium changes in terms of reversibility; sensitivity; and duration.
- **Spatial scope** refers to the geographical space/coverage and extent of the impact.
- **Duration** refers to the length of time over which the impact will cause change on the resource or receptor.

Impact Identification and Rating Process

There are several approaches for predicting and rating the risks and impacts of activities like the one being proposed for the FCE(T) site. The approach is illustrated as follows.

Identification of Potential Impacts

The possible risks and impacts were determined on the bases of related interactions between an activity and the environmental and social medium. The identification is a process done through the assessment of the nature and extent of works required, and base on experience from similar works. The entire process was guided by the ESF's proportionality concept for assessing the environmental and social risks and impacts of projects, as well as concerns of stakeholders and interactions with experts. The environmental and social components to be affected by the construction activities are listed as follows.

Environmental aspects prone to project activities.

Environmental Aspect	Components
Biophysical	• Atmospheric elements: Air Quality, Green House Gas emission etc.

	• Terrestrial: Geology, topography, soil quality, vegetation, and wildlife.
	• Noise Level.
	• Aquatic Ecology: Biota and Water.
	• Ecosystem.
Human, Socio-economic and cultural	• Land use pattern.
	• Local population level.
	• Socio-economic systems.
	• Socio-cultural system.
	• Basic Amenities system.
	• Transport system.
	• Aesthetics.

Categorization of Impacts

The risks and impacts of the project activities are characterized or described as in **Error! Reference source not found.** i.e.

Types of categories/type of impact.

Types of Impacts	Meaning
Beneficial	referring to those impacts that are beneficial and positive.
Adverse	are those impacts with negative effects.
Direct	are impacts that felt directly and can be connected to the action.
Indirect	not felt directly, they occur later or even away from the source of action.
Cumulative	may occur incrementally from an already executed action over space and time.
Reversible	are impacts that can return to original state or recover from an impact.
Irreversible	are impacts that are permanent and cannot be recover to original state after an action.
Residual	these impacts remain for a while even after mitigation measures are applied.
Short-Term	these impacts respond almost immediately to remedial intervention or mitigation.
Long-Term	these impacts don't respond immediately to mitigation measures, but rather takes a while.

Rating of Impact Likelihood

Here the impact is evaluated to rate the impact on the bases of probability, likelihood and frequency of the effect occurring (**Error! Reference source not found.**).

Likelihood of Occurrence of Impact.

Range (%)	Probability of Impact	Likelihood of Impact	Frequency of Impact
80-100	High probability	A very likely impact	Very frequent impacts
60-80	Medium high probability	A likely impact	Frequent impacts
40-60	Medium probability	A possible impact	Occasional impacts

20-40	Medium low probability	An unlikely impact	Few impacts
0-20	Low probability	A very unlikely impact	Rare impacts

Degree of Significance

The impact rating is determined considering the significance and potential of the consequence. Table **Error! Reference source not found.** provides the interpretations of the impact significance versus associated impact ratings.

Impact Significance with Associated Impact Ratings.

Impact Significance	Impact Ratings
Major Significance	Major Impact
Moderate Significance	Moderate Impact
Minor Significance	Minor Impact
Negligible Significance	Negligible Impact

Impact Assessment Matrix

The final stage is rating the impact on the base of the likelihood of occurrence and potential consequence of the impact. Rating each of the impact is followed by determining the mitigation measures. At this stage it is only those impacts that are moderate and major that would be considered for impact mitigation.

Criteria for Assessing Significance of Impacts.

Severity / Level of Benefits of Impact	Rating
Just Harmful / Just beneficial	1
Slightly Harmful / Slightly beneficial	2
Moderately harmful / Moderately beneficial	3
Extremely harmful / Extremely beneficial	4
Disastrous / Highly beneficial	5
Spatial Scope of Impact	Rating
Activity specific	1
Site specific	2
Local Area (within 5 km of site)	3
Regional	4
National	5
Duration of Impact	Rating
One day to one month	1
One month to one year	2
One year to ten years	3
Life of operation	4
Post closure / permanent	5
Frequency of Activity/Duration	Rating
Annually or less / low	1
6 monthly / temporary	2
Monthly / infrequent	3

Weekly /life of operation/ regularly likely	4
Daily /permanent / high	5
Frequency of Impact	Rating
Almost never / almost impossible	1
Very seldom / highly unlikely	2
Infrequent / unlikely / seldom	3
Often / regularly / likely / possible	4
Daily / highly likely / definitely	5

There is room for continuous improvement in practices which should address/mitigate the low impacts. Thus, the significance of the impact is assessed by providing a numerical value (criteria) for the assessment of the rating as shown **Error! Reference source not found..**

The purpose of the rating is to develop clear understanding of the influence and process associated with every impact. The *severity*, the *spatial scope* and *duration* of the impact together with the *Consequence* of the impact when summed gives a maximum value of **15**. The *frequency of the activity* and the *frequency of the impact* together gives rise to the likelihood of the impact occurring, which can give a maximum value of **10**. The values for likelihood and consequence of the impacts are then read off as significance matrix shown in **Error! Reference source not found.** and **Error! Reference source not found..**

Significance Rating Matrix

Probability - Likelihood (Frequency of Activity + Frequency of Impact)	Impact - CONSEQUENCE (Severity + Spatial Scope + Duration)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	12	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Significance Impact Rating

Colour Code	Significance Rating	Value
	Very High	126 -150
	High	101 -125
	Medium - High	76 - 100
	Low - Medium	51 - 75
	Low	26 - 50
	Very Low	1 - 25

For example, if an impact has a probability - likelihood value of 5 with a corresponding Impact - consequence value of 10, the significance value of that impact from the matrix is **50**, which is the meeting point of the two ratings. This is demonstrated by the **circle** on the matrix (**Error!**

Reference source not found.). The value 50 falls within the range of 51 - 75 which is rated as Low-medium from **Error! Reference source not found.**.

Impact Assessment

This refers to the detailed evaluation of the environmental and social risks and impacts of a proposed project and identified alternatives, compared to the baseline conditions. In other words, it is the process of identifying anticipated or actual impacts of a project activity on the social, economic, and environmental components of the pertinent area. The assessments are carried out by identifying the project's activities or actions that are likely to cause environmental impacts relative to the pertinent environmental condition and or components.

The valuation of impacts makes it possible to determine the magnitude and significance of an impact, this enables the preparation of an environmental management plan that is oriented towards eliminating, mitigating, or compensating for the negative impact of the proposed project, while leveraging on the project's positive impacts. It also helps in designing an environmental monitoring plan, with which to verify and validate the effectiveness of the proposed mitigation/management measures.

Identification of Impacts and Activities Interactions

The FCE(T) gully erosion and flood control project is envisaged to have a range of positive environmental and social impacts. Some of these impacts are a function of the objective of the rehabilitation project, while others are a function of the way in which the project is designed to meet its objectives.

It is important to note that some adverse impacts may be associated with the rehabilitation of the gully, but notwithstanding, the ESMP is prepared to ensure that these impacts are reduced to the barest minimum. As highlighted in previous sections, the first step in the identification of impact is the development of checklists of project activities that are likely to have significant impact on the environmental components of the project area. Thus, the details of the gully rehabilitation and operational activities capable of causing environmental and social risks and impacts are identified as follows:

- ✓ Site clearing and mobilization.
- ✓ Labor recruitment and engagement
- ✓ Excavation for drainage and gully route

Checklist of the components, sub-component, and anticipated Impact

Aspect	Environmental Component	Impact Indicators
Biophysical	Atmospheric Elements	• Gaseous emissions (like NO_x SO_x, PM, CO₂) that contaminates ambient air quality and contribute to greenhouse effects. • Increase in ambient noise level
	Noise Level	
	Soil	• Changes in physico-chemical and biological properties of soil.
	Aquatic Ecology	• Changes in the baseline physico-chemical properties of water. • Changes in community composition and abundance of aquatic biota including microbes, plankton, macrobenthos, fishes, • mammals, reptiles, amphibians, birds' species, etc.
	Topography	• Changes in land terrain and topography
	Vegetation	• Changes to vegetation population, health, species abundance and diversity and impact on engendered and economic species.
Human, Socio-economic and Cultural	Land-use pattern	• Changes in land-use patterns and acquisition etc.
	Local population level	• Influx of migrant workers to the affected communities
	Socio-economic system	• Changes in employment opportunities and income differentials.
	Socio-cultural center	• Changes in social structure, organization and cultural heritage, practices, and beliefs.
	Basic Amenities and Infrastructure	• Easy access to goods and services, education, health care, water, fuel and consumer goods.
	Aesthetics	• Presence of unsightly or noisy facilities.

- ✓ Culvert Construction
- ✓ Back filling
- ✓ Operation and maintenance
- ✓ Decommissioning

After the identification of the environmental and social components that are likely to be affected by the project, a checklist of the components, subcomponent and anticipated Impact are developed as presented in the **Error! Reference source not found.**

Preliminary Identification of Impacts

Prediction of impacts determines what would happen to the environmental and social components because of the project and its associated activities. This is essentially a repeat of the process undertaken in scoping, whereby the potential interactions between the project and the baseline environment are identified. At the impact assessment stage, these interactions are updated based on additional information. From the possible interactions, the possible impacts can be identified, and elaborated. Table 5. 1 provides the possible key impacts to occur during the preliminary stage of the implementation, these were further evaluated against **Error! Reference source not found.** during the ESMP preparation:

Environmental Components and their Impact Indicators.

Aspect	Environmental Component	Impact Indicators
Biophysical	Atmospheric Elements	Gaseous emissions (like NO_x, SO_x, PM, CO₂) that contaminates ambient air quality and contribute to greenhouse effects.
	Noise Level	Increase in ambient noise level
	Soil	Changes in physico-chemical and biological properties of soil.
	Aquatic Ecology	- Changes in the baseline physico-chemical properties of water. - Changes in community composition and abundance of aquatic biota including microbes, plankton, macrobenthos, fishes, mammals, reptiles, amphibians, birds' species, etc.
	Topography	Changes in land terrain and topography
	Vegetation	Changes to vegetation population, health, species abundance and diversity and impact on engendered and economic species.
Human, Socio-economic Cultural	Land-use pattern	Changes in land-use patterns and acquisition etc.
	Local population level	Influx of migrant workers to the affected communities
	Socio-economic system	Changes in employment opportunities and income differentials.
	Socio-cultural center	Changes in social structure, organization and cultural heritage, practices, and beliefs.
	Basic Amenities and Infrastructure	Easy access to goods and services, education, health care, water, fuel and consumer goods.
	Aesthetics	Presence of unsightly or noisy facilities.

ANNEX 17: IMPACT CHARACTERISATION MATRIX

Project Phase	PROJECT ACTIVITY	POTENTIAL IMPACT	IMPACT CHARACTERIZATION						PERMANENCY OF IMPACT	
			Benefit	Adverse	Reversal	Irreversible	Direct	Indirect	Residue	Non-Residue
Pre-Mobilization	Land acquisition and demolition of existing buildings	Reduction in access to land resources and anxiety on the part of the communities.		x	x		x			x
		Loss of structures close to the gully due to acquisition for construction of drain canals and accessibility.		x		x	x		x	
		Opportunities for income generation through land acquisition;	x			x	x			x
		Economic activities may thrive in the affected communities	x		x			x		x
		Grievance /conflict due to resettlement and compensation issues		x	x		x		x	
	Mobilization of equipment and personnel	Increase traffic and delays		x	x		x			x
		Noise from heavy duty vehicles		x	x		x			x
		Gas emission from vehicles and machines		x		x	x		x	
	Site clearing and preparation	Loss of species diversity and abundance		x	x		x			x
		Potential increase in erosion of area(s) cleared		x	x		x			x
		Increased generation of solid and liquid waste		x	x		x			x
		Dust generation and emissions from vehicles and machines		x		x	x			x
	Recruitment of local labor	Employment opportunities to the local populace	x		x		x			x
		Increase in economic activities	x		x			x		x

Project Phase	PROJECT ACTIVITY	POTENTIAL IMPACT	IMPACT CHARACTERIZATION						PERMANENCY OF IMPACT	
			Benefit	Adverse	Reversal	Irreversible	Direct	Indirect	Residue	Non-Residue
		Increase in the price of commodities (<i>High demand for food, fuel etc.</i>)		x	x			x		X
		Influx of people in search of jobs which may lead to population / demographic change		x	x			x		X
		Increase in the spread of communicable and sexually transmitted diseases (<i>e.g., HIV, Hepatitis</i>)		x		x		x	x	
		Cultural conflict between the migrant and local people.		x	x			x		x
	Excavation for drainage/gully route & Construction of Drain Canal	1. Physical								
		<i>Land use</i>								
		Change to local topography of the area		x		x	x		x	
		Creation of deviation routes/diversion that will likely take up land and cause traffic delay.		x	x			x		x
		Hindered access to homestead during drainages construction due to depth of ditches created along the gully route		x	x			x		x
		<i>Drainage and Hydrology</i>								
		Change in drainage pattern along the gully alignment		x		x	x		x	
		<i>Water Quality</i>								
		Soil erosion and siltation		x		x	x			x

Project Phase	PROJECT ACTIVITY	POTENTIAL IMPACT	IMPACT CHARACTERIZATION						PERMANENCY OF IMPACT	
			Benefit	Adverse	Reversal	Irreversible	Direct	Indirect	Residue	Non-Residue
		Pollution of surface and ground water system through oil spillage indiscriminate disposal of used lubricants.		x		x	x		x	
		Noise								
		Noise and ground vibration from heavy duty construction equipment		x	x		x			x
	Excavation for drainage/gully route & Construction of Drain Canal	Air Quality								
		Emission of Nitrogen Oxide from vehicles and machines leading to increase in Green House Gas emissions		x		x	x			x
		Dust generation from vehicles and machines and its attendant effect on the health of workers and people of the communities		x		x	x			x
		Emission of Nitrogen Oxide from vehicles and machines leading to increase in Green House Gas emissions		x		x	x			x
		Soil								
		Contamination because of accidental /improper discharge of fuel and lubricant		x		x	x			x
		Alteration of soil profile / gully bathymetry		x		x				x
		2. Biological								
		Terrestrial Flora								
		Loss of species diversity and abundance		x		x	x			x

Project Phase	PROJECT ACTIVITY	POTENTIAL IMPACT	IMPACT CHARACTERIZATION						PERMANENCY OF IMPACT	
			Benefit	Adverse	Reversal	Irreversible	Direct	Indirect	Residue	Non-Residue
		Habitat fragmentation		x		x	x		x	
		<i>Terrestrial Fauna</i>								
		Degradation and removal of habitats		x		x	x		x	
	Excavation for drainage/gully route & Construction of Drain Canal	Migration of wildlife to other areas		x		x	x		x	
		Disturbance of faunal species through construction noise and vibration		x		x	x		x	
		3. Human and Social								
		Economic activities will thrive in the affected communities;	x		x			x		x
		Provision of employment for both skilled and unskilled workers;	x		x			x		x
		Improved livelihood enhancing activities in affected communities;	x		x			x		x
		Potential change in the size of the local population, its ethnic and religious make-up;	x			x		x	x	
		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 site;	x		x			x		x
		Gully may no longer be a haven for criminals as there would be securities and workers around the gully sites,	x		x		x			x
		The large number of outside workers required could have a negative impact on social and cultural values among the residents;		x	x			x		x

Project Phase	PROJECT ACTIVITY	POTENTIAL IMPACT	IMPACT CHARACTERIZATION						PERMANENCY OF IMPACT	
			Benefit	Adverse	Reversal	Irreversible	Direct	Indirect	Residue	Non-Residue
		Influx of workers and in-migration could place pressure on the already limited social infrastructure e.g., schools, health facilities, village roads, water supplies, etc.;		x	x			x		X
	Excavation for drainage/gully route & Construction of Drain Canal	Increased local traffic and delays due to increased construction plant and vehicles moving to and from site which may affect pupils' movement to schools and sometimes religious activities due blockade of roads;		x	x			x		x
		Gender Based Violence, especially due to interaction between girl child hawkers and construction workers;		x	x			x		x
		Weak structures like houses may developed cracks due to movement of heavy machineries.		x	x		x			x
		Leisure and social activities may be halted, especially as some viewing centers and football pitches are found around and within the gully erosion site.		x	x			x		X
		Health and Safety								
		Occupational Health and safety concerns for the workforce		x	x		x			X
		Air pollution and subsequent impact on human health		x		x	x		x	
		Increase accident potential and emergency response		x		x	x			X
		Potential spread of HIV/AIDS and other STDs due to influx of migrants' workers;		x		x		x	x	

Project Phase	PROJECT ACTIVITY	POTENTIAL IMPACT	IMPACT CHARACTERIZATION						PERMANENCY OF IMPACT	
			Benefit	Adverse	Reversal	Irreversible	Direct	Indirect	Residue	Non-Residue
	Flow of storm water & De-silting	1. Physical								
		Change to local topography along the alignment of the gully		x		x	x		x	
		Alteration of natural drainage pattern		x		x	x		x	
		An indirect effect on terrestrial faunal species could occur relating to the continued storm water flow and the increase in human activity.		x		x	x		x	
		Noise pollution due to increase in vehicular movement		x		x	x		x	
		Air Quality will be affected in the communities due to anticipated increase in vehicular traffic in the area		x		x	x		x	
		Increase in domestic waste generated during operation because of surge in population in the affected communities may contribute to increased waste volumes going to landfill;		x		x		x	x	
		2. Human and Social								
		Rehabilitation of the erosion menace in the 12 affected communities;	X			x	x		x	
		Promotion of goodwill and community appreciation of the ACREsAL project in the affected communities;	x			x	x		x	
		Connection and restoration of access to houses and communities cut off by the gully;	x			x		x	x	
		Potential change in the size of the local population, its ethnic and religious make-up;	x			x		x	x	

Project Phase	PROJECT ACTIVITY	POTENTIAL IMPACT	IMPACT CHARACTERIZATION						PERMANENCY OF IMPACT	
			Benefit	Adverse	Reversal	Irreversible	Direct	Indirect	Residue	Non-Residue
	Flow of storm water & De-silting	Reduced fear of loss of properties due to the accelerated expansion of the gully;	x			x		x	x	
		Reduction in injuries, mortality, and morbidity from landslide;	x			x	x		x	
		Loss of employment for laborer after completion of the rehabilitation work; and		x		x		x	x	
		Loss of employment for laborer after completion of the rehabilitation work.		x		x	x			
Decommissioning	Dismantling and demobilization of equipment	Noise and vibration		x		x	x			
		Traffic congestions		x		x	x			X
	Land Restoration	Restoration of aesthetic value of the environment.	x			x	x		x	
		Leisure and social activities may resume in the affected communities	x			x		x	x	

ANNEX 18: IMPACT SIGNIFICANCE RATING

PROJECT ACTIVITY	ASSOCIATED AND POTENTIAL IMPACT	CONSEQUENCE															Total	LIKELIHOOD										Total	Overall Ranking	Overall Impact Significant Rating
		SEVERITY /LEVEL OF BENEFIT OF IMPACT					SPATIAL SCOPE OF IMPACT					DURATION OF IMPACT						FREQUENCY OF ACTIVITY					FREQUENCY OF IMPACT							
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5		1	2	3	4	5	1	2	3	4	5			
Land acquisition and demolition of existing buildings	Reduction in access to land resources and anxiety on the part of the communities.			x					x				x				8		x								x	7	56	Low-Medium
	Loss of structures closed to the gully due to acquisition for construction of drain canals	x							x						x		7	x									x	6	42	Low
	Opportunities for income generation due to land compensation	x							x				x				5	x									x	6	30	Low
	Economic activities may thrive in the affected communities					x					x		x				12				x			x				5	60	Low-Medium
	Grievance /conflict due to resettlement and compensation issues				x				x					x			9		x						x			5	45	Low
	Loss of species diversity and abundance		x						x					x			5		x								x	6	30	Low
	Potential increase in erosion of area(s) cleared			x					x					x			7		x							x		6	42	Low
	Increased generation of solid and liquid waste			x						x					x		9			x						x		7	64	Low-Medium
	1. Physical																													
	Land use																													
	Change to local topography of the area			x					x					x			7		x							x		6	42	Low

PROJECT ACTIVITY	ASSOCIATED AND POTENTIAL IMPACT	CONSEQUENCE															Total	LIKELIHOOD										Total	Overall Ranking	Overall Impact Significant Rating
		SEVERITY /LEVEL OF BENEFIT OF IMPACT					SPATIAL SCOPE OF IMPACT					DURATION OF IMPACT						FREQUENCY OF ACTIVITY					FREQUENCY OF IMPACT							
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5		1	2	3	4	5	1	2	3	4	5			
	Creation of deviation routes that will likely take up land and cause traffic delay.	x						x				x					7			x						x	7	49	Low	
	Hindered access to homestead during drainages construction due to depth of ditches created along the gully route			x					x				x				7		x							x	6	42	Low	
	Drainage and Hydrology																													
	Change in drainage pattern along the gully alignment	x						x					x				6		x							x	6	36	Low	
	Water Quality																													
		Soil erosion and siltation	x						x					x				6		x							x		5	30
Pollution of surface and ground water system through oil spillage indiscriminate disposal of used lubricants.				x					x					x			7			x						x		7	49	Low
Excavation for drainage/gully route & Construction of Drain Canal	Noise																													
	Noise and ground vibration from heavy duty construction equipment			x					x					x			7		x							x	6	42	Low	
	Air Quality																													
	Emission of Nitrogen Oxide from vehicles and machines leading to increase in Green House Gas emissions			x						x					x			8		x							x	6	48	Low

PROJECT ACTIVITY	ASSOCIATED AND POTENTIAL IMPACT	CONSEQUENCE															Total	LIKELIHOOD										Total	Overall Ranking	Overall Impact Significant Rating
		SEVERITY /LEVEL OF BENEFIT OF IMPACT					SPATIAL SCOPE OF IMPACT					DURATION OF IMPACT						FREQUENCY OF ACTIVITY					FREQUENCY OF IMPACT							
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5		1	2	3	4	5	1	2	3	4	5			
	Dust generation from vehicles and machines and its attendant effect on the health of workers and people of the communities			x					x							x	8		x							x	6	48	Low	
	Soil																													
	Contamination because of accidental /improper discharge of fuel and lubricant			x				x					x				7		x						x	6	42	Low		
	Alteration of soil profile / gully bathymetry		x					x					x				6			x					x	7	42	Low		
	2. Biological																													
	Terrestrial Flora																													
Excavation for drainage/gully route & Construction of Drain Canal	Noise																													
	Noise and ground vibration from heavy duty construction equipment			x				x					x				7		x						x	6	42	Low		
	Air Quality																													
	Emission of Nitrogen Oxide from vehicles and machines leading to increase in Green House Gas emissions			x				x					x				8		x						x	6	48	Low		
	Dust generation from vehicles and machines and its attendant effect on the health of workers and people of the communities			x				x						x			8		x						x	6	48	Low		

PROJECT ACTIVITY	ASSOCIATED AND POTENTIAL IMPACT	CONSEQUENCE															Total	LIKELIHOOD										Total	Overall Ranking	Overall Impact Significant Rating
		SEVERITY /LEVEL OF BENEFIT OF IMPACT					SPATIAL SCOPE OF IMPACT					DURATION OF IMPACT						FREQUENCY OF ACTIVITY					FREQUENCY OF IMPACT							
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5		1	2	3	4	5	1	2	3	4	5			
	Soil																													
	Contamination because of accidental /improper discharge of fuel and lubricant			x				x					x				7		x							x		6	42	Low
	Alteration of soil profile / gully bathymetry		x					x					x				6			x						x		7	42	Low
	2. Biological																													
Excavation for drainage/gully route & Construction of Drain Canal	Terrestrial Flora																													
	Loss of species diversity and abundance			x				x					x				9			x						x		8	72	Low-Medium
	Habitat fragmentation		x					x					x				5			x						x		6	30	Low-Medium
	Terrestrial Fauna																													
	Degradation and removal of habitats		x					x					x				5			x						x		6	30	Low-Medium
	Migration of wildlife to other areas			x				x					x				7		x							x		6	42	Low-Medium
	Disturbance of faunal species through construction noise and vibration			x				x					x				7		x							x		6	42	Low-Medium
	3. Human and Social																													

PROJECT ACTIVITY	ASSOCIATED AND POTENTIAL IMPACT	CONSEQUENCE															Total	LIKELIHOOD										Total	Overall Ranking	Overall Impact Significant Rating	
		SEVERITY /LEVEL OF BENEFIT OF IMPACT					SPATIAL SCOPE OF IMPACT					DURATION OF IMPACT						FREQUENCY OF ACTIVITY					FREQUENCY OF IMPACT								
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5		1	2	3	4	5	1	2	3	4	5				
	Opportunities for income generation through land acquisition;					x		x									x	12					x					x	10	120	High
	Grievance/conflict due to resettlement and compensation issues.				x			x					x					8		x							x		6	48	Low-Medium
	Provision of employment for both skilled and unskilled workers;					x			x				x					10				x					x		9	90	Medium-High
	Potential change in the size of the local population, its ethnic make-up and religious make-up;			x					x								x	11				x					x		8	88	Medium-High
	Risks of Gender-based violence, including sexual abuse, harassment, and exploitation																														
Excavation for drainage/gully route & Construction of Drain Canal	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 site;					x			x								x	13				x					x		9	117	High
	Gully may no longer be a safe haven for criminals as there would be securities and workers around the gully sites,				x				x					x				8		x							x		6	48	Low Medium
	The large number of outside workers required could have a negative impact on social and cultural values among the residents;					x				x				x				9		x							x		6	54	Medium-High

PROJECT ACTIVITY	ASSOCIATED AND POTENTIAL IMPACT	CONSEQUENCE															Total	LIKELIHOOD										Total	Overall Ranking	Overall Impact Significant Rating
		SEVERITY /LEVEL OF BENEFIT OF IMPACT					SPATIAL SCOPE OF IMPACT					DURATION OF IMPACT						FREQUENCY OF ACTIVITY					FREQUENCY OF IMPACT							
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5		1	2	3	4	5	1	2	3	4	5			
	Influx of workers and in-migration could place pressure on the already limited social infrastructure e.g., schools, health facilities, village roads, water supplies, etc.			x					x				x											x		6	48	Low		
Excavation for drainage/gully route & Construction of Drain Canal	Gender Based Violence, especially due to interaction between girl child hawkers and construction workers;				x				x				x											x		7	70	Low Medium		
	Increased local traffic and delays due to increased construction plant and vehicles moving to and from site which may affect pupils' movement to schools and sometimes religious activities due to blockade of roads;			x					x				x											x		7	56	Low Medium		
	Weak structures like houses may developed cracks due movement of heavy machineries.				x				x				x											x		6	48	Low		
	Leisure and social activities may be halted, especially as some viewing centers and football pitches are found around and within the gully erosion site.			x					x				x											x		6	42	Low		
	Occupational Health and safety concerns for the workforce				x				x				x											x		8	68	Medium-High		
	Air pollution and subsequent impact on human health due to increase traffic.			x					x				x											x		6	42	Low		

PROJECT ACTIVITY	ASSOCIATED AND POTENTIAL IMPACT	CONSEQUENCE															Total	LIKELIHOOD										Total	Overall Ranking	Overall Impact Significant Rating
		SEVERITY /LEVEL OF BENEFIT OF IMPACT					SPATIAL SCOPE OF IMPACT					DURATION OF IMPACT						FREQUENCY OF ACTIVITY					FREQUENCY OF IMPACT							
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5		1	2	3	4	5	1	2	3	4	5			
Flow of storm water & De-silting	Potential spread of HIV/AIDS and other STDs due to influx of migrants' workers;				x				x					x				7				x				x	8	56	Low-Medium	
	1. Physical																													
	An indirect effect on terrestrial faunal species could occur relating to the continued storm water flow and the increase in human activity.	x							x						x			7				x				x	8	56	Low-Medium	
	Noise pollution due to vehicular movement.	x							x						x			8				x				x	8	68	Low-Medium	
	Air Quality will be affected in the communities due to anticipated increase in vehicular traffic in the area	x							x						x			8				x				x	8	56	Low-Medium	
	Increase in waste produced during operation because of surge in population in the affected communities may contribute to increased waste volumes going to landfill;	x													x			7				x				x	8	56	Low-Medium	
Flow of storm water & De-silting	2. Human and Social																													
	Rehabilitation of the erosion menace in the 12 affected communities;					x				x					x			13				x				x	10	130	Very High	
	Promotion of goodwill and community appreciation of the ACRoSAL in the affected communities and the entire Gombe State;					x					x				x			14				x				x	9	126	Very High	

PROJECT ACTIVITY	ASSOCIATED AND POTENTIAL IMPACT	CONSEQUENCE															Total	LIKELIHOOD										Total	Overall Ranking	Overall Impact Significant Rating	
		SEVERITY /LEVEL OF BENEFIT OF IMPACT					SPATIAL SCOPE OF IMPACT					DURATION OF IMPACT						FREQUENCY OF ACTIVITY					FREQUENCY OF IMPACT								
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5		1	2	3	4	5	1	2	3	4	5				
Dismantling and demobilization of equipment	Connection and restoration of access to houses and communities already cut off by the gully;					x		x								x	11					x					x	9	99	Medium-High	
	Potential change in the size of the local population, its ethnic and religious makeup;			x					x							x	10					x						x	9	90	Medium-High
	Reduced fear of loss of properties due to the accelerated expansion of the gully;					x				x						x	10					x					x	8	80	Medium-High	
	Reduction in mortality and morbidity from landslide;					x			x							x	12					x					x	8	96	Medium-High	
	Loss of employment for laborers after completion of the rehabilitation work; and			x					x							x	11					x					x	8	88	Medium-High	
	Noise and vibration		x						x						x			6				x				x			4	24	Very-Low
	Traffic congestions		x						x					x				5				x					x		7	35	Low
Land Restoration	Restoration of aesthetic value of the environment.					x			x							x	10					x					x	8	80	Medium-High	
Land Restoration	Leisure and social activities may resume in the affected communities					x			x							x	9					x					x	8	72	Low-Medium	