



**NIGERIA EROSION AND WATERSHED  
MANAGEMENT PROJECT (NEWMAP)-  
(IDA Assisted)**

**Environmental and Social Management  
Plan (ESMP)**  
(Draft Final Report)

for

**Reclamation, Channeling and Remediation Works At  
Eguare-Ewu Flood and Gully Erosion Catchment Area  
in Edo State  
(EDS/NEWMAP/WKS/NCB/16/01)**

Submitted to

**Project Management Unit, Edo State Nigeria Erosion  
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## LISTS OF ABBREVIATIONS AND ACCRONYMS

AIDS	=	Acquired Immune Deficiency Syndrome
BEME	=	Bill of Engineering Measurement and Evaluation
BOD	=	Biological Oxygen Demand
CITES	=	Convention on International Trade in Endangered Species
CO	=	Carbon-Monoxide
DO	=	Dissolved Oxygen
EA	=	Environmental Assessment
EHS	=	Environment, Health and Safety
EIA	=	Environmental Impact Assessment
EMP	=	Environmental Management Plans
EIS	=	Environmental Impact Statement
ESA	=	Environmentally Sensitive Area
ESMF	=	Environmental and Social Management Framework
ESO	=	Environmental Safeguard Officer
ESMP	=	Environmental and Social Management Plan
FMEnv	=	Federal Ministry of Environment
FEPA	=	Federal Environmental Protection Agency
FRSC	=	Federal Road Safety Corps
GEF	=	Global Environmental Facility
GRMs	=	Grievance Redress Mechanisms
HIV	=	Human Immune Virus
HSE	=	Health Safety and Environmental
IFC	=	International Finance Corporation
ITCZ	=	Inter Tropical Convergence Zone
ITDZ	=	Inter-Tropical Discontinuity Zone
IMM	=	Impact Mitigation Monitoring
LGA	=	Local Government Area
MDA	=	Ministries Department and Agencies
NAST	=	Nigerian Advanced School of Theology
NESREA	=	National Environmental Standards and Regulations Enforcement Agency
NEWMAP	=	Nigeria Erosion and Watershed Management Project
NIMET	=	Nigeria Meteorological Agency
NPC	=	National Population Commission
NW	=	North Westerly
PPP	=	Polluter Pay Principle
PAP	=	Project Affected People
PPC	=	Public Compliant Commission
PCF	=	Prototype Carbon Fund
PAD	=	Project Appraisal Document
PID	=	Project Implementation Manual
PM	=	Particulate Matter
QA	=	Quality Assurance
QC	=	Quality Control
RH	=	Relative Humidity
RPF	=	Resettlement Policy Framework
SPMU	=	State Project Management Unit



STD	=	Sexually Transmitted Disease
SW	=	South Westerly
TDS	=	Total Dissolve Solid
THC	=	Total Hydrocarbon
ToR	=	Terms of Reference
TSS	=	Total Suspended Solid
TSP	=	Total Suspended Particulate
USCS	=	Unified Soil Classification System
USEPA	=	United States Environmental Protection Agency
VOC	=	Volatile Organic Compound
WB	=	World Bank

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## **EXECUTIVE SUMMARY**

### **CHAPTER ONE: Introduction**

Eguare-Ewu, Edo State, gully site is one of the ten gully erosion sites that had been selected by the SPMU of NEWMAP for Engineering Design and Construction Works in a bid to control the erosion, inhibit the advancement of the gully from causing further damage and rehabilitate the gully. The project is financed by the World Bank (WB), Global Environment Facility, the Special Climate Change Fund, and the Government of Nigeria. Our team of consultants from Global Impact Environmental Consulting Ltd was engaged to prepare the ESMP for the project in line with standard procedures for environmental assessment including the applicable World Bank Environmental and Social Safeguard policies and Nigerian environmental assessment guidelines

### **Objectives of the ESMP**

Specific objectives of this ESMP are to:

- Set out the measures to be taken in addressing the identified adverse impacts of the various components and activities of the project;
- Develop procedures and plans to ensure that the mitigation measures will be implemented throughout the phases for the remediation work at the Eguaren-Ewu Gully Erosion site; and
- Address the adequacy of the monitoring and institutional arrangements for the upper and lower watersheds in the intervention site.

### **Terms of Reference and Scope of Work of the ESMP**

- The consultant is expected to work in close collaboration with the SPMU project team, and the various other Agencies involved in the projects;
- The consultant shall visit the intervention sites, to have a first-hand overview of the situation on ground at the site, so as to have adequate knowledge of the requirements for the ESMP; and
- Identify the proposed management strategies to ensure the environment is appropriately protected and environmental issues are appropriately mitigated.

Specific scope of work is that the Consultant:

- Prepares ESMP, taking into consideration the activities in the intervention sites at Eguare-Ewu communities;
- The ESMP should contain an environmental and social checklist, to be used as a screening mechanism for the identified activities of the project; and
- Identifies any regulations and guidelines, which will govern activities of the nature contemplated by the proposed project including National and State legislation and regulations.

### **Deliverables**

The deliverables are Inception, Draft and Final ESMP Reports, acceptable to the Edo –NEWMAP SPMU, Edo State, and to the World Bank.

### **CHAPTER TWO: Policy, Legal and Administrative Framework**

A number of relevant international, national and state environmental policies, guidelines, legal and administrative framework applicable to the operation of the NEWMAP were reviewed as they relate to the proposed NEWMAP project at Eguaren-Ewu, Edo State.

Specifically, World Bank OP/BP 4.01: Environmental Assessment (EA), one of the 10+2 Environmental and Social Safeguard Policies of the WB, employed by the bank to examine the potential environmental risks and benefits associated with Bank lending operations was reviewed. A detailed listing of national statutory documents put in place by the FMEnv to aid in the monitoring, control and abatement of industrial wastes and natural disasters was produced in this chapter. Similarly, Edo State Regulations relating to Environmental Management was also reviewed.

### **CHAPTER THREE: Description of Biophysical Environment**

The Eguare-Ewu Gully Site is located about halfway between Benin City and Auchi, just north of the Benin City – Auchi road in Edo State. A massive gully has developed near the lower part of Ewu town where the main road crosses

the drainage line. The gully is very deeply incised and becomes shallower towards the outlet, the length of the gully is about 1000 m. It steadily decreases in depth from an initial depth of approximately 14 m at the gully head at the road in the village, to 8 m approximately 500 m downstream. It eventually daylights approximately 700 m downstream. The streambed is relatively steep for a section downstream of where the gully daylights. The gully developed as a result of the road drainage, which collects flows from across the catchment and concentrates them to the gully site, together with an increase in hardened surfaces in the catchment due mainly to anthropogenic influence which results in increased peak flows. The catchment that drains to the gully at Ewu is approximately 2.4 km<sup>2</sup> in size determined by means of a GIS.

### **Proposed Intervention Project in Eguaren-Ewu Gully Site**

The components of intervention project planned for this gully site are as follow:

Watershed Management: Storm water flows to be managed so that they do not cause unwanted erosion problems. By routing storm water around fields, contour ploughing, planting crops and minimizing the clearing of natural forest and bush that hold the soils and reduce peak flows effectively. Proper watershed management to include managing the peak flows in the catchment through maintaining natural watercourses and wetland areas that currently attenuate flows naturally.

Controlled Conveyance of Flows Into or Around the Gully: Various options for conveyance of flows into or around the gully were investigated as part of the Concept Design Study. It was found that diverting most of the flow around the gully head would be the most practical solution. This will allow for the construction of diversion channels, discharge chutes and stilling basins to occur in relative safety, away from the gully head, while the flow continues to be discharged into the gully head during construction.

Backfill and Reinstatement of the Gully Head Upstream of the Bypass Confluence: The gully head upstream of the bypass channel confluence will be backfilled and reinstated, while the road that collapsed as a result of the gully erosion will be reconstructed. The geotechnical design includes consideration of slope stability and soil erosion. Backfill material will be stabilized in the gully head to provide a suitable foundation for the reconstruction of the road.

Use of Suitable Grass and Tree Species to Stabilize the Soils: It is proposed that extensive use is also to be made of vegetation to improve the soil's resilience to erosion. The grass species to be planted are *Vetiveria zizanioides* and *Pueraria sp.* as approved by NEWMAP. The tree species is *Acacia sp.*

### **Quality Assurance and Quality Control (QA/QC) for the Proposed Intervention Project in Eguaren-Ewu**

The general conditions of contract are based on the World Bank harmonized FIDIC document for large works. The specifications are mostly based on the SATCC standard specifications for workmanship and materials. The British Standards are also to be used. In the Bill of Engineering Measurement and Evaluation (BEME), the major quantities are as follows:

- Concrete 3300 m<sup>3</sup>
- Structural steel 410 t
- Formwork 8600 m<sup>2</sup>
- Fill earthworks 45 000 m<sup>3</sup>
- Cut earthworks 38 000 m<sup>3</sup>
- Volume of gabions 7400 m<sup>3</sup>
- Filter Fabric 35 000 m<sup>3</sup>
- Area to be vegetated 4.0 ha

## **Description of the Project Environment**

### **Physical Environment of Edo State:**

Climate and Meteorology: Edo State has two principal seasons, rainy and dry, driven by the seasonal oscillations of the Inter-Tropical Discontinuity Zone (ITDZ) movement.

Temperature and Sunshine: Maximum temperatures typically range between 28°C and 34°C. The higher values are recorded in the dry months between December and March, which also coincide with periods of high sunshine. Mean sunshine hours per month vary from 53 hours in July to 176 hours in January. The low sunshine hours in the region are associated with the thick cloud cover that prevails in this climatic belt for most of the year.

Rainfall: Rainfall in Edo State is generally high, due to the relative proximity to the coast. Rain falls all through the year with the peak between June and October and the highest number of rain days also occurred within the same period. Lowest amount of rainfall occurs in the month of December, while the lowest rain days are recorded in February. Total annual rainfall is typically in excess of 2,500mm.

Relative Humidity: The highest relative humidity (RH) in the morning (0900 hrs.) in Edo State is about 84.0% and this often occurs in July, while the lowest is obtained in January with a value of about 59.0%. The RH record is higher for 0900hrs than for 1500hrs throughout the months.

Wind System: The climatic conditions of the state are influenced by two wind systems related to a global passat system; south-westerly (SW) and the north-easterly (NE). The SW winds, which predominate from April to August, have a speed range of 5.7 to 9.0 knots (mean  $7.4 \pm 1.4$  knots), but over the annual cycle, the overall mean is  $5.7 \pm 2.2$  knots, and this corresponds to light breeze on the Beaufort scale. Gentle and moderate breezes occur mostly from June to September.

Air Quality and Noise Levels: Total suspended particulates in ambient air around Edo State are generally low, ranging between  $25\mu\text{g}/\text{m}^3$  and  $74\mu\text{g}/\text{m}^3$ . This is far below the FMEnv limit of  $250\mu\text{g}/\text{m}^3$ , hence, the air quality in the state is of high quality. Noise level ranged between a low of 40 dB(A) and a high of 84 dB(A), with mean values at 51dB(A). In general, noise levels in the state complied with the 8-hr exposure limit of 90 dB(A) set by the FMEnv.

Geology of Edo State: Edo State lies within the Niger Delta thereby making its geology typical of the Niger Delta Basin. The area forms part of a geological sequence of the Quaternary and Tertiary formations of the Niger Delta.

### **Biological Environment of Edo State**

Vegetation: Vegetation in Edo state consists of mangrove swamps, freshwater swamps, rainforests and savanna grasslands. The savanna grasslands however occur in the northern reaches of the state.

Wildlife: Generally wildlife in Edo state consists of mammals, birds, reptiles and amphibians. Many parts of the state have been substantially modified by human activities, such that only very few original forests remain, and by extension, wildlife species composition and abundance have been seriously modified. The savanna grasslands in the state play host to rodents such as Grass cutters, Porcupines, Snakes, etc. Avian species, because of their mobility, are ubiquitous across the state.

### **Description of Eguaren-Ewu Gully Site Environment**

Administratively, Ewu community is located in Etsako West Local Government Area, Edo State. Agbede bounds Ewu in the north, in the southeast by Irrua, and southwest by Ekpoma. The community is located about 99km north east of Benin, 82.0km north of Agbor, and 30km south of Auchu town. Some of the major towns in the immediate vicinity of the Ewu community include Irrua, Uromi, Opoji, Ekpoma, Akahia and Ukhun among others. The coordinate of the gully head is Latitude 6.246908 and Longitude 6.803197 and it is within the community. The gully erosion site is 1.6 km using the shortest route and



2.85 km using the longer route off the Auchi-Benin road. The gully erosion site originates from the Ewu community and moves northward. Presently, there are buildings to the southern, eastern and western parts of the gully-head, however, the northern section is mainly fallow vegetation and farmland. The floristic composition of the vegetation ranges from the typical forests with dense canopies and a discontinuous multi-storey system. The undergrowth consists mostly of shrubs, epiphytes and grasses. The dominant vegetation species include *Anthocleista*; *Bridelia*; and *Elaeis guineensis*, among others. The most common grasses within the area include: *Andropogon*; *Ctenium newtonii*; *Imperata cylindrical*; and *Loudetia arundinacea*. Shrubs, herbs and climbers particularly *Alchornea*, *Combretum*, and *Chromolaena odorata* are very common, particularly on fallow lands.

#### **Geology, Geotechnical and Soil Types at Eguare-Ewu**

The site is underlain by Imo Clay-Shale Group lithologies consisting of clay and shales with limestone intercalations of the Ewekoro Formation. The presence of clays was confirmed by the Atterberg test results. A geotechnical investigation conducted at the Ewu Erosion Gully Site in Edo State, indicated that the site is underlain by clayey sands and are classified as 'SC' by the unified soil classification system (USCS). Field soil investigation, sampling and analysis of the surface 200-cm soil depth at the lower and upper reaches of the gully erosion site in Ewu indicated predominance of fine to medium sized sand particles. No evidence of lithologic discontinuity was observed as the formation, as observed from the gully exposed surface shows uniform lithology. Soils within and around the Ewu gully site are highly ferruginized, commonly brownish to reddish in colour, and often with ochric epipedon. The sand particles ranged from a minimum of 76% sand to 82% sand.

#### **CHAPTER FOUR: Socio-Economic Characteristics and Consultation with Stakeholders**

The socio-economic baseline information gathering on the two communities straddling the gully site documented the social risks associated with the rehabilitation and restoration of the gully. Furthermore, existing livelihoods opportunities, income, gender characteristics, age profile, health, transport

access, existing community structures were also investigated. In addition, existing formal and informal grievance redress mechanisms in the communities were also investigated. Community consultation was also held at the palace of the paramount ruler. The consultation was with a view to sensitizing the community on the government's plan to address the challenges posed by the gully through the rehabilitation of the damaged road infrastructure as a consequence of the gully erosion.

Findings indicated that youth accounted for 62% of the sampled respondents. This is an indication of the availability of able-bodied people that can provide labour needed during the construction phase of the project. Four major environmental concerns of the community identified during the consultation meeting are (a) irregular rainfall, (b) excessive rainfall, (c) soil loss and degradation, and (d) excessive heat. It was also documented that there is no existing formal institutional framework specifically setup to handle grievances that might arise from the gully erosion rehabilitation project in the community.

#### **CHAPTER FIVE: Assessment of Associated and Potential Impacts**

For the purpose of impact identification, the respective project activities to be undertaken for each phase of the intervention project are indicated in the box below:

<b>IMPACT ID</b>	<b>PROJECT PHASE</b>	<b>PROJECT ACTIVITY</b>	<b>PROJECT IMPACT</b>	<b>MITIGATION MEASURES</b>
1	Pre-Construction:	General clearing and preparation of project site for gully erosion site rehabilitation and construction works	Increased employment opportunities for the local communities	NEWMAP shall: <input type="checkbox"/> Utilize available workforce from the communities
			Interference with day-to-day community activities resulting in conflicts and complaints	NEWMAP shall: <input type="checkbox"/> Consult regularly with the communities (i.e. before, during and after site clearance) <input type="checkbox"/> Demarcate boundaries of acquired location.
2	Pre-Construction	Land Acquisition and demolition of existing buildings	Conflict over loss of land and resettlement benefits if payment is restricted to owners of buildings to be demolished for the construction of the diversion culvert	NEWMAP shall: <input type="checkbox"/> Consult regularly with the communities (i.e. before, during and after site clearance) <input type="checkbox"/> Carry out adequate enumeration of project affected people, property and

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<p>economic trees within the land area to be acquired for the project</p>
			<p>Conflict between the NEWMAP project and the resident community over relocation benefits due to those families whose buildings, land, and lives of loved ones were lost to the gully erosion at Ewu Esan Central</p>	<p>NEWMAP shall:</p> <ul style="list-style-type: none"> <li>□ Develop a sound implementable Resettlement Action Plan for the Ewu project</li> <li>□ Ensure that adequate compensation shall be paid to project affected people in consultation with various stakeholders to avoid conflicts that may arise if payments are made to wrong claimants.</li> </ul>
3	Pre-Construction	Disruption and encroachment into agricultural lands in close proximity to the gully erosion	Conflict over loss of agricultural lands due to gully erosion rehabilitation civil works downstream of the gully head in Ewu Esan Central community	<ul style="list-style-type: none"> <li>□ Consult extensively with the communities on land acquisition and payment of relocation benefits</li> </ul> <p>Develop a sound implementable Resettlement Action Plan for the Ewu NEWMAP project</p> <ul style="list-style-type: none"> <li>□ NEWMAP-Edo SPMU shall reach agreement with regard to ways and means of resettlement of any forced displacement and relocation of any existing land use and ownership on the proposed land take and respect those commitments;</li> <li>□ NEWMAP-Edo SPMU and Contractors shall negotiate, if necessary, for the acquisition of land or the right of passage and provide for adequate compensation;</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
4	Pre-Construction	Physical presence of construction workers on the Ewu Gully erosion intervention project site and environ	Contamination of soil and downstream water resources of the project area from indiscriminate disposal of untreated sewage	<p>NEWMAP shall ensure that:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Contractors provide adequate sanitary facilities for their site workers;</li> <li><input type="checkbox"/> Open air defecation is sternly discouraged among the project workers</li> </ul>
5	Pre-Construction	Contractor's site preparation operations	Increased employment opportunities for the local communities	<p>NEWMAP shall ensure that Contractors</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Utilize available workforce from the communities</li> </ul>
6	Pre-Construction:	Transportation of equipment, materials and workers to the project site	Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles	<p>NEWMAP shall ensure the:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Use of equipment with high combustion efficiency for the project activities</li> <li><input type="checkbox"/> Use of dust suppressants on the project site</li> </ul>
			Noise and vibration from vehicular movement	<p>NEWMAP shall:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure that Contractors provide Ear protective devices to the project workers at the site clearing stage;</li> <li><input type="checkbox"/> Ensure the use of the ear protective devices at site by project workers and visitors;</li> <li><input type="checkbox"/> Ensure that Contractors Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>
			Traffic congestion and increased risk of occurrence of traffic accidents and injuries	<p>NEWMAP-Edo SPMU and Contractors shall:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Avoid impeding traffic and traffic disruption around the project site by:</li> <li><input type="checkbox"/> Adjusting work schedules not to disturb traffic;</li> <li><input type="checkbox"/> Establishing an adequate system of</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<p>road signs and detour;</p> <ul style="list-style-type: none"> <li>❑ Notifying communities of pending work scope, duration and location</li> <li>❑ Avoid blocking public access roads;</li> <li>❑ Complying with road bearing capacity and repairing damage caused to roads during and at the end of the work;</li> <li>❑ Circumventing access roads to gathering places in Ewu and neighbouring communities</li> </ul>
7	Construction	Construction of sheds, equipment lay down areas, temporary office and sanitary facilities etc.	Increase in ambient noise levels and vibration	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li>❑ Ear protective device is provided to workers at the site clearing stage;</li> <li>❑ Use of the protective devices provided is enforced</li> <li>❑ Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>
8	Construction	Construction of drainage conduits upstream of the gully head and other associated road drainage infrastructure	Increase in employment opportunities and engagement of community labour	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li>❑ Utilization of available workforce in the communities is ensured</li> </ul>
			Social and cultural structure interference and complaints;	<ul style="list-style-type: none"> <li>❑ NEWMAP-Edo SPMU and Contractors shall obtain all necessary authorizations and permits prior to the execution of the work through consultation with relevant authorities</li> </ul>
			Marginal increase in population within the settlements in close proximity to the project site will lead to an increase in negative vices such as prostitution	<ul style="list-style-type: none"> <li>❑ NEWMAP-Edo State Project Management Unit (SPMU) and Contractors shall develop and provide a work schedule that will avoid disturbing the traditional and</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
			(commercial sex work) and crime which would affect social and cultural systems through a negative value system;	religious life of communities;
			Conflicts between the project and the community as well as the pressure of the influx of potential job seekers into the project area and associated risks;	<p>NEWMAP-Edo SPMU and Contractors shall:</p> <ul style="list-style-type: none"> <li>❑ Establish a communication program to inform communities of ongoing work and establish appropriate measures to minimize the disturbance caused by the work;</li> <li>❑ Implement the Influx Management Plan to address all socio-cultural issues, especially the preservation of social and cultural structures of the local communities;</li> <li>❑ Periodically conduct STD and HIV/AIDs and general safe sex awareness campaigns as control measure for the transmission of the disease;</li> <li>❑ Regularly distribute HIV/AIDS awareness communication materials;</li> <li>❑ Implement labour hiring programs away from construction sites to reduce the presence of “camp followers”, prostitutes, drug dealers/users and other potential HIV/AIDS carriers.</li> </ul>
			New wealth among the youth would threaten the existing authority structure;	<ul style="list-style-type: none"> <li>❑ NEWMAP-Edo SPMU and Contractors shall ensure that a percentage and certain category of jobs are reserved for the female gender in the resident</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<p>communities;</p> <ul style="list-style-type: none"> <li>❑ NEWMAP-Edo SPMU and Contractors shall arrange initial contact with local contractors to maximize opportunities for local procurement</li> <li>❑ NEWMAP-Edo SPMU and Contractors shall carry out extensive consultation with community leadership on the projects. The extent of consultation shall be determined by the complexity and the severity of the identified project impacts;</li> <li>❑ Establish working relationships between NEWMAP-Edo SPMU, contractors, private security, surrounding communities, and local law enforcement agency to quickly disburse unauthorized personnel from work locations, camp sites if any, and surrounding communities;</li> <li>❑ NEWMAP-Edo SPMU and Contractors shall guarantee access to private property and safety of residents and passer-by during the course of work by enacting the appropriate measures</li> </ul>
9		Transportation of equipment, materials and worker to project site	Accidental release of fuels, oils, chemicals, hazardous materials etc., to ground in the construction laydown area during delivery of materials and equipment to project	<p>NEWMAP shall:</p> <ul style="list-style-type: none"> <li>❑ Establish appropriate protocols for materials delivery and handling to ensure there are no spills;</li> <li>❑ Ensure that the</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
			site	<p>contractor HSE plan addresses the prevention and containment of oil spills, chemicals and hazardous materials releases during all phases of the project;</p> <ul style="list-style-type: none"> <li>□ Ensure that storage and handling of hazardous materials are in accordance with approved hazardous materials management plan</li> <li>□ Maintain transportation vehicles, heavy civil engineering machinery and construction equipment in good working order so as to avoid exhaust emissions as well as oil and fuel leaks</li> <li>□ Any oil/chemical spill should be reported to FMEv and Edo State Environmental Protection Agency</li> </ul>
10	Construction	Construction of 2.5m by 1.5m gully bypass closed box diversion drainage culverts	Conflict over loss of land and resettlement benefits for demolition of two existing buildings obstructing the construction of the diversion culvert	□ Consult regularly with the communities (i.e. before, during and after site clearance)
			Conflict between the NEWMAP project and the resident community over relocation benefits due to those families whose buildings, land, and lives of loved ones were lost to the gully erosion at Ewu Esan Central	□ Develop a sound implementable Resettlement Action Plan for the Ewu NEWMAP project
			Disruption of community activities and movement around the gully head	□ NEWMAP-Edo SPMU and Contractors shall obtain all necessary authorizations and permits prior to the execution of the work through consultation with relevant



IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<p>authorities;</p> <ul style="list-style-type: none"> <li>□ NEWMAP-Edo State Project Management Unit (SPMU) and Contractors shall develop and provide a work schedule that will avoid disturbing the traditional and religious life of communities;</li> <li>□ NEWMAP-Edo SPMU and Contractors shall establish a communication program to inform communities of ongoing work and establish appropriate measures to minimize the disturbance caused by the work</li> </ul>
11	Construction	Construction of Baffle Chute to the bottom of the gully	<p>Risk of chute failure by flow undermining gully head, overtopping or bypassing. The failure occurs when storm runoff fails to enter the baffle chute properly especially when the runoff leaks and flow bypassing occur at the chute entrance</p> <p>Occurrence of risks associated with large storm events that exceeds the design capacity of the Chute</p> <p>Loss of fertile top soil for infertile sub-surface soil that would not enhance vegetation establishment</p>	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li>□ Specialist is engaged to supervise the construction of the Chute to avoid the potential by undermining, overtopping or bypassing</li> </ul> <p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li>□ Capacity of the Chute to handle the conveyance of a large runoff event that exceeds storms of 1 in 50 years recurrence interval shall be assessed</li> </ul> <p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li>□ During the construction of Chutes, topsoil shall be removed and stockpiled before shaping the gully head. On completion, the topsoil shall be spread to a depth of</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				150mm over the face and sides of the chute
			Risk of loss of life and damage of the proposed gully drainage infrastructure	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Chute shall be constructed on firm excavated soil rather than on the fill</li> <li><input type="checkbox"/> Storm water leaving the chute and outlet structure flows freely without causing undesirable ponding or scour</li> </ul>
12	Construction	Construction of Stilling Basin	Loss of agricultural lands and increase in the exposure of erodible soil	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Staged earthworks approach shall be adopted by working in staged sections to ensure no more than a specified area of soil is disturbed or exposed at any point in time</li> </ul>
			Loss of valuable topsoil that the could be used for seeding vegetation	<ul style="list-style-type: none"> <li><input type="checkbox"/> Non-dispersive topsoil shall be stockpiled to be used as final cover soil after the gully head has been filled to encourage vegetation growth and establishment</li> </ul>
			Workers exposure to risk of falls into excavated pit and occurrence of accident or injuries	<ul style="list-style-type: none"> <li><input type="checkbox"/> Gully remediation intervention shall be performed during the dry season when there is no flow of storm water from the catchment area above the gully head;</li> <li><input type="checkbox"/> NEWMAP shall ensure that excavation and fill operations are conducted in compliance with all HSE measures in manners that do not endanger lives and properties.</li> </ul>
			Risk of stilling basin	<ul style="list-style-type: none"> <li><input type="checkbox"/> NEWMAP shall</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
			failure and occurrence of flooding, overtopping resulting in stilling basing sweep out and downstream channel erosion	ensure the stilling basin is designed to the correct capacity to handle the intended purpose in the management of a 1 in 50 years storm flows
13	Construction	Filling and reclamation of the gully head	Occurrence of accident and safety risk incidents	<p>NEWMAP shall:</p> <ul style="list-style-type: none"> <li>❑ Undertake all earthmoving activities in steep sided gullies where undercut has occurred with great care, observance of safety measures and use of appropriate PPE</li> <li>❑ Develop and ensure implementation of HSE Plan</li> <li>❑ Use earthmoving equipment with strict adherence to all recommended safety procedures</li> <li>❑ All construction equipment, earthmovers and demolition equipment shall be located, guarded, shielded to prevent contact with the public</li> <li>❑ Stockpile non-dispersive topsoil to be used as final cover soil after the gully head has been filled to encourage vegetation growth and establishment</li> </ul>
14			Waste handling and disposal	<p>NEWMAP shall:</p> <ul style="list-style-type: none"> <li>❑ Ensure adequate sanitary facilities are provided during the construction and operation phases of the project;</li> <li>❑ Ensure that good housekeeping is maintained on the project site and all areas used;</li> </ul>

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				<ul style="list-style-type: none"> <li>❑ Ensure that all areas of the project site used by the public is properly maintained and are free from debris, solid waste litter, equipment, materials;</li> <li>❑ Ensure that Solid waste management is addressed in Contractor's HSE Plan; and</li> <li>❑ Ensure that the Contractor develops and implements a Solid Waste Management Plan approved by FMEnv in compliance with appropriate World Bank Safeguard Policies</li> </ul>
			Increase in turbidity and sediment load in downstream receiving water bodies	<p>NEWMAP shall:</p> <ul style="list-style-type: none"> <li>❑ Ensure that storm water flows from upstream catchment of the gully head are safely diverted away from the gully head; and</li> <li>❑ Ensure that the Ewu gully rehabilitation project is carried out during the dry season to prevent mobilization of sediment into downstream receiving water bodies</li> </ul>
15	Construction	Reshaping of the gully channel by cutting earth from gully side slopes to fill the gully channel floor	Increase in the amount of disturbed areas created by earthmovers used in reshaping the gully side slopes	<p>NEWMAP shall:</p> <ul style="list-style-type: none"> <li>❑ Ensure that storm water flows have been completely diverted above the gully head before this project activity</li> </ul>
			Contamination of downstream receiving water bodies by fertilizers, and pesticides as well as creation of excessive bare soils by	<p>NEWMAP shall</p> <ul style="list-style-type: none"> <li>❑ If necessary, authorize the use of selective herbicides with caution and precision to avoid excessive creation of large areas of bare soil</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
			herbicides if used for the establishment of the recommended plant species seeded to control soil erosion	and only use herbicide selected by a specialist to maintain the desired plant species
			Exacerbated gully erosion channel bed undermined and washing away of fill materials resulting in increased sediment load in receiving water bodies downstream	<p>NEWMAP shall ensure that:</p> <ul style="list-style-type: none"> <li>□ The shaping of the gully walls is carried out only in the dry season after the gully head has been established with a structure such as a Chute to prevent washing away of the fill material</li> </ul>
		Increase in the amount of disturbed areas created by earthmovers used in reshaping the gully side slopes	Risk of erosion of exposed gully side slopes and erosion of ground area above the gully channel divide	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>□ Stabilize cut and fill slopes with vegetative contour or anchored rock;</li> <li>□ Develop nurseries for the recommended plant species to serve as sustainable plant source for gully erosion side slope stabilization throughout the life span of the infrastructure</li> </ul>
			Loss of fertile top soil that could be used for seeding vegetation	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>□ Stockpile non-dispersive topsoil with its leaf litter and organic matter, and use as final cover soil after the gully head has been filled to encourage vegetation growth and establishment</li> </ul>
			Occurrence of bank erosion along reshaped gully channel slopes	<p>NEWMAP-Edo SPMU shall:</p> <ul style="list-style-type: none"> <li>□ Ensure that Contractors carry out placement and anchorage of the earth</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<p>materials cut from the gully sides properly;</p> <ul style="list-style-type: none"> <li>□ Ensure that the soil materials used to fill the gully bed are well compacted in dry no flow conditions;</li> <li>□ Ensure that Contractors Plant or seed the recommended plant species in close growing positions immediately after placement of gully fill materials to serve as vegetative buffer strips to reduce the erosion of soil particles;</li> <li>□ Ensure that Contractors Perform the entire civil work of reshaping the gully sides/banks and the filling of the channel bed and gully head as one operation</li> </ul>
16	Construction	Placement of Gabion Drop Structures in gully channel to reduce longitudinal gradient to 0.05%	Disturbance of unnecessary large land areas for transportation of materials and heavy earthmovers	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>□ Disturb as little ground area as possible and stabilize disturbed areas immediately to ensure soil loss is prevented from such locations</li> </ul>
17	Construction	Erosion protection of gully banks by cutting and sloping the sides of the gully bank to a 1:2 gradient	Loss of fertile top soil which could be used for seeding vegetation	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>□ Conserve topsoil with leaf litter and organic materials in stockpiles and use this material as cover soil in the filled gully head and the stabilized bank slopes of the channel to promote the growth of local native vegetation</li> </ul>
			Risk of occurrence of accident or injury	NEWMAP-Edo SPMU shall:

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				<ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure that the Ewu gully erosion rehabilitation project is carried out before the rainy season;</li> <li>Ensure that Contractors Plant the appropriate vegetation along the edge of the top of the edge of the top of the slope to serve as a protective buffer for the slope faces. The greenbelt would serve provide a buffer between the slop face and resident structures in residential areas</li> </ul>
18	Construction	Reconstruction of damaged road	Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles	NEWMAP-Edo SPMU shall ensure that Contractors: <ul style="list-style-type: none"> <li><input type="checkbox"/> Use equipment with high combustion efficiency.</li> <li><input type="checkbox"/> Use dust suppressants on the project site</li> </ul>
			Noise and vibration from vehicular movement	NEWMAP-Edo SPMU shall ensure that Contractors: <ul style="list-style-type: none"> <li><input type="checkbox"/> Provide Ear protective device to project workers at the site clearing stage;</li> <li><input type="checkbox"/> Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>
19	Construction	Reshaping the gully and installation of erosion protection facilities to enable safe conveyance of storm water downstream of gully head	Water quality deterioration	NEWMAP-Edo SPMU shall ensure that: <ul style="list-style-type: none"> <li><input type="checkbox"/> Gully reshaping and drainage infrastructure installations are done during dry season</li> <li><input type="checkbox"/> Appropriate sediment control measures and devices are used by the Contractors to prevent the mobilization of sediment in suspended solids into downstream water</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				bodies
			Risk of hearing impairment from increased noise and vibrations	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li>□ Contractors provide Ear protective devices to project workers at the site clearing stage;</li> <li>□ Contractors Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>
			Loss of wildlife	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>□ Establish a consistent route for construction equipment and materials to access the gully rehabilitation site and ensure adjoining areas are left undisturbed to provide opportunity for wildlife to migrate to unaffected areas;</li> </ul>
			Loss of valuable topsoil that could be used for seeding vegetation	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>□ Remove topsoil and store upstream within close proximity to the gully head in stockpiles out of reach of any form of channel flows;</li> <li>□ Stockpile non-dispersive topsoil to be used as final cover soil after the gully head has been filled to encourage vegetation growth and establishment</li> </ul>
20	Construction	Transportation of heavy equipment, construction materials and workers to the	Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>□ Use equipment with high combustion efficiency.</li> </ul>



IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
		project site		<ul style="list-style-type: none"> <li>❑ Use dust suppressants on the project site</li> </ul>
			Noise and vibration from vehicular movement	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>❑ Provide Ear protective device to workers at the site clearing stage;</li> <li>❑ Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>
			Traffic congestion and increased risk of occurrence of traffic accidents and injuries	<p>NEWMAP-Edo SPMU and Contractors shall avoid impeding traffic and traffic disruption around the project site by:</p> <ul style="list-style-type: none"> <li>❑ Adjusting work schedules so as not to disturb traffic;</li> <li>❑ Establishing an adequate system of road signs and detour;</li> <li>❑ Notifying communities of pending work scope, duration and location</li> <li>❑ Avoid blocking public access roads;</li> <li>❑ Using road signs to notify work in progress;</li> <li>❑ Complying with road bearing capacity and repairing damage caused to roads during and at the end of the work;</li> <li>❑ Circumventing access roads to gathering places in Ewu and neighbouring communities</li> </ul>
			Accidental release of fuels, oils, chemicals, hazardous materials etc., to ground in the construction laydown	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>❑ Establish appropriate protocols for materials delivery</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
			area during delivery of materials to project site	<p>and handling to ensure there are no spills;</p> <ul style="list-style-type: none"> <li>❑ Develop HSE plan to address prevention and containment of oil spills, chemicals and hazardous materials releases during all phases of the project;</li> <li>❑ Store and handle hazardous materials according to approved hazardous materials management plan</li> <li>❑ Ensure that all high risk areas that are potential sources of release of chemical contaminants such as: fuel and chemical storage areas; refueling areas; material stockpile areas; vehicle and equipment washing areas are located away from the gully erosion channel;</li> <li>❑ Situate fuel, oils and chemicals storage facilities on an impervious base within a bund capable to contain at least 110% of the volume stored,</li> <li>❑ Maintain transportation vehicles and machinery in good working order so as to avoid exhaust emissions as well as oil and fuel leaks</li> <li>❑ Report any oil/chemical spill to FMEv and Edo State Ministry of Environment</li> </ul>
21	Operation	Utilization of the rehabilitated gully site and installed storm	Risk of failure of the gully erosion installed drainage infrastructure to safely route storms of 1 in 50 years	<p>NEWMAP-Edo SPMU shall:</p> <ul style="list-style-type: none"> <li>❑ Ensure that the design basis and specifications of the</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
		water drainage infrastructure		proposed Edo State NEWMAP gully erosion rehabilitation project is accurately followed and achieved during the construction implementation
			Risks from debris and sediment accumulation in the drainage channels in upstream catchment area of the gully head, Diversion Culvert, Baffle Chute, Gabion Drop Structures and Stilling Basin resulting in performance failure of the drainage infrastructure	NEWMAP-Edo SPMU shall ensure that Contractors: <input type="checkbox"/> Develop and implement on a regular basis, a systematic Ewu Esan Central Gully Erosion Channel and Drainage Infrastructure Management Plan to remove sediments, debris, solid waste materials and aquatic plants from the channel, prevent the incidence of undercutting and scouring of the drainage infrastructure
			Risk of undermining and occurrence of scouring in the Baffle Chute could result in deteriorating performance of the structure	NEWMAP-Edo SPMU shall ensure that: <input type="checkbox"/> Scouring of the infrastructure and accumulation of sediment, litter and vegetation in drainage infrastructure are some of the factors that can cause under-functioning of the infrastructure. To effectively and regularly monitor the operation and functionality of the gully erosion control devices by a dedicated Contractor Representative in collaboration with a

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				Project Manager/Site Engineer from Edo State Project Monitoring Unit, a five-year maintenance contract should be added to the contractor's existing contract
22	Operation	Maintenance of the gully drainage infrastructure	Risk of failure of the gully intervention from poor maintenance of the drainage infrastructure to achieve the desired project objectives such as (Creation of new gullies within the channel; breeding of vectors in the settling basin, undermining of the drainage infrastructure and scouring of the drainage structure, etc.)	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>□ Develop and implement on a regular basis, a systematic Ewu Esan Central Gully Erosion Channel and Drainage Infrastructure Management Plan to remove sediments, debris, solid waste materials and aquatic plants from the channel, prevent the incidence of undercutting and scouring of the drainage infrastructure</li> <li>□ Conduct site inspection and monitoring as follows: <ul style="list-style-type: none"> <li>➤ Inspect erosion and sediment control devices installed at Ewu gully erosion intervention site within 24 hours of every rainfall or storm event;</li> <li>➤ The erosion, sediment and drainage control devices inspection should be by a person qualified and certified to perform this role. He could be a</li> </ul> </li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<p>project manage, site supervisor, or engineer working in Edo State SPIM unit of NEWMAP.</p> <ul style="list-style-type: none"> <li>➤ The Ewu gully erosion control infrastructure inspection and monitoring to: <ul style="list-style-type: none"> <li>✚ Ensure that the Ewu Esan Central Gully Erosion Channel and Drainage Infrastructure Management Plan is appropriate for the gully erosion site and is being implemented efficiently;</li> <li>✚ Ensure the erosion - sediment control and drainage infrastructure are properly maintained</li> </ul> </li> </ul>
			<p>Disruption of the side slopes during routine maintenance of the gully channels</p>	<p>NEWMAP-Edo SPMU shall:  Ensure special precautions are taken by Contractors when using backhoe to remove aquatic plants or sediment from the channel during maintenance. Ensure that the earthmover with vented slotted or cross-drilled bucket that allow water to seep out is used for maintenance operations. Once a bucketful of sediment or aquatic vegetation is picked up, the bucket should be raised to allow</p>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				most of the water to drain out over the gully channel or stilling basin. Then the earthmover's boom should be swung far from the gully channel bank so that water remaining in the spoil removed will flow away from the gully channel to prevent the erosion of the banks.
23	Decommissioning	Dismantling and removal of civil engineering equipment	Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Use equipment with high combustion efficiency.</li> <li><input type="checkbox"/> Use dust suppressants on the project site</li> </ul>
			Noise and vibration from vehicular movement	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Provide Ear protective devices to project workers at the site clearing stage;</li> <li><input type="checkbox"/> Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>
24	Decommissioning	Waste handling and disposal	Solid Waste generation, handling and disposal	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Solid waste management is addressed in Contractor HSE Plan</li> </ul>
			Poor housekeeping and environmental sanitation	<p>NEWMAP-Edo SPMU shall</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure the Contractor develops and implements a Solid Waste Management Plan approved by NEWMAP and FMEnv in compliance with appropriate World Bank Safeguard Policies</li> </ul>
25	Decommissioning	Transportation of solid waste, equipment and	Traffic congestion and increased risk of occurrence of traffic	NEWMAP-Edo SPMU and Contractors shall avoid impeding traffic and

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
		workers out of the project site.	accidents and injuries	<p>traffic disruption around the project site by:</p> <ul style="list-style-type: none"> <li>❑ Adjusting work schedules so as not to disturb traffic;</li> <li>❑ Establishing an adequate system of road signs and detour;</li> <li>❑ Notifying communities of pending work scope, duration and location</li> <li>❑ Avoid blocking public access roads;</li> <li>❑ Circumventing access roads to gathering places in Ewu and neighbouring communities</li> </ul>
			Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles	<p>NEWMAP-Edo SPMU shall:</p> <ul style="list-style-type: none"> <li>❑ Ensure that Contractors Use equipment with high combustion efficiency.</li> <li>❑ Ensure Contractors Use dust suppressants on the project site</li> </ul>
			Noise and vibration from vehicular movement	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li>❑ Contractors provide Ear protective device to workers at the site clearing stage;</li> <li>❑ Contractors Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>

A checklist of the Associated and Potential Impacts with each of these project activities at different project phases was documented in this chapter. The impact identification considers the magnitude, severity and duration of each of the impacts.

## **CHAPTER SIX: Environmental And Social Management Plan (ESMP)**

This chapter presents the specific objectives of the ESMP, the environmental and social impacts of the intervention identified, a discussion of the mitigation measures recommended to address the adverse project impacts, the institutional responsibilities and accountabilities, the capacity building requirements, the public consultation plan, the mechanism for resolving community conflicts and disagreements regarding the project activities in line with the ESMF, RPF, RAP, and Project Implementation Manual.

The mitigation measures are presented in relation to specific project activities that would cause them. The usual practice is to ensure the implementation of these measures as part of the overall operational plans and procedures that will be used by the Edo State Project Management Unit of NEWMAP and its Contractors. The two monitoring that will be undertaken consists of:

- (a) Environmental Auditing (Environmental impact monitoring), and
- (b) Environmental and social impact mitigation compliance monitoring.

In this chapter, the Institutional Arrangement for Monitoring Plan was addressed. The roles, responsibilities and institutional arrangements for the implementation of the mitigation measures and the monitoring activities outlined for the Ewu intervention project are clearly documented. Roles and responsibilities of the key stakeholders in the implementation of the ESMP are also clearly presented.

Capacity building training is essential for ensuring that the ESMP requirements are implemented. To this end, the relevant training and capacity building programs have been identified as pre-requisite for effective implementation of the Ewu gully erosion site rehabilitation project. The training course content, duration, target participants and the estimated cost are clearly documented.

The total cost for the implementation of the Ewu Gully Rehabilitation ESMP add up to US\$ 132,857. This cost also include Monitoring and Evaluation, as well as the Capacity Building Activities.



## **CHAPTER SEVEN: Summary and Conclusion**

Concise summary of each of the preceding chapters was presented here, and it was concluded that with careful implementation of this ESMP, the various phases of the proposed intervention project in Eguare-Ewu Gully site would be realized with minimal residual impacts to the physical, biological and social environment of the project affected communities.

# CHAPTER ONE

## INTRODUCTION

### 1.1 Introduction

Erosion is one of the surface processes that sculpture the earth's landscape and constitutes one of the global environmental problems. Soil erosion is perhaps the most serious mechanism of land degradation in the tropics (El-Swaify *et al.*, 1982). However, gully erosion is visually the most impressive of all types of erosion (El-Swaify, 1990), highly visible and affects soil productivity, restricts land use and can threaten roads, fences, buildings and human life (Afegbua *et al*/2016). It has been described as a well-defined water worn channel (Monkhouse and Small, 1978); a recently extended drainage channel that transmits ephemeral flow, steep side, steeply sloping or vertical head scarf with a width greater than 0.3 m and a depth greater than 0.6 m (Brice, 1966); a V or U-shaped trench in unconsolidated materials with a minor channel in the bottom, but not necessarily linked to a major stream (Graf, 1983); as well as a relatively deep, vertical-walled channel recently formed within a valley where no well-defined channel previously existed (Bettis III 1985). Gully erosion is an advanced stage of rill erosion where surface channels have been eroded to the point where they cannot be smoothed over by normal tillage operations (Hilborn, 1985).

Like in other parts of the world, gully erosion is one of the major environmental challenges facing Nigeria. The menace is more predominant in the eastern, southeastern and some parts of southwestern part of the country with Southeastern part regarded as gully erosion region (Igbokwe *et al* 2008) probably due to susceptibility of the soils in southern part of the country to erosion as well as varied underlying geology. Whilst Edo and Kogi states are most affected in southwestern Nigeria; Abia, Anambra, Ebonyi, Enugu, and Imo states are most affected in the southeast. In Edo state which is geologically underlain by sedimentary terrain, crystalline basement as well as sedimentary/crystalline basement contact; Ewu gully site is one of the ten gully erosion sites that has been selected by the State Project Management Unit (SPMU) of the Nigeria Erosion and Watershed Management Project (NEWMAP) for Engineering design and construction works in a bid to control

the erosion, inhibit the advancement of the gully from causing further damage and rehabilitate the eroded gullies.

## **1.2 Overview of the Nigeria Erosion and Watershed Management Project (NEWMAP)**

The Government of Nigeria is implementing the multi-sectoral Nigeria Erosion and Watershed Management Project (NEWMAP), which are financed by the World Bank, Global Environment Facility, the Special Climate Change Fund, and the Government of Nigeria. NEWMAP finances activities implemented by States and activities implemented by the Federal government. The project currently includes 7 states, namely Anambra, Abia, Cross River, Edo, Enugu, Ebonyi, and Imo.

The lead agency at the Federal level is the Federal Ministry of Environment (FMEnv), Department of Erosion, Flood and Coastal Zone Management. State and local governments, local communities and CSOs are or will be involved in the project, given that the project is a multi-sector operation involving MDAs concerned with water resources management, public works, agriculture, regional and town planning, earth and natural resources information, and disaster risk management.

The development objective of NEWMAP is: to rehabilitate degraded lands and reduce longer-term erosion vulnerability in targeted areas. At State level, NEWMAP activities involve medium-sized civil works such as construction of infrastructure and/or stabilization or rehabilitation in and around the gullies themselves, as well as small works in the small watershed where gullies form and expand. These works trigger the World Bank's Safeguard Policies including Environmental Assessment OP 4.01; Natural Habitats OP 4.04; Cultural Property OP 11.03; Involuntary Resettlement OP 4.12 Safety of Dams OP 4.37; Pest Management Safeguard Policy OP 4.09; and Projects on International Waterways OP 7.50.

### **1.3 Environmental and Social Safeguards Concerns**

The World Bank Environmental and Social Safeguards concerns for the NEWMAP are addressed by the policies that provide guidelines for the identification, preparation, and implementation of projects. These several policies are used to address environmental and social safeguards concerns for projects and these include but not limited to EA (OP/BP 4.01), Natural Habitats (OP/BP 4.04), and Forests (OP4.36) etc.

Other documents already prepared under the project include an Environmental and Social Management Framework (ESMF), Resettlement Policy Framework (RPF), the Project Appraisal Document (PAD) and the Project Implementation Manual (PIM). Specifically engineering designs are also prepared for the site-specific gully sites.

This report therefore focuses on the Environmental and Social Management Plan (ESMP) developed for the Ewu Gully Erosion Site in Esan Central Local Government Area of Edo State. The NEWMAP intends to reclaim and rehabilitate the gully erosion site so as to reduce the environmental impacts created in the targeted area. The proposed activities will employ some civil works such as channelization, remediation works of the gully site. The drainage systems upstream of the gully and possible ways of stabilising the gully have previously been examined in the Stormwater Master Planning and Concept Design Study. Details of the study and the approved conceptual designs are included in the Stormwater Master Planning and Conceptual Design Report – Part 1, revision 02 dated 30 November 2015.

This ESMP is prepared in accordance with standard procedures for environmental assessment including the applicable World Bank (WB) Environmental and Social Safeguard policies and Nigerian environmental assessment guidelines

### **1.4 Rationale for the ESMP**

A project's environmental and social management plan (ESMP) consists of the set of mitigation, monitoring, and institutional measures to be taken during implementation and operation to eliminate adverse environmental impacts,

offset them, or reduce them to acceptable levels. The plan also includes the actions needed to implement these measures. The ESMP is an essential safeguard element for Category B projects, such as the planned gully erosion rehabilitation works in Eguare-Ewu, Edo State.

This Environmental and Social Management Plan (ESMP) is therefore an important project management strategy that will manage the proposed Ewu gully erosion site rehabilitation project activities such that the potential environmental and social impacts arising from the project implementation will be mitigated, avoided or eliminated.

The ESMP outlines Edo State NEWMAP Project Management Unit's corporate commitment to managing the project implementations in a sustainable manner. The ESMP will also ensure compliance with applicable environmental standards all through the life span of the projects. The Bank will disclose the ESMP document publicly, in Nigeria and at the World Bank Info-shop before project implementation.

### **1.5 Objectives of the ESMP**

The objective of the Environmental and Social Management Plan (ESMP) is to set out the measures to be taken in addressing the identified adverse impacts of the various components and activities of the project. In addition, the ESMP is meant to develop procedures and plans to ensure that the mitigation measures will be implemented throughout the phases for the Remediation work of Ewu Gully Erosion site.

Specific objectives of this ESMP include the following:

Specifically, as indicated in the Terms of Reference (ToR) document provided as part of the contractual process for the project, the following objectives are outlined:

- 1) ESMP will include the measures needed to implement these actions, addressing the adequacy of the monitoring and institutional arrangements for the upper and lower watersheds in the intervention site.

## 1.6 Specific Tasks

The consultant is required to carry out the following tasks:

- Describe biophysical and social environment including the existing status of the sub-watershed (Upper/Lower) and gullies;
- Identify the potential environmental and social issues/risks associated with the intervention;
- Drawing on the feasibility and engineering report and site design, appropriate baseline indicators (for example, m<sup>3</sup>/sec of runoff collected in the sub-watershed during a heavy hour-long rainfall).
- Develop a plan for mitigating environmental and social risks associated with construction and operation in the gully intervention in consultation with the relevant public and government agencies;
- Identify feasible and cost-effective measures that may reduce potentially significant adverse environmental and social impacts to acceptable levels;
- Develop a time-bound plan for mitigating environmental and social risks associated with the specific intervention in the designated sub-watershed management in consultation with the relevant public and government agencies;
- Identify feasible and cost-effective measures that may reduce potentially significant adverse environmental and social impacts to acceptable levels;
- Identify monitoring objectives and specifies the type of monitoring, with linkages to the impacts assessed and the mitigation measures described above (in bullets 1-5);
- Provide a specific description of institutional arrangements: the agencies responsible for carrying out the mitigation and monitoring measures (e.g., for operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training) and the contractual arrangements for assuring the performance of each implementing agency;

- Define technical assistance programs that could strengthen environmental management capability in the agencies responsible for implementation;
- Provide an implementation schedule for measures that must be carried out as part of the project, showing phasing and coordination with overall project implementation plans; and
- Provide the expected capital and recurrent cost estimates and sources of funds for implementing the ESMP and inform accordingly the design consultants so that these costs are duly taken into consideration in the designs.
- Other tasks: The consultant shall assist the SPMU to:
  - i. Register the ESMP with the environmental assessment (EA) departments at Federal and State levels; and
  - ii. Disclose the finalized ESMP at National, State, LGA and Community levels.

### **1.7 Scope of Work**

Based on the terms of reference provided as part of the contract for this ESMP, it is expected that the consultant shall work in close collaboration with the SPMU project team, and the various other Agencies involved in the projects. The consultant shall visit the two intervention sites, to have a first-hand overview of the situation on ground at the sites, so that he will have adequate knowledge of the requirements for the ESMP, and identify the proposed management strategies to ensure the environment is appropriately protected and environmental issues are appropriately mitigated.

The specific scope of work will include the following:

- A. The consultant is expected to prepare the Environmental and Social Management Plan (ESMP) taking into consideration the activities in the intervention sites at Eguare-Ewu communities.
- B. The Consultant will prepare an ESMP, which will contain an environmental and social checklist, to be used as a screening mechanism for the identified activities of the project.

C. The consultant will identify any regulations and guidelines, which will govern activities of the nature contemplated by the proposed project including National and State legislation and regulations.

### **1.8 Deliverables**

The deliverable will include the preparation of Inceptions, draft and final ESMP Report, which will be acceptable to the Edo –NEWMAP SPMU Edo State, and to the World Bank.



## CHAPTER TWO

### POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

#### 2.1 Introduction

This section presents an overview of relevant regulations, treaties and conventions that apply directly or remotely to the proposed intervention project. The presentation here is essentially a brief summary of the relevant/applicable provisions of each guideline.

#### 2.2 Legal and Administrative Framework

A number of national and international environmental guidelines are applicable to the operation of the NEWMAP. In Nigeria, the power to enforce all activities that might impact 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 environmental criteria for projects, which must be met by project proponents before the agencies could invest in them.

##### 2.2.1 Administrative Structure for Environmental Management at the Federal (National) Level

Power for the management of the biophysical and socio-economic environment in Nigeria was vested in the now defunct Federal Environmental Protection Agency (FEPA), which was absorbed into the Federal Ministry of Environment (FMEnv) in 1999. Specific guidelines and regulations of the FMEnv are highlighted below:

##### 2.2.1.1 Federal Ministry of Environment

The act establishing the Ministry places on it the responsibility of ensuring that all development and industry activities, operations and emissions are within the limits prescribed in the National Guidelines and Standards, and ensure compliance with the relevant regulations for environmental pollution management in Nigeria as may be specified by the Ministry. To fulfill this mandate, a number of regulations/instruments are available (see “section on National Legal Instruments on Environment”), however, the main instrument in ensuring that environmental and social issues are mainstreamed into development projects is the Environmental Impact Assessment (EIA) Act No.

86 of 1992. With this Act, the FMEEnv prohibits public and private sectors from embarking on major prospects or activities without due consideration, at the early stages, of environmental and social impacts. The act makes an EIA mandatory for any development project, and prescribes the procedures for conducting and reporting EIA studies.

As part of the effective utilization of the EIA tool, the Ministry has produced 'Sectoral Guidelines' detailing the necessary requirements of the EIA process for each Sector. One of these Sectoral Guidelines that is applicable to the proposed project is the 'Sectoral Guidelines on Infrastructure Development'.

Within the FMEEnv, there is the Environmental Impact Assessment Division, headed by a Director; to take all responsibilities for EIA related issues. Still within the EIA division in FMEEnv, is the Impact Mitigation Monitoring (IMM) unit, with the special responsibility for monitoring the implementation of Environmental Management Plans (EMP) contained in the approved EIAs.

As contained in FEPA Acts 58 of 1988 and EIA of 1992 (Amended as EIA Act Cap 12, LFN 2004), FMEEnv has put in place statutory documents to aid the monitoring, control and abatement of industrial wastes. The statutory documents currently in place include though are not necessarily limited to:

- i. National Policy on the Environment, 1999;
- ii. National Environmental (Soil Erosion and Flood Control) Regulations, 2010 (S.I.12);
- iii. National Environmental Protection (Effluent Limitations) Régulations (S.1.8) 1991 ;
- iv. National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) (S.1.9) 2004;
- v. National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations (S.1.15) 1991;
- vi. Guidelines and Standards for Environmental Pollution Control in Nigeria 1991;
- vii. Sectorial Guidelines for EIA 1995;
- viii. Harmful Wastes (Criminal Provisions) Decree No. 42, 1988;
- ix. National Policy on the Environment, 1989;

- x. Environmental Impact Assessment Procedural Guidelines, 1995;
- xi. Environmental Impact Assessment (EIA) Act No. 86 of 1992; and
- xii. Environmental Impact Assessment (Amendments) Act, 1999.
- xiii. National Guidelines and Standards for Water Quality, 1999
- xiv. National Guidelines on Environmental Management Systems (EMS), 1999
- xv. National Guidelines on Environmental Audit in Nigeria, 1999

These statutory documents clearly state the restrictions imposed on the release of toxic substances into the environment and the responsibilities of all industries whose operations are likely to pollute the environment. Such responsibilities include provision of antipollution equipment and adequate treatment of effluent before being discharged into the environment.

FMEEnv also has put in place procedural and sectorial guidelines detailing the EIA process including a categorization of environmental projects into Categories I, II and III (referred to by the World Bank as categories A, B and C respectively). The guidelines require that a complete EIA be performed for category I projects, Category II projects may not require an EIA depending on the screening criteria, while Category III projects do not require an EIA.

In addition to the guidelines for EIA, Decree No. 86 contains provisions for the screening of projects according to impact potential, including listed activities for which mandatory EIA preparation is required:

- a. Category I projects will require a full Environmental Impact Assessment (EIA).
- b. Category II projects may require only a partial EIA, which will focus on mitigation and environmental planning measures, unless the project is located near an “Environmentally Sensitive Area” (ESA) in which case a full EIA is required.
- c. Category III projects are considered to have “essentially beneficial impacts” on the environment, for which Environmental Impact Statement (EIS) will be prepared.

### **2.2.1.2 National Environmental Standards and Regulations Enforcement Agency (NESREA)**

NESREA Act 27 of 2007 established the National Environmental Standards and Regulations Enforcement Agency (NESREA), and the Agency works under the FME<sub>env</sub>. NESREA is saddled with the responsibility of the protection and development of the environment, biodiversity conservation and sustainable development of Nigeria's natural resources in general and environmental technology, including coordination and liaison with relevant stakeholders within and outside Nigeria on matters of enforcement of environmental standards, regulations, rules, laws, policies and guidelines. The functions of the Agency include:

- Enforcement of compliance with laws, guidelines, policies and standards on environmental matters;
- Coordinate and liaise with stakeholders, within and outside Nigeria, on matters of environmental standards, regulations and enforcement;
- Enforce compliance with the provisions of international agreements, protocols, conventions and treaties on the environment including climate change, biodiversity conservation, desertification, forestry, oil and gas, chemicals, hazardous wastes, ozone depletion, marine and wild life, pollution, sanitation and such other environmental agreements as may from time to time come into force;
- Enforce compliance with policies, standards, legislation and guidelines on water quality, environmental health and sanitation, including pollution abatement;
- Enforce compliance with guidelines and legislation on sustainable management of the ecosystem, biodiversity conservation and the development of Nigeria's natural resources;
- Enforce compliance with any legislation on sound chemical management, safe use of pesticides and disposal of spent packages thereof;
- Enforce compliance with regulations on the importation, exportation, production, distribution, storage, sale, use, handling and disposal of hazardous chemicals and wastes, other than in the oil and gas sector;

- Enforce through compliance monitoring, the environmental regulations and standards on noise, air, land, seas, oceans and other water bodies other than in the oil and gas sector;
- Ensure that environmental projects funded by donor organizations and external support agencies adhere to regulations in environmental safety and protection;
- Enforce environmental control measures through registration, licensing and permitting systems other than in the oil and gas sector;
- Conduct environmental audit and establish data bank on regulatory and enforcement mechanisms of environmental standards other than in the oil and gas sector;
- Create public awareness and provide environmental education on sustainable environmental management, promote private sector compliance with environmental regulations other than in the oil and gas sector and publish general scientific or other data resulting from the performance of its functions; and
- Carry out such activities as are necessary or expedient for the performance of its functions.

**2.2.1.3 Other Relevant National Policies and Regulations  
National Environmental (Soil Erosion and Flood Control) Regulations,  
2010 (S.I.12)**

The overall objective of this regulation is to check all earth-disturbing activities, practices or developments for non-agricultural, commercial, industrial and residential purposes.

**Natural Resources Conservation Council Act 286 of 1990**

This provision is aimed at establishing the Natural Resources Conservation council to be responsible for the conservation of natural resources of Nigeria and to formulate national policy for natural resources conservation.

**The National Policy on the Environment 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, in particular to:

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

### **Proposed Nigerian Environmental Management Act No 20 of 2004**

This act was drafted following the amalgamation of FEPA and FMEnv (see section 2.1.2) but was never ratified. The proposed Act sought to repeal the 1988 FEPA Decree No.58 (amended No.59 and No.14). It does not repeal any other environmentally related legislation. As well as the general environmental provisions, which include environmental sanitation and occupational health, it specifies the powers of authorized officers, penalties and fines. The Act gives the Minister the authority to grant environmental permits for prescribed activities that include sand mining but not any other mining activities.

## **Land Use Act 1978**

The legal basis for land acquisition and resettlement in Nigeria is the Land Use Act 1978 and modified in 1990. The followings are the selected relevant sections:

Section 1: Subject to the provision of this Act, all land comprised in the territory of each state in the Federation are hereby vested in the Governor of each state, and such land shall be held in trust and administered for the use and common benefit of all Nigerians in accordance with the provisions of this Act.

Section 2: (a) All land in urban areas shall be under the control and management of the Governor of each State; and (d) all other land shall be under the control and management of local government within the area of jurisdiction in which the land is situated. Therefore, according to the Land Use Act, all land in Nigeria is vested in the Governor of each State, and shall be held in trust for the use and common benefit of all people.

The administration of land area is divided into urban land, which will be directly under the control and management of the Governor of each State; and nonurban land, which will be under the control and management of the Local Government. The Governor of each State will have the right to grant statutory rights of occupancy to any person or for any purpose; and the Local Government will have the right to grant customary rights of occupancy to any person or organization for agricultural, residential and other purposes.

The Act gives the government the right to acquire land by revoking both statutory and customary rights of occupancy for the overriding public interest. In doing so, the Act specifies that the State or Local Government should pay compensation to the current holder or occupier with equal value.

## **2.2.2 Edo State Regulations Relating to Environmental Management**

### **Edo State Sanitation and Pollution Management Law No. 5 of 2010**

The statutory responsibility of protecting and/or ensuring the protection of the environment in Edo State rests on the Edo State Ministry of Environment. Relevant sections of this provision are as follows:

Section 8 is a provision on Disposal of Refuse. Subsection 1 prescribes that 'No person shall dispose of refuse or waste except through a Waste Manager approved by the Board or appropriate authority for the area where he resides or carries on business'.

Subsection 2 states that it shall be an offence for any person to bury; burn or dispose waste in drains or moat.

Section 13 provides for Maintenance of Drains, Sewage and Septic Tanks.

Subsection 1 prescribes that every person shall:

- a. Clean and maintain any drain in the frontage, sides or rear of his tenement or building; and
- b. Provide suitable holding tank for liquid waste or sewage and ensure regular evacuation and disposal of it.

Subsection 2 provides that no person shall cause or knowingly permit any sewage effluent or liquid waste to be discharged into any drain or drainage system, road, gorges, water courses or any part thereof except at such place as may be authorized by the appropriate authority.

Section 16, subsection 1 prohibits throwing or burying of industrial or commercial waste on any tenement or open space.

Subsection 2 prohibits erection or construction of or use of an incinerator without prior approval or permit of the appropriate authority or its designate and Subsection 3 prohibits the setting of fire to the contents of any owned litterbin.



Section 34 subsections 1 stipulates the periodic payment of Environmental Remediation and Pollution Management Levy for environmental remediation, management and pollution related activities in the State by all industrial or commercial establishment in the State.

Subsection 7 stipulates the right of the appropriate authority to seal-up any business or commercial organization that refuses to obey the Environmental Remediation and Pollution Management.

Subsection 9 provides a penalty of two million naira (N2, 000,000) for any corporate organization that break the seal and open such sealed premises.

Section 36 is Dumping of Toxic waste and electrical or electronic waste in the State.

Subsection 3 stipulates that electronic/electrical waste generated within the State may be disposed off in manner as may be specified by the appropriate authority, with emphasis on recycling of useful components.

Subsection 4 prohibits the translocation, disposal or dumping of radioactive waste in any part of the State.

Subsection 5 provides a penalty of fine as prescribed in the schedule to the State or a term of imprisonment of 10 years or both fine and imprisonment.

Section 45 is Environmental Impact Assessment (EIA) and Related Matters in the State. Subsection 1 provides that all development projects in the State shall undergo EIA process before commencement under the supervision of the appropriate authority. Subsection 4 provides a fine of not less than Five Million Naira (N5, 000,000) and/or closure of such facility of any company, establishment, corporate organization etc. who contravenes this section and is convicted.

Section 45 is Environmental Auditing of all Industrial Facilities. This section mandates the conduct of periodic (every 2 years) Environmental Audit on facilities and operations of all industrial establishments whose activities have or are likely to have environmental impacts. It also mandates such audit to be

carried out by Federal and State Ministry of Environment accredited Consultant. The section also prescribes a fine to any defaulter.

Section 47, subsection 1, prescribes the establishment of Environment, Health and Safety (EHS) units in each corporate organization or company.

Subsection 2 prescribes a minimum fine of ten thousand naira (N10, 000) and a maximum of One million naira (N1, 000,000) and/or closure of such facilities of any corporate organization or group who fails to establish or create EHS units with relevant personnel with required basic qualifications, experience and training.

Section 52, subsection 1 provides that it is the sole responsibilities of all who impact negatively on the environment to provide adequate and timely funding for the remediation of all impacted sites and ecosystems in the State; including the logistics for rapid response to distress calls/signals from the impacted/degraded zone(s). Subsection 4 prescribes a fine of not less than Ten million naira (N10, 000,000) for corporate organisations that contravenes provisions of section 52.

Section 59 provides the creation of Special Environmental Protection court for the purpose of trying cases relating to degradation, pollution and abuses of land, air and water, environmental remediation and pollution management levy and payment of compensation, claims and all other environmental quality management related matters.

Section 60 prescribes the polluter pay principle (PPP).

Subsection 1 stipulates that owners and/or operators of facilities shall be responsible for confirmatory test/experiments that shall be carried out from time to time to ascertain their various claims as to the status of their immediate impacted environment.

### **2.2.3 International Regulatory Framework**

A number of international regulations apply to this project. Some of these regulations and guidelines include but not limited to the following:

## **World Bank OP/BP 4.01: Environmental Assessment (EA)**

This is one of the 10+2 Environmental and Social Safeguard Policies of the World Bank. It is used in the Bank to examine the potential environmental risks and benefits associated with Bank lending operations. Under OP/BP 4.01, Bank lending operations are broadly defined to include investment lending, sector lending, rehabilitation, lending through financial intermediaries, and investment components of hybrid lending. Prototype Carbon Fund (PCF) and Global Environmental Facility (GEF) co-financed projects are also subject to the provisions of OP/BP 4.01.

Under this guideline, The Bank requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. EA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. The Bank favours preventive measures over mitigatory or compensatory measures, whenever feasible.

EA takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources); and trans-boundary and global environmental aspects. EA considers natural and social aspects in an integrated way. It also takes into account the variations in project and country conditions; the findings of country environmental studies; national environmental action plans; the country's overall policy framework, national legislation, and institutional capabilities related to the environment and social aspects; and obligations of the country, pertaining to project activities, under relevant international environmental treaties and agreements.

The Bank does not finance project activities that would contravene such country obligations, as identified during the EA. EA is initiated as early as possible in project processing and is integrated closely with the economic, financial, institutional, social, and technical analyses of a proposed project. The Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of EA. The Bank classifies the proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

**Category A:** A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. For a Category A project, the borrower is responsible for preparing a report, normally an EIA (or a suitably comprehensive regional or sectorial EA) that includes, as necessary, elements of the other instruments referred to in paragraph 7.

**Category B:** A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas--including wetlands, forests, grasslands, and other natural habitats--are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A. Like Category A EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The findings and results of Category B EA are described in the

project documentation (Project Appraisal Document and Project Information Document).

**Category C:** A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

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

For projects that require Banks funding, the borrower is responsible for carrying out the EA. For Category A projects, the borrower retains independent EA experts not affiliated with the project to carry out the EA. For Category A projects that are highly risky or contentious or that involve serious and multidimensional environmental concerns, the borrower should normally also engage an advisory panel of independent, internationally recognized environmental specialists to advise on all aspects of the project relevant to the EA. The role of the advisory panel depends on the degree to which project preparation has progressed, and on the extent and quality of any EA work completed, at the time the Bank begins to consider the project.

Depending on the project, a range of instruments can be used to satisfy the Bank's EA requirement: environmental impact assessment (EIA), regional or sectorial EA, environmental audit, hazard or risk assessment, and environmental management plan (EMP). EA applies one or more of these instruments, or elements of them, as appropriate. When the project is likely to have sectorial or regional impacts, sectorial or regional EA is required.

Other Banks guidelines and procedures that were considered in this study include: Natural Habitats (OP 4.04), Pest Management (OP 4.09), Physical Cultural Resources (OP 4.11), Involuntary Resettlement (OP 4.12), Safety of Dams (OP 4.37), and Projects on International Waterways (OP 7.50).

An overview of the specific World Bank OPs that are triggered by the current projects in Ewu are shown in **Table 2.1** below.

**Table 2.1: Summary of IFC Performance Standards and their applicability to the proposed Project**

Operational Policy	Requirements	Rationale	EIA Reference
OP 4.01: Environmental Assessment	The OP requires that the Project initiate regular assessment of the potential social and environmental risks and impacts and consistently tries to mitigate and manage these potential impacts on an on-going basis.	The Project has environmental and social aspects <sup>1</sup> , which may pose potential E&S risks and/or impacts. These include for example, land clearing, civil work activities, and engagement of labour. Best practice suggests that all projects, as long as E&S aspects exist, should possess systems for assessing and managing the potential risks and impacts resulting from such E&S aspects. Therefore OP 4.01 is applicable.	Chapter 3 – Existing Biophysical Environment of the Project Area  Chapter 6 – Project Impacts and Mitigation Measures  Chapter 7 – Environmental and Social Management Plan (ESMP)
OP 4.09: Pest Management	In assisting borrowers to manage pests that affect either agriculture or public health, the Bank supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides. In Bank-financed projects, the borrower addresses pest management issues in the context of the project's environmental assessment	In the event that swamps develop in the areas where diverted floodwaters are channelled, pest issues may arise, especially disease pathogens and thus require pest management. Therefore, OP 4.09 is applicable to this project.	Chapter 6 – Impacts and Mitigation
OP 4.12: Involuntary resettlement	The Project is required to develop a resettlement action plan so that physically or economically displaced individuals have their living conditions and livelihoods restored or improved.	There will be need to acquire some land and property, including farmlands, to create room for the diversion as well as to arrest the continued development of the existing gullies. Therefore OP 4.12 is applicable to this project	Chapter 3 – Existing Biophysical Environment of the Project Area  Chapter 6 – Project Impacts and Mitigation

<sup>1</sup> An environmental or social aspect is defined as an element of a project's activities, operations, products, or services that can or does interact with the environment, people, surrounding communities and/or the larger society.

Operational Policy	Requirements	Rationale	EIA Reference
			Measures  Chapter 7 – Environmental and Social Management Plan (ESMP)

**Other International Conventions**

In her responsiveness and responsibility in regional and global efforts towards sustainable development particularly in the safeguard of the environment and natural resources, Nigeria has entered into a number of international treaties and conventions. Being signatory to the conventions, Nigeria pledges to uphold the principles of such conventions. Some of the conventions considered in this project are as follows:

**African Convention on the Conservation of Nature and Natural Resources, Algiers, 1968**

This convention came into force in Nigeria on 7<sup>th</sup> May 1974. The objectives of the convention is to encourage individual and joint action for the conservation, utilization and development of soil, water flora and fauna for the present and future welfare of mankind, from an economic, nutritional, scientific, educational, cultural and aesthetic point of view.

**Convention on Wetland of International Importance, Especially as Water Fowl Habitat, Ramsar, Iran, 1971**

This provision came into force in Nigeria on 2<sup>nd</sup> February 2001 with the objective to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value.

**Convention on Biological Diversity, Rio de Janerio, 1992**

This convention came into force in Nigeria on 27<sup>th</sup> November 1994. The objectives are to conserve biological diversity, promote the sustainable use of its components and encourage equitable sharing of the benefit arising out of the utilization of genetic resources. Such equitable sharing includes

appropriate access to genetic resources as well as appropriate transfer of technology, taking into account existing rights over such resources.

**Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora, Washington, D.C., on 3 March 1973; Amended at Bonn, on 22 June 1979**

This convention identifies floral and/or faunal species that are threatened with extinction and in which trade and exportation may play a part in accelerating their extinction. It also places restrictions on trade in such species and stipulates measures to be taken by parties to the convention, which include penalties for trade in listed species and options for confiscation and/or return to original place the species were taken from.



## CHAPTER THREE

### DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT

#### 3.1 Introduction

The description of the biophysical environment provides information on the Ewu gully erosion site at Eguare Ewu in Edo State and the factors that enhanced the emergence of the gully. The section also presented an overview of the general biophysical environment setting of Edo State, along with some specific environmental information on the proposed project site. Information presented here was obtained from a combination of sources, including literature (published and unpublished), recent environmental studies around the project site and field sampling and laboratory analyses conducted specifically for this project. This section also provides overview of the various options considered for the intervention project and the justification for the preferred option.

#### 3.2 Description of Erosion Gully Site

##### 3.2.1 Location of the Erosion Gully at Ewu

Ewu is located about halfway between Benin City and Auchi, just north of the Benin City – Auchi road in Esan Central Local Government area of Edo State. A massive gully has developed near the lower part of Ewu town where the main road crosses the drainage line (**Plate 3.1**). The gully is very deeply incised and becomes shallower towards the outlet, The gully developed along northwest – southeast trending riparian zone, intercepts and destroys the road linking Eguare and Ehanlen communities and partly destroyed a building (**Plate 3.2**). Some other buildings located southward of the gully head and along the riparian zone are severely threatened by the gully erosion. The length of the gully is about 1000 m. It steadily decreases in depth from an initial depth of approximately 14 m at the gully head at the road in the village, to 8 m approximately 500 m downstream. Its eventually daylighted approximately 700 m downstream. The streambed is relatively steep for a section downstream of where the gully daylighted. Further head cut is located in the gully bed some 300m downstream of the gully head. It is likely that this head cut is migrating upstream towards the current gully head, which

could cause additional instability in the current gully head area if it is not stabilised (**Figure 3.1a & b**). Various buildings are under threat upstream of and around the gully head. The further advancement of the gully needs to be stopped and drainage master plan for the community developed to prevent further damage and loss of lives.



**Plate 3.1. A section of the Gully in Ewu, Esan Local Government Area of Edo State, Nigeria**



**Plate 3.2: Gully at Ewu showing some affected Houses and Tarred Road as at March 2017**



Figure 3.1a: Satellite imagery of Gully Erosion Site at Ewu Town.



**Figure 3.1b: Satellite imagery of Gully Erosion Site at Ewu Town.**

### **3.2.2 Factors that Enhanced the Emergence of the Gully Erosion at Ewu**

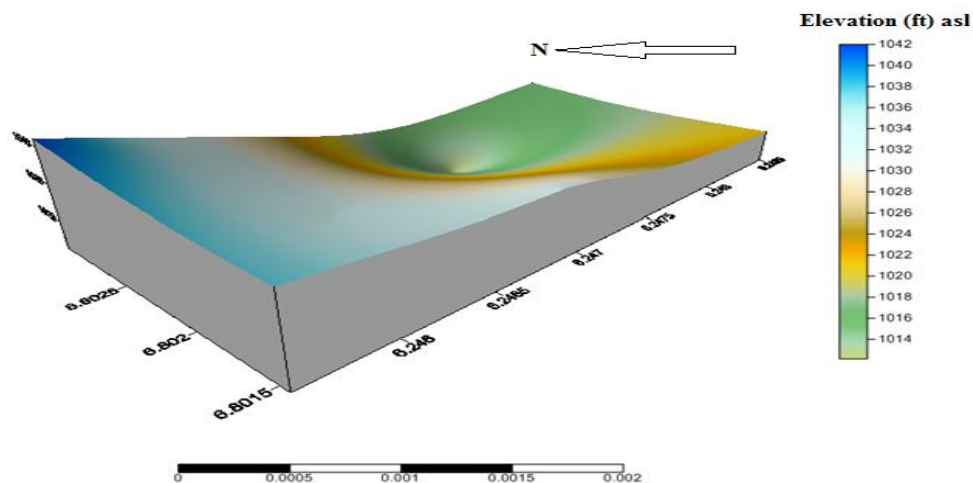
The road entering Ewu settlement from the west side of the Benin–Auchi Road contains large drainage channels on each side. These channels collect and channel flows to the gully head from the western part of the catchment. The gully developed as a result of the road drainage, which collects flows from across the catchment and concentrates them to the gully site, together with an increase in hardened surfaces in the catchment due mainly to anthropogenic influence which results in increased peak flows. The catchment that drains to the gully at Ewu is approximately 2.4 km<sup>2</sup> in size determined by means of a GIS. Part of the catchment area consists of wild forest and bush; a part is cultivated and a part urbanized. Of the total catchment, approximately 40% is undeveloped, while the rest (approximately 60%) lies within a developed area. Approximately 20% of the catchment consists of hardened surfaces such as roads, roofs or compacted earth where infiltration of water into the soil is very low. The eastern

side of the catchment is bordered by the Benin–Auchi road, which contains a large side drain that cuts off some flows and redirects them away from Ewu into an adjacent catchment. A road in Ewu village also directs flows into the catchment of the gully.

Peak flows were determined to be approximately 37 m<sup>3</sup>/s at the gully head, increasing to approximately 48 m<sup>3</sup>/s at the end of the gully, and taking additional inflows from the sides into account.

### 3.2.3 Geomorphology and Landscape

The topography dips towards the gully from Eguare and Ehanlen communities at the western and eastern part of Ewu town respectively with elevation ranging from 1012 ft. (337.3m) to 1042 ft (347.3m) above sea level (**Figure 3.2**). The gully aligns with northwest – southeast trending riparian zone in the area (**Figure 3.3**), which has been invaded with buildings. These suggest discharge from the road drainage from both Eguare and Ehanlen communities' end of the town as well as increased peak flows resulting from encroachment of the riparian zone might have probably enhanced the development of the gully. The conceptual model of the gully site as shown in **Figure 3.3** suggests the area of influence to be about 10 – 20 m away from the edge of the gully head eastward and westward. This is however subject to engineering properties and integrity of the soils.



**Figure 3.2: Digital Elevation model of the topography around Ewu gully head**

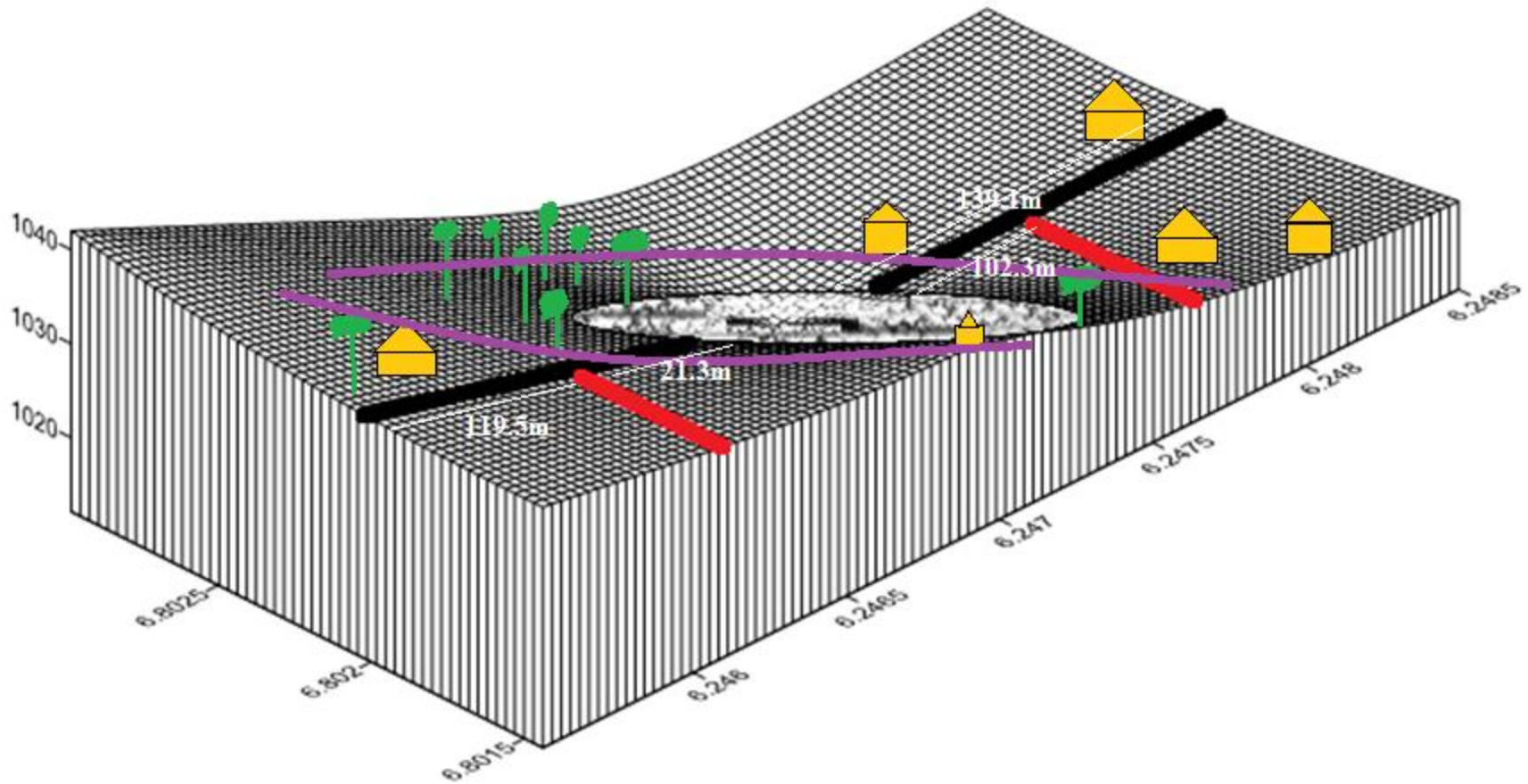


Figure 3.3: Conceptual model of Ewu gully head (the main and adjoining roads are in black and red colour respectively; shelters are in yellow; the riparian zone is as represented by green trees; and the area of influence is as delineated by purple arc)

### 3.2.4 Surface and Groundwater Hydrology

There were neither hand dug wells nor surface water as at the time of field visit on February 23 through 25, 2017 but a water borehole (**Plate 3.3**). The major source of water is through rain harvest (**Plate 3.4**) suggesting the water table is very deep and scarcity of potable water in the area especially during dry season. This is exemplified by reasonably large number of people fetching water from the only bore hole as at the time of field visit in February 2017. Discussions with Ewu residents indicated that the ground water table is very deep and is several order of magnitude below the gully bottom thus lending further credence to the postulation that the gully was caused rather by surface flow and not subsurface flow.

Based on the findings during the field visit that there were no hand dug wells; the groundwater flow pattern and hence groundwater recharge and discharge area could not be delineated. Hence, the localized watershed of the gully could not be determined and as such the development of the gully cannot be attributed to subsurface flow but rather run-off and surface flow. However, both local run-off and surface flow in the area could not have mustered such a very high energy to cause a gully head of depth of such high magnitude and lateral extent except there are contributions from external sources. It is on this premise that the watershed catchments of the gully at Ewu have been conceived as rather from the neighbor-hood, (**Figure 3.4**), specifically, areas on a relatively topographically higher altitude (enclosed in red oval in **Figure 3.4**) which could provide the run-off with high kinetic energy originated from high potential energy as a result of the altitude and hence high flow velocity. This is as corroborated by the material balance around the gully head (**Figure 3.4**) suggesting in-flows to Ewu gully head as:

#### **In-flow 1**

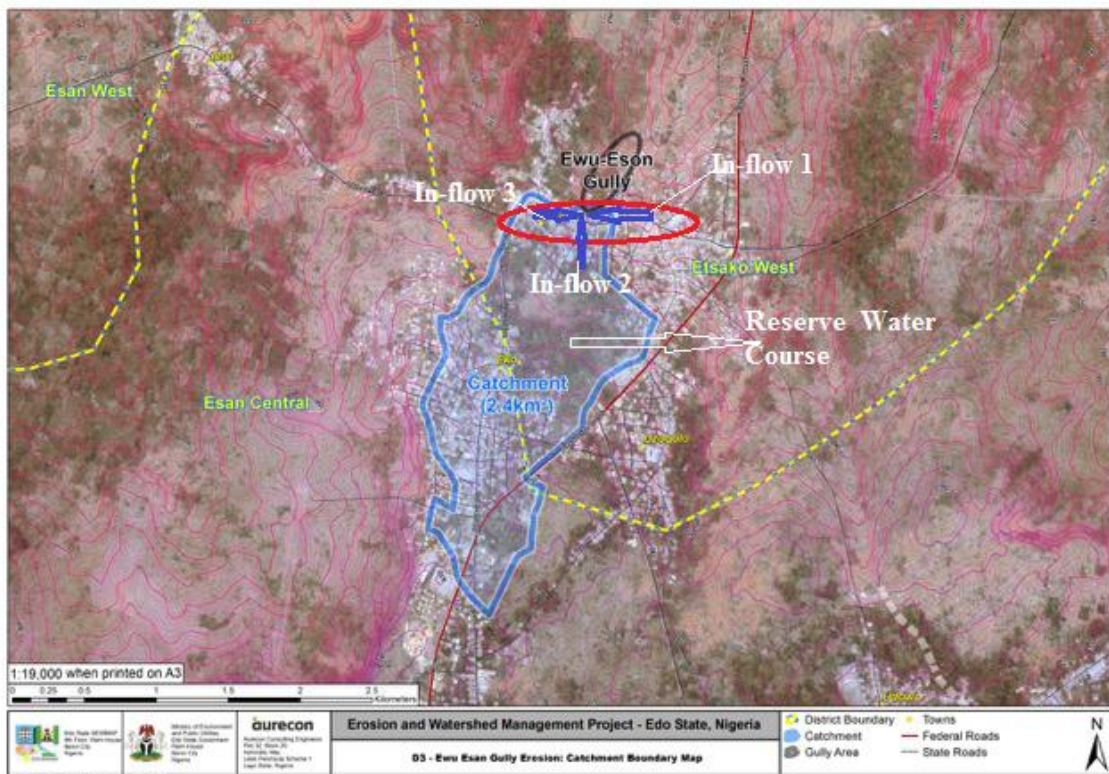
The in-flow 1 is the discharge from the road drainage and peak flows from Ehanlen community end of the town. The flow is enhanced by relatively east – west dipping topography (**Figure 4.5**) with estimated slope of  $0.63^\circ$  (estimated hydraulic gradient of 0.011) towards the gully head.

### **In-flow 2**

The in-flow 2 is provided by northwest – southeast trending riparian zone and could be attributed to peak flows, which could occur during flooding of the reserve water course.

### **In-flow 3**

The in-flow 3 is the discharge from the road drainage and peak flows from Eguare community end of the town. The flows are collected probably from the run-offs due to urbanization in the neighborhood, specifically, at southwestern part and favoured by west-east dipping topography (**Figure 3.3**) with estimated slope of  $2.72^\circ$  suggesting a hydraulic gradient of 0.047.



**Figure 3.4: Water shed catchment of the gully head at Ewu and material balance around the gully showing inflows.**





**Plate 3.3: Water borehole at Ewu (6.80144°N, 6.24689°E)**



**Plate 3.4: Typical Rainwater Harvest Facility at Ewu**

### **3.2.5 Topographical Survey of the Ewu Esan Central Gully**

The surveys of existing stormwater infrastructure and erosion gullies included the following:

- The gully invert and rim (main gully and sub-gullies, locally referred to as “fingers”) from the start point (inlet) to the discharge point (outlet);
- The gully surveys indicate the nature of the stage of gully development (i.e. whether V- or U-shaped) and where local slope stabilization may be needed to prevent damage to assets, etc. near the gully rim;
- The determination of the existing road / carriageway / stormwater infrastructure centerlines and edges;
- Fixing the infrastructure alignment by using a combination of traversing and tacheometry with total stations and GPS used for the control of directions and bearings;
- Cross section surveys of roadways at intervals not exceeding 20 m and not less than 15 m outside the existing right of way (ROW), if applicable;
- The establishment of benchmarks in permanent concrete posts (at 500 m intervals). All benchmarks were plotted and referenced regarding X, Y and Z values on the drawings. Secondary beacons, as required, will also be installed;
- The positions and levels of cross drainage structures, drainage channels and larger drainage structures such as culverts;
- The details of all utilities and services, trees with a girth larger than 0.3 m, buildings, huts, fencing, etc. within the ROW, if applicable; and
- The outline of critical structures that are located near erosion gullies that need to be protected against loss or damage.

The above information was used to generate digital terrain models (DTMs), on which the proposed design was based.

### **Topography of the Ewu Esan Central Area**

The gully is very deeply incised and becomes shallower towards the outlet. The length of the gully, is about 1 000 m.

### **3.3 Proposed Intervention Project at Ewu Gully Site**

#### **3.3.1 Aims of the Ewu Esan Central Gully project**

The aims of the Ewu gully intervention projects are:

- To route the catchment flow around the gully head so as to bypass the head of the gully and to discharge the flow back into the gully at a safe distance downstream;
- To manage the energy of the flowing waters in such a way that the flow discharges back into the gully in a controlled manner;
- To manage the flow in the downstream section of the gully so as to limit velocities thereby avoiding the need for surface lining and to ensure that extensive vegetation cover is established;
- To backfill, landscape and re-vegetate the gully head;
- To provide facilities with sufficient capacity to intercept surface flows into the gully bypass system; and
- To rehabilitate the damaged rural tarred road.

#### **3.3.2 Scope of Ewu Gully Rehabilitation work**

The scope of the work was as follow:

- Desk studies, a field investigation and a site assessment;
- A detailed topographical survey of the affected area;
- Hydrological studies to determine stormwater runoff;
- The engineering design of all structures including:
  - Hydraulics;
  - Reinforced concrete;
  - Slope stability;
  - Layout and earthworks;
- Risk and safety considerations;
- Preparation of a Bill of Engineering Measurement and Evaluation (BEME), priced and unpriced;
- Tender documentation; and
- The final design report.

### **3.4 Analysis of Project Intervention Options**

The proposed remedial measures of the gully at Ewu include: *modification of the drainage system into consisting of various intakes upstream of the gully head, a short diversion around the gully head, chute and energy dissipator and gully stabilization. In addition, the gully head will be filled and the affected portion of the Main Road will be reconstructed.* This will however further require: *Management of storm water within the catchment area above the gully so as to reduce the peak flow quantity and mitigate the impacts of development within the catchment; Safe routing of the storm water that caused the gully to form through or around the problem area in such a way that it does not cause any further erosion; Dissipation of energy of the water once inside the gully; Stabilization of the gully side slopes and handling of local runoff so as to improve public safety and prevent further erosion of the surfaces of the slopes; Protection of the base of the side slopes from being undermined; and prevention of the base of the gully from eroding.* In this section, the environmental implication and management of the options considered are appraised, discussed and more environmentally friendly option and cost effective option selected.

#### **3.4.1 Alternative options considered for the intervention (Including reason for their rejection)**

##### **(i) Routing the storm water into the gully**

The goal here is to prevent further damage and erosion in the gully while routing the storm water into the gully from the upstream catchment along a new route or safely into and down the gully. The available options proposed to overcome this challenge are:

*Option 1: Divert flow in a channel away from or around the gully head. Flow could be routed either back into the gully at a point downstream, or into a neighbouring stream (which could include erosion protection of the receiving stream if this was found to be necessary). This option will usually allow construction of the outfall on firm, in-situ material. It will also allow construction to*

*take place in dry conditions while run-off continues to flow into the gully. Once completed, flows may then be diverted into the new channel allowing rehabilitation of the gully head to take place.*

This option could result to creation of new erosion channels and could be more costly as there will be need to dredge the receiving stream to accommodate the storm water as well as constructing new channels. It is therefore rejected.

*Option 2: Direct routing of flow into the gully at the head of the gully. Since the gully head is often dangerously close to buildings or roads, this option will usually require some filling of the gully head prior to construction of the new outfall channel.*

Since option 1 also requires rehabilitation of gully head; option 2 could be less expensive and not likely result to new erosion channels. Option 2 is therefore accepted and could be more effective using stepped-baffle chute (**Plate 3.5**), which is capable of enhancing energy dissipation through reduction in the flow velocities as water enters the downstream channel. The spikes included also prevent undue acceleration of the flow as it passes down the chute.



**Plate 3.5: Stepped baffle chute**

**(ii) *Dissipating the energy at the base of the gully***

The stepped baffle option design chosen will ensure the energy of water as it falls has been well dissipated before it gets to the base of the gully. Based thereon; no stilling base will be required save the leveling should be well aligned to achieve a gentle horizontal stream bed gradient to protect the base of the side slopes from being undermined or incised as well as prevented aggradation or degradation from taken place.

***(iii) Stabilizing the side slopes of the gully***

After construction has been completed or in certain situations, when construction is still on going, the slopes of the gullies will need to be protected against further erosion from local influences, such as rain falling on the soil surface, local runoff and even the action of people and animals passing over the slopes. The options for slope stabilization include (US EPA):

*Option 1: Temporary seeding*

*Temporary seeding is presumably employed as a temporary measure to prevent or control the danger of erosion prior to construction work. The practice uses fast growing grasses or other suitable species, which are seeded as soon as practicably possible after disturbance has taken place. Temporary seeding is only practical in wet climates and all the sites in Edo State should present no problems for temporary seeding if it is required.*

A permanent and effective option rather than a temporary option, which could be an extra cost to the project, is preferred. Temporary seeding option is a temporary measure and possibly of no benefit since construction will start in earnest.

*Option 2: Mulching*

*Mulching is a temporary soil stabilization or erosion control practice where materials such as grass, hay, woodchips, wood fibers, straw or gravel are placed on a surface. Mulch tends to stabilize the surface of the soil and reduce the speed of runoff. It*

*does not require subsequent removal at a later stage because it breaks down naturally. It is cheap and can be used in conjunction with seeding for a permanent soil stabilization solution. The US EPA recommends areas steeper than 2:1 or areas where runoff is flowing across the area are mulched when seeding is undertaken.*

Since Mulching is used in conjunction with temporary seeding, the rejection of Temporary seeding option implies rejection of mulching option.

#### *Option 3: Geotextiles*

*A geotextile is a porous fabric manufactured for use in construction. Some*

*geotextiles are biodegradable while others are not. When used alone geotextiles can be used as matting over the soil surface. They can also be used on recently planted slopes to protect seedlings until they become established.*

The use of geotextiles is also rejected on the premise of rejection of Temporary seeding option.

#### *Option 4: Chemical stabilization*

*Chemical stabilization of soils is a temporary erosion control practice. Materials made of vinyl, asphalt or rubber is sprayed on to the surface of the soil to hold it in place. Chemical stabilization can be used as an alternative to temporary seeding practices and can provide immediate, effective and inexpensive erosion control. Chemical stabilization can cause impervious surfaces, which in turn can lead to increased runoff downstream. It can also cause harmful impacts on water quality if not used correctly. It is usually more expensive than vegetative cover.*

The use of chemical stabilization will defeat the purpose behind safe dropping of waters into the gully because the resultant impervious surface will further enhance the flowing velocity, which could lead to incision, aggravation and

degradation. Furthermore, the chemical used could be a source of pollutant to aquatic organisms downstream or at point of discharge. Chemical stabilization option is therefore rejected

*Option 5: Permanent seeding and planting*

*Permanent seeding is probably the most suitable soil stabilization alternative at the NEWMAP sites because of the high rainfall and warm climate, where plants grow very fast and do not need constant attention after they have established. Vegetation reduces runoff velocities, holds the soil together, provides habitat for wildlife and is aesthetically pleasing. It is also cheap. It is important to select appropriate species that are preferably indigenous and non-invasive. Timing of planting in Edo State is probably less of an issue than in many other parts of the world, but the soils may need conditioning prior to planting. Topsoil needs to be imported and established where planting is desired if topsoil does not already exist in these areas, or where mulching and fertilizer alone cannot sufficiently improve soil quality.*

Permanent seeding and planting could be effective in controlling and preventing the erosion as well as aesthetically pleasing. However, the imported topsoil could be washed away during a heavy downpour and may require replacement and hence additional cost to ensure survival of the seed. Furthermore, the imported soils are not localized and may require maintenance and hence an extra cost. The importation of the topsoil could also require foreign exchange and be expensive. The permanent seeding option is therefore rejected.

*Option 6: Sod stabilization*

*Sod stabilization can be used when seeding may not be immediately effective enough. Grass or other vegetation sods are laid down on the soil in a pattern that covers the entire area. Sodding is more expensive than seeding.*



Since Sodding is more expensive than seeding, it is rejected on the same premise as permanent seeding and planting option.

*Option 7: Soil retaining measures*

*Soil retaining measures include structures or vegetative stabilization practices used to hold the soil firmly to its original place or confine it within the site boundary. Examples include reinforced soil retaining systems and stream bank protection using shrubs and reeds. Soil retaining measures are used when other methods are not practical (such as vegetation), and can be expensive.*

The roots of the shrubs could be invasive and cause further havoc. Soil retaining measures is also expensive. It is therefore rejected.

*Option 8: Re-grading of the slope*

*The slope can be graded back to a stable slope and can have additional benefits such as making it safer for people and animals.*

Slope re-grading option is acceptable because it is more a re-conditioning option.

**(iv) Stabilizing the base of the side slopes**

The bases of the gully slopes are particularly vulnerable to erosion due to the erosive effect of water flowing in the base of the gully. The flow could undercut the side slopes by incision, resulting in slip surfaces developing and subsequent collapse of the slopes. Various options available for the protection of the base of the side slopes are:

*Option 1: Vegetated rock walls*

*Vegetated rock walls (**Figure 3.5**) prevent surface erosion and shallow mass movement of the slope by stabilizing and protecting the base of the slope and are discussed by the United*

*States Department of Agriculture, 2007). It can provide edge habitats and reduce the need to grade back the banks. They are not designed to resist earth pressure and are most applicable in high-energy streams with narrow riparian corridors, a very similar situation to the gullies.*

The presence of habitat at the edge makes the walls susceptible to collapse as a result of activities of the anticipated increased population of the habitat. Specifically, the roots of the plants could penetrate the space between the rocks thereby increasing the sizes of the pore spaces and hence enhance infiltration and aeration. The environment of the habitat will therefore become non-anoxic favourable to the growth of the roots of the plants as well as accelerated oxidation process that could to reduction in strength of the intervening rock mass. Vegetated rock walls option is therefore rejected.

*Option 2: Sloping bench*

*A sloping bench can be provided behind the wall to serve as a transition slope on which vegetation can be planted. Tamped earth is placed behind the wall and also in places between the rocks as they are placed. Live branch cuttings can be placed in interstices of the rock wall as it is constructed, with the butt ends of the branches extending into the backfill behind the wall.*

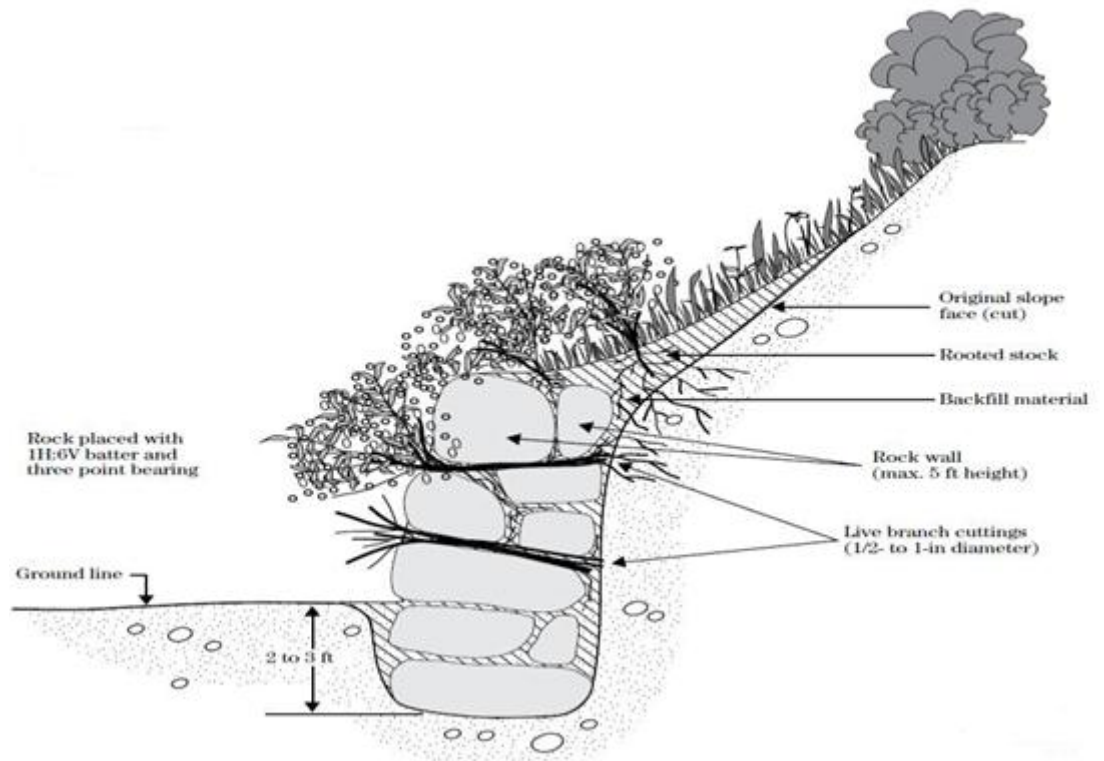
The roots of the planted vegetation could be invasive, penetrate the base of the wall and result to eventual collapse of the wall. Sloping bench option is therefore rejected.

Other options that may be considered include the use of coconut fibers rolls, gabions, reno-mattresses, riprap or cement stabilized sandbags. However, a riprap option is acceptable, as it would prevent incision by flowing water at the base of the wall by reducing the flow velocity thus preventing further erosion.

**(v) Stabilizing the floor of the gully**

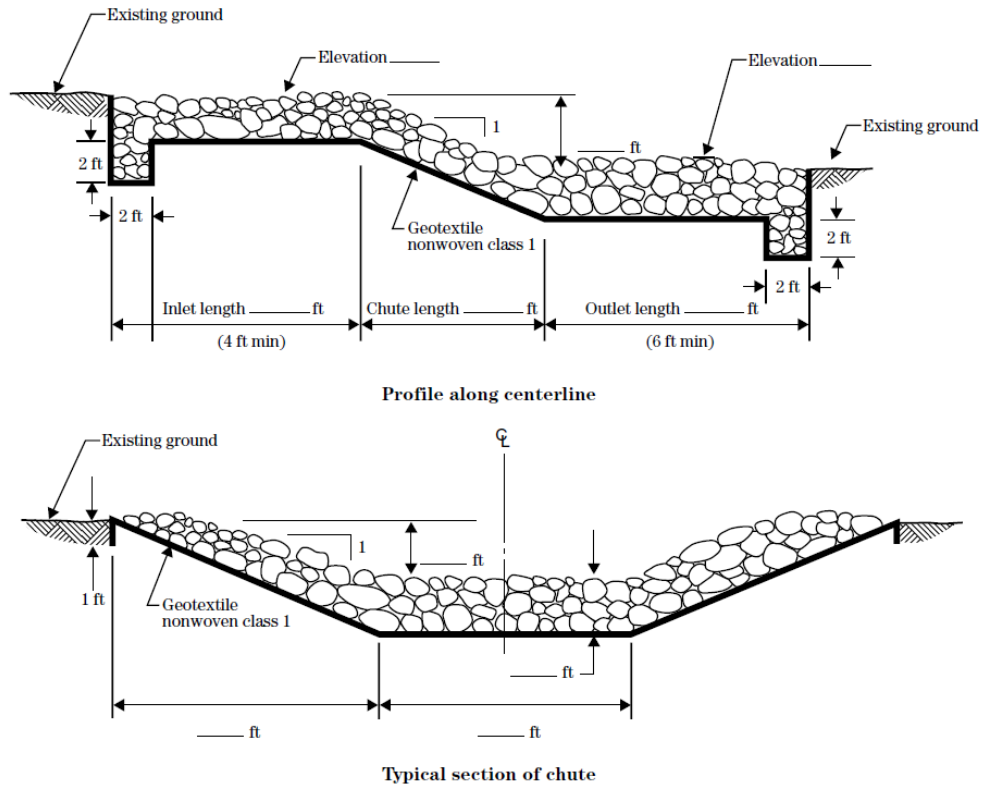
After the water has been routed safely into the gullies, the water will then need to be safely routed down the gullies without causing further erosion. The

stabilization of the Floor of the gully can be achieved by re-grading the gully bed to a stable gradient

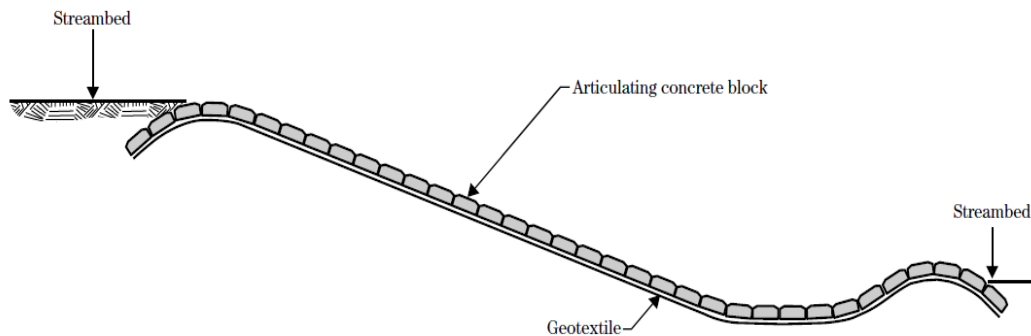


**Figure 3.5: Vegetated rock walls**

(Grade control structures) employing concrete drop structures, gabion drop structures, sheet pile structures, rock structures built out of riprap (**Figure 3.6**) or articulated concrete block systems (**Figure 3.7**) as well as continuous lining of channel using either Rip-rap, Reno-mattress or articulated concrete blocks. Rock chute grade control structure with riprap channel lining is the preferred option for stabilizing the floor of the gully. The combination will ensure flow on the floor of the gully to be laminar and incapable of causing aggradation thus preventing further erosion and safe routing to the point of discharge.



**Figure 3.6: Typical rock chute grade control structure (Adapted from USDA, 2007)**



**Figure 3.7: Articulated concrete block system (Adapted from USDA, 2007)**

### 3.5 Quality Assurance and Quality Control (QA/QC) for the Proposed Intervention Project

The general conditions of contract are based on the World Bank harmonized FIDIC document for large works. The specifications are mostly based on the SATCC standard specifications for workmanship and materials. The British Standards are also to be used. In the Bill of Engineering Measurement and Evaluation (BEME), the major quantities are as follows:

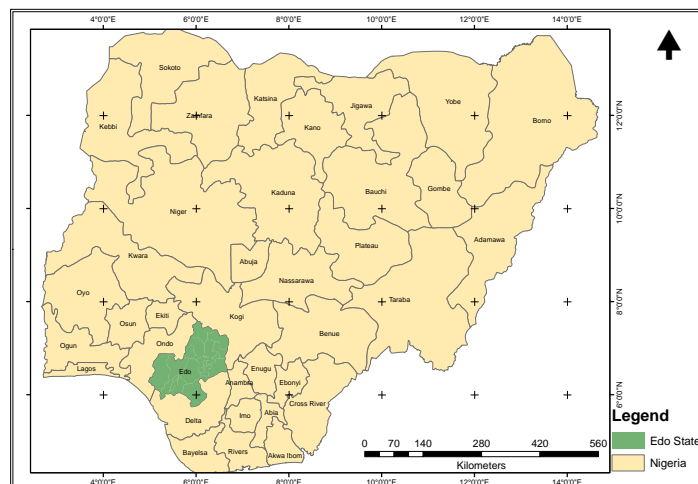
- Concrete 3300 m<sup>3</sup>

- Structural steel 410 t
- Formwork 8600 m<sup>2</sup>
- Fill earthworks 45 000 m<sup>3</sup>
- Cut earthworks 38 000 m<sup>3</sup>
- Volume of gabions 7400 m<sup>3</sup>
- Filter Fabric 35 000 m<sup>3</sup>
- Area to be vegetated 4.0 ha

### 3.6 Description of Project Environment

#### 3.6.1 Overview of the Project State

Edo State with its administrative headquarter in Benin City was created out of former Bendel state in August 27, 1991 by the then regime of General Ibrahim Babangida. The state is one of the thirty-six (36) states in Nigeria. Edo state is located in the South-South geopolitical zone of the country and it is bounded in the north and east by Kogi State, in the south by Delta State and in the west by Ondo State (**Figure 3.8**). The State occupies an area of about 17,802 km<sup>2</sup>. Apart from Benin City (capital of the ancient Benin kingdom), which provides administrative and industrial functions, some other major towns in the state include Ubiaja, Auchi, Ekpoma and Uromi. There are several other settlements within the state.



**Figure 3.8: Map of Nigeria Showing Edo State**

Generally, it is a low-lying area except in the north where it is marked by undulating hills. Thus, the combinations of topography, climate condition, soil condition and unregulated land use have brought about high numbers of

gullies in the State. The State has over 123 gully sites and this makes it one of the states with the highest numbers of gully erosion sites in Nigeria. The Ewu gully erosion site is one the gully erosion sites that have been identified in Edo State.

### 3.6.2 Physical Environment of Edo State

#### **Climate and Meteorology**

The climate of Edo State, as in other parts of Nigeria is driven by the seasonal oscillations of the Inter-tropical Discontinuity Zone (ITDZ) movement. ITDZ separates two principally different air masses: Atlantic equatorial hot and humid tropical maritime air mass, and tropical warm and dry air mass of the Sahara desert. The north – south oscillation of ITDZ determines the seasonal variations in the weather and climatic conditions in Nigeria, where the two principal seasons are rainy and dry.

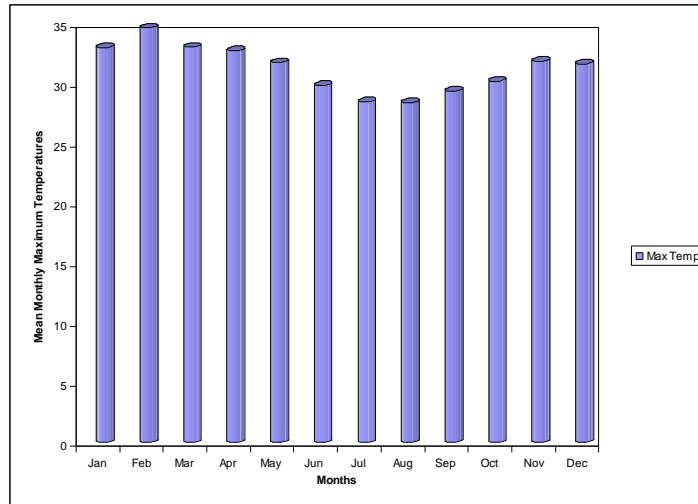
#### ***Temperature and Sunshine***

The temperature characteristics observed in Edo State correspond to what is typically obtained in most part of the middle belt of Nigeria. Temperature here is moderated by the effect of the two dominant wind systems in the country. Maximum temperatures typically range between 28°C and 34°C (**Table 3.1** and **Figure 3.9**). The higher values are recorded in the dry months between December and March, which also coincide with periods of high sunshine. Mean sunshine hours per month vary from 53 hours in July (the wettest month) to 176 hours in January (the driest month). The low sunshine hours in the region are associated with the thick cloud cover that prevails in this climatic belt for most of the year.

**Table 3.1: Mean Monthly Maximum Temperatures in Edo State**

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Benin	33.08	34.7	33.1	32.8	31.8	29.9	28.5	28.42	29.4	30.24	31.9	31.7

**Source: NIMET, Oshodi**



**Figure 3.9: Pattern of the Mean Monthly Maximum Temperatures in Edo State**

**Rainfall**

The hydrological cycle depends fundamentally on the inter-relationship between the circulation of the ocean and the atmosphere. Water is withdrawn from the oceans into the atmosphere by the process of evaporation, which is dependent on factors such as air/sea temperatures, wind strength and humidity. In addition, there is usually a dry spell on rainfall distribution annually. Rainfall in Edo State is generally high, due to the relative proximity to the coast. Rain falls all through the year with the peak between June and October and the highest number of rain days also occurred within the same period. However, the lowest amount of rainfall occurs in the month of December, while the lowest rain days are recorded in February. The mean monthly rainfall in Benin synoptic station is shown in **Table 3.2** and **Figure 3.10**. Total annual rainfall is typically in excess of 2,500mm.

**Table 3.2: Mean Monthly Rainfall (mm) in Edo State**

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Benin	43.5	56.7	125.6	200.3	285.6	230.8	383	278	398	254.7	101.4	45

**Source: NIMET, Oshodi**

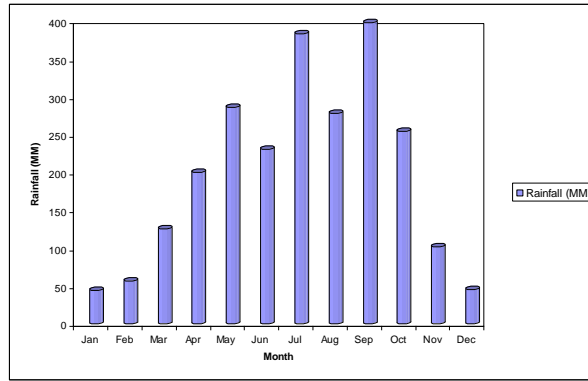


Figure 3.10: Pattern of Rainfall Distribution in Edo State.

**Relative Humidity**

The relative humidity (RH) in Edo State is high. The highest relative humidity in the morning (0900 hrs.) is about 84.0% and this often occurs in July, while the lowest is obtained in January with a value of about 59.0%. **Table 3.3** and **Figure 3.11** show that RH increases gradually from January through to September when it reaches its peak and after which it starts to decline until January. Typically, there is a direct correlation between rainfall and humidity, such that the lower humidity values coincide with the periods of low rainfall (December to March), while the higher values occur in the peak of the rains, between June and October. The RH record is higher for 0900hrs than for 1500hrs throughout the months.

**Table 3.3: Mean Monthly Relative Humidity in Edo State**

Rel. Humidity (%)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Benin	59	59	64	66	69	76	84	79	85	75	68	57

Source: NIMET, Oshodi

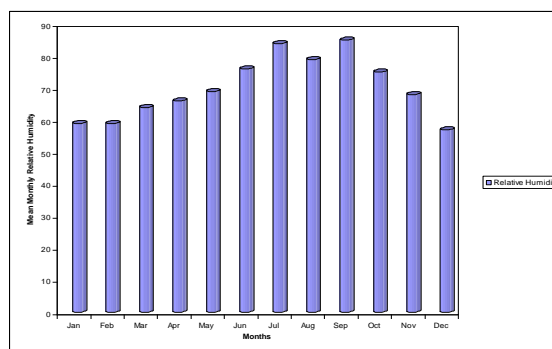


Figure 3.11: Mean Monthly Relative Humidity in Edo State



### **Wind System**

The climatic conditions of the state are influenced by two wind systems related to a global passat system; south-westerly (SW) and the north-easterly (NE). The former (SW) is due to the influence of the Atlantic Ocean air mass, and reversed passat system of the southern hemisphere, while the latter (NE) arises from the passat system of the northern hemisphere blowing from the Sahara desert. The SW winds, which predominate from April to August, have a speed range of 5.7 to 9.0 knots (mean  $7.4 \pm 1.4$  knots), but over the annual cycle, the overall mean is  $5.7 \pm 2.2$  knots, and this corresponds to light breeze on the Beaufort scale. Gentle and moderate breezes occur mostly from June to September.

### **Air Quality and Noise Levels**

No specific air quality sampling was undertaken for this ESMP. Thus, the information presented here is taken from previous studies around Edo State, including a recent EIA for proposed MTN BTS Stations around Edo State (2015).

The summary of air quality and noise measurements around Edo State is presented in **Table 3.4**. At present, air quality is being increasingly assessed against legally adopted standards, as shown in **Table 3.5**.

**Table 3.4: Summary of Air Quality and Noise Measurements around Edo State**

Values	Suspended Particulate Matter ( $\mu\text{g}/\text{m}^3$ )	Noise Level dB(A)	CO	NO <sub>2</sub>	SO <sub>2</sub>	THC	H <sub>2</sub> S	NH <sub>3</sub>
			(PPM)					
Minimum	25	40	0.1	ND	ND	ND	ND	ND
Maximum	74	84	2.5	ND	ND	ND	ND	ND
Mean	49.5	51	1.5	ND	ND	ND	ND	ND

Source: MTN Base Station EIA (2015); ND = not detected

**Table 3.5: Nigerian ambient air quality standard**

Air Pollutants	Limits
Particulates	250 ( $\mu\text{g}/\text{m}^3$ )
SO <sub>2</sub>	0.1 (ppm)
Non-methane <i>Hydrocarbon</i>	160 ( $\mu\text{g}/\text{m}^3$ )
CO	11-4 ( $\mu\text{g}/\text{m}^3$ ) or 10 (ppm)
NO <sub>x</sub>	0.04-0.06 (ppm)
Photochemical Oxidant	0.06 (ppm)

**Source: FMEnv, 1991**

In Nigeria, the Federal Ministry of Environment (FMEnv) has adopted the standards of WHO and other developed countries as the national interim standards for gaseous emissions against which air quality parameters monitored are compared in order to ascertain its “cleanliness”.

Total suspended particulates in ambient air around Edo State were generally low ranging between  $25\mu\text{g}/\text{m}^3$  and  $74\mu\text{g}/\text{m}^3$ . This is far below the FMEnv limit of  $250\mu\text{g}/\text{m}^3$  and is probably reflective of the fact that the data presented here were collected in the rainy season. Typically, rainfall contributes substantially to scrubbing the atmosphere of suspended particulates through wet deposition.

When compared with the air quality standards of Jain *et al.* (1976), shown in **Table 3.6**, it can be seen that air quality in the state is of high quality.

**Table 3.6: Air Quality Classification Based on TSP Values**

Range of TSP Values ( $\mu\text{g}/\text{m}^3$ )	Class of Air Quality
0 – 75	High Quality
76 – 230	Moderate Quality
231 – 600	Poor Quality

**Source: Jain, et. al (1976)**

Noise level ranged between a low of 40 dB(A) and a high of 84dB(A), with mean values at 51dB(A). To a large extent, high noise emissions arose from anthropogenic activities such as vehicular movement, generators, trading activities and even music blaring either from religious houses or from Music

Recording Stores. In general, noise levels in the state complied with the 8-hr exposure limit of 90dB(A) set by the FMEnv.

## Geology and Geomorphology of Edo State

Edo State lies within the Niger Delta thereby making its geology typical of the Niger Delta Basin. The area forms part of a geological sequence of the Quaternary and Tertiary formations of the Niger Delta. The Tertiary section of the Niger Delta is divided into three formations, representing prograding depositional phases that are distinguished mostly on the basis of sand-shale ratios.

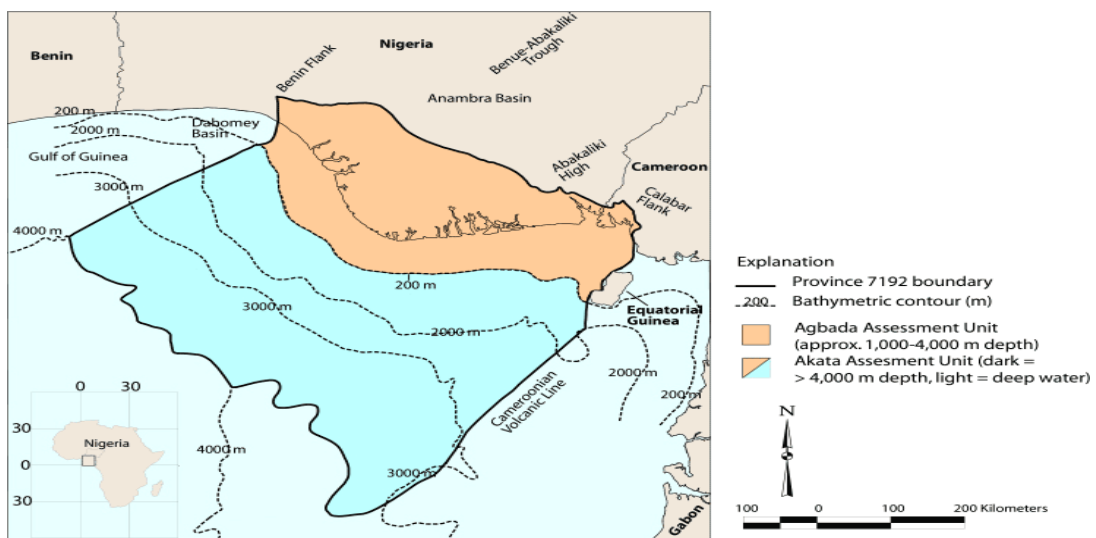


Figure 1. Map showing the extent of the Agbada Assessment Unit (71920101) and the Akata Assessment Unit (71920102). The Agbada Unit overlies the Akata Unit where the two overlap areally.

### Figure 3.12: Structural Elements of the Niger delta. Source: Odoh *et al.*, 2012.

The Akata Formation at the base of the delta is of marine origin and is composed of thick shale sequences (potential source rock), turbidite sand (potential reservoirs in deep water), and minor amounts of clay and silt. Beginning in the Paleocene and through the recent, the Akata Formation formed during low stands when terrestrial organic matter and clays were transported to deep-water areas characterized by low energy conditions and oxygen deficiency. The formation underlies the entire delta, and is typically over-pressured. Turbidity currents likely deposited deep-sea fine sands within the upper Akata Formation during development of the delta.

Deposition of the overlying Agbada Formation, the major petroleum-bearing unit, began in the Eocene. The formation consists of paralic-silicic-clastics over 3700 meters thick and represents the actual deltaic portion of the sequence. The clastics accumulated in delta-front, delta-top set, and fluvio-deltaic environments. In the lower Agbada Formation, shale and sandstone beds were deposited in equal proportions. However, the upper portion is mostly sand with only minor shale inter-beds.

The Agbada Formation is overlain by the third formation, the Benin Formation. A continental latest Eocene to Recent deposit of alluvial and upper coastal plain sands that are up to 2000 m thick.

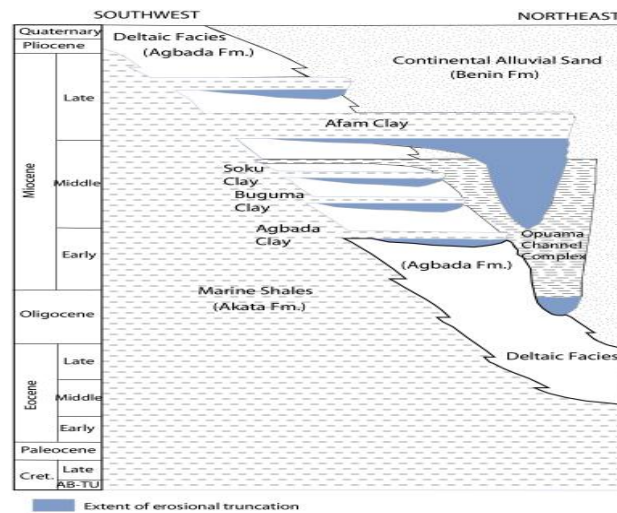


Figure 7. Stratigraphic column showing the three formations of the Niger Delta. Modified from Shannon and Naylor (1989) and Doust and Omatsola (1990).

**Figure 3.13: Structural Elements of the Niger delta. Source: Odoh *et al.*, 2012.**

The younger sediments (Holocene) found near the present shoreline consist of barrier beaches, coastal-barrier sands and river mouth sand bars which merge into laminated sandy and silty clays and eventually into fine clays on the continental shelf, edge and continental slope seaward (Allen, 1965). In terms of superficial deposits, the litho-stratigraphy shows brown silty clay to a depth of 6m overlain by medium and fine silty sands at Akoku-Uno, and the southern part of the field.

**Table 3.7: Geologic units of the Niger Delta**

Geologic unit	Lithology	Age
Alluvium (General)	Gravel, sand, clay, silt	
Freshwater back swamp, meander belt	Sand, clay, some silt, gravel	
Saltwater mangrove swamp and back swamp	Medium-fine sands, clay and some silt	Quaternary
Active/abandoned beach ridges	Sand, clay, and some silt	
Sombreiro-Warri deltaic plain	Sand, clay, and some silt	
Benin formation (Coastal Plain Sand)	Coastal to medium sand; subordinate silt and clay lenses	Miocene-Recent
Agbada formation	Mixture of sand, clay and silt	Eocene-Recent
Akata formation	Clay	Paleocene

Source: Akpokodje, 1989

Overlying these sequences in most of the basin are Quaternary deposits. Four geomorphologic units characterize these deposits (Wigwe, 1975). These are:

- (i) **The Deltaic Plain Belt (Sombreiro-Warri):** This is an extensive low-lying area dominated by fluvial systems, some with braided characteristics, although a few meander belts are developed. The flood plains are vegetated with raffia palms while the inter-fluvial settings are characterized by oil-palm. The typical lithology is fine-coarse grained sand.
- (ii) **The Freshwater Swamps and Meander Belts:** These are represented by abandoned meander loops (ox-bow lakes) and extensive point bars. It is capped by natural levees with the crevasse splay deposits typifying flood plains. The stratigraphy in places consists of a top grey-black organic clay or silty clay overlying a predominantly sandy lithology with intercalating clay.
- (iii) **The Saltwater Mangrove Swamp Belt.** These areas surround the estuaries, creeks and lagoons, and are dominated by a system of interconnecting fairly rectangular meandering tidal creeks, cut-off meander loops surrounded by centrally depressed tidal flats in places. Thick undergrowth's and rich mangrove vegetation characterize this belt. The stratigraphy is highly variable, made up

of a top layer of black silty clay/clay underlain by a predominantly sandy lithology intercalated.

- (iv) **Coastal Islands and Beach Ridges:** This belt includes both the active and abandoned ridges facing Tile Sea, separated by the various river mouths which dissect them into small islands - 5 - 47 Km long and approximately 12 Km wide. The upper layer is made up of fine to medium grained sand below which is an organic peaty silty clay or clay. A predominantly sandy lithology with some gravelly characteristic is found deeper below

### **Tectonics of the Niger Delta**

The tectonic framework of the continental margin along the West Coast of equatorial Africa is controlled by Cretaceous fracture zones expressed as trenches and ridges in the deep Atlantic. The fracture zone ridges subdivide the margin into individual basins, and, in Nigeria, form the boundary faults of the Cretaceous Benue-Abakaliki trough, which cuts far into the West African shield. The trough represents a failed arm of a rift triple junction associated with the opening of the South Atlantic. In this region, rifting started in the Late Jurassic and persisted into the Middle Cretaceous. In the region of the Niger Delta, rifting diminished altogether in the Late Cretaceous.

After rifting ceased, gravity tectonics became the primary deformational process. Shale mobility induced internal deformation and occurred in response to two processes. First, shale diapirs formed from loading of poorly compacted, over-pressured, and pro-delta and delta-slope clays (Akata Fm.) by the higher density delta-front sands (Agbada Fm.). Second, slope instability occurred due to a lack of lateral, basin ward, support for the under-compacted delta-slope clays (Akata Fm.). For any given eco-belt, gravity tectonics were completed before deposition of the Benin Formation and are expressed in complex structures, including shale diapirs, roll-over anticlines, collapsed growth fault crests, back-to-back features, and steeply dBTSing, closely spaced flank faults. These faults mostly offset different parts of the

Agbada Formation and flatten into detachment planes near the top of the Akata Formation.

### ***Topography of Edo State***

Some areas in the southern fringes of Edo State are swampy mangrove forests with numerous creeks and rivers dissecting the land area. In the southwest, there are sandy plains with many rivers and streams. This portion, which is the Benin Lowlands, has a few hills and the land is drained by the Ikpoba, Orhionmwon and Osse Rivers. Going northwards is the Esan Plateau, which is an extension of the plateaux and ranges that are found in the far north areas of the state. They are mainly sandstone plateaux whose heights range from 200 to 300 metres above sea level. There is a gradual fall into the Orle and Niger Valleys from the north and south, while the landmass in the south and west descends gradually to the Benin Lowlands. A river that cut a ridge in the sandstone sub-strata of the Northern and Esan Plateaux formed the Orle Valley, which runs from the west to east. The Owan and Orle rivers drain the area. The Northern Plateau has ranges that are between 180 and 300 meters of basement rock. Granite peaks are found at random, sometimes rising above 600 meters. The southern portion of this plateau is mainly sandstone.

### **3.6.3 Biological Environment of Edo State**

#### **Vegetation**

Vegetation is a general term for the plant life of a region; it refers to the ground cover provided by plants. It is a general term, without specific reference to particular taxa, life forms, structure, spatial extent, or any other specific botanical or geographic characteristics. It is broader than the term *flora*, which refers exclusively to species composition. Perhaps the closest synonym is plant community, but *vegetation* can, and often does, refer to a wider range of spatial scales than that term does, including scales as large as the global. Primeval redwood forests, coastal mangrove stands, sphagnum bogs, desert soil crusts, roadside weed patches, wheat fields, cultivated gardens and lawns; all are encompassed by the term *vegetation*, rainforest, mangrove forest and rich biodiversity.

Vegetation in Edo state consists of mangrove swamps, freshwater swamps, rainforests and savanna grasslands. The mangroves and freshwater swamps occur in the southern end of the state, especially around its frontier with Delta State, where the water bodies get periodic inflow of saltwater from proximity to the sea and saline creeks flow. The savanna grasslands however occur in the northern reaches of the state, around Okpella and Igarra, which have frontiers with Kogi State.

## **Wildlife**

As is typical of any area with such a wide range of vegetation, wildlife also varies greatly in species composition and abundance. Generally however, wildlife in Edo state consists of mammals, birds, reptiles and amphibians. Many parts of the state have been substantially modified by human activities, such that only very few original forests remain, and by extension, wildlife species composition and abundance have been seriously modified.

The forest zones host large mammals such as Mona monkeys, Duikers, Warhogs, etc. Swamps play host to reptiles such as Crocodiles, Swamp Turtles, Monitor lizards and Buffaloes, while the savanna grasslands play host to rodents such as Grass cutters, Porcupines, Snakes, etc. Avian species, because of their mobility, are ubiquitous across the state, and range from birds of the waterside such as Pelicans, Hammerkops, Egrets and Herons to birds of the gardens such as Doves, Wild Pigeons, Robins and Weaverbirds.

### **3.6.4 Specific Environmental Baseline Information on Ewu Site**

Here, specific environmental information on the project location around Ewu is presented. Information presented here is based on specific site data collection and laboratory analyses carried out specifically for this ESMP.

## **Administrative location**

Administratively, Ewu community is located in Esan Central Local Government Area, Edo State (**Figure 3.14**). Agbede bounds Ewu in the north, in the southeast by Irrua, and southwest by Ekpoma. Natives also pronounce Ewu Elu. Ewu settlement comprises the villages and towns of Eguare-Ewu, Ehanlen-Ewu, Ihenwen-Ewu, Uzogholo-Ewu, Ukhiodo-Ewu, Idunwele-Ewu, Eko-Ojeme, Oghodogbor, and Ukpeko Ori.



The community is located about 99km north east of Benin (Capita of Edo State), 82.0km north of Agbor, and 30km south of Auchi town. Some of the major towns in the immediate vicinity of the Ewu community include Irrua, Uromi, Opoji, Ekpoma, Akahia and Ukhun among others. The coordinate of the gully head is Latitude 6.246908 and Longitude 6.803197 and it is within the community. The gully erosion site is 1.6 km using the shortest route and 2.85 km using the longer route off the Auchi-Benin road. Ewu Monastery is a major Faith Based Institution in the community. The gully erosion site originates from the Ewu community and moves northward. Presently, there are buildings to the southern, eastern and western parts of the gully head, however, the northern section is mainly fallow vegetation and farmland.

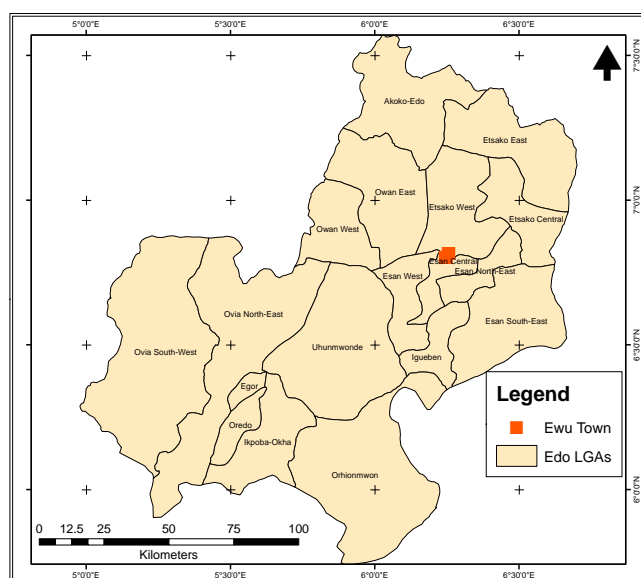


Figure 3.14: Administrative Map of Edo State Showing Ewu Community

### 3.6.5 Physical Environment of Ewu Erosion Gully Site *Climate and Meteorology:*

The climate of the Ewu and its immediate surrounding falls within the semi-humid equatorial zone of the tropical climate area of Nigeria. The climate is determined largely by the influence of two wind systems; the southwesterly winds and the northeasterly winds. The former is due to the hot and humid tropical maritime air mass blowing in from the Atlantic Ocean while the latter are due to the warm and dry air mass from the Sahara Desert, in the north. The two air masses are separated by a front or zone of discontinuity (the

Inter-tropical convergence zone, ITCZ), which oscillates from north south following the movement of the sun. This north-south oscillation of the ITCZ gives rise to the basic variation in the weather and climatic conditions prevailing in the area. Generally, the climate is humid tropical in the southern areas of the state and sub-humid in the north.

Temperature and the thermal characteristics in the area depend on the apparent movement of the sun and on the wind regime and proximity of the area to the Atlantic Ocean. The annual temperature cycle is characterised by two peaks - major and minor. The major peak occurs between March and April while the minor peak occurs in the months of November and December. The minor fall in temperature is due to the presence of the Harmattan wind, which occurs between December and January while the major fall (or minimum values) coincides with the peak of rainfall in July. The average temperatures vary during the year by 3.0 °C. The warmest month of the year is April, with an average temperature of 27.5 °C. In July, the average temperature is 24.5 °C. It is the lowest average temperature of the whole year. Therefore, the highest and the lowest daily temperatures (32.7°C and 20.5°C) occur at the peak of the dry and rainy seasons respectively in March and August (**Table 4.8**).

Rainfall and humidity regimes are characterised by similar dual maximum and minimum peaks exhibiting an inverse annual pattern with temperature. The spatial and temporal distributions of disturbances that result in storm development are unpredictable. Although the spatial and temporal distribution of rainfall and its intensity are determined largely by the Atlantic Ocean surface temperature, biospheric feedbacks and behaviour of the Inter-Tropical Convergence Zone (ITCZ) as well as its associated air masses, i.e. the maritime tropical air masses or the south westerlies. The entire area is very humid; hence the high condensation level and frequent dews and fogs. Average humidity, even during dry spells is greater than 77%. Rainfall is local, mainly convective and rainy days are in excess of 200 while the warm currents further augment the tropical humidity. Annual average rainfall/precipitation ranges between 1657mm in the northern section to about 2025 mm in the southern and eastern part of the state (**Table 3.8**). The

difference in precipitation between the driest month and the wettest month is 329 mm. There is no real dry season and even the driest month (January) has an average of 9 mm of rainfall. Most precipitation falls in September, with an average of 338 mm. The rainfall regime is characterized by double maxima in the months of July and September respectively with a short “August break”. The dry season lasts between mid-December to late March. Rainstorms during change in seasons are characterized by thunder and lightning. The average annual number of days with thunderstorms is between 45 and 70 days. The highest number of about 5-9 days usually occurs between April and May and towards the end of the rainy season around October when rainfall is accompanied by greater frequency of thunderstorms, line squalls and disturbance lines.

Relative Humidity (R.H) is high both night and day but usually slightly lower in the evenings than in the morning hours. While it is greater than 80% in the night, it is between 62% and 79% during the day. Generally, the drier months between December and February have low R.H of between 60-70% whereas it ranges from 80 to over 90% in the wet season.

Mean sunshine hours per month are influenced by the amount of rainfall such that a low sunshine hour is recorded in July at the peak of the rains, while high values are recorded in January. Hours of daylight and darkness do not vary for more than one hour during any period of the year because of the latitudinal location of the region. The total sunshine hours for the year is greater than 466 with mean monthly values varying between 51 and 165.7 | July and December respectively, a factor of prevailing season depending on atmospheric attenuation by cloud and rainfall.

**Table 3.8: Monthly Temperature and Precipitation within the study area  
(Source: NIMET, Oshodi)**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rain	9	44	109	164	199	267	331	247	338	233	62	22
No of Rain Day/Month	1	1	3	6	12	13	15	15	17	12	1	0
Humidity 10:00 (%)	89	87	82	89	92	91	96	94	95	92	96	92

Humidity 16:00 (%)	60	59	66	65	69	78	72	76	75	74	70	60
Av Wind Speed (Knots)	2.4	5.6	4.1	5.6	3.3	2.8	4.6	5.2	3.8	2.6	2.8	3.7
Min Temp	21.1	21.8	22.3	22.9	22.4	21.8	21.2	21.2	21.7	21.8	21.8	20.5
Max Temp	31.7	32.7	32.6	32.1	31.6	29.4	27.8	27.8	28.2	30.0	31.6	31.6
Average Temp	26.4	27.2	27.4	27.5	27.0	25.6	24.5	24.5	24.9	25.9	26.7	26.0

### **Land Use**

Land use/cover in the Ewu and adjoining communities can be described as a mixture of human settlements and bush fallow occasionally interspaced by forest (**Figure 3.15**). There are no large industries in Ewu community except the Flour Mill. Elsewhere, there are numerous cottage industries most especially those devoted to palm kernel crushing and subsequent extraction of its oil. In addition, palm oil extraction industries were also observed during the field data collection. Agriculture is the most dominant occupation of the people (male) while females engaged in sales of daily needs and agricultural produce. Food and cash crops production are the primary human activities. Banana, plantain, maize, yam, cocoyam, cassava and a number of fruits and vegetables are the main food crops while oil palm constitute the major cash crop. Fruits produced in the area include mangoes, pawpaw, pineapples, guava and oranges. Individual farm holdings range between 0.1 ha and about 1.0 ha for the food crops but extend up to 2.0 ha for cash crops, depending on the crops and its proximity to settlements.

Forest cover is the prominent land cover in the immediate vicinity of the community (**Figure 3.15**). The floristic composition of the vegetation ranges from the typical forests with dense canopies and a discontinuous multi-storey system. The undergrowth consists mostly of shrubs, epiphytes and grasses. The complex tropical forest species rise up to 20 m high in some areas. Large proportions of the vegetal cover, especially towards the forest peripherals and close to settlements are under encroachments for subsistence agriculture, cash crop plantation and physical construction activities. The dominant vegetation species include *Anthocleista*; *Bridelia*; and *Elaeis guineensis*, among others. The most common grasses prominent within the area include:

*Andropogon*; *Ctenium newtonii*; *Imperata cylindrical*; and *Loudetia arundinacea*. Shrubs, herbs and climbers particularly *Alchornea*, *Combretum*, and *Chromolaena odorata* are very common, particularly on fallow lands.

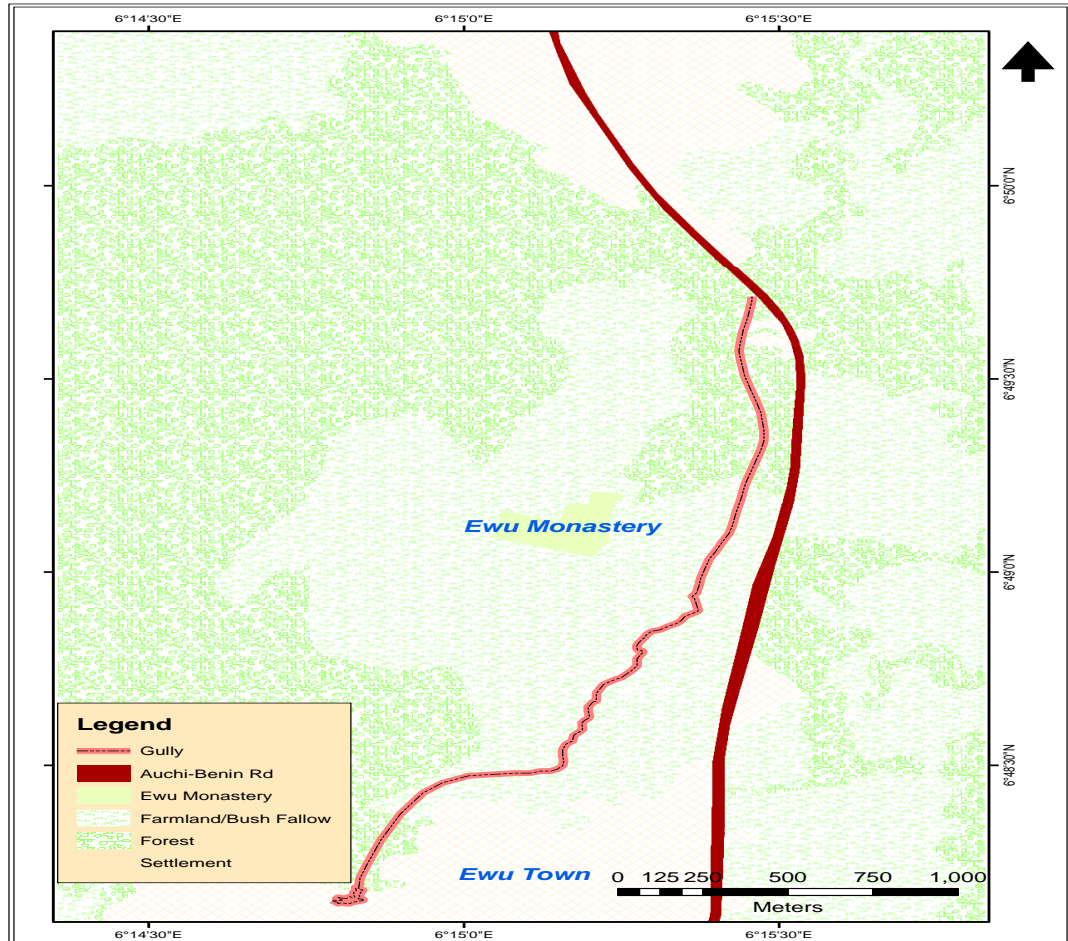


Figure 3.15: Gully Erosion Site in the Ewu Town

### ***Geology, Geotechnical and Soil Types at Ewu***

According to the published 1:2,000,000 Geological Map of Nigeria (see **Fig. 3.16**: Geological Survey of Nigeria, 1994), the site is underlain by Imo Clay-Shale Group lithology's consisting of clay and shale with limestone intercalations of the Ewekoro Formation. The presence of clays was confirmed by the Atterberg test results. A geotechnical investigation was conducted on 14 March 2016 at the Ewu Erosion Gully Site Edo State, Nigeria, where six soil samples were taken and tested in the laboratory. The laboratory results indicated that the site is underlain by clayey sands and are classified as 'SC' by the unified soil classification system (USCS).

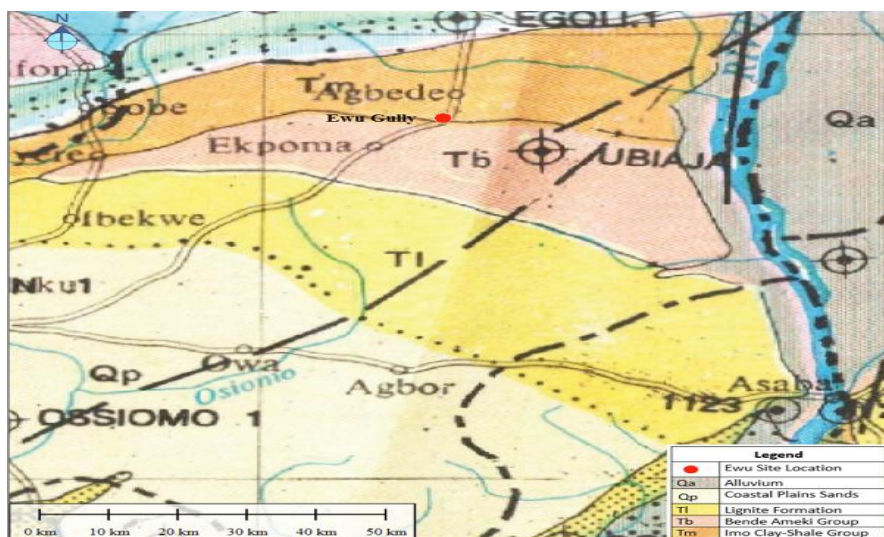


Figure 3.16: General geological map of Nigeria (Geological Survey of Nigeria, 1994)

By 24<sup>th</sup> February 2017, field soil investigation and sampling of the surface 200-cm soil depth at the lower and upper ridges of the gully erosion site in Ewu was carried out. Following the particle size (grain size) analysis of the six soil samples collected using Dutch Soil Auger (see **Tables 3.9 & 3.10**), results indicated predominance of fine to medium sized sand particles in the surface (0 – 200cm) substratum at Ewu site. No evidence of lithologic discontinuity was observed as the formation, as observed from the gully-exposed surface, shows uniform lithology.

Table 3.9: Typical Grain Size Distribution of the Surface 2-m Depth of Soils within and around the Gully Erosion Site in Ewu, as at 24<sup>th</sup> February, 2017

Soil Sampling Depth (cm)	Genetic Horizon	Soil Physical Properties			
		Grain Size Analysis			
		Sand	Silt	Clay	Texture
0 – 20	A	78	3	19	SL
20 – 60	AB	76	3	21	SCL
60 - 120	B	76	3	21	SCL
120 - 200	B	76	5	19	SCL

SL = Sandy loam; SCL = Sandy clay loam

**Table 3.10: Average Composition of the Grain Size Distribution of Soils within and around the Gully Erosion Site in Ewu, Edo State (24<sup>th</sup> February, 2017)**

Statistics (n = 6)	0 – 100cm			100 – 200 cm		
	Grain Size Analysis (%)					
	Sand	Silt	Clay	Sand	Silt	Clay
Min	77	3	13	76	5	9
Max	82	5	18	80	12	15
Mean.	80.75	3.25	16.00	78.4	10.6	10.7
Sd	1.75	1.28	2.27	1.3	1.6	1.4

Geo-morphologically, very long gentle slopes, with slopes not steeper than 3 - 4%, characterize the study area. The very long slope length of the drainage catchments and the loose, incoherent, sandy nature of the soil, along with the hardened surface soils occasioned by human influence readily predispose the soils to intensive water erosion that could lead to gully formation in the downstream part of the study area. These factors indeed enhanced the development of gully at site in Ewu.

Ewu gully site as observed from a cut section (**Plate 3.6**) is generally marked by top reddish earth, and often pebbly horizons, 16.7 cm – 31.0 cm thick, composed of ferruginized sandstone or litalized clay sand that mark the Paleo-Coastal Environment of Paleocene-Pleistocene Age.



**Plate 3.6: Soil profile obtained from a cut section in Ehanlen community, Ewu (6.80148°N, 6.24710°E; Scale: Pen 15.5 cm long)**

Soils within and around the Ewu gully site are highly ferruginized, commonly brownish to reddish in colour, and often with ochric epipedon (i.e. light

coloured surface soil horizon). In addition, the soils are highly weathered, well sorted, well drained, and high in sand content, with low content of clay and silt. Tables 4.9 and 4.10 show the grain size distribution of the soils as at 24<sup>th</sup> of February 2017. From the various soil samples collected at various locations in the area, the sand particles ranged from a minimum of 76% sand to 82% sand. The implication of this high sand content is that the soils in all parts of the area are sandy, porous and hence would be readily permeable to aqueous materials and or contaminants.

The pattern of distribution of the various soil particles (i.e. sand, silt and clay) within the subsoil horizons in soils of the area was not significantly different from those of the surface soil horizons, thus further justifying the absence of lithologic discontinuity.

### **3.6.6 Biological Environment of Ewu Erosion Gully Site**

#### **Vegetation**

As part of the field studies for this ESMP, observations on the vegetal composition and situation around the intervention site at Ewu were recorded. Generally, the project site and immediate surrounding consists of oil palm dominated secondary forests and a mosaic of forest, farmland and buildings.

Within and around the buildings close to, or verging the gully sites, there are fruit trees like mangoes, cashew, oranges, etc., as well as shrubs and forbs like Goat weed, Siam weed, etc. Several small holding farms were also observed around the homesteads, with cassava, cocoyams and plantains/bananas being the most common crops planted.

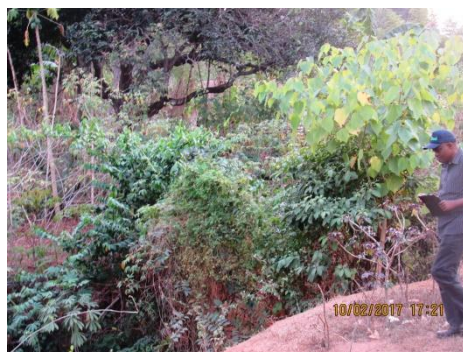
**Table 3.11** presents an overview of the vegetation species observed within and around the Ewu project site, while **Plates 3.7 to 3.10** show some of the vegetation observed in the course of the field studies for this ESMP.



**Table 3.11: Vegetation Species around the Project Site**

	<b>Scientific Name</b>	<b>Common English Name</b>	<b>Habit</b>
1.	<i>Anthocleistavogelii</i>	Cabbage tree	Tree
2.	<i>Anthostemaaubryanum</i>		Tree
3.	<i>Asystasiagagentica</i>		Herb
4.	<i>Azadirachtaindica</i>	Neem Plant	Tree
5.	<i>Panicumsp</i>		
6.	<i>Calamusdecratus</i>	Rattan palm	Climber
7.	<i>Commelinabenghalensis</i>	Wandering Jew	Herb
8.	<i>Chromolaenaodorata</i>	Siam Weed	herb
9.	<i>Dissotiserecta</i>		Herb
10.	<i>Elaeisqueensis</i>	Oil palm	Tree
11.	<i>Parinariexcelsa</i>		Tree
12.	<i>Dinophorasphennerioides</i>		Shrub
13.	<i>Sacoglottisgabonensis</i>		Tree
14.	<i>Caalotropisprocera</i>		Shrub
15.	<i>Chrysobalanusicaco</i>		Shrub
16.	<i>Cleistopholis patens</i>		Tree
17.	<i>Aframomum sp.</i>	Grain of paradise	Herb
18.	<i>Cocusnucifera</i>		Tree
19.	<i>Mangiferaindica</i>		Tree
20.	<i>Carica papaya</i>	Paw paw	Tree
21.	<i>Musa spp</i>	Plantain and banana	Tree
22.	<i>Alchorneacordifolia</i>	Christmas tree	Shrub
23.	<i>Alstoniaboonei</i>	Stool wood	Tree
24.	<i>Halleaciliata</i>	Abura	Tree
25.	<i>Ipomoea mauritiana</i>		Climber
26.	<i>Lycopodiumcernum</i>		Climber
27.	<i>Palisotahirsuta</i>		Herb
28.	<i>Uapacaheudelotii</i>		Tree
29.	Raphiahookeri	Wine palm	Tree
30.	Nephrolepis sp.		Herb
31.	<i>Scleriasp</i>	Razor grass	Herb
32.	<i>Syzygiumguineensis</i>		Tree
33.	<i>Tetraceraalnifolia</i>		Climber
34.	<i>Parkiabiglobosa</i>	Locust bean tree	Tree
35.	<i>Adansoniadigitata</i>		Tree

Source: Fieldwork (February, 2017)



### Plates 3.7 to 3.10: Vegetation/Land Cover Types Observed Around Project Site in Ewu

In terms of biomass productivity, the productivity of the area, as assessed during field studies for this project were found to range between 250g/m<sup>2</sup> and 375g/m<sup>2</sup>. These values are relatively low, compared to values recorded from previous studies around the state. However, the low records are attributed to the fact that this field study was undertaken in the dry season, when general productivity is impaired due to unfavourable climatic and edaphic factors. It is expected that productivity will be much higher in the rainy season. The values recorded however agree with Al Mufti *et al.* (1976) for areas with similar conditions.

### Wildlife and Endangered Species

Based on field observations and literature information, three main groups of wildlife occur in the area. These are: Mammals, birds and reptiles. **Table 3.12** presents a list of mammals, reported in the project area.

**Table 3.12: List of Mammals in the Study Area**

Common Name	Biological Name	Status
Mona Monkey	<i>Cecopithecus mona</i>	Common
White-bellied Pangolin	<i>Manisticuspis</i>	Common

Black-bellied Pangolin	<i>Manistetractyla</i>	Common
Red-legged Sun Squirrel	<i>Heliosciurusrufobrachium</i>	Uncommon
Fire-footed Tree-Squirrel	<i>Funisciuruspyrrhopus</i>	Common
Cape Clawless Otter (“Bush dog”)	<i>Aonyxcapensis</i>	Uncommon
Blotched Genet (“Bush cat”)	<i>Genettatigrina</i>	“
Marsh Mongoose (“Fox”)	<i>Atilaxpaludinosus</i>	Uncommon
Sitatunga (“Antelope”)	<i>Tragelaphusspekei</i>	Common
Brush-tailed porcupine	<i>Alterurusafricanus</i>	Common
Bush pig (warthog)	<i>C. sylviculton</i>	Common
Grass cutter	<i>Thyromyssidindeianous</i>	Common
African palm squirrel	<i>Epixerusebii</i>	Common
Fruit bat	<i>Eidolon heluum</i>	Common
Giant Rat	<i>Cricetomygambianus</i>	Very common
Grimm’s Duiker	<i>Sylvicapagrimmi</i>	common
Red River Hog	<i>Potamocheirusporcus</i>	uncommon

Various birds were seen in the project area during fieldwork, but were too far off to be clearly captured with the Camera taken to the field. However, these birds ranged from those of the waterside such as kingfishers, egrets and herons, to garden and forest species such as the doves and weaverbirds. Their number and variety suggests that the avian population of the area is very rich and near pristine. **Table 3.13** presents a list of birds observed during the fieldwork exercise while **Plates 3.11** and **3.12** show some of the birds caught on camera.

**Table 3.13: List of Birds in the Study Area**

Common Name	Biological Name
Cattle Egret	<i>Ardeola ibis</i>
Palm-nut Vulture	<i>Gypohieraxangolensis</i>
Black Kite	<i>Milvusmigrans</i>
Kittlitz’s Sand Plover	<i>Charadriuspecaurius</i>
Common Tern	<i>Sterna hirundo</i>
Common Sandpiper	<i>Actitishypoleucos</i>
Red-eyed Dove	<i>Streptopeliasemitorquata</i>
Blue-breasted Kingfisher	<i>Halcyon malimbicus</i>
Pied Kingfisher	<i>Cerylerudis</i>
Square-tailed Rough-winged Swallow	<i>Psaldiprocnenitens</i>
Plain-backed Pipit	<i>Anthusleucophrys</i>

Carmelite Sunbird	<i>Nectariniafuliginosa</i>
Olive-bellied Sunbird	<i>Nectariniachloropygia</i>
Common Bulbul	<i>Pycnonotusbarbaetus</i>
Grey-headed Sparrow	<i>Passer griseus</i>
Village Weaver	<i>Ploceuscuculatus</i>
Pied (white collared) crow	<i>Corvustorquatus</i>



**Plates 3.11 and 3.12: Some birds observed during fieldwork**

The reptilian fauna consists of turtles, crocodiles, snakes and lizards. Dangerous snakes found in the project area include pythons, mambas and spitting cobras (**Table 4.14**).

**Table 3.14: List of Reptiles in the Study Areas**

<b>Biological Name</b>	<b>Common Name</b>
<i>Trionyxtriunguis</i>	African Soft-shelled Turtle
<i>Kinixyserosa</i>	Serrate Hinge-backed Tortoise
<i>Pelusiosniger</i>	Black Swamp Turtle
<i>Crocodilusniloticus</i>	Nile Crocodile
<i>Osteolemustetraspis</i>	Dwarf Crocodile ("Alligator")
<i>Varanusniloticus</i>	Nile Monitor Lizard ("Iguana")
<i>Python sebae</i>	African Python
<i>Dasypeltisfasciata</i>	Egg-eating Snake
<i>Dendroaspisjamesoni</i>	Green Mamba
<i>Najanigricollis</i>	Spitting Cobra
<i>Chameleogracilis</i>	Common Chameleon
<i>Dicroglossusoccipitalis</i>	Bullfrog ("Jumping Chicken")

**Source: Fieldwork (February, 2017)**

## CHAPTER FOUR

### SOCIO-ECONOMIC CHARACTERISTICS AND CONSULTATION WITH STAKEHOLDERS

#### 4.1 Socio-economic Assessment

This chapter focuses on the socioeconomic characteristics of Ewu residents. In addition, issues of consultation with the community and anticipated environmental impacts of the gully erosion intervention project activities as envisaged by the residents were also discussed.

#### 4.2 Methodology

##### 4.2.1 Data Collection Approaches

The assessment of the gully erosion sites in the Eguare-Ewu and Ehanlen-Ewu communities was conducted between 10 and 14th February 2017. The assessment was with a view to having first-hand information on the gully erosion that has almost separated these two adjoining communities. In addition, the assessment was also with a view to obtaining socio-economic baseline information on the two communities straddling the gully site. The socio-economic baseline information also assessed and documented the social risks associated with the rehabilitation and restoration of the gully erosion site. Furthermore, existing livelihoods opportunities, income, gender characteristics, age profile, health, transport access, existing community structures were also investigated. In addition, existing formal and informal grievance redress mechanisms in the communities were also investigated.

A reconnaissance visit to the site provided opportunities to obtain both still and motion pictures of the gullies. The present land use/cover around the gullies was also captured. Some of the local efforts at arresting the gullies' expansion were observed and recorded, while the effects of the gully development on nearby buildings (such as cracks and exposure of building foundations) were captured.

A major part of the socio-economic survey was the community consultation held in February 2017 at Eguare-Ewu community. The consultation was held at the palace of the paramount ruler. The consultation was with a view to sensitising the community on the government's plan to address the challenges posed by the gully through the rehabilitation of the damaged road infrastructure as a consequence of the gully erosion. In attendance at the consultation were the paramount ruler, council of elders and chiefs, women and youth groups. Various community development associations (youth, women and development) were also in attendance. Apart from intimating the community on the preparedness of the government to address the gully erosion challenges, the consultation provided opportunity to understand cultural issues that may affect the proposed project. In addition, community organizations and conflict resolution mechanisms in the community were also discussed. The residents also raised issues of compensation.

Key informant interviews were also held with some residents most especially, those that live close to the gully site. Essentially, the interviews were to obtain information on their perception of the cause(s) of the gullies and the various challenges they have encountered as a result of their proximity to the gully site.

Finally, questionnaire administration was used in complementing the information obtained from the community. A systematic random sampling was used in administering the questionnaire to household heads in the immediate corridors of the gullies. A total of 83 questionnaires were administered with more emphasis placed on the neighbourhood around the gully head where the gully appeared to be devastating. Though the respondents indicated that they have filled some in the recent past, nevertheless, were willing to fill the questionnaire after repeated assurance that government is ready to address their plight.

#### *4.2.2 Socio-Economic Data Analysis*

Questionnaires obtained during the field survey were analysed using IBM SPSS (V22). Questionnaires were serially numbered and coded appropriately before being entered into the SPSS spreadsheet. Thereafter, variables were defined including missing values. Frequency tables of responses were generated and these tables form the basis of description of the socioeconomic baseline characteristics of Ewu community. In addition, graphs were used to reinforce the visual impression of variables.

### **4.3 Socio-Economic Analytical Results**

#### *4.3.1 History and Governance*

Ewu is the second largest town after Irrua in Esan Central Local Government Area Council (<https://en.wikipedia.org/wiki/Ewu>). The monarchy of Ewu was organized by Oba Ewuare, at about 1460 (Common Era) and was associated with Bini princes and warriors who made it their garrison in their quest to subjugate cotton and fabrics producing Esan tribes, especially the powerful Uzea kingdom. Prior to the coming of Oba Ewuare in the mid-15th century, the Ewu community was organized and governed by an ancient geruntocracy where a council of the oldest people called Edion administered the various villages that constituted Ewu, independently. But Oba Ewuare of imperial Benin Kingdom overturned the geruntocratic system of administration he met in his conquest of Esanland and enthroned some of his princes as viceroys in its place, and the Benin general Ozaine became a viceroy of the Oba in Ewu and first Onojie of Ewu kingdom. These princes of Benin Empire checked the frequent rebellion and insubordination of the ancient, powerful Uzea and Uromi kingdoms in Esanland, and co-opted the Esan kingdoms into the then fast-expanding Benin Empire. Notwithstanding the occupation of Ewu in about 1460 by Benin Empire, Ewu people have various accounts of oral tradition, which trace their pre-existence to time immemorial. In all the accounts of origin, it is generally accepted that the people of Ehanlen were the aboriginals in the ancient land of Ewu. It is also believed that the people of Idunwele were migrant farm settlers and hunters from Emaudo in Ekpoma. It is believed that the people from Benin Kingdom were settled at Ihenmwun and Ukhiodo, especially among the families that occupy the area of

Ewu known as Idumigun quarters. The people are believed to have originated from Igun in Benin City.

The Ewu kingdom is ruled by the Ojeifo dynasty, which traces its roots via Ekpebua to Ozaine, the first Onoje of Ewu, who was a viceroy of the Oba Ewuare of Benin. The aboriginal peoples of Ewu are the Ehanlen people and other settlers came from Igun and Ugbekun Quarters of Benin kingdom during the occupation of Ewu by the Benin imperialists. These settlers settled at Ihenwen at the quarters known as Idumigun. Later nomads and emigrants came from Emaudo in Ekpoma and settled in the areas known as Idunwele and Eko. Other waves of Benin emigrants fled from the tyranny of Oba Ewuare to Ewu and settled at Uzogholo, Idunwele and Ehanlen.

#### *4.3.2 Demographic Characteristics*

Data on population distribution in Ewu town is not available from the National Population Commission (NPC), Nigeria. Nevertheless, we have used the state and local government population to characterize the demographic pattern that might likely emerge in the community. Based on the 1991 population figure from the National Population Commission, Edo State had a population of 2,172,005 in 1991 comprising of 1,147,746 Males and 1,185,980 Females and this increased to 3,233,366 comprising of 1,633,946 Males and 1,599,420 Females in 2006 (**Table 4.1**). Hence there was a 48.87% increase in the population over a 15-year period. At annual growth rate of 3.18%, Edo state is expected to have a population of 3,285,209 in 2007, 3,373,909 in 2008, and 3,465,005 in 2009 and 4,294,727 in 2021. The cosmopolitan nature of Edo state may have been responsible for the slightly higher percentage of female population in the 1991 figure, but this changed in 2006, as there were more males than females in the state. Therefore, with an area extent of 17,802km<sup>2</sup> and a population of 3,233,366, the state has a population density of 181.63 persons per square kilometer.



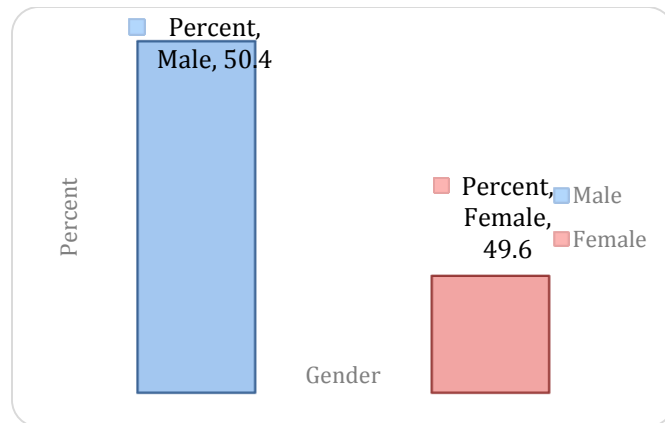
**Table 4.1: Population Distribution in the Edo State and Esan Central Local Government Area of the State (Source: Annual Abstract of Statistics, 2012)**

LGA Name	1991 Population			2006 Population		
	Male	Female	Total	Male	Female	Total
Edo State	1,085,156	1,086,849	2,172,005	1,633,946	1,599,420	3,233,366
Esan Central LGA	53,646	56,518	110,164	53,017	52,225	105,242

Similarly, the population of Esan Central Local Government decreased from 110,164 comprising of 53,646 Males and 56,518 Females in 1991 to 105,242 comprising of 53,017 Males and 52,225 Females in 2006 and a project population of 120,450 in 2011 (**Table 4.1**). The population of the LGA declined by 4.47% between 1991 and 2006, while it is expected to increase by 2.74% between 2006 and 2011. Female population in 1991 dominated the population, while there were more males in 2006. The age group between 15-64 years dominated the population in 2006 accounting for about 60,604 of the entire population. With an area estimate of 253 km<sup>2</sup> and a population of 120,450 in 2011, the LGA has a population density of 476.1 person/km<sup>2</sup> in 2011.

#### 4.3.3 Sex Composition

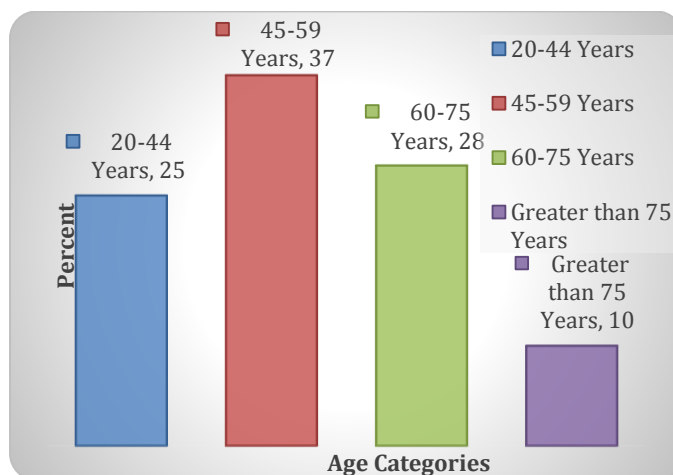
The sex composition of respondents obtained from the questionnaire survey in the community showed that there were more males than females. Males accounted for 50.4% while females accounted for the remaining 49.6% of the sampled population. The margin between male and female population is not too wide, although, it is still in conformity with the contemporary state and local government population trend as observed in the 2006 population census. The higher percentages of male population could be due to the agrarian nature of the local economy.



**Figure 4.1: Gender Distribution among Respondents**

#### 4.3.4 Age Composition

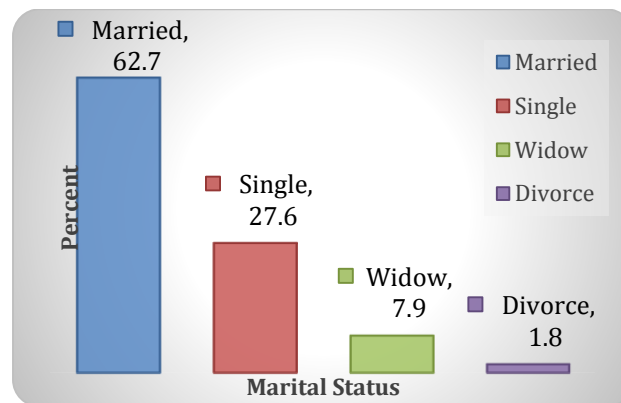
The age characteristics of Ewu community obtained through questionnaire survey showed that 1 (one) out of every 4 (four) respondents age between 20 and 44 years, while 37.0% age between 45 and 59 years. In addition, 28.0% of the respondents age between 60 and 75 years while the remaining 10.0% indicated that they are more than 75 years. This category, together with those below the age of 20 years, constituted the dependent population. Expectedly, the youth accounted for 62% of the sampled respondents. This is an indication of the availability of able-bodied people that can provide labour needed during the construction phase of the project.



**Figure 4.2: Age Categories among Sampled Respondents**

#### 4.3.5 Marital Status

The percentage of the respondents surveyed in the community who indicated that they are married was 62.7%, those who were single accounted for 27.6%, widow (7.6%), and separated/divorced (1.8%). The larger percentage of those that are married may be indicative of possible potential for population increase (**Figure 4.3**).



**Figure 4.3: Marital Status among Respondents in Ewu Community**

#### 4.3.6 Religion

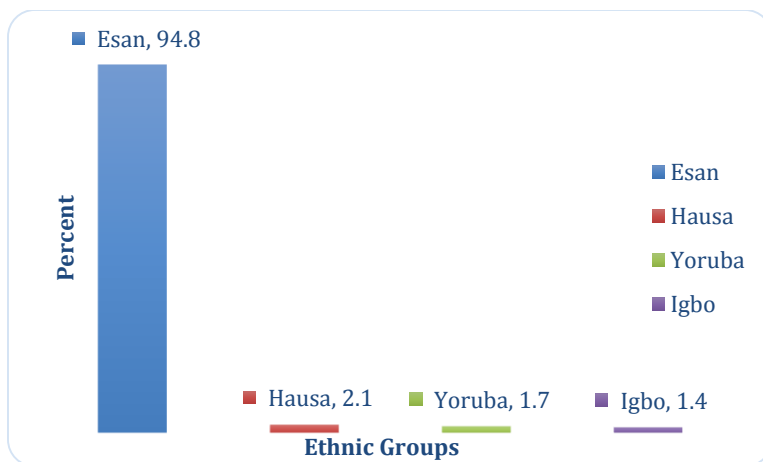
Ewu has three major religions: Ebor, Islam and Christianity. Islam was introduced in the early 20th century. Ewu is home to the St. Benedict Monastery, a monastery of the Roman Catholic Church. It is home to an advanced theological seminary owned by the Assemblies of God Church, Nigeria, known as the Nigerian Advanced School of Theology (NAST). Consequently, there are more Christians compared to Moslems although the gap is becoming narrower. Also, there are few shrines in the community as well (**Plate 4.1**). According to the information gathered during our stakeholder engagement with the community, a shrine was said to be located within the corridor of the gully. However, due to the importance of the proposed intervention projects to the community, they are ready to relocate the shrine for ease access for the proposed projects.



**Plate 4.1: Shrine on the Outskirt of Ewu town**

#### 4.3.7 Ethnic Composition

The community is almost ethnically homogenous as 94.8% indicated that they are Esan. Other ethnic groups noted included Hausa (2.1%), Yoruba (1.7%) and Igbo (1.4%) (**Figure 4.4**). People from other ethnic origins are mostly traders and artisans. The implication of this is that the social stratification, issue of compensation (if any) and resettlement plan should take cognisance of the culture and tradition of the Esan people most especially those relating to land allocation.

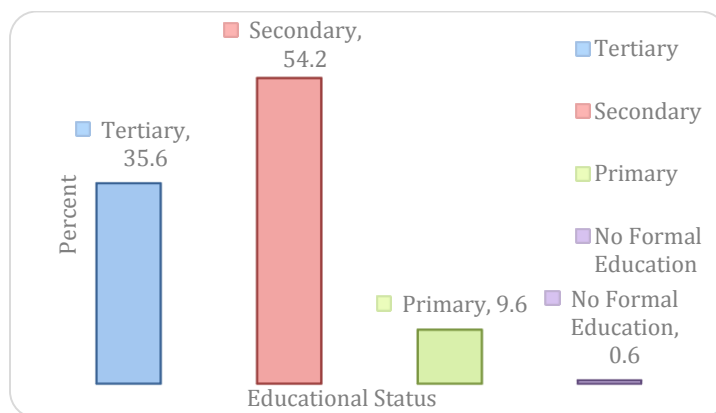


**Figure 4.4: Ethnic Composition in the Study Area**

## 4.4. Analysis of Existing Livelihoods Opportunities

### 4.4.1 Educational Status

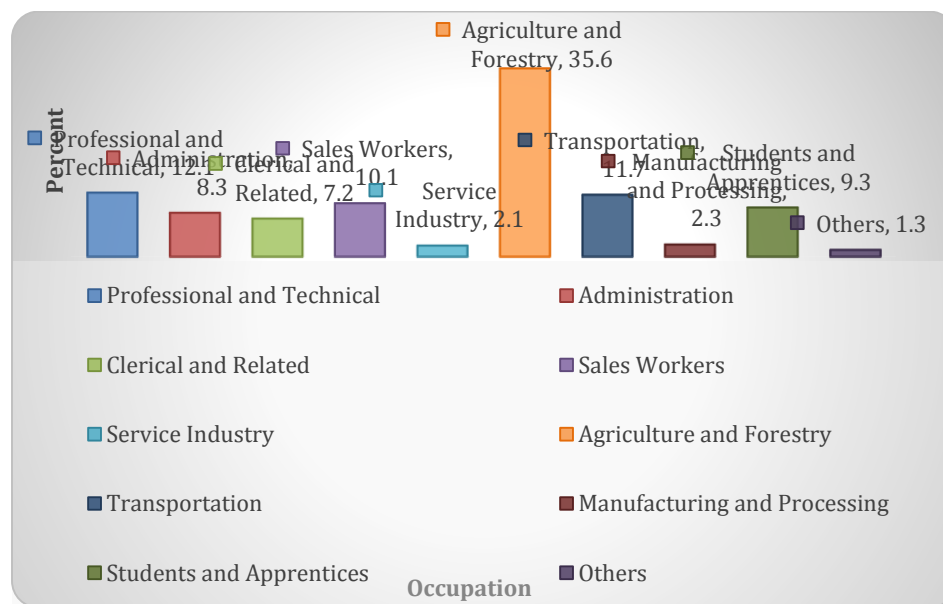
Educational attainment in Ewu community shows that the level of education is comparatively high as more than 50% of the respondents indicated that they have at least primary school leaving certificate. This shows that almost all the residents are educated. The educational attainment based on the questionnaire survey shows that 35.6% have tertiary (Colleges of Education, Polytechnic or University) educational certificates, while about 54.2% indicated that they have secondary school leaving certificates, while 9.6% claimed that they have only primary school leaving certificate. Less than 1.0% (0.6%) has no formal education (**Figure 4.5**). This educational level is therefore very high when compared with other parts of the country and even other LGAs in the State. It was noticed that the majority of respondents who indicated that they have secondary school leaving certificates are respondents that are under the age of 25 years and the implication of this is that they can still pursue higher education. In addition, gender variations exist in educational attainment between male and female with male having higher educational attainment compared to females. The foregoing therefore shows that majority of the respondents in the proposed project area are well educated. Therefore, education-wise, there are enough human resources that can be employed during the project construction. However, it is imperative that the occupational structure should also be examined. This is with a view to understanding the various carrier pathways that exist in the neighbourhood.



**Figure 4.5: Educational Status among the Sampled Respondents**

#### 4.4.2 Occupation, Income and Unemployment Characteristics

Comprehensive information on occupational characteristics of residents of Ewu town was obtained through questionnaire administration. **Figure 4.6** contains the results of the occupational assessment conducted in the town. Occupational structure in Ewu community shows diversities of careers among respondents. These diversities are expected in view of the educational attainment of most of the respondents sampled in the study area. Expectedly, those that are engaged in agriculture dominate the occupational spectrum and allied areas (35.6%) and those who are engaged in professional and technical jobs including various artisans accounting for 12.1% followed. A number of small-scale industries were also sighted (**Plate 4.2-4.4**). Respondent who engages in transportation account for 11.7%



**Figure 4.6: Occupational Characteristics in Ewu Town**



**Plate 4.2: Garri Processing Machine in the Community**



**Plate 4.3: Extraction of Black oil from Palm Kernel for Soap Making**

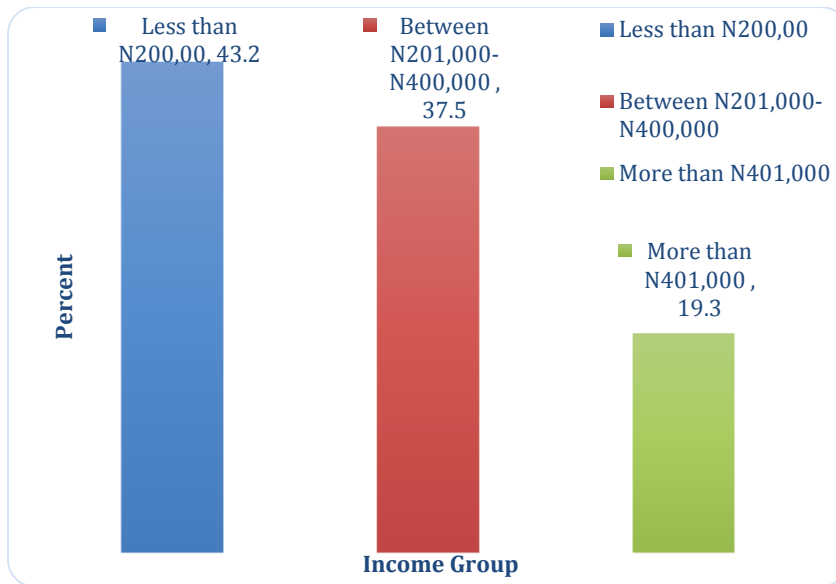


**Plate 4.4: Palm Kernel Crushing Machine**

Unemployment and under-employment are parts of the major challenges confronting most of the States in Nigeria. Unemployment has been identified as a major cause and catalyst of social vices in the society. It also has a very strong linkage with poverty. A relatively large number of the youths indicated that they are not employed or at best underemployed presently and therefore are looking forward to whatever benefits they can derive from the engineering and subsequent remediation of the erosion ravaged site.

With regards to the distribution of income in this area, it is expected that income distribution pattern should be relatively low based on the predominant agrarian economy. The survey of income shows that 43.2% of the respondents claimed that they earn less than ₦200, 000 annually, 37.5% earn between ₦201, 000- ₦400, 000 annually, while the remaining 19.3% earn well over ₦401, 000 thousand per annum (**Figure 4.7**). Generally, the neighbourhood can be described as a low-income neighbourhood with medium residential density.

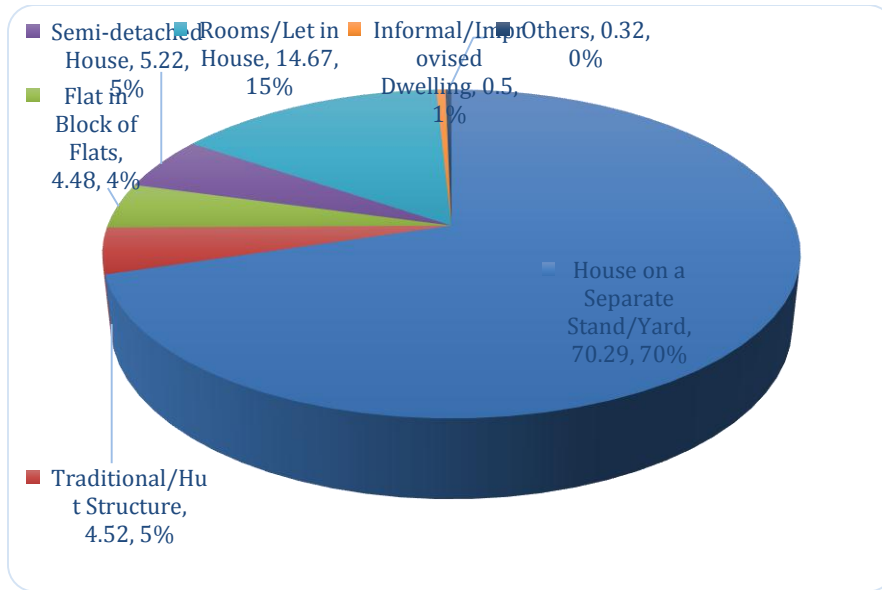




**Figure 4.7: Income Distribution among the Sampled Respondents**

#### 4.4.3 Housing Characteristics

The housing characteristic provides information basically on the type of housing units, floor materials, wall materials and roof material in communities such as the Ewu community. With respect to the type of housing, more than 70% were houses on a separate stand, 14.67% were let in house (**Figure 4.8** and **Plate 4.5**). Outside of the town, most especially going toward Auchi-Benin road, there were isolated traditional huts. The percentage that lived in informal/improvised dwelling was marginal. This comprises of dwelling made of shed.



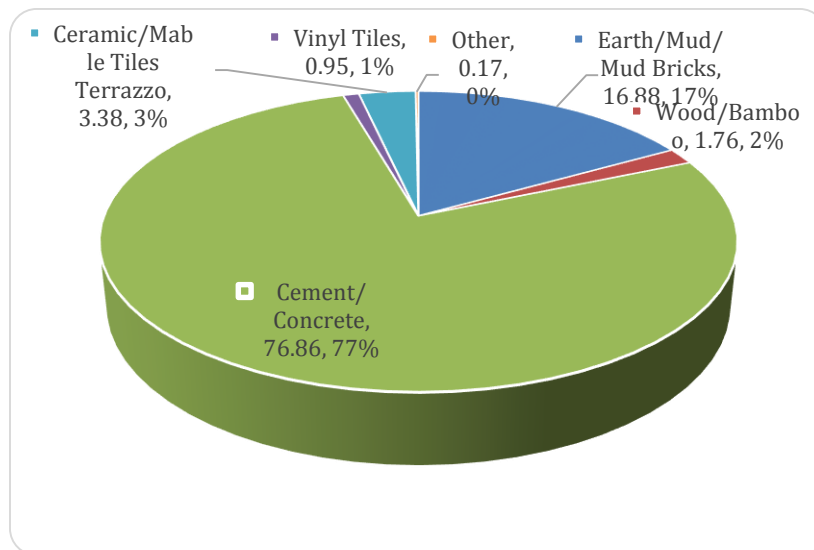
**Figure 4.8: Housing Types in Ewu Community**



**Plate 4.5: Semi-Detached Buildings in the Vicinity of the Gully Erosion Site**

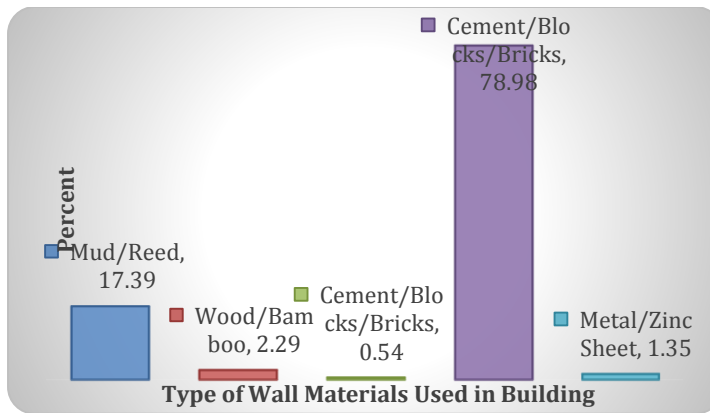
Floor materials used in these buildings include earth/mud/mud brick (16.88%), wood/bamboo (1.76%) cement/concrete (76.86%), ceramic/Mable tiles etc. (**Figure 4.9**) Thus, majority of the household used concrete floor, although some put carpet or rug on

such concrete to make it look decent. In some of the houses visited, the sitting room was tiled while concrete flooring was used in other rooms in the building.



**Figure 4.9: Floor Materials Used in Buildings**

Cement is the most dominant wall material (58.98%) used in most of the houses and this is followed by mud (37.39%) (**Plate 4.6**). Other type of wall materials accounted for less than 5.0%. The use of mud/reed is still common in Ewu community perhaps because of the abundance of red soil (clay). It is also common to notice some of the residents in the outskirts of the town most especially towards the Auchi-Benin road still used zinc as their wall material. Although, most of the makeshift shops in the town used metal/iron as their wall material (**Figure 4.10**). It should be noted that the use of wood/Bamboo and metal/Zinc sheet as wall materials is common where the dwelling place is temporal, or where the owner is not buoyant enough to afford a decent wall material.

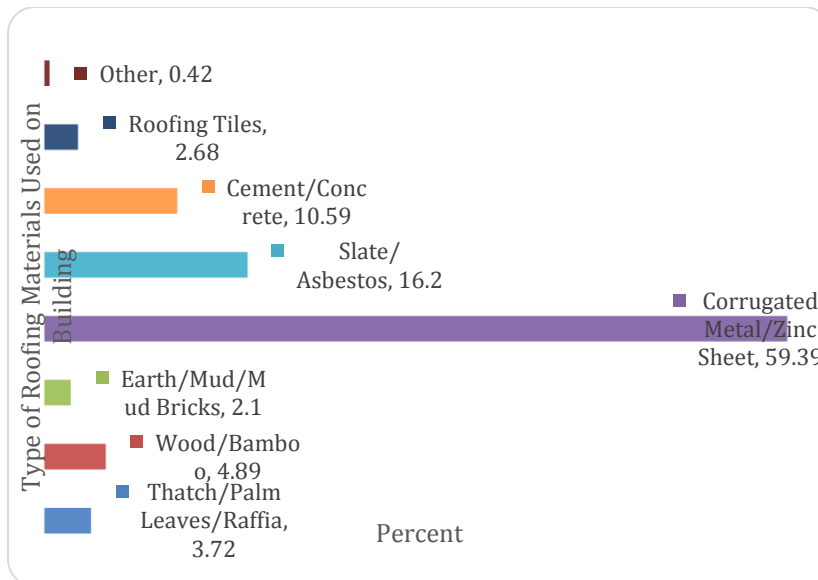


**Figure 4.10: Type of Wall Materials Used in Building**



**Plate 4.6: Mud and Block Materials Used in Building Construction in the Vicinity of the Gully Erosion Site**

The roof material also used varied from house to house. The use of corrugated metal/Zinc sheet appeared to be the most dominate and this was followed by the use of slate/asbestos (16.20%). The percentage that used roofing tiles was 2.68% and this is common in newer buildings in the town (**Plate 4.7**). Thatch/palm leaves/raffia were sighted outskirts of the town although they are few (**Figure 4.11**). Most of the people that use Cement/Concrete are those who are still hopeful of putting another structure on their building.



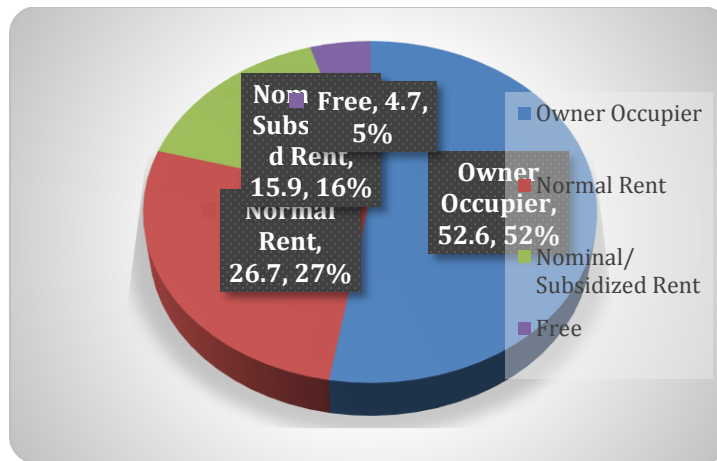
**Figure 4.11: Type of Roof Materials Used on Building**



**Plate 4.7: Long Span Aluminium Used in the Ewu Town Hall**

#### 4.4.4 Tenancy Pattern

Tenancy in Ewu town as in other parts of Nigeria was classified into four categories. The percentage of persons that indicated living in owner occupier building was 52.6%, 26.7% indicated that they live in a rented building, while 15.9% indicated that they live in a subsidised rented building, and 4.7% indicated that they are not paying rent where they live (**Figure 4.12**).



**Figure 4.12: Type of Housing Ownership in Ewu Town**

## 4.5 Amenities and Facilities in the Community

### 4.5.1 Sources of Energy:

Energy used mainly in lighting houses is derived from electricity. Electricity is obtained from the national electricity grid of the Electricity Distribution Company (**Plate 4.8**). Apart from lighting house, electricity is used to power household electrical appliances that make life more comfortable for the people. Kerosene, a bye product of crude oil refining is used by many households for cooking, although its scarcity and escalated cost has forced residents to switch to alternatives such as charcoal and firewood. Charcoal is sometimes imported from the southwestern and northern part of the country while firewood is obtained from nearby forest. It was gathered that residents travelled as much as 2-km from the community to get firewood used in cooking although some fetch firewood from their farm.



**Plate 4.8: Low Tension Electricity Line in Ewu Town**

#### 4.5.2 Sources of Domestic Water.

Water used for drinking and domestic purposes are obtained from borehole, rainwater and streams. During the rainy season, residents depend on rainwater for their household domestic chores. To this end, virtually all houses have a rainwater harvest device, which is used to harvest and store water during the rainy season (**Plate 4.9**). Drinking water essentially is obtained from borehole provided either by private individuals or government (**Plate 4.10**). Residents complained that the productivity of the boreholes in the community is very low; hence children and adult alike que to obtain drinking water. The situation is more precarious during the dry season when there is acute water scarcity. About 1 (one) out of every 4 (four) residents indicated that they use water from stream most especially during the rainy season. Scarcity of potable water may have been responsible for regular typhoid fever and other water related diseases reported in the community.



**Plate 4.9: Rain Water Harvesting in Ewu Town**



**Plate 4.10: Private Borehole Water Providing Water for the Residents of Ewu Town**

#### *4.5.3 Medical and Health Facilities:*

There is one Primary Health Facility and two private health care facilities in Ewu community. Primary Health Care Facility, Ewu, is the only government health care facility in the community. Tessy Maternity and Messiah Medical Centre were the two privately owned medical facilities in the community. Tessy Maternity is the closest to the Ewu gully erosion site as the facility is within 500-meters corridor of the gully.

#### *4.5.4 Educational Facilities:*

There are three public primary schools in Ewu and these are Eguare Primary School, Ehanlen Primary School, and Uzogholo Primary School, while there are two public secondary schools, viz: Ewu Grammar School Junior and Ewu Grammar School Senior. In addition, there are two private schools; Covenant Nursery/Primary School, Ewu and Alhidayah International School. All these schools are located within the metropolis and the closest school within 500-meters to the gully site are the Covenant Nursery/Primary School followed by Eguare Primary School.

#### *4.5.5 Water Points*

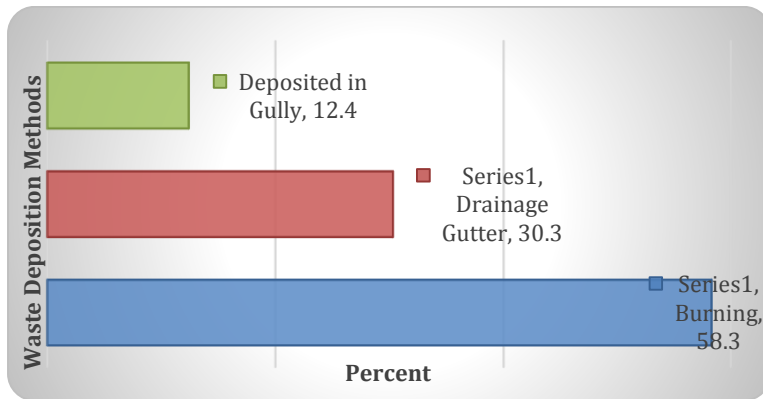
Three types of water points were observed in Ewu community and these are the Tap water, Borehole and unimproved water points. The Eguare-Ewu community has one tap water point and two boreholes. Ehanlen-Ewu community on the other hand has three tap water points and five borehole water points randomly distributed in the community. The Uzogholo Ewu has one borehole water point and one tap water point. Some of the water points do not produce enough water for the people and this has resulted in a situation where residents congregate around the functional and productive borehole water points in the town. Two of the tap water points in Ehanlen-Ewu are within 200-meters from the gully erosion site.

#### *4.5.6 Waste Management Methods:*

Waste management approach by communities determines their vulnerability to diseases. It is an indication of their level of hygiene, which may be rooted in socio-cultural and behavioural practices, and moderated by income. Respondents who



indicated that they deposit waste in their backyard where they ultimately burn were 58.3%, while those who indicated that they deposit along the drainage gutter (**Plate 4.11**) so that rainwater will wash it away were 30.3% and 12.4% stated that they deposit it in the gully because they were attempting to fill the gully and that the waste would eventually be washed away by the flood water (**Figure 4.13** and **Plate 4.12**).



**Figure 4.13: Waste Deposition Methods**



**Plate 4.11: Waste Deposition in Drainage Channels**



**Plate 4.12: Waste Deposition in the Gully Erosion Site**

#### 4.6 Environmental Concern in the Community

Four major environmental concerns of the community identified during the consultation meeting are (a) irregular rainfall (b) excessive rainfall (c) soil loss and degradation, and (d) excessive heat. It was noted during the consultation that rainfall patterns have become highly irregular and unpredictable in recent time. This to a large extent has affected their agricultural practices. This challenge could be linked to the global climate change issue. Furthermore, when the rain comes, it is always in excess leading to issue of flooding and subsequent widening of the gully site in the community. Also, the excessive rainfall is also responsible for soil loss and degradation of soil quality leading to low agricultural yield. Prolonged dry season and excessive sunshine in dry season combined to produce excessive heat. Some of the respondents indicated that the increasing number of children with chicken pox could be linked to their exposure to excessive heat, while a number of adults indicated inability to sleep at night due to excessive heat. Some of the adults indicated that they sleep outside of their house to get enough fresh air at night. However, this has increased the vulnerability to mosquito bites and subsequent malaria fever.

##### 5.6.1 *Perceived Environmental Impacts of the Gully Erosion*

The consequences of the gully erosion to the community revealed that destruction of road infrastructure, alteration of the aesthetic beauty of the town, break in social relation, increased cost of commuting, land degradation, fear of property and humans being swept away by the flood water, and fear of falling into the gully are some of their concerns over the existence of the gully. One of the major concerns, which have been raised by the community people over the existence of the gully site in their community, is the effect of the gully on a major road in the community. The road has caved-in thereby making commuting between one part of the town and another difficult. Consequently, this has reduced social interaction between one part and another within the Ewu community (**Plate 4.13**). In addition, it has raised the cost of transportation because some of the residents claimed they now pay more than 50% of what they used to pay for transportation because of the destruction to the road. The gully and associated flood downstream is also threatening the road that leads to the Ewu

Monastery (**Plate 4.14**). The widening of the gully head is also a major concern to the community people because large amount of soil is washed away every year. Rill erosion is also noticed downstream of the gully heads and this rill erosion is taking place in areas devoted to agricultural use. Consequently, the residents in the community have observed low agricultural yields and destruction of farmland and produce. It should be noted that there is another developing gully about 300-meters from the main gully head in the Ewu town and this is moving backward towards the town (**Plate 4.15** and **Plate 4.16**). This new gully is developing in an area completely devoted to agriculture. Residents in the vicinity of the gully hardly sleep anytime it rains in the town because of the fear that their house may cave into the gully. There are relics of washed away and abandoned buildings in and near the gully heads. Some of the youths also claimed that nightlife has been reduced to zero because of the fear of falling into the gully. Therefore, the cost of the gully site to residents of Ewu community is too much for them to bear and that is why they have been calling on government at various levels over the years to come to their aid and assist with rehabilitating the gully site to ensure safety of lives and properties in the communities.



**Plate 4.13: Ewu Gully Erosion Head**



**Plate 4.14: Ewu Monastery Road Devastated by Growing Gully Erosion**



**Plate 4.15: Secondary Gully Erosion Site Close to Ewu Monastery Road**



**Plate 4.16: Secondary Gully Erosion Site Close to Ewu Monastery Road**

#### ***4.7. Assessment of Existing Formal and Informal Grievances Redress Mechanism***

Grievance Redress Mechanisms (GRMs) are defined as organizational systems and resources established by national government agencies (or, as appropriate, by regional municipal agencies or local traditional institutions) to receive and address concerns about the impact of their policies, programs and operations on external stakeholders. The stakeholder input handled through these systems and procedures may be called “grievances,” “complaints,” “feedback,” or any other functionally equivalent term. GRMs act, as recourse for situations in which, despite proactive stakeholder engagement, some stakeholders have a concern about a project or program’s potential impacts on them. GRMs can therefore be seen as part of institutional framework to redress perceived injustice or marginalisation arising from project implementation.

GRMs are intended to be accessible, collaborative, expeditious and effective in resolving concerns through dialogue, joint fact-finding, negotiation, and problem solving. They are generally designed to be the “first line” of response to stakeholder concerns that have not been prevented by proactive stakeholder engagement. GRMs are intended to complement, not replace, formal legal channels for managing grievances (e.g., the court system, organizational audit mechanisms, etc.). Stakeholders always have the option to use other, more formal alternatives, including legal remedies. It is important to emphasize that national GRMs are not intended to replace the judiciary or other forms of legal recourse. The existence of a GRM should not prevent citizens or

communities from pursuing their rights and interests in any other national or local forum, and citizens should not be required to use GRMs before seeking redress through the courts, administrative law procedures, or other formal dispute resolution mechanisms.

Based on the foregoing, it is clear that there is no existing formal institutional frameworks specifically setup to handle grievances that might arise from the gully erosion rehabilitation project in the community. Public Complaint Commission (PCC) perhaps is the only formal agency saddled with such responsibility. The agency has its presence in virtually all the state capitals in Nigeria. Complaints about the project can therefore be lodged at their office in Benin, Edo State. This office appears to be the closest to the project site.

In conjunction with stakeholders, the Edo state NEWMAP nevertheless will develop and implement a Grievance Redress Mechanisms (GRM) that will include the following:

- i. Anyone may contact the NEWMAP, in person, by mail, or by telephone to submit a grievance;
- ii. Contacts about grievances may be initiated by the affected person, through an agreed local liaison committee or through the Ewu community;
- iii. All complaints will be documented by Edo State NEWMAP and tracked to resolution, and information on the status will be available to the person making the complaint;
- iv. The Edo State NEWMAP will investigate the complaint and determine the response including, if applicable, proposed actions;
- v. The Edo State NEWMAP will inform the person making the complaint, either verbally or in writing;
- vi. Prior to rehabilitation of the Ewu gully erosion site, Edo State NEWMAP will work with stakeholders to develop arbitration system for resolving complaints;
- vii. The grievance mechanism will inform complainants of their options if the complaint cannot be resolved;
- viii. The Edo State NEWMAP will strive to investigate and resolve complaints promptly;

- ix. There will be no cost to the person presenting the complaint;
- x. All complaints will be treated with appropriate confidentiality;
- xi. Complaints will be investigated and resolved without retribution to the complainant or other persons; and,
- xii. Project personnel, especially those who have contact with the public, will be briefed/trained about the grievance procedure, including whom to contact within the Edo State NEWMAP or the Edo State Government about a complaint.

Ewu traditional council has been identified as the only informal grievance redress mechanism that can be employed by residents in Ewu community. Over the years, the council has amicably resolved grievances among warring factions, families and individuals in the community. The achievement was made possible because of the high regard accorded traditional institution in the community. The council is made up of the paramount ruler and council of chief. Perceived grievances arising from the gully erosion project implementation can be reported to the council. During the stakeholder engagement, the council assured that any grievance (as long as it is not criminal and is within the purview of the council) reported to them would be amicably settled. Anticipated grievances that may arise during the gully erosion project and which might be amicably resolved include trespasses on land, property and farmland by the contractor and during the payment of compensation for those to be involuntarily relocated away from the gully head area to a safer location.

#### ***4.7.1 Stakeholder Engagement Plan***

The Edo State NEWMAP has been implementing its Stakeholder Engagement Plan since the project inception in the state and it includes the following:

- i. Identification of Project stakeholders;
- ii. Summary of past consultation efforts;
- iii. Planned consultation efforts to prepare for construction activities;
- iv. Stakeholder engagement during construction;
- v. Stakeholder engagement during operations;

- vi. Resources for stakeholder engagement;
- vii. Monitoring and reporting on stakeholder engagement; and
- viii. Formation of the Ewu gully erosion site monitoring committees

#### 4.7.2 Consultations with relevant stakeholders

Community consultation with residents of Ewu community on the gully erosion site rehabilitation was with a view to informing them about government readiness to intervene in the project. In addition, it serves to secure community buy-in on the project while at the same time identifying issues that could generate grievances between the community and the contractor during the construction activity.

Consultation on the gully erosion was held at Ewu palace and in attendance were various community groups and individuals (**See Plate 4.17 - 4.22** for the stakeholder engagements held at Ewu community and **Appendix 1.0** for list of individuals in attendance). The project team leader introduced the project to the community and thereafter, questions and the team entertained concerns.







**Plate 4.17 -4.22: View of the stakeholder engagement held at Ewu community**

It was gathered that the erosion started about 17 years ago as small rill erosion but has since become a massive gully in the community. Topography of the gully site was identified as being responsible for the emergence of the gully and it was sustained by vegetation clearance. Residents have attempted to reduce the effect of associated flood through the use of sand bags as embankment around their houses, however, while the initiative helped to reduce the amount of floodwater that entered their house, it did not reduce the widening of the gully. Digging of small retention ponds and clearing of drainage channel and opening up of new drainage channels were among the efforts embarked upon to reduce the volume and speed of storm water entering into the gully site. It was reported that the Senate Committee of the National Assembly on work had visited the community in the past to assess the extent of damages occasioned by the gully.

Some of the untoward consequences of the gully erosion were that:

- i. Some of the residents had been carried away by the flood water and later found dead;
- ii. Some died when their house collapsed during the flood water;
- iii. Some have equally lost domestic animals to the rampaging flood;
- iv. Not less than 10 houses had been destroyed by the flood water, while a number of building had suffered structural defects as a result of the flood and gully erosion (**Plate 4.23 & 4.24**);

- v. The flood has increased the cost of communication between Ehanlen and Idunwele;
- vi. It has also increased the distance and cost of travelling to the community market;
- vii. It has affected the social relationship between Ehanlen and Idunwele; and
- viii. Human portage has become the order of the day as people carry loads on their head because no vehicle would ply the road in the town.



**Plates 4.23: Eroded Building Foundation Consequent upon the Flood**



**Plate 4.24: Structurally Affected House Close to the Gully Head in Ewu Town**

It was also reported that:

- i. There are few shrines located along the corridor of the gully route but the community is willing to relocate those shrines because the rehabilitation of the gully takes precedence over and above everything else.
- ii. Issues of compensation for properties that are likely to be affected during construction phase should be properly discussed ahead of the construction to forestall conflict;
- iii. The community frowns at stealing and would not want any of the contractor staff to trespass into resident's farmland;
- iv. The community has not witnessed any major conflict in the last 20 years. Neither communal nor ethno-religious conflict has been experienced in the community;
- v. The project would not in any way impinge on the cultural values of the residents;
- vi. The contractor should employ sizeable number of the residents for its various activities;
- vii. The communities assured of their cooperation with the Edo state NEWMAP, contractors and consultants. They promised adequate security / protection of lives, properties and equipment during construction and other related activities; and
- viii. Towards a successful implementation of the NEWMAP project, the community has setup various committees to assist the contractor that would be handling the construction work.

#### *4.7.3 Anticipated Impacts of the Gully Erosion Intervention Project*

Residents in Ewu community are quite aware of the government's intention to assist them in addressing the challenges posed by the gully erosion. During the questionnaire administration and consultations, residents claimed that they have been seeing different kinds of people coming to inspect the gully site and that they have helped in conducting them round the community so that they will have a first-hand view of the challenge posed by the gully. Virtually all the adults in the community seem to be aware of NEWMAP intervention as they often ask strangers they see whether they are in the

community because of the NEWMAP project. Based on the consultations held with the residents, their expectation is very high although some of them are sceptical whether government will address the problem immediately or deferred it till another time when money would be available. They however pleaded that in view of risks posed by the gully to lives and properties, government should urgently rise to their aid to address the problem of the gully immediately.

As part of the community preparation, various committees have been inaugurated to interface with the consultant that would handle the intervention project at the gully site. The committee meets regularly to educate residents on what government is doing or planning to do to address the gully issue in the community. Hence, the intervention project implementation might not likely face any challenge because it is a top priority need in the community. Some of the issues that the residents think could engender crisis included; violation of customs and tradition of the community, none engagement of the community people during the construction phase of the project, improper handling of issues relating to compensation and theft of agricultural produce by project amongst others.

It was gathered during the community consultation and key informant interview with the paramount ruler of Ewu town, that, although, there are shrines close to the gully downstream, nevertheless, the community is willing to relocate the shrines to another location. The community is committed to the rehabilitation of the gully and therefore, not wanting anything to disturb the project. It was also noted that since there would always be community people with the contractor, the contractor would be adequately guided on the local cultures and taboos. The community people would also be happy if they are engaged in the rehabilitation work. It was noticed that there are able-bodied men that can provide labour for different aspects of the construction during the implementation phase and operational phase of the project. Another issue of concern relates to compensation and modalities for allocation of compensation among the project affected people (PAP). The issue of what to pay, and who to be pay, as well as how much to be paid were extensively discussed during the consultations. It was clear that if the issue of

compensation is not properly addressed, it could result in conflict between residents and the NEWMAP. Being an agricultural society, the residents in Ewu community frown at theft of their produce. They therefore encourage construction workers to adhere strictly to their rules of engagement during their work in the community.

## **CHAPTER FIVE**

### **ASSESSMENT OF ASSOCIATED AND POTENTIAL IMPACTS**

#### **5.1 Introduction**

This chapter presents in a succinct and precise manner, the identified impacts of the proposed NEWMAP gully erosion site rehabilitation intervention project in Ewu Esan Central LGA of Edo State, Nigeria. The associated and potential impacts of the NEWMAP intervention in Ewu was identified based on the interaction of specific project activities with the biophysical and social characteristics of the project environment as well as the health/safety requirements of the Ewu Esan Central community and the construction workers. Details of the methodology adopted for impact analysis; the associated and potential impacts of the project; the residual impacts identified; mitigation measures for the amelioration of the identified impacts and the broad beneficial impacts of the proposed NEWMAP intervention are presented herein.

#### **5.2 Associated and Potential Impacts Determination**

The impact assessment methodology approach utilized followed a four-step approach which consists of:

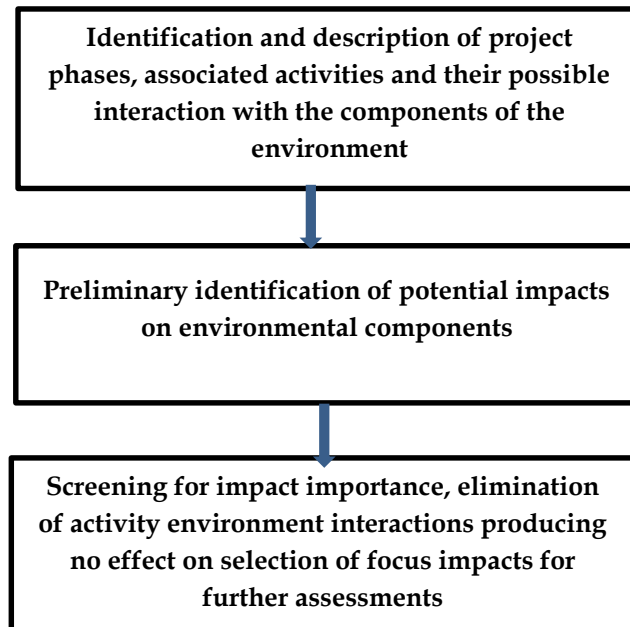
##### **Step One:**

Elaboration of baseline situation, which describes the existing social and biophysical conditions of Ewu Esan Central, the project area prior to implementation of the proposed NEWMAP gully erosion site rehabilitation. Based on this, the impact analysis focus on all components, which are anticipated to be affected or modified by the project;

##### **Step Two:**

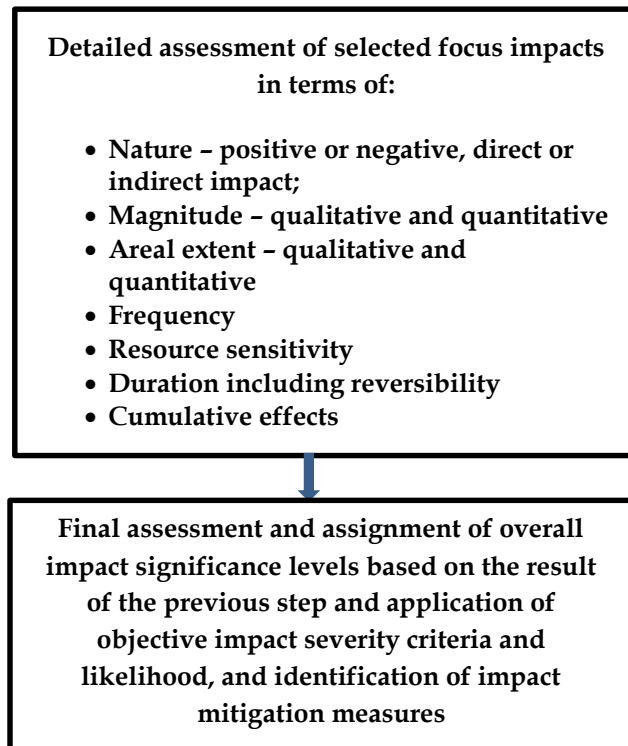
General Screening of potential impacts: The aim of the screening is to identify as exhaustively as possible all impacts, beneficial or detrimental which can reasonably result from the gully erosion site rehabilitation project implementation. A matrix approach is utilized, crossing all the parameters of the social and biophysical

environment with each project activity involved in project, during the site clearing and preparation, construction, operation and maintenance, and decommissioning phases. The impact identification and prediction approach utilizes elements of various impact identification and prediction methods such as checklists, matrices and flowcharts. To effectively perform these general screening of potential environmental impacts of the projects, the following approach was followed:



### **Step Three:**

**Impact Analysis and Elaboration of Corrective Measures:** On the basis of the screening stage, the main impacts were analyzed, in order to quantify them, whenever possible and to elaborate specific measures to cancel, reduce or compensate the most detrimental ones. This step was performed by performing the following tasks:



#### **Step Four:**

On conclusion of the impact analysis, the details of the positive and negative effects of the proposed developments on the environment are outlined and appropriate solutions or mitigation measures to minimize any undesirable effects resulting from the proposed

#### **5.2.1 Project Activities and Affected Environmental Media**

The analysis of project impacts of the NEWMAP gully erosion site rehabilitation project involves the identification of environmental media that could be potentially affected by all project activities in the four phases of the project viz.

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



For the purpose of impact identification, the respective project activities to be undertaken for each phase of the project include:

**Table 5.1: Project activities at the four phases of the proposed NEWMAP Intervention project in Ewu Esan Central**

S/No	Project Phase	Project Activities
1	Pre-construction	<ul style="list-style-type: none"> <li>➤ Land Acquisition and demolition of existing buildings</li> <li>➤ Contractor's Site Clearing and Preparation Activities and Logistics; <ul style="list-style-type: none"> <li>• General clearing and preparation of the project site for gully erosion site engineering solution construction works</li> <li>• Surveying and setting out of the new storm water drainage infrastructure (Culverts);</li> <li>• Utilization of existing access roads to the proposed project site;</li> <li>• Construction of sheds and equipment lay down areas for the storage of materials;</li> </ul> </li> <li>➤ Transportation of equipment, materials and workers to the project site</li> </ul>
2	Construction	<ul style="list-style-type: none"> <li>➤ Construction of drainage conduits upstream of the gully head to contain and direct overland flows into the new diversion culverts;</li> <li>➤ Demolition of two existing buildings to make way for the construction of the main bypass culvert;</li> <li>➤ Construction of gully bypass system, a 2.5m by 1.5m closed box diversion drainage culverts to collect and direct storm water flows from existing roadside channels and overland flows into a Chute (drop down structure)</li> <li>➤ Construction of a Baffled Chute to the bottom of the gully (a drainage infrastructure for discharging storm water into the gully downstream of the gully head);</li> <li>➤ Construction of Stilling Basin;</li> <li>➤ Filling of the gully head</li> <li>➤ Reshaping of the gully as an earth channel by a cut-and-fill civil works whereby the earth removed from the gully sides slopes is used to compact the gully floor.</li> <li>➤ Placement and positioning of nine (9) regularly spaced gabion drop structures over every 500m of the gully channel to reduce the longitudinal gradient to 0.05% (with a 2m drop) and slow down the flow velocity to 1.4m/s to prevent further incidence of erosion</li> <li>➤ Erosion protection of the banks by cutting and sloping the sides of the gully banks to a gradient of 1:2</li> </ul>

		<ul style="list-style-type: none"> <li>➤ Use of gully bank soil materials to fill the gully bed a few meters and the to fill the gully head</li> <li>➤ Re-construction of the damaged road;</li> <li>➤ Reconstruction of all associated road drainage infrastructure</li> <li>➤ Reshaping the gully and installation of erosion protection facilities to enable safe conveyance of storm water downstream of the gully head;</li> <li>➤ Transportation of Heavy Equipment, Construction Materials and Workers to the Project Site;</li> <li>➤ Operation of Heavy Construction Equipment;</li> <li>➤ Fuel Storage and Dispensing to Heavy Equipment and Vehicles.</li> </ul>
4	Operation and Maintenance	<ul style="list-style-type: none"> <li>➤ Utilization and operation of the rehabilitated gully erosion site channel and;</li> <li>➤ Maintenance of the drainage infrastructure of the Ewu gully erosion site</li> <li>➤ Monitoring of the Ewu gully erosion infrastructure to ensure full functionality</li> </ul>
4	Decommissioning	<ul style="list-style-type: none"> <li>➤ Dismantling and Removal of Equipment; and Vehicles</li> <li>➤ Restoration of the Project Site to its natural state and</li> <li>➤ Waste Management.</li> </ul>

### 5.3 Associated and Potential Environmental and Social Impacts

The potential environmental and social impacts of the proposed project are as shown in **Table 5.2**

**Table 5.2: The potential environmental and social impacts of the project**

PROJECT PHASE	PROJECT ACTIVITY	AFFECTED ENVIRONMENTAL AND/OR /SOCIAL COMPONENT	PROJECT IMPACT
Pre-Construction:	General clearing and preparation of project site for gully erosion site rehabilitation and construction works	Socio-economics	<input type="checkbox"/> Increased employment opportunities for the local communities
		Socio-economics	<input type="checkbox"/> Interference with day-to-day community activities resulting in conflicts and complaints
Pre-Construction	Land Acquisition and demolition of existing buildings	Socio-economics	<input type="checkbox"/> Conflict over loss of land and resettlement benefits if payment is restricted to owners of the two buildings to be demolished for the construction of the diversion culvert
		Socio-economics	<input type="checkbox"/> Conflict between the NEWMAP project and the resident community over relocation benefits due to those families whose buildings, land, and lives of loved ones were lost to the gully erosion at Ewu Esan Central
Pre-Construction	Physical presence of construction workers on the Ewu Gully erosion intervention project site and environ	Soil	<input type="checkbox"/> Contamination of soil and downstream water resources of the project area from indiscriminate disposal of untreated sewage
Pre-Construction	Contractor’s site preparation operations	Socio-economics	<input type="checkbox"/> Increased employment

			opportunities for the local communities
Pre-Construction:	Transportation of equipment, materials and workers to the project site	Air Quality	<input type="checkbox"/> Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles
		Noise Levels	<input type="checkbox"/> Noise and vibration from vehicular movement
		Transportation/infrastructure	<input type="checkbox"/> Traffic congestion and increased risk of occurrence of traffic accidents and injuries
Construction	Construction of sheds, equipment lay down areas, temporary office and sanitary facilities etc.	Air Quality	<input type="checkbox"/> Increase in ambient noise levels and vibration
Construction	Construction of drainage conduits upstream of the gully head and other associated road drainage infrastructure	Socio-economics	<input type="checkbox"/> Increase in employment opportunities and engagement of community labour
		Socio-economics	<input type="checkbox"/> Social and cultural structure interference and complaints;
		Community/Public Health	<input type="checkbox"/> Marginal increase in population within the settlements in close proximity to the project site will lead to an increase in negative vices such as prostitution (commercial sex work) and crime which would affect social and cultural systems

			through a negative value system;
		Socio-economics	<input type="checkbox"/> Conflicts between the project and the community as well as the pressure of the influx of potential job seekers into the project area and associated risks;
		Socio-economics	<input type="checkbox"/> New wealth among the youth would threaten the existing authority structure;
Construction	Disruption and encroachment into agricultural lands in close proximity to the gully erosion	Socio-economics	<input type="checkbox"/> Conflict over loss of agricultural lands due to gully erosion rehabilitation civil works downstream of the gully head in Ewu Esan Central community
	Transportation of equipment, materials and worker to project site	Soil and Groundwater	<input type="checkbox"/> Accidental release of fuels, oils, chemicals, hazardous materials etc., to ground in the construction laydown area during delivery of materials and equipment to project site
Construction	Construction of 2.5m by 1.5m gully bypass closed box diversion drainage culverts	Socio-economics	<input type="checkbox"/> Conflict over loss of land and resettlement benefits for demolition of two existing buildings obstruction the construction of the diversion culvert
		Socio-economics	<input type="checkbox"/> Conflict between the NEWMAP

			<p>project and the resident community over relocation benefits due to those families whose buildings, land, and lives of loved ones were lost to the gully erosion at Ewu Esan Central</p>
		Socio-economics	<ul style="list-style-type: none"> <li><input type="checkbox"/> Disruption of community activities and movement around the gully head</li> </ul>
Construction	Construction of Baffle Chute to the bottom of the gully	Soil and Erosion	<ul style="list-style-type: none"> <li><input type="checkbox"/> Risk of chute failure by flow undermining gully head, overtopping or bypassing. The failure occurs when storm runoff fails to enter the baffle chute properly especially when the runoff leaks and flow bypassing occur at the chute entrance</li> </ul>
		Soil and erosion; Health and Safety; Socio-economics	<ul style="list-style-type: none"> <li><input type="checkbox"/> Occurrence of risks associated with large storm events that exceeds the design capacity of the Chute</li> </ul>
		Soil and Agriculture	<ul style="list-style-type: none"> <li><input type="checkbox"/> Loss of fertile top soil for infertile sub-surface soil that would not enhance vegetation establishment</li> </ul>
		Socio-economics; health and safety	<ul style="list-style-type: none"> <li><input type="checkbox"/> Risk of loss of life and damage of the proposed gully drainage infrastructure</li> </ul>

Construction	Construction of Stilling Basin	Soil and Agriculture	<input type="checkbox"/> Loss of agricultural lands and increase in the exposure of erodible soil
		Soil and Agriculture	<input type="checkbox"/> Loss of valuable topsoil that the could be used for seeding vegetation
		Health and Safety	<input type="checkbox"/> Workers exposure to risk of falls into excavated pit and occurrence of accident or injuries
		Socio-economics; Health and Safety	<input type="checkbox"/> Risk of stilling basin failure and occurrence of flooding, overtopping resulting in stilling basing sweep out and downstream channel erosion
Construction	Filling and reclamation of the gully head	Health and Safety	<input type="checkbox"/> Occurrence of accident and safety risk incidents
		Health and Safety	<input type="checkbox"/> Waste handling and disposal
		Water Quality	<input type="checkbox"/> Increase in turbidity and sediment load in downstream receiving water bodies
Construction	Reshaping of the gully channel by cutting earth from gully side slopes to fill the gully channel floor	Soil and Erosion	<input type="checkbox"/> Increase in the amount of disturbed areas created by earthmovers used in reshaping the gully side slopes
		Water Quality	<input type="checkbox"/> Contamination of downstream receiving water bodies by fertilizers, and pesticides as well as creation

			of excessive bare soils by herbicides if used for the establishment of the recommended plant species seeded to control soil erosion
		Soil and Erosion	<input type="checkbox"/> Exacerbated gully erosion channel bed undermined and washing away of fill materials resulting in increased sediment load in receiving water bodies downstream
	Increase in the amount of disturbed areas created by earthmovers used in reshaping the gully side slopes	Soil and Erosion	<input type="checkbox"/> Risk of erosion of exposed gully side slopes and erosion of ground area above the gully channel divide
		Soil and Agriculture	<input type="checkbox"/> Loss of fertile top soil that could be used for seeding vegetation
		Soil and Erosion	<input type="checkbox"/> Occurrence of bank erosion along reshaped gully channel slopes
Construction	Placement of Gabion Drop Structures in gully channel to reduce longitudinal gradient to 0.05%	Soil and Erosion; Vegetation and Wildlife	<input type="checkbox"/> Disturbance of unnecessary large land areas for transportation of materials and heavy earthmovers
Construction	Erosion protection of gully banks by cutting and sloping the sides of the gully bank to a 1:2 gradient	Soil and Agriculture	<input type="checkbox"/> Loss of fertile top soil which could be used for seeding vegetation
		Health and Safety	<input type="checkbox"/> Risk of occurrence of accident or injury
Construction	Reconstruction of damaged road	Air Quality	<input type="checkbox"/> Ambient air quality deterioration from airborne dust particulates,



			fugitive emissions, exhaust of equipment/automobiles
		Noise Level	<input type="checkbox"/> Noise and vibration from vehicular movement
Construction	Reshaping the gully and installation of erosion protection facilities to enable safe conveyance of storm water downstream of gully head	Water Quality	<input type="checkbox"/> Water quality deterioration
		Health and Safety	<input type="checkbox"/> Risk of hearing impairment from increased noise and vibrations
		Vegetation and Wildlife	<input type="checkbox"/> Loss of wildlife
		Soil and Agriculture	<input type="checkbox"/> Loss of valuable topsoil that could be used for seeding vegetation
Construction	Transportation of heavy equipment, construction materials and workers to the project site	Air Quality	<input type="checkbox"/> Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles
		Noise Level	<input type="checkbox"/> Noise and vibration from vehicular movement
		Transportation and Infrastructure	<input type="checkbox"/> Traffic congestion and increased risk of occurrence of traffic accidents and injuries
		Soil and Groundwater	<input type="checkbox"/> Accidental release of fuels, oils, chemicals, hazardous materials etc., to ground in the construction laydown area during delivery of materials to project site
Operation	Utilization of the rehabilitated gully site and installed storm water drainage	Socio-economics; Infrastructure	<input type="checkbox"/> Risk of failure of the gully erosion installed drainage infrastructure to

	infrastructure		safely route storms of 1 in 50 years
		Soil and Erosion; Flooding and Infrastructure	<ul style="list-style-type: none"> <li>❑ Risks from debris and sediment accumulation in the drainage channels in upstream catchment area of the gully head, Diversion Culvert, Baffle Chute, Gabion Drop Structures and Stilling Basin resulting in performance failure of the drainage infrastructure</li> </ul>
		Infrastructure	<ul style="list-style-type: none"> <li>❑ Risk of undermining and occurrence of scouring in the Baffle Chute could result in deteriorating performance of the structure</li> </ul>
Operation	Maintenance of the gully drainage infrastructure	Soil and Erosion Health and Safety	<ul style="list-style-type: none"> <li>❑ Risk of failure of the gully intervention from poor maintenance of the drainage infrastructure to achieve the desired project objectives such as (Creation of new gullies within the channel; breeding of vectors in the settling basin, undermining of the drainage infrastructure and scouring of the drainage structure, etc.)</li> </ul>
		Soil and Erosion	<ul style="list-style-type: none"> <li>❑ Disruption of the side slopes during routine maintenance of the gully channels</li> </ul>

Decommissioning	Dismantling and removal of civil engineering equipment	Air Quality	<input type="checkbox"/> Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles
		Noise levels	<input type="checkbox"/> Noise and vibration from vehicular movement
Decommissioning	Waste handling and disposal	Waste Management	<input type="checkbox"/> Solid Waste generation, handling and disposal
		Health and Safety	<input type="checkbox"/> Poor housekeeping and environmental sanitation
Decommissioning	Transportation of solid waste, equipment and workers out of the project site.	Transportation and Infrastructure	<input type="checkbox"/> Traffic congestion and increased risk of occurrence of traffic accidents and injuries
		Air Quality	<input type="checkbox"/> Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles
		Noise Levels	<input type="checkbox"/> Noise and vibration from vehicular movement

### **5.3.1 Positive Impacts of Pre-construction and Construction Phase**

The bulk of the positive impacts expected from this project are as a result of employment and income generation during various stages of project execution as well as improved aesthetics and living conditions due to the restoration of affected gully site at Ewu, such that they can become useful over time, in addition to prevention of further loss of houses, lives and property. The sites, as they currently exist, constitute various hazards.

The various intervention projects are also expected to generate several jobs at the different phase of the intervention projects. For instance, site clearing will require the employment of local labour, who will work on various stages of the project. During construction, a lot of the local population, especially the traders and food vendors may witness increased patronage, as construction workers are likely to patronize them for food items, clothing and other domestic use items. This will lead to some form of prosperity and increased cash flow for the local communities.

In spite of these positive impacts however, there are some potential and associated negative impacts. These are discussed in the next sub-section of the report.

### **5.3.2 Negative Impacts**

Field observation shows severe damage to the roadsides drainage channels within the gully site while the tarred road had been very deeply eroded. The gully itself poses serious danger to cyclists, motorists and even the pedestrians. Similarly, buried infrastructures such as communication cables and pipes for potable water supply had been severely damaged. Due to the gully on the tarred road, human and vehicular traffics were diverted causing social and cultural inconveniences to residents along the traffic route diverts. Several buildings were reported to have been washed off by the gully erosion in the time past and till now, lots of other closed-by houses within the immediate surroundings of the gully are deeply cracked, and are no longer habitable as they could collapse at any time. Downstream of the gully, lots of plants of economic, medicinal and cultural values had been eroded and lost to the devastating effect of the

soil erosion. If the implementation of the proposed intervention project is delayed, some burial ground and a number of nearby houses, mostly bungalows are envisaged to be affected by the rampaging influence of the gully. This further exposes a lot more life and properties to the destructive hazards of the existing gully erosion especially during the rainy season.

In view of the above stated negative impact of the gully erosion site at Ewu, the proposed intervention are expected to have few negative impacts are anticipated from the project activities, and a summary of these impacts are presented below:

### ***Pre-Construction Phase***

This phase of the project includes activities such as designs, site preparation activities, land Acquisition and demolition of existing buildings, Physical presence of construction workers on the Ewu Gully erosion intervention project site and environ and project implementation strategies. Given the various activities involved at this phase of the intervention project, some impacts are anticipated at this phase and these include:

- *Displacement of People:* Prior to the construction activities, the people located within the delineated area of influence around the gully head/site for the proposed intervention project will have to be displaced thereby forcing them to relocate to a different location within the community. Based thereon, these areas will have to be acquired by the Edo State NEWMAP-SPMU employing the state policy on land acquisition as well as recognizing and respect the mutual agreement with the affected landowners.
- *Emotional disturbance:* The people displaced will already have an emotional attachment to their properties and as such may be reluctant if not outright rejection to move to a new location in anticipation of non-payment of compensation commensurate with demolished buildings, workshops/shades destroyed farmlands/economic trees along the project site either being under-paid or neglected. These could result to ill health and apathy towards Government and the projects.

- *Impact on Ambient air quality:* During the site preparation activities, there is bound to be transportation of equipment, materials and workers. These activities could lead to ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles;
- *Increased pressure on road traffic volume and other existing infrastructure:* As a result of influx of people, road traffic might be disrupted during mobilization of personnel and equipment to site. These disruptions and increase in volume of traffic as well as current poor and terrible condition of Auchi – Benin road could cause traffic jams and enhance the risk of accidents. The influx will also put more pressure on the already deficient physical, social and economic institutional infrastructure. For instance, power and telecommunications cables crossing roads in and to the project area could be disrupted and destructed. Furthermore, the thin asphalt pavement overlay of the main road within Ewu community may not be able to withstand the anticipated volume and loads of the traffic.

### **Construction Phase**

During construction activities, vegetation and other materials within the gully site at Ewu will be cleared, and the entire site will generally prepared for project activities. Cleared materials will most likely be added to fill materials. In addition, fill materials will be brought from offsite locations to make up the required volume that will be required for the reclamation activity, in addition to the construction of proper drainage channels. Other construction activities include construction of drainage conduits upstream of the gully head and other associated road drainage infrastructure etc. At this phase, the various machinery, vehicles and equipment will generate emissions and noise. Human presence within and around the site will increase significantly, and there will be a number of critical negative impacts on the environment. Some of these impacts are summarized below:

- *Impact on Ambient air quality:* Emission of noxious gases from the exhaust of trucks, automated cranes etc. moved to the project site may pose negative health impacts to project workers who will have to inhale them on a continuous basis, as well as residents of Ewu community, especially those located downwind of the

project site. In addition, mobilisation of equipment to site may increase the average noise level from the current background levels. This could contribute towards the impairment or hearing among project workers as well as residents of community.

- *Impact on Vegetation:* The process of mechanical clearing of vegetation could lead to the introduction of exotic species of plants, which could out-compete native species leading to an alteration of species composition and abundance in the general vicinity of the project area. Such as altering the natural vegetal structure from tropical rain forest to open stretch woodland or shrub land within the high-rainfall forest zone.
- *Impact on Hydrogeology:* During construction phase, the hydrogeological significant and critical concern in the area is the contamination of soils as a result of improper discharge and/or storage as well as leakage of waste oil generated by the construction equipment, effluents from sewage tanks inclusive;
- *Impact on Soil:* During the construction of still basin and Baffle Chute to the bottom of the gully, there is likely the loss of fertile top soil for infertile sub-surface soil that would not enhance vegetation establishment and loss of valuable topsoil that the could be used for seeding vegetation;
- *Impact on Downstream water bodies:* During filling and reclamation of the gully head and reshaping of the gully channel by cutting earth from gully side slopes to fill the gully channel floor, there will be increase in turbidity and sediment load in downstream receiving water bodies. In addition, the contamination of downstream receiving water bodies could occur by fertilizers, and pesticides as well as creation of excessive bare soils by herbicides if used for the establishment of the recommended plant species seeded to control soil erosion;
- *Impact on Wildlife:* The reshaping of the gully and installation of erosion protection facilities to enable safe conveyance of storm water downstream of gully head could lead to loss of wildlife;
- *Impact on transportation:* Increased vehicular traffic in the area during this period may lead to traffic congestion and the associated physiological stress on

commuters and residents of Ewu community, who will have to spend longer periods travelling from one point to the other.

- *Impact on Waste Management:* Solid wastes especially iron cuts and fragments generated during construction. This will pose a problem in terms of waste handling;
- *Impact on Social Issues:* The influx of a largely youthful, sexually active people, many of who are likely to be single is anticipated to increase the potential for casual sex and the transmission of STIs. This is because commercial sex workers often constitute a significant proportion of camp followers for the project of this magnitude. Other social pathological conditions such as increase in crime rate, fraud, prostitution; drug and alcohol abuse, etc. will be on the increase.

### **Operation Phase**

During operational phase, the proposed intervention project would have been completed. However, these intervention projects are to be maintained in order to increase the life span of the intervention project. To achieve this, the following activities will be carried out, namely utilization of the rehabilitated gully site and installed storm water drainage infrastructure and the maintenance of the gully drainage infrastructure.

These activities are likely to have some negative impacts and these are:

- Risk of failure of the gully erosion installed drainage infrastructure to safely route storms of 1 in 50 years;
- Risks from debris and sediment accumulation in the drainage channels in upstream catchment area of the gully head, Diversion Culvert, Baffle Chute, Gabion Drop Structures and Stilling Basin resulting in performance failure of the drainage infrastructure;
- Risk of undermining and occurrence of scouring in the Baffle Chute that could result in deteriorating performance of the structure;
- Disruption of the side slopes during routine maintenance of the gully channels.



### ***Decommissioning Phase***

During this phase of the proposed project, all structures within the project location shall be dismantled and disposed of in an environmentally friendly manner. This process may cause minor negative impacts on the environment, some of which include:

- *Impact on Ambient air quality and Noise level:* During the decommissioning of the intervention projects, several demolitions and dismantling of still basin to mention will occur. These activities could lead to ambient air quality deterioration from airborne dust particulates, fugitive emissions, and exhaust of equipment/automobiles. In addition, the activities could lead to noise level increase and vibrations from vehicular movement and equipment.
- *Impact on Solid Waste Generation:* Solid wastes especially iron cuts, cement bricks and fragments generated during demolition. This will pose a problem in terms of waste handling;
- *Impact on traffic movement:* The decommissioning activities could lead to traffic congestion and increased risk of occurrence of traffic accidents and injuries.

### **5.3.3 Residual and Cumulative Impacts**

Residual impacts are those that remain even after implementing recommended mitigation measures. Cumulative Impacts, on the other hand, are those that occur in addition to existing impacts. For instance, when a construction project is to happen close to a quarry that is already emitting particulates into the ambient air, then the particulate impact is cumulative. If, on the other hand, an impact is rated major, but applying mitigation measures can reduce the significance to minor, then the minor impact is the residual impact.

For the current project, no major impacts were identified. The application of mitigation measures, as recommended in a later part of this chapter will effectively reduce the moderate impacts to minor residual impacts, while the minor impacts are completely eliminated (no residual impact) or leave only negligible impacts. In terms of cumulative impacts, no cumulative impacts are expected from the planned project activities.

## CHAPTER SIX

### ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

#### 6.1 Overview

Environmental and Social Management Plan (ESMP) is an important project management strategy that will manage the proposed Ewu gully erosion site rehabilitation project activities such that the potential environmental and social impacts arising from the project implementation will be mitigated, avoided or eliminated. This chapter presents the specific objectives the proposed ESMP shall achieve, the environmental and social impacts of the intervention identified, a discussion of the mitigation measures recommended to address the adverse project impacts, the institutional responsibilities and accountabilities, the capacity building requirements, the public consultation plan, the mechanism for resolving community conflicts and disagreements regarding the project activities in line with the ESMF, RPF, RAP, and Project Implementation Manual, the Environmental Monitoring Plan indicating the suitable monitoring indicators for the project and the costs of implementation of the ESMP. In order for the ESMP to address the environmental and social issues that would arise from the implementation of the civil engineering works and gully erosion control infrastructural development solutions, the proposed ESMP shall achieve the following specific objectives:

- ❑ Ensure that all social and environmental considerations that assure compliance with sustainable development tenets are incorporated at all phases of the gully erosion intervention project;
- ❑ Proactively initiate strategies to identify any sign of environmental stress, deterioration or degradation within the Ewu watershed arising from the gully erosion site rehabilitation civil engineering works by scientific investigation of specific environmental monitoring parameters and comparing them to established background values stipulated by regulatory agencies;
- ❑ Provide assurance that the environmental impact mitigation measures recommended for implementation during the project phases are adequate for

effective amelioration of the project impacts and indicate whether the respective impact monitoring parameters investigated are within the stipulated environmental limits of regulatory agencies;

- Provide early warning of environmental damage so that actions may be taken during the implementation of the NEWMAP intervention project to reduce such harmful impacts;
- Ensure that regulatory standards for pollutants are not exceeded;
- Assure adequate stakeholder engagement and consultation in the implementation of the NEWMAP gully erosion rehabilitation project;
- Verify the compliance of the project Contractors and NEWMAP Edo SPMU with regulatory requirements and the Environmental Management and Monitoring Plan proposed in this ESMP;
- Establish and explicitly indicate the roles and responsibilities of all pertinent stakeholders in the implementation of the proposed Edo State NEWMAP ESMP at Ewu gully watersheds;
- Establish the required reporting procedures, the appropriate line of communication of complaints and for managing and monitoring the environmental and social concerns of the gully erosion rehabilitation intervention project;
- Ensure that all the impact mitigation measures recommended for the NEWMAP gully erosion site rehabilitation intervention project works are effectively implemented;
- Ensure that all project contractors and relevant stakeholders comply with the recommended impact mitigation measures in the proposed ESMP and other relevant regulatory requirements;
- Determine the training, capacity building and technical assistance needed to successfully implement the provisions of the Ewu, Edo State NEWMAP ESMP;
- Verify NEWMAP's compliance with the recommended Environmental and Social Management Plan; and
- Estimate the cost and budget for the implementation of the Ewu, Edo State NEWMAP gully erosion rehabilitation project.

## 6.2 Mitigation Measures for the Identified Impacts

Mitigation measures are options that can be used to either completely eliminate or minimize identified significant negative impacts of a development project to levels that can be acceptable. The traditional approach to design and operations is to ensure compliance with the applicable safety codes and standards during design. However, compliance with regulations, codes and standards may not be sufficient to achieve an appropriate level of Health Safety and Environmental (HSE) performance in design. Design codes are generic and applicable to facilities in a number of geographical areas that face a wide range of technical challenges unique, to the project. The design of the proposed project is based on the strictest of international codes and best practices. The mitigation measures discussed here are therefore designed to reduce, avoid or eliminate the negative project impacts to acceptable levels and as much as possible enhance the positive project impacts.

The usual practice is to ensure the implementation of these measures as part of the overall operational plans and procedures that will be used by the Edo State Project Management Unit of NEWMAP and its Contractors. For ease of comprehension, the mitigation measures are presented in relation to specific project activities that would cause them.

### ***Pre-Construction Phase***

To mitigate the impacts identified during the pre-construction phase, the followings shall be ensured:

NEWMAP shall:

- Consult regularly with the communities (i.e. before, during and after site clearance)
- Demarcate boundaries of acquired location.

NEWMAP shall:

- Consult regularly with the communities (i.e. before, during and after site clearance)

- ❑ Carry out adequate enumeration of project affected people, property and economic trees within the land area to be acquired for the project

NEWMAP shall:

- ❑ Develop a sound implementable Resettlement Action Plan for the Ewu project
- ❑ Ensure that adequate compensation shall be paid to project affected people in consultation with various stakeholders to avoid conflicts that may arise if payments are made to wrong claimants.
- ❑ Consult extensively with the communities on land acquisition and payment of relocation benefits
- ❑ Develop a sound implementable Resettlement Action Plan for the Ewu NEWMAP project
- ❑ NEWMAP-Edo SPMU shall reach agreement with regard to ways and means of resettlement of any forced displacement and relocation of any existing land use and ownership on the proposed land take and respect those commitments;
- ❑ NEWMAP-Edo SPMU and Contractors shall negotiate, if necessary, for the acquisition of land or the right of passage and provide for adequate compensation;

NEWMAP shall ensure that:

- ❑ Contractors provide adequate sanitary facilities for their site workers;
- ❑ Open air defecation is sternly discouraged among the project workers

NEWMAP shall ensure the:

- ❑ Use of equipment with high combustion efficiency for the project activities
- ❑ Use of dust suppressants on the project site

NEWMAP shall:

- ❑ Ensure that Contractors provide ear protective devices to the project workers at the site clearing stage;
- ❑ Ensure the use of the ear protective devices at site by project workers and visitors;
- ❑ Ensure that Contractors Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line

NEWMAP-Edo SPMU and Contractors shall:

- ❑ Avoid impeding traffic and traffic disruption around the project site by:
- ❑ Adjusting work schedules not to disturb traffic;
- ❑ Establishing an adequate system of road signs and detour;
- ❑ Notifying communities of pending work scope, duration and location
- ❑ Avoid blocking public access roads;
- ❑ Complying with road bearing capacity and repairing damage caused to roads during and at the end of the work;
- ❑ Circumventing access roads to gathering places in Ewu and neighbouring communities

### ***Construction Phase***

To mitigate the impacts identified during the construction phase, the followings shall be ensured:

NEWMAP-Edo SPMU shall ensure that:

- ❑ Ear protective device is provided to workers at the site clearing stage;
- ❑ Use of the protective devices provided is enforced
- ❑ Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line
  
- ❑ NEWMAP-Edo SPMU and Contractors shall obtain all necessary authorizations and permits prior to the execution of the work through consultation with relevant authorities
- ❑ NEWMAP-Edo State Project Management Unit (SPMU) and Contractors shall develop and provide a work schedule that will avoid disturbing the traditional and religious life of communities;

NEWMAP-Edo SPMU and Contractors shall:

- ❑ Establish a communication program to inform communities of ongoing work and establish appropriate measures to minimize the disturbance caused by the work;
- ❑ Implement the Influx Management Plan to address all socio-cultural issues, especially the preservation of social and cultural structures of the local communities;

- ❑ Periodically conduct STD and HIV/AIDs and general safe sex awareness campaigns as control measure for the transmission of the disease;
- ❑ Regularly distribute HIV/AIDS awareness communication materials;
- ❑ Implement labour hiring programs away from construction sites to reduce the presence of “camp followers”, prostitutes, drug dealers/users and other potential HIV/AIDS carriers.
- ❑ NEWMAP-Edo SPMU and Contractors shall ensure that a percentage and certain category of jobs are reserved for the female gender in the resident communities;
- ❑ NEWMAP-Edo SPMU and Contractors shall arrange initial contact with local contractors to maximize opportunities for local procurement
- ❑ NEWMAP-Edo SPMU and Contractors shall carry out extensive consultation with community leadership on the projects. The extent of consultation shall be determined by the complexity and the severity of the identified project impacts;
- ❑ Establish working relationships between NEWMAP-Edo SPMU, contractors, private security, surrounding communities, and local law enforcement agency to quickly disburse unauthorized personnel from work locations, camp sites if any, and surrounding communities;
- ❑ NEWMAP-Edo SPMU and Contractors shall guarantee access to private property and safety of residents and passer-by during the course of work by enacting the appropriate measures

NEWMAP shall:

- ❑ Establish appropriate protocols for materials delivery and handling to ensure there are no spills;
- ❑ Ensure that the contractor HSE plan addresses the prevention and containment of oil spills, chemicals and hazardous materials releases during all phases of the project;
- ❑ Ensure that storage and handling of hazardous materials are in accordance with approved hazardous materials management plan
- ❑ Maintain transportation vehicles, heavy civil engineering machinery and construction equipment in good working order so as to avoid exhaust emissions as well as oil and fuel leaks

- ❑ Any oil/chemical spill should be reported to FMEnv and Edo State Environmental Protection Agency
- ❑ Consult regularly with the communities (i.e. before, during and after site clearance
- ❑ Develop a sound implementable Resettlement Action Plan for the Ewu NEWMAP project
- ❑ NEWMAP-Edo SPMU and Contractors shall obtain all necessary authorizations and permits prior to the execution of the work through consultation with relevant authorities;
- ❑ NEWMAP-Edo State Project Management Unit (SPMU) and Contractors shall develop and provide a work schedule that will avoid disturbing the traditional and religious life of communities;
- ❑ NEWMAP-Edo SPMU and Contractors shall establish a communication program to inform communities of ongoing work and establish appropriate measures to minimize the disturbance caused by the work

NEWMAP-Edo SPMU shall ensure that:

- ❑ Specialist is engaged to supervise the construction of the Chute to avoid the potential by undermining, overtopping or bypassing

NEWMAP-Edo SPMU shall ensure that:

- ❑ Capacity of the Chute to handle the conveyance of a large runoff event that exceeds storms of 1 in 50 years recurrence interval shall be assessed

NEWMAP-Edo SPMU shall ensure that:

- ❑ During the construction of Chutes, topsoil shall be removed and stockpiled before shaping the gully head. On completion, the topsoil shall be spread to a depth of 150mm over the face and sides of the chute

NEWMAP-Edo SPMU shall ensure that:

- ❑ Chute shall be constructed on firm excavated soil rather than on the fill
- ❑ Storm water leaving the chute and outlet structure flows freely without causing undesirable



ponding or scour

NEWMAP-Edo SPMU shall ensure that:

- Staged earthworks approach shall be adopted by working in staged sections to ensure no more than a specified area of soil is disturbed or exposed at any point in time
- Non-dispersive topsoil shall be stockpiled to be used as final cover soil after the gully head has been filled to encourage vegetation growth and establishment
- Gully remediation intervention shall be performed during the dry season when there is no flow of storm water from the catchment area above the gully head;
- NEWMAP shall ensure that excavation and fill operations are conducted in compliance with all HSE measures in manners that do not endanger lives and properties.
- NEWMAP shall ensure the stilling basin is designed to the correct capacity to handle the intended purpose in the management of a 1 in 50 years storm flows

NEWMAP shall:

- Undertake all earthmoving activities in steep sided gullies where undercut has occurred with great care, observance of safety measures and use of appropriate PPE
- Develop and ensure implementation of HSE Plan
- Use earthmoving equipment with strict adherence to all recommended safety procedures
- All construction equipment, earthmovers and demolition equipment shall be located, guarded, shielded to prevent contact with the public
- Stockpile non-dispersive topsoil to be used as final cover soil after the gully head has been filled to encourage vegetation growth and establishment

NEWMAP shall:

- Ensure adequate sanitary facilities are provided during the construction and operation phases of the project;
- Ensure that good housekeeping is maintained on the project site and all areas used;
- Ensure that all areas of the project site used by the public is properly maintained and are free from debris, solid waste litter, equipment, materials;
- Ensure that Solid waste management is addressed in Contractor's HSE Plan; and

- Ensure that the Contractor develops and implements a Solid Waste Management Plan approved by FMEnv in compliance with appropriate World Bank Safeguard Policies

NEWMAP shall:

- Ensure that storm water flows from upstream catchment of the gully head are safely diverted away from the gully head; and
- Ensure that the Ewu gully rehabilitation project is carried out during the dry season to prevent mobilization of sediment into downstream receiving water bodies

NEWMAP shall:

- Ensure that storm water flows have been completely diverted above the gully head before this project activity

NEWMAP shall

- If necessary, authorize the use of selective herbicides with caution and precision to avoid excessive creation of large areas of bare soil and only use herbicide selected by a specialist to maintain the desired plant species

NEWMAP shall ensure that:

- The shaping of the gully walls is carried out only in the dry season after the gully head has been established with a structure such as a Chute to prevent washing away of the fill material.

NEWMAP-Edo SPMU shall ensure that Contractors:

- Stabilize cut and fill slopes with vegetative contour or anchored rock;
- Develop nurseries for the recommended plant species to serve as sustainable plant source for gully erosion side slope stabilization throughout the life span of the infrastructure

NEWMAP-Edo SPMU shall ensure that Contractors:

- Stockpile non-dispersive topsoil with its leaf litter and organic matter, and use as final cover soil after the gully head has been filled to encourage vegetation growth and establishment

NEWMAP-Edo SPMU shall:

- Ensure that Contractors carry out placement and anchorage of the earth materials cut from the gully sides properly;
- Ensure that the soil materials used to fill the gully bed are well compacted in dry no flow conditions;
- Ensure that Contractors Plant or seed the recommended plant species in close growing positions immediately after placement of gully fill materials to serve as vegetative buffer strips to reduce the erosion of soil particles;
- Ensure that Contractors Perform the entire civil work of reshaping the gully sides/banks and the filling of the channel bed and gully head as one operation

NEWMAP-Edo SPMU shall ensure that Contractors:

- Disturb as little ground area as possible and stabilize disturbed areas immediately to ensure soil loss is prevented from such locations

NEWMAP-Edo SPMU shall ensure that Contractors:

- Conserve topsoil with leaf litter and organic materials in stockpiles and use this material as cover soil in the filled gully head and the stabilized bank slopes of the channel to promote the growth of local native vegetation

NEWMAP-Edo SPMU shall:

- Ensure that the Ewu gully erosion rehabilitation project is carried out before the rainy season;

Ensure that Contractors Plant the appropriate vegetation along the edge of the top of the edge of the top of the slope to serve as a protective buffer for the slope faces. The greenbelt would serve provide a buffer between the slop face and resident structures in residential areas

NEWMAP-Edo SPMU shall ensure that Contractors:

- Use equipment with high combustion efficiency.
- Use dust suppressants on the project site

NEWMAP-Edo SPMU shall ensure that Contractors:

- Provide Ear protective device to project workers at the site clearing stage;
- Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line

NEWMAP-Edo SPMU shall ensure that:

- Gully reshaping and drainage infrastructure installations are done during dry season
- Appropriate sediment control measures and devices are used by the Contractors to prevent the mobilization of sediment in suspended solids into downstream water bodies

NEWMAP-Edo SPMU shall ensure that:

- Contractors provide Ear protective devices to project workers at the site clearing stage;
- Contractors Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line

NEWMAP-Edo SPMU shall ensure that Contractors:

- Establish a consistent route for construction equipment and materials to access the gully rehabilitation site and ensure adjoining areas are left undisturbed to provide opportunity for wildlife to migrate to unaffected areas;

NEWMAP-Edo SPMU shall ensure that Contractors:

- Remove topsoil and store upstream within close proximity to the gully head in stockpiles out of reach of any form of channel flows;
- Stockpile non-dispersive topsoil to be used as final cover soil after the gully head has been filled to encourage vegetation growth and establishment

NEWMAP-Edo SPMU shall ensure that Contractors:

- Use equipment with high combustion efficiency.
- Use dust suppressants on the project site

NEWMAP-Edo SPMU shall ensure that Contractors:

- Provide Ear protective device to workers at the site clearing stage;
- Install acoustic mufflers on large equipment where necessary to limit noise levels at fence

line

NEWMAP-Edo SPMU and Contractors shall avoid impeding traffic and traffic disruption around the project site by:

- Adjusting work schedules so as not to disturb traffic;
- Establishing an adequate system of road signs and detour;
- Notifying communities of pending work scope, duration and location
- Avoid blocking public access roads;
- Using road signs to notify work in progress;
- Complying with road bearing capacity and repairing damage caused to roads during and at the end of the work;
- Circumventing access roads to gathering places in Ewu and neighbouring communities.

NEWMAP-Edo SPMU shall ensure that Contractors:

- Establish appropriate protocols for materials delivery and handling to ensure there are no spills;
- Develop HSE plan to address prevention and containment of oil spills, chemicals and hazardous materials releases during all phases of the project;
- Store and handle hazardous materials according to approved hazardous materials management plan
- Ensure that all high risk areas that are potential sources of release of chemical contaminants such as: fuel and chemical storage areas; refueling areas; material stockpile areas; vehicle and equipment washing areas are located away from the gully erosion channel;
- Situate fuel, oils and chemicals storage facilities on an impervious base within a bund capable to contain at least 110% of the volume stored,
- Maintain transportation vehicles and machinery in good working order so as to avoid exhaust emissions as well as oil and fuel leaks
- Report any oil/chemical spill to FMEnv and Edo State Ministry of Environment

### **Operation Phase**

To mitigate the impacts identified during the operation phase, the followings shall be ensured:

NEWMAP-Edo SPMU shall:

- Ensure that the design basis and specifications of the proposed Edo State NEWMAP gully erosion rehabilitation project is accurately followed and achieved during the construction implementation

NEWMAP-Edo SPMU shall ensure that Contractors:

- Develop and implement on a regular basis, a systematic Ewu Esan Central Central Gully Erosion Channel and Drainage Infrastructure Management Plan to remove sediments, debris, solid waste materials and aquatic plants from the channel, prevent the incidence of undercutting and scouring of the drainage infrastructure

NEWMAP-Edo SPMU shall ensure that:

- Scouring of the infrastructure and accumulation of sediment, litter and vegetation in drainage infrastructure are some of the factors that can cause under-functioning of the infrastructure. To effectively and regularly monitor the operation and functionality of the gully erosion control devices by a dedicated Contractor Representative in collaboration with a Project Manager/Site Engineer from Edo State Project Monitoring Unit, a five-year maintenance contract should be added to the contractor's existing contract

NEWMAP-Edo SPMU shall ensure that Contractors:

- Develop and implement on a regular basis, a systematic Ewu Esan Central Central Gully Erosion Channel and Drainage Infrastructure Management Plan to remove sediments, debris, solid waste materials and aquatic plants from the channel, prevent the incidence of undercutting and scouring of the drainage infrastructure
- Conduct site inspection and monitoring as follows:

- Inspect erosion and sediment control devices installed at Ewu gully erosion intervention site within 24 hours of every rainfall or storm event;
- The erosion, sediment and drainage control devices inspection should be by a person qualified and certified to perform this role. He could be a project manager, site supervisor, or engineer working in Edo State SPIM unit of NEWMAP.
- The Ewu gully erosion control infrastructure inspection and monitoring to:
  - Ensure that the Ewu Esan Central Central Gully Erosion Channel and Drainage Infrastructure Management Plan is appropriate for the gully erosion site and is being implemented efficiently;
  - Ensure the erosion - sediment control and drainage infrastructure are properly maintained

NEWMAP-Edo SPMU shall:

Ensure special precautions are taken by Contractors when using backhoe to remove aquatic plants or sediment from the channel during maintenance. Ensure that the earthmover with vented slotted or cross-drilled bucket that allow water to seep out is used for maintenance operations. Once a bucketful of sediment or aquatic vegetation is picked up, the bucket should be raised to allow most of the water to drain out over the gully channel or stilling basin. Then the earthmover's boom should be swung far from the gully channel bank so that water remaining in the spoil removed will flow away from the gully channel to prevent the erosion of the banks.

### ***Decommissioning Phase***

To mitigate the impacts identified during the decommissioning phase, the followings shall be ensured:

NEWMAP-Edo SPMU shall ensure that:

- ❑ Solid waste management is addressed in Contractor HSE Plan
- ❑ Ensure the Contractor develops and implements a Solid Waste Management Plan approved by NEWMAP and FMEEnv in compliance with appropriate World Bank Safeguard Policies

NEWMAP-Edo SPMU and Contractors shall avoid impeding traffic and traffic disruption around the project site by:

- ❑ Adjusting work schedules so as not to disturb traffic;
- ❑ Establishing an adequate system of road signs and detour;
- ❑ Notifying communities of pending work scope, duration and location
- ❑ Avoid blocking public access roads;
- ❑ Circumventing access roads to gathering places in Ewu and neighbouring communities

NEWMAP-Edo SPMU shall:

- ❑ Ensure that Contractors Use equipment with high combustion efficiency.

Ensure Contractors Use dust suppressants on the project site

NEWMAP-Edo SPMU shall ensure that:

- ❑ Contractors provide Ear protective device to workers at the site clearing stage;
- ❑ Contractors Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line

To engender a holistic presentation of the mitigation strategy, **Table 6.1** presents the details of the project activities constituting the NEWMAP intervention project at the pre-construction, construction, operation and maintenance and decommissioning project phases; their respective environmental and social impacts and the recommended impact mitigation measures recommended for implementation in the ESMP. The mitigation measures outlined in **Table 6.1** constitute the impact mitigation measures the Project Contractor will comply with and implement under the supervision and monitoring of NEWMAP Edo State Project Management Unit (SPMU) and the Federal Ministry of Environment under close supervision of the World Bank.



**Table 6.1: Mitigation measures recommended for the Potential and associated impacts of Ewu Gully Erosion site rehabilitation Project**

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
1	Pre-Construction:	General clearing and preparation of project site for gully erosion site rehabilitation and construction works	Increased employment opportunities for the local communities	NEWMAP shall: <input type="checkbox"/> Utilize available workforce from the communities
			Interference with day-to-day community activities resulting in conflicts and complaints	NEWMAP shall: <input type="checkbox"/> Consult regularly with the communities (i.e. before, during and after site clearance) <input type="checkbox"/> Demarcate boundaries of acquired location.
2	Pre-Construction	Land Acquisition and demolition of existing buildings	Conflict over loss of land and resettlement benefits if payment is restricted to owners of buildings to be demolished for the construction of the diversion culvert	NEWMAP shall: <input type="checkbox"/> Consult regularly with the communities (i.e. before, during and after site clearance) <input type="checkbox"/> Carry out adequate enumeration of project affected people, property and economic trees within the land area to be acquired for the project
			Conflict between the NEWMAP project and the resident community over relocation benefits due to those families whose buildings, land, and lives of loved ones were lost to the gully erosion at Ewu Esan Central Central	NEWMAP shall: <input type="checkbox"/> Develop a sound implementable Resettlement Action Plan for the Ewu project <input type="checkbox"/> Ensure that adequate compensation shall be paid to project affected people in consultation with various stakeholders to avoid conflicts that may arise if payments are made to wrong claimants.
3	Pre-Construction	Disruption and encroachment into agricultural lands in close proximity to the gully erosion	Conflict over loss of agricultural lands due to gully erosion rehabilitation civil works downstream of the gully head in Ewu Esan Central Central	<input type="checkbox"/> Consult extensively with the communities on land acquisition and payment of relocation benefits Develop a sound implementable

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
			community	Resettlement Action Plan for the Ewu NEWMAP project <ul style="list-style-type: none"> <li>❑ NEWMAP-Edo SPMU shall reach agreement with regard to ways and means of resettlement of any forced displacement and relocation of any existing land use and ownership on the proposed land take and respect those commitments;</li> <li>❑ NEWMAP-Edo SPMU and Contractors shall negotiate, if necessary, for the acquisition of land or the right of passage and provide for adequate compensation;</li> </ul>
4	Pre-Construction	Physical presence of construction workers on the Ewu Gully erosion intervention project site and environ	Contamination of soil and downstream water resources of the project area from indiscriminate disposal of untreated sewage	NEWMAP shall ensure that: <ul style="list-style-type: none"> <li>❑ Contractors provide adequate sanitary facilities for their site workers;</li> <li>❑ Open air defecation is sternly discouraged among the project workers</li> </ul>
5	Pre-Construction	Contractor's site preparation operations	Increased employment opportunities for the local communities	NEWMAP shall ensure that Contractors <ul style="list-style-type: none"> <li>❑ Utilize available workforce from the communities</li> </ul>
6	Pre-Construction:	Transportation of equipment, materials and workers to the project site	Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles	NEWMAP shall ensure the: <ul style="list-style-type: none"> <li>❑ Use of equipment with high combustion efficiency for the project activities</li> <li>❑ Use of dust suppressants on the project site</li> </ul>
			Noise and vibration from vehicular movement	NEWMAP shall: <ul style="list-style-type: none"> <li>❑ Ensure that Contractors provide</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
			<p>Traffic congestion and increased risk of occurrence of traffic accidents and injuries</p>	<p>Ear protective devices to the project workers at the site clearing stage;</p> <ul style="list-style-type: none"> <li>❑ Ensure the use of the ear protective devices at site by project workers and visitors;</li> <li>❑ Ensure that Contractors Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul> <p>NEWMAP-Edo SPMU and Contractors shall:</p> <ul style="list-style-type: none"> <li>❑ Avoid impeding traffic and traffic disruption around the project site by:</li> <li>❑ Adjusting work schedules not to disturb traffic;</li> <li>❑ Establishing an adequate system of road signs and detour;</li> <li>❑ Notifying communities of pending work scope, duration and location</li> <li>❑ Avoid blocking public access roads;</li> <li>❑ Complying with road bearing capacity and repairing damage caused to roads during and at the end of the work;</li> <li>❑ Circumventing access roads to gathering places in Ewu and neighbouring communities</li> </ul>
7	Construction	Construction of sheds, equipment lay down areas, temporary office and sanitary facilities etc.	Increase in ambient noise levels and vibration	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li>❑ Ear protective device is provided to workers at the site clearing stage;</li> <li>❑ Use of the protective devices provided is enforced</li> <li>❑ Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
8	Construction	Construction of drainage conduits upstream of the gully head and other associated road drainage infrastructure	Increase in employment opportunities and engagement of community labour	NEWMAP-Edo SPMU shall ensure that: <ul style="list-style-type: none"> <li><input type="checkbox"/> Utilization of available workforce in the communities is ensured</li> </ul>
			Social and cultural structure interference and complaints;	<ul style="list-style-type: none"> <li><input type="checkbox"/> NEWMAP-Edo SPMU and Contractors shall obtain all necessary authorizations and permits prior to the execution of the work through consultation with relevant authorities</li> </ul>
			Marginal increase in population within the settlements in close proximity to the project site will lead to an increase in negative vices such as prostitution (commercial sex work) and crime which would affect social and cultural systems through a negative value system;	<ul style="list-style-type: none"> <li><input type="checkbox"/> NEWMAP-Edo State Project Management Unit (SPMU) and Contractors shall develop and provide a work schedule that will avoid disturbing the traditional and religious life of communities;</li> </ul>
			Conflicts between the project and the community as well as the pressure of the influx of potential job seekers into the project area and associated risks;	NEWMAP-Edo SPMU and Contractors shall: <ul style="list-style-type: none"> <li><input type="checkbox"/> Establish a communication program to inform communities of ongoing work and establish appropriate measures to minimize the disturbance caused by the work;</li> <li><input type="checkbox"/> Implement the Influx Management Plan to address all socio-cultural issues, especially the preservation of social and cultural structures of the local communities;</li> <li><input type="checkbox"/> Periodically conduct STD and HIV/AIDs and general safe sex awareness campaigns as control measure for the transmission of the disease;</li> <li><input type="checkbox"/> Regularly distribute HIV/AIDS awareness communication</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<p>materials;</p> <ul style="list-style-type: none"> <li>❑ Implement labour hiring programs away from construction sites to reduce the presence of “camp followers”, prostitutes, drug dealers/users and other potential HIV/AIDS carriers.</li> </ul>
			<p>New wealth among the youth would threaten the existing authority structure;</p>	<ul style="list-style-type: none"> <li>❑ NEWMAP-Edo SPMU and Contractors shall ensure that a percentage and certain category of jobs are reserved for the female gender in the resident communities;</li> <li>❑ NEWMAP-Edo SPMU and Contractors shall arrange initial contact with local contractors to maximize opportunities for local procurement</li> <li>❑ NEWMAP-Edo SPMU and Contractors shall carry out extensive consultation with community leadership on the projects. The extent of consultation shall be determined by the complexity and the severity of the identified project impacts;</li> <li>❑ Establish working relationships between NEWMAP-Edo SPMU, contractors, private security, surrounding communities, and local law enforcement agency to quickly disburse unauthorized personnel from work locations, camp sites if any, and surrounding communities;</li> <li>❑ NEWMAP-Edo SPMU and Contractors shall guarantee access to private property and safety of residents and passer-by during the</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				course of work by enacting the appropriate measures
9		Transportation of equipment, materials and worker to project site	Accidental release of fuels, oils, chemicals, hazardous materials etc., to ground in the construction laydown area during delivery of materials and equipment to project site	NEWMAP shall: <ul style="list-style-type: none"> <li><input type="checkbox"/> Establish appropriate protocols for materials delivery and handling to ensure there are no spills;</li> <li><input type="checkbox"/> Ensure that the contractor HSE plan addresses the prevention and containment of oil spills, chemicals and hazardous materials releases during all phases of the project;</li> <li><input type="checkbox"/> Ensure that storage and handling of hazardous materials are in accordance with approved hazardous materials management plan</li> <li><input type="checkbox"/> Maintain transportation vehicles, heavy civil engineering machinery and construction equipment in good working order so as to avoid exhaust emissions as well as oil and fuel leaks</li> <li><input type="checkbox"/> Any oil/chemical spill should be reported to FMEnv and Edo State Environmental Protection Agency</li> </ul>
10	Construction	Construction of 2.5m by 1.5m gully bypass closed box diversion drainage culverts	Conflict over loss of land and resettlement benefits for demolition of two existing buildings obstructing the construction of the diversion culvert	<input type="checkbox"/> Consult regularly with the communities (i.e. before, during and after site clearance
			Conflict between the NEWMAP project and the resident community over relocation benefits due to those families whose buildings, land, and lives of loved ones were lost to the gully erosion at Ewu Esan Central	<input type="checkbox"/> Develop a sound implementable Resettlement Action Plan for the Ewu NEWMAP project
			Disruption of community activities	<input type="checkbox"/> NEWMAP-Edo SPMU and

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
			and movement around the gully head	<p>Contractors shall obtain all necessary authorizations and permits prior to the execution of the work through consultation with relevant authorities;</p> <ul style="list-style-type: none"> <li>□ NEWMAP-Edo State Project Management Unit (SPMU) and Contractors shall develop and provide a work schedule that will avoid disturbing the traditional and religious life of communities;</li> <li>□ NEWMAP-Edo SPMU and Contractors shall establish a communication program to inform communities of ongoing work and establish appropriate measures to minimize the disturbance caused by the work</li> </ul>
11	Construction	Construction of Baffle Chute to the bottom of the gully	<p>Risk of chute failure by flow undermining gully head, overtopping or bypassing. The failure occurs when storm runoff fails to enter the baffle chute properly especially when the runoff leaks and flow bypassing occur at the chute entrance</p> <p>Occurrence of risks associated with large storm events that exceeds the design capacity of the Chute</p> <p>Loss of fertile top soil for infertile sub-surface soil that would not enhance vegetation establishment</p>	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li>□ Specialist is engaged to supervise the construction of the Chute to avoid the potential by undermining, overtopping or bypassing</li> </ul> <p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li>□ Capacity of the Chute to handle the conveyance of a large runoff event that exceeds storms of 1 in 50 years recurrence interval shall be assessed</li> </ul> <p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li>□ During the construction of Chutes, topsoil shall be removed and stockpiled before shaping the gully</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<p>head. On completion, the topsoil shall be spread to a depth of 150mm over the face and sides of the chute</p>
			<p>Risk of loss of life and damage of the proposed gully drainage infrastructure</p>	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Chute shall be constructed on firm excavated soil rather than on the fill</li> <li><input type="checkbox"/> Storm water leaving the chute and outlet structure flows freely without causing undesirable ponding or scour</li> </ul>
12	Construction	Construction of Stilling Basin	<p>Loss of agricultural lands and increase in the exposure of erodible soil</p>	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Staged earthworks approach shall be adopted by working in staged sections to ensure no more than a specified area of soil is disturbed or exposed at any point in time</li> </ul>
			<p>Loss of valuable topsoil that the could be used for seeding vegetation</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Non-dispersive topsoil shall be stockpiled to be used as final cover soil after the gully head has been filled to encourage vegetation growth and establishment</li> </ul>
			<p>Workers exposure to risk of falls into excavated pit and occurrence of accident or injuries</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Gully remediation intervention shall be performed during the dry season when there is no flow of storm water from the catchment area above the gully head;</li> <li><input type="checkbox"/> NEWMAP shall ensure that excavation and fill operations are conducted in compliance with all HSE measures in manners that do not endanger lives and properties.</li> </ul>
			<p>Risk of stilling basin failure and</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> NEWMAP shall ensure the stilling</li> </ul>



IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
			occurrence of flooding, overtopping resulting in stilling basing sweep out and downstream channel erosion	basin is designed to the correct capacity to handle the intended purpose in the management of a 1 in 50 years storm flows
13	Construction	Filling and reclamation of the gully head	Occurrence of accident and safety risk incidents	NEWMAP shall: <ul style="list-style-type: none"> <li>❑ Undertake all earthmoving activities in steep sided gullies where undercut has occurred with great care, observance of safety measures and use of appropriate PPE</li> <li>❑ Develop and ensure implementation of HSE Plan</li> <li>❑ Use earthmoving equipment with strict adherence to all recommended safety procedures</li> <li>❑ All construction equipment, earthmovers and demolition equipment shall be located, guarded, shielded to prevent contact with the public</li> <li>❑ Stockpile non-dispersive topsoil to be used as final cover soil after the gully head has been filled to encourage vegetation growth and establishment</li> </ul>
14			Waste handling and disposal	NEWMAP shall: <ul style="list-style-type: none"> <li>❑ Ensure adequate sanitary facilities are provided during the construction and operation phases of the project;</li> <li>❑ Ensure that good housekeeping is maintained on the project site and all areas used;</li> <li>❑ Ensure that all areas of the project</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<p>site used by the public is properly maintained and are free from debris, solid waste litter, equipment, materials;</p> <ul style="list-style-type: none"> <li>❑ Ensure that Solid waste management is addressed in Contractor’s HSE Plan; and</li> <li>❑ Ensure that the Contractor develops and implements a Solid Waste Management Plan approved by FMEnv in compliance with appropriate World Bank Safeguard Policies</li> </ul>
15	Construction	Reshaping of the gully channel by cutting earth from gully side slopes to fill the gully channel floor	<p>Increase in turbidity and sediment load in downstream receiving water bodies</p> <p>Increase in the amount of disturbed areas created by earthmovers used in reshaping the gully side slopes</p> <p>Contamination of downstream receiving water bodies by fertilizers, and pesticides as well as creation of excessive bare soils by herbicides if used for the establishment of the recommended plant species seeded to control soil erosion</p> <p>Exacerbated gully erosion channel bed undermined and washing away</p>	<p>NEWMAP shall:</p> <ul style="list-style-type: none"> <li>❑ Ensure that storm water flows from upstream catchment of the gully head are safely diverted away from the gully head; and</li> <li>❑ Ensure that the Ewu gully rehabilitation project is carried out during the dry season to prevent mobilization of sediment into downstream receiving water bodies</li> </ul> <p>NEWMAP shall:</p> <ul style="list-style-type: none"> <li>❑ Ensure that storm water flows have been completely diverted above the gully head before this project activity</li> </ul> <p>NEWMAP shall</p> <ul style="list-style-type: none"> <li>❑ If necessary, authorize the use of selective herbicides with caution and precision to avoid excessive creation of large areas of bare soil and only use herbicide selected by a specialist to maintain the desired plant species</li> </ul> <p>NEWMAP shall ensure that:</p> <ul style="list-style-type: none"> <li>❑ The shaping of the gully walls is</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
			of fill materials resulting in increased sediment load in receiving water bodies downstream	carried out only in the dry season after the gully head has been established with a structure such as a Chute to prevent washing away of the fill material
		Increase in the amount of disturbed areas created by earthmovers used in reshaping the gully side slopes	Risk of erosion of exposed gully side slopes and erosion of ground area above the gully channel divide	NEWMAP-Edo SPMU shall ensure that Contractors: <ul style="list-style-type: none"> <li><input type="checkbox"/> Stabilize cut and fill slopes with vegetative contour or anchored rock;</li> <li><input type="checkbox"/> Develop nurseries for the recommended plant species to serve as sustainable plant source for gully erosion side slope stabilization throughout the life span of the infrastructure</li> </ul>
			Loss of fertile top soil that could be used for seeding vegetation	NEWMAP-Edo SPMU shall ensure that Contractors: <ul style="list-style-type: none"> <li><input type="checkbox"/> Stockpile non-dispersive topsoil with its leaf litter and organic matter, and use as final cover soil after the gully head has been filled to encourage vegetation growth and establishment</li> </ul>
			Occurrence of bank erosion along reshaped gully channel slopes	NEWMAP-Edo SPMU shall: <ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure that Contractors carry out placement and anchorage of the earth materials cut from the gully sides properly;</li> <li><input type="checkbox"/> Ensure that the soil materials used to fill the gully bed are well compacted in dry no flow conditions;</li> <li><input type="checkbox"/> Ensure that Contractors Plant or seed the recommended plant species in close growing positions immediately after placement of gully fill materials to serve as vegetative</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				buffer strips to reduce the erosion of soil particles; <input type="checkbox"/> Ensure that Contractors Perform the entire civil work of reshaping the gully sides/banks and the filling of the channel bed and gully head as one operation
16	Construction	Placement of Gabion Drop Structures in gully channel to reduce longitudinal gradient to 0.05%	Disturbance of unnecessary large land areas for transportation of materials and heavy earthmovers	NEWMAP-Edo SPMU shall ensure that Contractors: <input type="checkbox"/> Disturb as little ground area as possible and stabilize disturbed areas immediately to ensure soil loss is prevented from such locations
17	Construction	Erosion protection of gully banks by cutting and sloping the sides of the gully bank to a 1:2 gradient	Loss of fertile top soil which could be used for seeding vegetation	NEWMAP-Edo SPMU shall ensure that Contractors: <input type="checkbox"/> Conserve topsoil with leaf litter and organic materials in stockpiles and use this material as cover soil in the filled gully head and the stabilized bank slopes of the channel to promote the growth of local native vegetation
			Risk of occurrence of accident or injury	NEWMAP-Edo SPMU shall: <input type="checkbox"/> Ensure that the Ewu gully erosion rehabilitation project is carried out before the rainy season; Ensure that Contractors Plant the appropriate vegetation along the edge of the top of the edge of the top of the slope to serve as a protective buffer for the slope faces. The greenbelt would serve provide a buffer between the slop face and resident structures in residential areas

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
18	Construction	Reconstruction of damaged road	Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles	NEWMAP-Edo SPMU shall ensure that Contractors: <ul style="list-style-type: none"> <li><input type="checkbox"/> Use equipment with high combustion efficiency.</li> <li><input type="checkbox"/> Use dust suppressants on the project site</li> </ul>
			Noise and vibration from vehicular movement	NEWMAP-Edo SPMU shall ensure that Contractors: <ul style="list-style-type: none"> <li><input type="checkbox"/> Provide Ear protective device to project workers at the site clearing stage;</li> <li><input type="checkbox"/> Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>
19	Construction	Reshaping the gully and installation of erosion protection facilities to enable safe conveyance of storm water downstream of gully head	Water quality deterioration	NEWMAP-Edo SPMU shall ensure that: <ul style="list-style-type: none"> <li><input type="checkbox"/> Gully reshaping and drainage infrastructure installations are done during dry season</li> <li><input type="checkbox"/> Appropriate sediment control measures and devices are used by the Contractors to prevent the mobilization of sediment in suspended solids into downstream water bodies</li> </ul>
			Risk of hearing impairment from increased noise and vibrations	NEWMAP-Edo SPMU shall ensure that: <ul style="list-style-type: none"> <li><input type="checkbox"/> Contractors provide Ear protective devices to project workers at the site clearing stage;</li> <li><input type="checkbox"/> Contractors Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>
			Loss of wildlife	NEWMAP-Edo SPMU shall ensure that Contractors: <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Establish a consistent route for</b></li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<p><b>construction equipment and materials to access the gully rehabilitation site and ensure adjoining areas are left undisturbed to provide opportunity for wildlife to migrate to unaffected areas;</b></p> <p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Remove topsoil and store upstream within close proximity to the gully head in stockpiles out of reach of any form of channel flows;</li> <li><input type="checkbox"/> Stockpile non-dispersive topsoil to be used as final cover soil after the gully head has been filled to encourage vegetation growth and establishment</li> </ul>
20	Construction	Transportation of heavy equipment, construction materials and workers to the project site	<p>Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles</p> <p>Noise and vibration from vehicular movement</p> <p>Traffic congestion and increased risk of occurrence of traffic accidents and injuries</p>	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Use equipment with high combustion efficiency.</li> <li><input type="checkbox"/> Use dust suppressants on the project site</li> </ul> <p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Provide Ear protective device to workers at the site clearing stage;</li> <li><input type="checkbox"/> Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul> <p>NEWMAP-Edo SPMU and Contractors shall avoid impeding traffic and traffic disruption around the project site by:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Adjusting work schedules so as not to disturb traffic;</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<ul style="list-style-type: none"> <li><input type="checkbox"/> Establishing an adequate system of road signs and detour;</li> <li><input type="checkbox"/> Notifying communities of pending work scope, duration and location</li> <li><input type="checkbox"/> Avoid blocking public access roads;</li> <li><input type="checkbox"/> Using road signs to notify work in progress;</li> <li><input type="checkbox"/> Complying with road bearing capacity and repairing damage caused to roads during and at the end of the work;</li> <li><input type="checkbox"/> Circumventing access roads to gathering places in Ewu and neighbouring communities</li> </ul>
			<p>Accidental release of fuels, oils, chemicals, hazardous materials etc., to ground in the construction laydown area during delivery of materials to project site</p>	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Establish appropriate protocols for materials delivery and handling to ensure there are no spills;</li> <li><input type="checkbox"/> Develop HSE plan to address prevention and containment of oil spills, chemicals and hazardous materials releases during all phases of the project;</li> <li><input type="checkbox"/> Store and handle hazardous materials according to approved hazardous materials management plan</li> <li><input type="checkbox"/> Ensure that all high risk areas that are potential sources of release of chemical contaminants such as: fuel and chemical storage areas; refueling areas; material stockpile areas; vehicle and equipment washing areas are located away from the gully erosion channel;</li> <li><input type="checkbox"/> Situate fuel, oils and chemicals storage facilities on an impervious</li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				base within a bund capable to contain at least 110% of the volume stored, <input type="checkbox"/> Maintain transportation vehicles and machinery in good working order so as to avoid exhaust emissions as well as oil and fuel leaks <input type="checkbox"/> Report any oil/chemical spill to FMEnv and Edo State Ministry of Environment
21	Operation	Utilization of the rehabilitated gully site and installed storm water drainage infrastructure	Risk of failure of the gully erosion installed drainage infrastructure to safely route storms of 1 in 50 years  Risks from debris and sediment accumulation in the drainage channels in upstream catchment area of the gully head, Diversion Culvert, Baffle Chute, Gabion Drop Structures and Stilling Basin resulting in performance failure of the drainage infrastructure  Risk of undermining and occurrence of scouring in the Baffle Chute could result in deteriorating performance of the structure	NEWMAP-Edo SPMU shall: <input type="checkbox"/> Ensure that the design basis and specifications of the proposed Edo State NEWMAP gully erosion rehabilitation project is accurately followed and achieved during the construction implementation  NEWMAP-Edo SPMU shall ensure that Contractors: <input type="checkbox"/> Develop and implement on a regular basis, a systematic Ewu Esan Central Central Gully Erosion Channel and Drainage Infrastructure Management Plan to remove sediments, debris, solid waste materials and aquatic plants from the channel, prevent the incidence of undercutting and scouring of the drainage infrastructure  NEWMAP-Edo SPMU shall ensure that: <input type="checkbox"/> Scouring of the infrastructure and accumulation of sediment, litter and vegetation in drainage infrastructure are some of the



IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<p>factors that can cause under-functioning of the infrastructure. To effectively and regularly monitor the operation and functionality of the gully erosion control devices by a dedicated Contractor Representative in collaboration with a Project Manager/Site Engineer from Edo State Project Monitoring Unit, a five-year maintenance contract should be added to the contractor's existing contract</p>
22	Operation	Maintenance of the gully drainage infrastructure	Risk of failure of the gully intervention from poor maintenance of the drainage infrastructure to achieve the desired project objectives such as (Creation of new gullies within the channel; breeding of vectors in the settling basin, undermining of the drainage infrastructure and scouring of the drainage structure, etc.)	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>❑ Develop and implement on a regular basis, a systematic Ewu Esan Central Central Gully Erosion Channel and Drainage Infrastructure Management Plan to remove sediments, debris, solid waste materials and aquatic plants from the channel, prevent the incidence of undercutting and scouring of the drainage infrastructure</li> <li>❑ Conduct site inspection and monitoring as follows: <ul style="list-style-type: none"> <li>➤ Inspect erosion and sediment control devices installed at Ewu gully erosion intervention site within 24 hours of every rainfall or storm event;</li> <li>➤ The erosion, sediment and drainage control devices inspection should be by a</li> </ul> </li> </ul>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<p>person qualified and certified to perform this role. He could be a project manager, site supervisor, or engineer working in Edo State SPIM unit of NEWMAP.</p> <ul style="list-style-type: none"> <li>➤ The Ewu gully erosion control infrastructure inspection and monitoring to:                             <ul style="list-style-type: none"> <li>✚ Ensure that the Ewu Esan Central Gully Erosion Channel and Drainage Infrastructure Management Plan is appropriate for the gully erosion site and is being implemented efficiently;</li> <li>✚ Ensure the erosion - sediment control and drainage infrastructure are properly maintained</li> </ul> </li> </ul>
			<p>Disruption of the side slopes during routine maintenance of the gully channels</p>	<p>NEWMAP-Edo SPMU shall: Ensure special precautions are taken by Contractors when using backhoe to remove aquatic plants or sediment from the channel during maintenance. Ensure that the earthmover with vented slotted or cross-drilled bucket that allow water to seep out is used for maintenance operations. Once a bucketful of sediment or aquatic vegetation is picked up, the bucket should be raised to allow most of the water to drain out over the gully channel or stilling basin. Then the earthmover's boom should be swung far from the</p>

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				gully channel bank so that water remaining in the spoil removed will flow away from the gully channel to prevent the erosion of the banks.
23	Decommissioning	Dismantling and removal of civil engineering equipment	Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles	NEWMAP-Edo SPMU shall ensure that Contractors: <input type="checkbox"/> Use equipment with high combustion efficiency. <input type="checkbox"/> Use dust suppressants on the project site
			Noise and vibration from vehicular movement	NEWMAP-Edo SPMU shall ensure that Contractors: <input type="checkbox"/> Provide Ear protective devices to project workers at the site clearing stage; <input type="checkbox"/> Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line
24	Decommissioning	Waste handling and disposal	Solid Waste generation, handling and disposal	NEWMAP-Edo SPMU shall ensure that: <input type="checkbox"/> Solid waste management is addressed in Contractor HSE Plan
			Poor housekeeping and environmental sanitation	NEWMAP-Edo SPMU shall <input type="checkbox"/> Ensure the Contractor develops and implements a Solid Waste Management Plan approved by NEWMAP and FMEEnv in compliance with appropriate World Bank Safeguard Policies
25	Decommissioning	Transportation of solid waste, equipment and workers out of the project site.	Traffic congestion and increased risk of occurrence of traffic accidents and injuries	NEWMAP-Edo SPMU and Contractors shall avoid impeding traffic and traffic disruption around the project site by: <input type="checkbox"/> Adjusting work schedules so as not to disturb traffic;

IMPACT ID	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES
				<ul style="list-style-type: none"> <li><input type="checkbox"/> Establishing an adequate system of road signs and detour;</li> <li><input type="checkbox"/> Notifying communities of pending work scope, duration and location</li> <li><input type="checkbox"/> Avoid blocking public access roads;</li> <li><input type="checkbox"/> Circumventing access roads to gathering places in Ewu and neighbouring communities</li> </ul>
			<p>Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles</p>	<p>NEWMAP-Edo SPMU shall:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure that Contractors Use equipment with high combustion efficiency.</li> <li><input type="checkbox"/> Ensure Contractors Use dust suppressants on the project site</li> </ul>
			<p>Noise and vibration from vehicular movement</p>	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Contractors provide Ear protective device to workers at the site clearing stage;</li> <li><input type="checkbox"/> Contractors Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>

### **6.3 Institutional Arrangement for ESMP and Monitoring Plan**

The roles, responsibilities and institutional arrangements for the implementation of the mitigation measures and the monitoring activities outlined in the Ewu NEWMAP ESMP are presented in this section. NEWMAP involves many Federal and State Ministries, Departments and Agencies (MDAs), Local Governments, Communities and Civil Societies. These in addition to the private sector and independent Consultants constitute the stakeholders. Effective implementation of the NEWMAP intervention project requires the participation of inter-ministerial and inter-State coordination, collaboration, and information sharing. The MDAs responsible for planning, the economy and finance, works, water resources, agriculture, power, transportation, forestry, emergency response, climate and meteorology, hydrological information and river basin development all have roles and responsibilities in the NEWMAP intervention. It is imperative that all stakeholders involved in the implementation of the NEWMAP intervention projects to explicitly understand their roles and responsibilities.

Edo State NEWMAP finances the Ewu gully erosion site rehabilitation while Edo State Government is primarily responsible for land management and land allocations requirement of the project. The Federal Ministry of Environment (FMEnv) is the lead-implementing Agency for NEWMAP. The Federal Project Management Unit (FPMU) headed by a Federal Project Coordinator hosted by FMEnv is responsible for the overall coordination of NEWMAP interventions at the national level. The Edo State Project Management Unit (Edo SPMU) headed by the State Project Coordinator hosted by the Edo State Ministry of Environment and Public Utility is responsible for coordinating activities of the Ewu gully erosion NEWMAP intervention project and the required implementation of the proposed ESMP. Environmental Officers are provided for the NEWMAP intervention from both the Federal and State Coordinating Units with responsibility for mainstreaming environmental issues into the NEWMAP project interventions. Edo State Environmental Officer is responsible for coordinating the implementation of the Ewu gully erosion site ESMP on behalf of the State Project Coordinator. At the community level, an Ewu Gully Erosion Site Monitoring Committee will be established to participate on ensuring full compliance with all cooperative

alliances during the implementation of the gully rehabilitation construction works project activities.

An explicit understanding of the roles and responsibilities of all stakeholders and the establishment of sound institutional arrangements is highly essential for the implementation of the proposed Ewu NEWMAP ESMP. The execution of the environmental and social safeguard measures recommended requires the involvement of relevant Ministries, Departments and Agencies (MDAs) at Federal and State administrative levels, public and private sectors, Community Associations and Community Based Organizations (CBOs), community based committees, and the Development Partners (World Bank).

The specific institutional arrangements, the roles and responsibilities of the stakeholders involved in the implementation of the ESMP during the pre-construction, construction, and operation and maintenance project phases are presented as follows.

### **Pre-Construction Phase**

The stakeholders with roles in the implementation of the ESMP during the pre-construction phase consists of:

- The Federal NEWMAP Project Monitoring Unit (PMU);
- Edo State NEWMAP-PMU;
- Edo State Ministries, Departments and Agencies in Environment, Water Resources Management, Information, Health, Lands, Finance, Physical Planning and Urban Development; Agriculture,
- Community Based Organizations in Ewu;
- Ewu Gully Erosion Site Committee and
- The World Bank.
- The Global Environment Facility and
- The Special Climate Change Fund

## **Roles of Agencies and Stakeholders Involved in the ESMP Implementation**

Monitoring of the implementation of the ESMP during the pre-construction phase:

- Site Engineer;
- Federal Ministry of Environment
- Edo State Ministry of Environment
- Edo State Ministry of Health

Implementation and Reporting of the ESMP:

- The Construction Contractor (Service Provider/Contractor)

Pre-construction Community Engagement and Consultation Meetings:

- Ewu Gully Erosion Site Committee;
- Community Associations in Ewu Esan Central Central;
- Ewu Esan Central Central Based Community Based Associations. and
- Concerned members of the Ewu Community in the area

Liaising with NEWMAP-PMU and Edo SPMU on issues raised during the Community Engagement and Consultation in order to satisfy international safeguard policies of the World Bank shall be the sole responsibility of:

- The Construction Contractor and
- The Independent Environmental Consultant

Communication of the concerns of the resident communities to the appropriate Edo State Ministries and their respective Departments and Agencies (MDAs) for prompt actions on the issues raised shall be the sole responsibility of:

- Edo State Project Monitoring Unit (Edo SPMU)

### **Responsibility for Reporting and Follow-Up**

Submission of Community Meetings held at the local level on the project to Edo NEWMAP SPMU shall be the sole responsibility of the appointed Secretary of the following community groups:

- Ewu Gully Erosion Site Committee;
- Community Associations in Ewu Esan Central Central;
- Ewu Esan Central Central Based Community Based Associations. And
- Concerned members of the Ewu Community in the area

The Community Secretary shall perform all follow-up actions to ensure feedback, prompt reporting and sound follow-up mechanisms are in place for the issues raised and monitor their implementation. Issues raised shall be forwarded with the recommendations of Edo State NEWMAP based on the outcome of their review of the comments raised within the scope of the project and compliance with the World Bank requirements to Federal NEMAP-PMU and the World Bank.

The Construction Contractor shall ensure that the comments are promptly implemented as agreed with the communities and feedback should be communicated to Edo State NEWMAP-PMU. This cycle of community engagement/consultation – reporting – feedback – follow-ups – response mechanism actions shall continue until the completion of the pre-construction phase of the proposed Ewu NEWMAP intervention.

### **Construction Phase**

Stakeholders responsible for ESMP implementation during the Construction Phase are:

- The Independent Environmental Consulting Firm;
- The Construction Contractor and any other relevant Service Provider Contractor;
- Edo State NEWMAP-PMU;
- Federal NEWMAP-PMU;
- Edo State Ministries, Departments, and Agencies (Works and Infrastructure, Environment, Water Resources, Health, Agriculture and Forestry, and Physical Planning and Urban Development)



- Environmental Officers of Federal NEWMAP-PMU;
- Environmental Officers of Edo State NEWMAP-PMU;
- Federal Ministry of Environment
- NESREA;
- World Bank.

Roles of the stakeholders during the Construction Phase implementation of the ESMP is as follows:

*NEWMAP Edo State Project Monitoring Unit (SPMU) Environmental and Safeguard Officer*

Responsible for the provision of feedbacks to the Project Coordinate of Edo SPMU on the implementation of the ESMP and other environmental issues. He shall be responsible for carrying out the supervision, control and monitoring of the implementation of the ESMP and the NEWMAP gully erosion intervention project. The Edo NEWMAP SPMU Environmental Officer shall perform daily inspection of the gully erosion rehabilitation intervention works and monitor the implementation of the ESMP.

*Independent Environmental Consultancy Firm's Environmental Supervisor and Safeguard Specialist*

The sole responsibility for the implementation of the ESMP during the Construction Phase shall be given to an Environmental Supervisor and Safeguard Specialist appointed by an Independent Environmental Consulting Firm under Contractual Agreement with NEWMAP Edo SPMU to actually carryout the implementation of the ESMP on its behalf.

*Site Engineer and Construction Contractors*

The Environmental Supervisor will be present on weekly basis to implement the ESMP during the construction phase. However, the Construction Contractor and its Site Engineer shall be responsible for:

- monitoring and reporting on weekly basis to Edo State NEWMAP-PMU the ESMP implementation activities of the independent Environmental Consultant;
- provision of adequate support, information and logistics requirements for the monitoring of the compliance of the Construction Contractor and other service provider contractors with the implementation of the recommended mitigation measures and the impact monitoring otherwise called environmental auditing processes;
- regular supervision and reporting of the ESMP implementation to Edo State PMU

### Edo State MDAs

Edo State MDAs, especially the Ministries of Environment, Works and Infrastructure, Health, Agriculture and Forestry should monitor the ESMP implementation to ensure that the internal mechanisms, policies, established laws of the State are complied with in the Ewu gully erosion site rehabilitation works. The MDAs shall carry out periodic site visits with the representatives of Federal NEWMAP SPMU and Edo State NEWMAP SPMU during the construction phase implementation of the ESMP. The report of their findings should be submitted to the World Bank.

### Federal Ministry of Environment, NESREA and Edo State Ministry of Environment

Environmental Officers from Federal Ministry of Environment and NESREA as well as Officials of Federal NEWMAP shall periodically visit the project site to observe the level of implementation of the ESMP and the compliance of the Construction Contractors with the recommended mitigation measures.

### Reporting and Follow-Up during the Construction Phase

The responsibility for ESMP reporting belongs to the independent Environmental Consulting Firm's representative (Environmental Supervisor / Safeguard Specialist) who shall prepare weekly Environmental Compliance Monitoring Reports and Quarterly Environmental Impact Monitoring (Environmental Auditing) Reports for submission to Edo State NEWMAP-PMU Project Coordinator for review, comments, observations, recommendations and approval.. Thereafter the review of the ESMP implementation

documentations, the Edo State NEWMAP-PMU will send feedback to the Site Engineer and the Construction Contractor Environmental Officer when urgent action is required in cases on non-compliance to mitigation measures or there was an occurrence of spillage of hazardous chemicals or petrochemical spillage or any other safety incidence. The Environmental Supervisor from the independent Environmental Consultancy Firm and the Construction Contractor's Environmental Officer shall be responsible for checking and reporting on the implementation of all follow-up actions during the construction phase.

Furthermore, the Construction Contractor's Environmental Officer and the Site Engineer shall submit monthly reports on the implementation of the ESMP to Edo State NEWMAP-PMU Project Coordinator. The Edo State NEWMAP-PMU's Environmental Officer shall advise the SPMU Project Coordinator after thorough review of the ESMP Report. In the advent of any non-compliance or discrepancy on any environmental or social issue, the Edo SPMU Project Coordinator shall convene a Project Environmental Management (PEM) meeting to discuss the way forward on the issue.

### **Operation and Maintenance Phase**

The responsibility for the implementation recommendations of the ESMP during the operation and maintenance phase of the Ewu gully erosion site drainage infrastructure belongs to the relevant Edo State MDAs such as the Ministry of Environment, Ministry of Health, Ministry of Water Resources, Ministry of Physical Planning and Urban Development. These MDAs of Edo State shall work in collaboration on behalf of Edo State Government to ensure relevant Project Officers are transferred to the Edo State NEWMAP Office to supervise the operations, daily inspection and monitoring the operations of the drainage infrastructure and maintenance works during the operation phase. Edo State NEWMAP SPMU framework will have to be transferred to the Edo State Government composed government officials and professionals that will handle the day-to-day operations of the gully erosion site infrastructure, maintenance operations and implementation of the requirements of the ESMP at the operation and maintenance phase.

## **Key MDAs in Edo State Government**

During the operation and maintenance phase, the major ministries the Edo State NEEWMAP will absorb include:

- Edo State Ministry of Environment;
- Edo State Ministry of Water Resources;
- Ministry of Works and Infrastructure
- Edo State Ministry of Transportation
- Edo State Ministry of Agriculture and Forestry
- NIMET
- NEMA
- Nigerian Police;
- Ministry of Health and
- The Ewu Esan Central Central Local Government Administrative Council

## **Roles of the Relevant MDAs**

The roles of the respective ministries and their professionals / specialists in the operation and maintenance of the Ewu Gully Erosion site drainage infrastructure are as follows:

- Edo State Ministry of Health and their relevant departments and agencies should carry out regular site visits to the rehabilitated gully erosion site and channel to check and confirm that the operation and maintenance of the infrastructure is adequate and does not constitute any threat to public health.
- The Ministry of Environment should conduct regular inspection to the gully erosion infrastructure to ensure its functionality, the adequacy of its maintenance, the status quo of the different storm water drainage infrastructure to ensure there is no form of performance failure and to ensure prompt remedial actions is taken in case of any occurrence of performance failure.
- Edo State Ministry of Transportation shall be responsible for checking the status of vehicular traffic and road transportation in the area to ensure safety and ensure adequate road detours and signs are in place to protect vehicular accidents around the gully erosion channel.

- Edo State Ministry of Agriculture and Forestry shall conduct periodic inspections to ensure compliance with Watershed Management Plans for the establishment of vegetation cover in the upstream watershed areas of the gully head and the channel stabilization downstream of the gully head.
- Nigerian Police shall ensure that crime and criminal activities are monitored and minimized as much as possible to prevent the association of such activities with the operation of the gully erosion infrastructure;
- NEMA shall be responsible for all emergency response requirements in case of any incidence of performance failure in advent of the arrival of flood greater than the anticipated 1 in 50 year recurrence interval.
- NIMET shall be responsible for provision of climatic alerts on the occurrence of heavy rainfall events during the operation phase of the rehabilitated gully erosion site.

### **Responsibility for the Implementation of the ESMP at the Local Level**

The responsibilities of the local government in the implementation of the ESMP during the operation and maintenance phase includes:

- Provision of oversight function across the LGAs for ESMP compliance
- Participate in awareness campaign for the effective operation of the Ewu gully erosion drainage infrastructure amongst the various relevant grass root interest groups to ensure people does not dump refuse and solid waste into the gully drainage channel
- Organize, coordinate and ensuring safe use of volunteers in a response action, and actually identifying where these volunteers can best render services effectively and
- Providing wide support assistance helpful in the effective operation of the drainage infrastructure and ensure that implementation of the operation and maintenance phase ESMP mitigation measures

## Responsibility for Financing the Implementation of the ESMP at all the Project Phases

The financing of the ESMP during the pre-construction and construction phases shall be the responsibility of Federal NEWMAP under the financial provisions made available for the project in Edo State by the World Bank and the other financial institutions. However, upon the completion of the rehabilitation construction phase, during the operation and maintenance phase, the financial responsibility for ESMP financing shall be given to the Edo State Government and any assistance available from development partners on the project. The Edo NEWMAP SPMU during the operation phase shall consist of NEWMAP Staffs and relevant Edo State MDAs Government Officials. This new Edo State NEWMAP structure shall be responsible for the supervision of the operation of the infrastructure, the enforcement of all ESMP measures, monitoring of the performance of the drainage infrastructure, initiation and implementation of remedial actions, reporting and staff training as required.

The details of the institutional arrangements, and the roles and responsibilities of the pertinent stakeholders in the implementation of the ESMP are as shown in **Table 6.2** below.

**Table 6.2: Roles and responsibilities of the key stakeholders in the implementation of the ESMP**

S/No.	KEY STAKEHOLDER	RESPONSIBILITIES
	NEWMAP Federal Project Management Unit	<ul style="list-style-type: none"> <li>• Overall coordination of the implementation of a multi-sectorial NEWMAP in seven Nigerian States</li> <li>• Establishment of the development objectives to be achieved by the NEWMAP intervention</li> <li>• NEWMAP Federal Project Support Unit (FPSU) manage the coordination and provision of program support to State counterpart Agencies</li> </ul>
	NEWMAP Edo State Project Management Unit (SPMU) Project Coordinator	<p>Project Coordinator of Edo SPMU is responsible for the implementation of the ESMP and ensures compliance with the requirements of the environmental and social impact mitigation measures. The Project Coordinator of Edo SPMU should perform the following roles and responsibilities:</p> <ul style="list-style-type: none"> <li>➤ Overall management of the Project Contractor and ensure compliance with recommended impact mitigation measures and the requirements of the ESMP</li> <li>➤ Liaise with FMEnv and the World Bank to coordinate the preparation and implementation of the ESMP</li> <li>➤ Enforce the integration of the recommended environmental and social impact mitigation measures and requirement for the implementation of the ESMP in the tender documents and contract award documents</li> </ul>

S/No.	KEY STAKEHOLDER	RESPONSIBILITIES
		<ul style="list-style-type: none"> <li>➤ Supervise and monitor the implementation of the mitigation measures in the ESMP and take adequate steps</li> <li>➤ Compilation and submission of periodic ESMP reports to the World Bank</li> </ul>
	NEWMAP Edo State Project Management Unit (SPMU) Environmental and Safeguard Officer	<p>The Environmental and Safeguard Officer of Edo SPMU shall be responsible for the provision of feedbacks to the Project Coordinate of Edo SPMU on the implementation of the ESMP and other environmental issues. He shall be responsible for carrying out the supervision, control and monitoring of the implementation of the ESMP and the NEWMAP gully erosion intervention project. He shall also be responsible for the following</p> <ul style="list-style-type: none"> <li>➤ Review all Environmental Assessment and Social Assessment documents prepared by Consultants and ensure adequacy under the World Bank policies including OP4.01;</li> <li>➤ Ensure that the project design and specifications adequately conform with the recommendations of the ESMP</li> <li>➤ Coordinate application, follow up processing and obtain requisite clearances required for the project on behalf of the Contractor if required;</li> <li>➤ Develop, organize and deliver training programs for the Project Implementation Unit (PIU) staffs, the Contractors and others involved in the implementation of the NEWMAP intervention in collaboration with the Project Management Unit (PMU);</li> <li>➤ Review and approve the Contractor's Implementation Plan 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 PIU;</li> <li>➤ Liaise with the Contractor on the implementation of the ESMP / RAP</li> <li>➤ Liaise with various Federal and State Government agencies on environmental, resettlement and other regulatory matters</li> <li>➤ Interact consistently with NGOs and CBOs that are involved in the project;</li> <li>➤ Establish dialogue with the resident communities in Ewu Esan Central Central to ensure that the environmental concerns and suggestions are incorporated in the implementation of the NEWMAP gully erosion rehabilitation</li> <li>➤ Review the performance of the project through an assessment of the periodic environmental monitoring reports; provide a summary report to the Project Coordinator, and initiate follow-up actions;</li> <li>➤ Provide support and assistance to the Government Agencies and the World Bank in their efforts at supervising the implementation of the ESMP and the NEWMAP intervention</li> </ul>
	Federal Ministry of Environment, EIA Department and NESREA	<ul style="list-style-type: none"> <li>• Perform the role of the lead environmental regulator overseeing the compliance of the Contractor with the ESMP mitigation requirements, granting consent on the ESMP implementation, supervision and monitoring of the gully erosion rehabilitation implementation;</li> <li>• Lead role in the provision of advice on screening, scoping, review of draft ESMP report in liaison with State Ministry of Environment; receiving comments from stakeholders, public hearing of the project proposals, and convening a technical decision making panel, project categorization for EA, applicable standards, environmental and social liability investigations, monitoring and evaluation process and</li> </ul>

S/No.	KEY STAKEHOLDER	RESPONSIBILITIES
		<p>criteria;</p> <ul style="list-style-type: none"> <li>• Provision of approval, required clearance and other environmental clearance for the ESMP in association with State Ministry of Environment</li> <li>• Review environmental monitoring reports</li> <li>• Ensure corrective actions are taken to mitigate significant environmental and social impacts</li> <li>• Conduct periodic site visits to investigate and verify the nature and occurrence of the identified impacts</li> </ul>
	Federal Ministry of Environment, Department of Erosion, Flood and Coastal Zone Management	<ul style="list-style-type: none"> <li>• The Department of Erosion, Flood and Coastal Zone Management is the implementing authority for the NEWMAP gully erosion intervention with the following responsibilities: <ul style="list-style-type: none"> <li>✚ Coordinate all policies, programs and actions of NEWMAP across the States in Nigeria;</li> <li>✚ Ensure smooth and efficient implementation of the project's various technical programs;</li> <li>✚ Cooperate with relevant stakeholders through a Steering Committee that provides guidance on the technical aspects of all project activities of the gully erosion rehabilitation;</li> <li>✚ Maintain and manage all fields effectively and efficiently for the projects</li> </ul> </li> </ul>
	Edo State Ministry of Environment.	<ul style="list-style-type: none"> <li>• Oversee the implementation of the ESMP, compliance with the recommended mitigation measures, at State level.</li> <li>• Ensure that all the project activities involved in the gully erosion site rehabilitation comply with the Edo State environmental laws and requirements</li> <li>• Perform regular compliance monitoring and periodic inspection of all the stages and phases of the NEWMAP intervention in Ewu Esan Central Central gully erosion site</li> </ul>
	State Government MDAs (Ministry of Lands, Surveys and Urban Development etc.)	<ul style="list-style-type: none"> <li>• Compliance overseer at State Level;</li> <li>• Other MDAs come in as and when relevant areas or resources under their jurisdiction or management are likely to be affected</li> <li>• Compliance overseer at State level on matters of land allocation, compensation and other resettlement issues</li> <li>• They participate in the EA processes and in project decision-making that helps prevent or minimize impacts and to mitigate them. These institutions could be required to issue consent or approval for an aspect of the project, allow an area to be included in a project, or allow impact to a certain extent or impose restrictions on conditions, monitoring responsibilities or supervisory oversight</li> </ul>
	Site Manager	<ul style="list-style-type: none"> <li>• Ensure minimum land areas are disturbed and all land disturbance activities are conducted in accordance with relevant legislations;</li> <li>• Minimize on-site erosion and control sediment in accordance with the site Erosion and Sediment Control Plan;</li> <li>• Communicate the content of any changes made to the Site Erosion and Sediment Control Plan to all employees and Contractors;</li> <li>• Inspect the operations of the erosion and sediment control devices installed in the Ewu gully erosion channel and initiate repairs or maintenance as required;</li> <li>• Instruct employees and contractors in the purpose and operation of erosion and sediment control devices and the need to maintain them in proper working condition at all times;</li> </ul>



S/No.	KEY STAKEHOLDER	RESPONSIBILITIES
		<ul style="list-style-type: none"> <li>Provide adequate onsite waste collection bins and ensure proper solid waste handling and disposal that eliminates waste littering and creation of environmental nuisance</li> </ul>
	Site Engineers/Supervisor	<ul style="list-style-type: none"> <li>Provide oversight function during construction and decommissioning</li> </ul>
	Service Provider/Contractor	<ul style="list-style-type: none"> <li>Compliance with Bills of Materials specifications in procurement of materials and construction</li> </ul>
	Esan Central Local Government	<ul style="list-style-type: none"> <li>Provide over sight function across subproject in LGAs for ESMP compliance</li> <li>Liaising with the PMU to verify the adequacy of resettlement location and provide approval for such sites, providing additional resettlement area if the designated locations are not adequate, provide necessary infrastructure in relocated areas, engage and encourage carrying out comprehensive and practical awareness campaign for the proposed project, amongst the various relevant grassroots interest groups</li> </ul>
	Community Development Associations (CDAs)	<ul style="list-style-type: none"> <li>Ensure community participation by mobilizing, sensitizing community members</li> </ul>
	Community Based Organizations / CSOs	<ul style="list-style-type: none"> <li>Assisting in their own respective ways to ensure effective response actions. Conducting scientific researches alongside government groups to evolve and devise sustainable environmental strategies and rehabilitation techniques;</li> <li>Organize, coordinate and ensuring safe use of volunteers in a response action, and actually identifying where these volunteers can best render services effectively and</li> <li>Providing wide support assistance helpful in management planning, institutional / governance issues and other livelihood related matter, project impacts and mitigation measures, and awareness campaign</li> </ul>
	Resident Community Representatives	<ul style="list-style-type: none"> <li>Participation in community engagement and consultations;</li> <li>Communication of grievances and complaints on the project</li> <li>Identify issues that could derail the project; and</li> <li>Support project impact mitigation measures implementation and compliance requirements</li> <li>Participate in awareness campaigns on the NEWMAP intervention</li> </ul>
	The World Bank	<p>The World Bank shall perform the following roles:</p> <ul style="list-style-type: none"> <li>Ensure that the Safeguard Policies of the World Bank are complied with in the implementation of the ESMP;</li> <li>Recommend additional measures for strengthening the ESMP and implementation performance;</li> <li>Carry out the final review, clearance and approval of the ESMP</li> <li>Ensure that environmental safeguards are complied with during World Bank supervision mission</li> </ul>
	The Construction Contractor	<ul style="list-style-type: none"> <li>For day-to-day onsite implementation of the ESMP and coordination of all environmental and safety related activities of the Company, the Contractor shall appoint: <ul style="list-style-type: none"> <li>An Environmental Officer;</li> <li>Site Engineer and</li> <li>An Independent Consultant</li> </ul> </li> <li>The Environmental Officer or Representative of the Contractor shall be responsible for performing the following: <ul style="list-style-type: none"> <li>Development of a sound Environmental Management Plan for the proposed gully erosion rehabilitation project;</li> <li>Ensure that all construction site staff including all subcontractors comply with the requirements of the ESMP;</li> <li>Supervise the implementation of all the mitigation measures and</li> </ul> </li> </ul>

S/No.	KEY STAKEHOLDER	RESPONSIBILITIES
		<ul style="list-style-type: none"> <li>preparation of the required monitoring reports;</li> <li>✚ Perform regular inspection of the Ewu gully erosion site to ensure adherence to all relevant environmental management actions specified by the ESMP;</li> <li>✚ Preparation of work plans for environmental management in line with the ESMP;</li> <li>✚ Provide inputs into the regular environmental report to be compiled by the Environmental Safeguard Officer (ESO);</li> <li>✚ Maintain adequate records of environmental and safety incidence as well as corrective and preventive actions taken;</li> <li>✚ Ensure that any changes made during the construction process that may have a significant environmental and social impact are communicated to the ESO on time and managed accordingly;</li> <li>✚ Ensure ESO is adequately informed about the Contractor's monitoring results</li> </ul>
	Independent Environmental Consultant	<ul style="list-style-type: none"> <li>• Coordinate the implementation of the requirements of the EMP during the phases of the project;</li> <li>• Coordinate the environmental monitoring activities at the field level;</li> <li>• Communicate the results of monitoring and auditing inspections to appropriate offices through submission of reports, summaries of reports, periodic formal and informal reports as appropriate;</li> <li>• Communicate with the HSE Manager regarding emerging environmental and social matters and concerns;</li> <li>• Conduct independent monitoring and auditing to ensure compliance with the requirements of this EMP and Contractor's HSE plan and other site-specific plans;</li> <li>• Review EMP compliance monitoring reports and conduct site visits/inspections;</li> <li>• Collaborate with the EIA Consultant regarding environmental and social concerns and conducting stakeholders consultation;</li> <li>• Advise the Contractor field personnel concerning environmental and social issues and the implementation of the environmental and social regulatory requirements</li> <li>• Compile a comprehensive report on the implementation of this EMP for submission to the regulatory agencies and other relevant stakeholders.</li> </ul>

### **Contractual Arrangement for Assuring the Performance of each Implementing Agency**

Schedule of Monitoring is mostly ongoing and on daily basis as indicated in **Table 6.2**. But the Environmental Impact Monitoring (Environmental Auditing) shall be performed on quarterly basis for effective monitoring of the profile of the impact mitigation and occurrence if predicted project impacts actually occur. .

#### **6.4 Capacity Building and Training Plan**

Giving consideration to the composition of stakeholders in public and private sector, the resident communities, community based organizations and the development partners that will perform key roles and responsibilities in the implementation of the proposed NEWMAP gully erosion rehabilitation and the ESMP, capacity building and training of the relevant stakeholders is imperative. Capacity building training is essential for ensuring that the ESMP requirements are implemented. To this end, the relevant training and capacity building programs have been identified and recommended to NEWMAP Edo SPMU and other stakeholders as pre-requisite for effective implementation of the Ewu gully erosion site rehabilitation project and the recommended ESMP:

The training will enhance their capability to function effectively and perform their roles on the project. They will be aware of the environmental and social policy and safeguards regulating their areas of responsibilities; the potential adverse environmental and social impacts of various project activities; their roles and responsibilities in the achievement of conformance with the policy and procedures, and with the requirements of this ESMP. The World Bank procedure ensures that any person performing tasks on a World Bank financed project that have the potential to cause significant adverse environmental or social impact identified should have the requisite competence on the basis of appropriate education, training or experience. NEWMAP personnel having responsibility of performing site inspections will receive training on how to do so with the help of external resources. Consequently, Edo State NEWMAP will develop and institute training for SPMU, community and other relevant stakeholders with defined roles and responsibilities on the project that will raise their awareness and competence in the following areas:

- ❑ The environmental and social impacts that could arise from the project activities;
- ❑ The necessity of conforming to the requirements of the NEWMAP Ewu ESMP in order to avoid or reduce the identified project impacts; and
- ❑ The roles and responsibilities that NEMAP personnel must assume to achieve the desired ESMP Conformity and impact compliance

- Safeguard training for the entire SPMU on World Bank safeguard policy triggered by the NEWMAP;
- GIS Analysis and Image Processing training for the Safeguard Officers to enhance their capability to interpret gully erosion site imagery that will be delivered along with the ESMP as contained in the TOR;
- Training of SPMU on emergency response procedures for handling emergency incidence during phases of the NEWMAP gully erosion intervention.

The training of Contractor personnel and workforce shall be designed to enhance their awareness of the various aspects of the ESMP in relations to their roles and responsibilities in its implementation. The training will be specified, as requirement Contactor personnel must fulfill to fully qualify to possess full work permit to participate in the project and a requirement of contract for the Contractor. Moreover, related specific training shall be provided to workers with responsibilities related to the implementation of the ESMP. The Contractor personnel training shall include but not limited to:

- Training on environmental management, monitoring and conservation, project impact mitigation and Environmental and Social Management Plan implementation;
- Induction Courses on Environmental Management and Safety Management;
- Safety Briefing and the relevance of Daily Tool Box Talks

The capacity building training program proposed for the implementation of the ESMP is as shown in **Table 6.3**.

**Table 6.3: Capacity Building Training Program Proposed for the implementation of the ESMP**

CAPACITY BUILDING TRAINING MODULE	DESCRIPTION OF COURSE CONTENT	REQUIRED PARTICIPANTS	DURATION	COST (Naira)
Module One: Sensitization and Induction Training	Basic Environmental Awareness Training: <ul style="list-style-type: none"> <li>(a) Definition of key words such as Environment, Environmental Management, Protection and Conservation; Environmental Awareness; Environmental and Social Management Plan; NEWMAP Gully Erosion Site Remediation; Integrated Watershed Management; etc.</li> <li>(b) The Potential Impacts and hazards of the interaction of gully erosion site rehabilitation project activities with biophysical and social components of the environment;</li> <li>(c) Need for impact mitigation for protection of the environment and livelihood of the host communities;</li> <li>(d) Training on Ewu NEWMAP rehabilitation Environmental and Social Management Plan and its implementation</li> <li>(e) Safety induction course;</li> <li>(f) Emergency and spill response preparedness and drill;</li> <li>(g) Social responsibility during the construction phase and the modalities for community communication, interaction and relations;</li> <li>(h) Basic First Aid Training and In-depth Training for selected personnel;</li> <li>(i) The importance of Personal Protection Equipment (PPE) as a safety measure in occupational safety;</li> <li>(j) The Permit to Work System</li> <li>(k) Environmental and Safety Awareness Training</li> </ul>	<ul style="list-style-type: none"> <li>❑ Edo State NEWMAP Staff;</li> <li>❑ The Principal Contractor;</li> <li>❑ Site Personnel of the Principal Contractor;</li> <li>❑ Host Community Representatives and the General Public</li> </ul>	3 Days	N 6,550, 000:00
Module Two: Training on Environmental and Social Management Plan Implementation	<ul style="list-style-type: none"> <li>❑ Environmental and Social Impact Assessment Process in Nigeria</li> <li>❑ The NEWMAP Project Environmental and Social Impacts</li> <li>❑ The Impact Control and Mitigation Measures for the Ewu NEWMAP Intervention;</li> <li>❑ Ewu NEWMAP ESMP;</li> <li>❑ ESMP Implementation Approach,</li> <li>❑ Environmental Impact Monitoring</li> <li>❑ Mitigation Measures Compliance Monitoring</li> <li>❑ ESMP Communications and Reporting</li> </ul>	FMEEnv Staff; Edo SPMU Officials; Edo State Ministry of Environment Officer; Officials of relevant MDAs; Local Government Officers; NGOs and CBOs; Principal Contractor Personnel;	2 Days	N2, 950, 000:00
Module Three: Training on Construction HSE	<ul style="list-style-type: none"> <li>❑ Primer on Construction Best Management Practices and HSE</li> <li>❑ Health and Safety Hazards in Gully Erosion Drainage Infrastructure Construction Works</li> <li>❑ Incidence, Causation, Investigation and Reporting</li> <li>❑ Excavation Safety</li> <li>❑ Construction Site Inspection</li> <li>❑ Personal Protection Equipment</li> </ul>	FMEEnv Staff; Edo SPMU Officials; Edo State Ministry of Environment Officer; Officials of relevant MDAs; Local Government Officers; NGOs and CBOs; Principal Contractor Personnel;	2 Days	N2,950,000:00
Module Four: Integrated	Integrated Watershed Management in Gully Erosion Site	FMEEnv Staff; Edo SPMU	3 Days	N6, 050,000:00

CAPACITY BUILDING TRAINING MODULE	DESCRIPTION OF COURSE CONTENT	REQUIRED PARTICIPANTS	DURATION	COST (Naira)
Watershed Management Approach in NEWMAP Intervention	Rehabilitation: <ul style="list-style-type: none"> <li><input type="checkbox"/> Primer on Integrated Watershed Management;</li> <li><input type="checkbox"/> Watershed Delineation in ArcHydro - ArcGIS 10.3</li> <li><input type="checkbox"/> Gully Erosion Drainage Infrastructure in NEWMAP intervention</li> <li><input type="checkbox"/> Gully Erosion Slope Stabilization and Erosion Control Using Vegetation</li> <li><input type="checkbox"/> Erosion and Sediment Control - A Field Guide for Construction Site Managers</li> <li><input type="checkbox"/> Dispute Resolution Mechanism</li> </ul>	Officials; Edo State Ministry of Environment Officer; Officials of relevant MDAs; Local Government Officers; NGOs and CBOs; Principal Contractor Personnel;		
Total Cost of Training				<b>N18,500,000.00</b>

## NOTES ON COSTING FOR CAPACITY BUILDING

It has been assumed that the capacity building trainings will be undertaken by a team of 4 consultants for module 1, 2 consultants for module 2, 4 consultants for module 3 and 4 consultants for module 4. The costs for each training module will typically consist of consultants' costs and costs of participation by regulators (SPMU and State Ministry of Environment). A breakdown of the costs is presented below:

### MODULE 1:

• Honorarium for Consultants	N800,000.00
• Per diem for consultants and training secretariat (Assuming 10 people for 3 days each @N75, 000/day)	N2, 250,000.00
• Transportation costs for training team	N250, 000.00
• Cost of venue (including lunch and tea breaks each day)	N1, 500,000.00
• Course materials and certificates	N250, 000.00
• Cost of participation by Regulators	N1, 500,000.00
• Total cost for module 1	N6, 550,000.00

### MODULE 2:

• Honorarium for Consultants	N400, 000.00
• Per diem for consultants and training secretariat (Assuming 6 people for 2 days each @N75, 000/day)	N900, 000.00
• Transportation costs for training team	N250, 000.00
• Cost of venue (including lunch and tea breaks)	N500, 000.00
• Course materials and certificates	N150, 000.00
• Cost of participation by Regulators	N750, 000.00
• Total cost for module 2	N2, 950,000.00

### MODULE 3:

• Honorarium for Consultants	N400, 000.00
• Per diem for consultants and training secretariat (assume 6 people for 2 days each @N75, 000/day)	N900, 000.00

• Transportation costs for training team	N250, 000.00
• Cost of venue (including lunch and tea breaks)	N500, 000.00
• Course materials and certificates	N150, 000.00
• Cost of participation by Regulators	N750, 000.00
• Total cost for module 3	N2, 950,000.00

#### **MODULE 4:**

• Honorarium for Consultants	N800, 000.00
• Per diem for consultants and training secretariat (Assuming 10 people for 3 days each @N75, 000/day)	N2, 250,000.00
• Transportation costs for training team	N250, 000.00
• Cost of venue (including lunch and tea breaks)	N1, 000,000.00
• Course materials and certificates	N250, 000.00
• Cost of participation by Regulators	N1, 500,000.00
• Total cost for module 4	N6, 050,000.00

The total costs for the 4 modules come to N18, 500,000.00. Converting this to US\$ at an official rate of US\$1: N350, this gives US\$52,857.00 for the 4 modules.

#### **6.5 Grievance Redress Mechanism**

The grievance redress mechanism allows NEWMAP project affected persons or the general public to file complaints and receive adequate and timely response from NEWMAP SPMU. Land acquisition is an inevitable issue in the project that may raise grievances from within the communities. The grievance address mechanism that shall be utilized on the Ewu NEWMAP gully erosion site rehabilitation shall be consistent with the Grievance Redress Mechanism outlined in the NEWMAP Environmental and Social Framework document.

#### **6.6 Environmental and Social Management and Monitoring Plan**

This section presents the Environmental and Social Management Plan (ESMP) and the Environmental Monitoring Plan proposed for the implementation during the pre-



construction, construction, operation and maintenance and decommissioning phases of the proposed NEWMAP gully erosion site rehabilitation intervention project in Ewu Esan Central Central, Edo State.

The implementation approach for the proposed ESMP involves the performance of two types of monitoring that constitutes surveillance and monitoring techniques that shall be used to detect if any negative impact has occurred during the life cycle of the project. The approach offers a quantitative estimate of the magnitude of the identified environmental and social impacts. The proposed monitoring will provide information on the occurrence of the identified impacts. The monitoring explicitly indicates the specific monitoring indicators that shall be investigated; the sampling location and the frequency of monitoring that shall be performed. The two monitoring that will be undertaken consists of:

- (a) Environmental Auditing (Environmental impact monitoring), and
- (b) Environmental and social impact mitigation compliance monitoring.

**The environmental impact monitoring involves sample collection as well as laboratory analysis. The field plan and parameters to be monitored are detailed below.**

#### **6.6.1 Environmental and Social Management Plan (ESMP)**

The ESMP is presented in **Table 6.4** depicting the details of the mitigation measures recommended for the amelioration of the adverse environmental and social impacts of specific project activities constituting the gully erosion site rehabilitation intervention; the impact monitoring indicators or parameters to be measured, the frequency of monitoring, the stakeholders responsible for monitoring implementation; the type of monitoring that shall be performed and the cost implication of the implementation and monitoring of the impact mitigation measures.

**Table 6.4: Environmental and Social Management Plan for Ewu Esan Central Central Gully Erosion Site Rehabilitation**

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
1	Pre-Construction	Land Acquisition and demolition of existing buildings	Conflict over loss of land and resettlement benefits if payment is restricted to owners of buildings to be demolished for the construction of the diversion culvert	NEWMAP shall <ul style="list-style-type: none"> <li><input type="checkbox"/> Consult regularly with the communities (i.e. before, during and after site clearance)</li> <li><input type="checkbox"/> Develop and implement the provisions of the Resettlement Action Plan before mobilization to project site</li> <li><input type="checkbox"/> carry out adequate enumeration of project affected people, property and economic trees within the land area to be acquired for the project</li> </ul>	Number of consultation held;  Sighting of the following: <ul style="list-style-type: none"> <li><input type="checkbox"/> Number of consultation held</li> <li><input type="checkbox"/> Minutes of meetings held;</li> <li><input type="checkbox"/> Report of implementation of RAP with signatures showing community participation</li> </ul> Compliance with RAP provisions	Once before commencement of pre-construction works, say 3 weeks before Construction starts	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project Coordinator</li> </ul>	<ul style="list-style-type: none"> <li>• Edo State NEWMAP</li> <li>• FMEEnv</li> <li>• World Bank</li> </ul>	1,500,000
			Conflict between the NEWMAP project and the resident community over relocation benefits due to those families whose buildings, land, and lives of loved ones were lost to the gully erosion at Ewu Esan Central Central	NEWMAP shall <ul style="list-style-type: none"> <li><input type="checkbox"/> Develop a sound implementable Resettlement Action Plan for the Ewu NEWMAP project</li> <li><input type="checkbox"/> Ensure that adequate compensation shall be paid to project affected people in consultation with various stakeholders to avoid conflicts that may arise if payments are made to wrong claimants.</li> </ul>	Number of consultation held;  Sighting of the following: <ul style="list-style-type: none"> <li><input type="checkbox"/> Number of consultation held</li> <li><input type="checkbox"/> Minutes of meetings held;</li> <li><input type="checkbox"/> Report of implementation of RAP with signatures showing community participation</li> <li><input type="checkbox"/> Compliance with RAP provisions</li> </ul>	Once before commencement of pre-construction works, say three (3) months before Construction starts	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project Coordinator</li> </ul>	<ul style="list-style-type: none"> <li>• Edo State NEWMAP</li> <li>• FMEEnv</li> <li>• World Bank</li> </ul>	0
2	Pre-Construction:	General site clearing and preparation of	Increased employment opportunities for the local communities	NEWMAP shall <ul style="list-style-type: none"> <li><input type="checkbox"/> Utilize available workforce from the communities</li> </ul>	Daily observation of employment records	Daily	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project</li> </ul>	<ul style="list-style-type: none"> <li>• FMEEnv</li> <li>• Edo State Ministry of Environment</li> </ul>	0

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
		project site					Coordinator	<ul style="list-style-type: none"> <li>Edo State NEWMAP</li> </ul>	
			Interference with day-to-day community activities resulting in conflicts and complaints	NEWMAP shall <ul style="list-style-type: none"> <li>Consult regularly with the communities (i.e. before, during and after site clearance)</li> <li>Demarcate boundaries of acquired location.</li> </ul>	Sighting of the following: <ul style="list-style-type: none"> <li>Number of consultation held</li> <li>Minutes of meetings held;</li> </ul>	Once before commencement of pre-construction works, say three (3) months before Construction starts	<ul style="list-style-type: none"> <li>Contractor</li> <li>Site Manager;</li> <li>Site Engineer</li> <li>SPMU Project Coordinator</li> </ul>	<ul style="list-style-type: none"> <li>Esan Central Local Govt.;</li> <li>CDAs / CBOs</li> <li>Community Rep.</li> <li>Edo State NEWMAP</li> <li>FMEEnv</li> <li>World Bank</li> </ul>	0
							<b>Total costs for Item 1-2</b>	<b>N1, 300,000.00</b>	
3	Pre-Construction	Disruption and encroachment into agricultural lands in close proximity to the gully erosion	Conflict over loss of agricultural lands due to gully erosion rehabilitation civil works downstream of the gully head in Ewu Esan Central Central community	NEWMAP shall <ul style="list-style-type: none"> <li>Consult extensively with the communities on land acquisition and payment of relocation benefits</li> <li>Develop a sound implementable Resettlement Action Plan for the Ewu NEWMAP project</li> <li>NEWMAP-Edo SPMU shall reach agreement with regard to ways and means of resettlement of any forced displacement and relocation of any existing land use and ownership on the proposed land take and respect those commitments;</li> <li>NEWMAP-Edo SPMU and Contractors shall negotiate, if necessary, for the acquisition of land or the right of passage and provide for adequate compensation;</li> </ul>	Sighting of the following: <ul style="list-style-type: none"> <li>Number of consultation held</li> <li>Minutes of meetings held;</li> <li>Report of implementation of RAP with signatures showing community participation</li> </ul> Compliance with RAP provisions	Once every two months	<ul style="list-style-type: none"> <li>Contractor</li> <li>Site Manager;</li> <li>Site Engineer</li> <li>SPMU Project Coordinator</li> </ul>	<ul style="list-style-type: none"> <li>Edo State NEWMAP</li> <li>FMEEnv</li> <li>World Bank</li> </ul>	0
4	Pre-Construction	Physical	Contamination of soil	NEWMAP shall ensure that:	Adequacy of	Ongoing or	• Contractor	Edo State	0

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
		presence of construction workers on the Ewu Gully erosion intervention project site and environ	and downstream water resources of the project area from indiscriminate disposal of untreated sewage	<ul style="list-style-type: none"> <li><input type="checkbox"/> Contractors are to provide adequate sanitary facilities for their site workers;</li> <li><input type="checkbox"/> Open air defecation is sternly discouraged among the project workers</li> </ul>	sanitary facilities available on site	Daily	<ul style="list-style-type: none"> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project Coordinator</li> </ul>	NEWMAP; Edo State Ministry of Environment;	
5	Pre-Construction:	Transportation of equipment, materials and workers to the project site	Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles	NEWMAP shall ensure that <ul style="list-style-type: none"> <li><input type="checkbox"/> Use of equipment with high combustion efficiency for the project activities.</li> <li><input type="checkbox"/> Premob equipment and automobiles before usage</li> <li><input type="checkbox"/> Use of dust suppressants by spraying water ground surface of the project site</li> </ul>	In-situ measurement of ambient air quality parameters: <ul style="list-style-type: none"> <li>• CO, NO<sub>x</sub>, SO<sub>x</sub>, VOC and Particulate Matter, SPM, THC, VOC, CH<sub>4</sub>; Vehicle exhaust measurement;</li> <li>• Records of maintenance for all machinery, equipment and vehicles.</li> </ul>		<ul style="list-style-type: none"> <li>• Independent Environmental Consultant</li> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project Coordinator</li> </ul>	Edo State Ministry of Environment FME <sub>env</sub>	
			Noise and vibration from vehicular movement	NEWMAP shall <ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure that contractors provide ear protective devices to the project workers at the site clearing stage;</li> <li><input type="checkbox"/> Ensure the use of the ear protective devices at site by project workers and visitors</li> <li><input type="checkbox"/> Ensure that contractors install acoustic mufflers on large equipment where necessary to limit noise levels at fence</li> </ul>	Ambient noise and vibration level monitoring; Comparison of ambient noise level to regulatory limit of 90dB(A) Daily Observation of large equipment operating onsite Examine the number of complaints in the	Ongoing Daily	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Independent Environmental Consultant</li> </ul>	FME <sub>env</sub> Edo SME ESO NEWMAP	

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
				line	complaint register  Sight the records of equipment maintenance				
			Traffic congestion and increased risk of occurrence of traffic accidents and injuries	NEWMAP-Edo SPMU and Contractors shall -avoid impeding traffic and traffic disruption around the project site by: <ul style="list-style-type: none"> <li><input type="checkbox"/> Adjusting work schedules not to disturb traffic;</li> <li><input type="checkbox"/> Establishing an adequate system of road signs and detour;</li> <li><input type="checkbox"/> Notifying communities of pending work scope, duration and location</li> <li><input type="checkbox"/> Avoid blocking public access roads;</li> <li><input type="checkbox"/> Complying with road bearing capacity and repairing damage caused to roads during and at the end of the work;</li> <li><input type="checkbox"/> Circumventing access roads to gathering places in Ewu and neighbouring communities</li> </ul>	Daily observation of traffic volume and level of congestion	Ongoing	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• NEWMAP-Edo SPMU</li> <li>• SPMU Project Coordinator</li> </ul>	FMEv Edo State Ministry of Environment	
6	Construction	Construction of sheds, equipment lay down areas, temporary office and sanitary facilities etc.	Increase in ambient noise levels and vibration	NEWMAP-Edo SPMU shall ensure that: <ul style="list-style-type: none"> <li><input type="checkbox"/> Ear protective device is provided to workers at the site clearing stage;</li> <li><input type="checkbox"/> Use of the protective devices provided is enforced</li> <li><input type="checkbox"/> Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>	Ambient noise and vibration level monitoring  Daily Observation of large equipment onsite	Ongoing  Ongoing	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Independent Environmental Consultant</li> </ul>	FMEv Edo State Ministry of Environment	

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
7	Construction	Construction of drainage conduits upstream of the gully head and other associated road drainage infrastructure	Increase in employment opportunities and engagement of community labour	NEWMAP-Edo SPMU shall ensure that: <input type="checkbox"/> Utilization of available workforce in communities is enforced	Daily observation of employment records	Ongoing	<ul style="list-style-type: none"> <li>Contractor</li> <li>Site Manager;</li> <li>Site Engineer</li> <li>SPMU Project Coordinator</li> </ul>	<ul style="list-style-type: none"> <li>FME nv</li> <li>Edo State Ministry of Environment</li> <li>Edo State NEWMAP</li> </ul>	0
			Social and cultural structure interference and complaints;	<input type="checkbox"/> NEWMAP-Edo SPMU and Contractors shall obtain all necessary authorizations and permits prior to the execution of the work through consultation with relevant authorities <input type="checkbox"/> Contractor should establish and put in place a public complaint unit and a complaint register the public can easily access.	Sighting and visual observation of the following: <input type="checkbox"/> Number of consultation held <input type="checkbox"/> Minutes of meetings held <input type="checkbox"/> Complaint Register <input type="checkbox"/> Compilation of authorization and permit given by recognized leaders of the resident community	Ongoing as deemed necessary during the construction works	<ul style="list-style-type: none"> <li>Contractor</li> <li>Site Manager;</li> <li>Site Engineer</li> <li>SPMU Project Coordinator</li> </ul>	<ul style="list-style-type: none"> <li>Edo State NEWMAP</li> <li>Edo State Ministry of Environment;</li> <li>FME nv</li> </ul>	0
			Marginal increase in population within the settlements in close proximity to the project site will lead to an increase in negative vices such as prostitution (commercial sex work) and crime which would affect social and cultural systems through a negative value system;	<input type="checkbox"/> NEWMAP-Edo State Project Management Unit (SPMU) and Contractors shall develop and provide a work schedule that will avoid disturbing the traditional and religious life of communities; <input type="checkbox"/> Provide education and awareness programs, guidance and counseling on HIV/AIDS and other STDs <input type="checkbox"/> Provide condoms to construction workers	Sighting and visual observation of <input type="checkbox"/> NEWMAP gully erosion rehabilitation work schedule submitted to the community <input type="checkbox"/> The register of the number of workers educated on HIV/AIDS and other STDs	Once before start of construction works	NEWMAP-Edo SPMU; and Contractors Local Government	<input type="checkbox"/> Environmental and Safety Officer NEWMAP	
			Conflicts between the project and the community as well as the pressure of the influx of potential job seekers into the project area and	NEWMAP-Edo SPMU and Contractors shall: <input type="checkbox"/> establish a communication program to inform communities of	Sighting and visual observation of the following: <input type="checkbox"/> Evidence of the Communication process	Monthly	NEWMAP-Edo SPMU; Contractors Local Government; Resident Community Leaders;	Environmental and Safety Officer NEWMAP	0

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
			associated risks;	ongoing work and establish appropriate measures to minimize the disturbance caused by the work; <input type="checkbox"/> NEWMAP-Edo SPMU and Contractors should develop and implement the Influx Management Plan to address all socio-cultural issues, especially the preservation of social and cultural structures of the local communities; <input type="checkbox"/> NEWMAP-Edo SPMU and Contractors shall periodically conduct STD and HIV/AIDS and general safe sex awareness campaigns as control measure for the transmission of the disease; <input type="checkbox"/> Regularly distribute HIV/AIDS awareness communication materials; <input type="checkbox"/> Implement labour hiring programs away from construction sites to reduce the presence of "camp followers", prostitutes, drug dealers/users and other potential HIV/AIDS carriers.	established by Contractor with the community <input type="checkbox"/> The Influx Management Plan developed by SPMU <input type="checkbox"/> Number of consultation held <input type="checkbox"/> The register of the number of workers educated on HIV/AIDS and other STDs <input type="checkbox"/> Samples of the HIV/AIDS awareness communication materials distributed and record of workers that have collected the document <input type="checkbox"/> Record of labour hiring and the location of hiring away from the site				
			New wealth among the youth would threaten the existing authority structure;	<input type="checkbox"/> NEWMAP-Edo SPMU and Contractors shall ensure that a percentage and certain category of jobs are reserved for the female gender in the resident communities; <input type="checkbox"/> NNEWMAP-Edo	Sighting and visual observation of the following: <input type="checkbox"/> Evidence of the number of female workers compared to male employed by Contractor	Monthly for three consecutive months after commencement of construction works	NEWMAP-Edo SPMU; Contractor; Local Government; Resident Community Leaders;	Environmental and Safety Officer NEWMAP	0

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
				<p>SPMU and Contractors shall arrange initial contact with local contractors to maximize opportunities for local procurement</p> <ul style="list-style-type: none"> <li>❑ NEWMAP-Edo SPMU and Contractors shall carry out extensive consultation with community leadership on the projects. The extent of consultation shall be determined by the complexity and the severity of the identified project impacts;</li> <li>❑ Establish working relationships between NEWMAP-Edo SPMU, contractors, private security, surrounding communities, and local law enforcement agency to quickly disburse unauthorized personnel from work locations, camp sites if any, and surrounding communities;</li> <li>❑ NEWMAP-Edo SPMU and Contractors shall guarantee access to private property and safety of residents and passer-by during the course of work by enacting the appropriate measures</li> </ul>	<ul style="list-style-type: none"> <li>❑ Record of contractual arrangements reached with the local contractors</li> <li>❑ Number of consultation held on the project and record of minutes collected with signatures of the community leaders and pictures taken with date</li> <li>❑ The record of the cooperative alliance established between NEWMAP-Edo SPMU, contractors, private security, surrounding communities, and local law enforcement agency regarding security and safety on the project environ</li> <li>❑ Samples of the HIV/AIDS awareness communication materials distributed and record of workers that have collected the document</li> <li>❑ Record of labour hiring and the location</li> </ul>				



S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
					of hiring away from the site				
8		Transportation of equipment, materials and worker to project site	Soil contamination from accidental release of fuels, oils, chemicals, hazardous materials etc., to ground in the construction laydown area during delivery of materials and equipment to project site	<p>NEWMAP shall</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Establish appropriate protocols for materials delivery and handling to ensure there are no spills;</li> <li><input type="checkbox"/> Ensure that the contractor HSE plan to addresses the prevention and containment of oil spills, chemicals and hazardous materials releases during all phases of the project;</li> <li><input type="checkbox"/> Ensure that storage and handling of hazardous materials are in accordance with approved hazardous materials management plan</li> <li><input type="checkbox"/> Maintain transportation vehicles, heavy civil engineering machinery and construction equipment in good working order so as to avoid exhaust emissions as well as oil and fuel leaks</li> <li><input type="checkbox"/> Any oil/chemical spill should be reported to FMEEnv and Edo State Environmental Protection Agency</li> </ul>	<p>Soil quality sampling, visual inspection, in-situ / lab measurements of soil physico-chemistry (pH, Nitrates, Heavy Metals, etc)</p> <p>Evidence of Contractor's compliance with HSE Plan, Protocol for material delivery and handling to prevent occurrence of any form of spillages;</p> <p>Records of incidence of leakages of oil and fuels</p> <p>Evidence of oil and fuel leakage or spillage like oil sheen on topsoil</p> <p>Sighting and Inspection of the storage facility for hazardous materials, fuel,</p> <p>Photographs of storage facility taken with dates</p>	Quarterly	Contractor	Environmental and Safety Officer NEWMAP; FMEEnv; SME; World Bank	
9	Construction	Construction of 2.5m by 1.5m gully bypass closed box diversion culverts	Conflict over loss of agricultural land and resettlement benefits for demolition of existing buildings obstructing the construction of the diversion culvert	<ul style="list-style-type: none"> <li><input type="checkbox"/> Consult regularly with the communities (i.e. before, during and after site clearance</li> </ul>	<p>Sighting of the following:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Number of consultation held</li> <li><input type="checkbox"/> Minutes of meetings held;</li> </ul>	Once every two months	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project Coordinator</li> </ul>	<ul style="list-style-type: none"> <li>• Edo State NEWMAP</li> <li>• FMEEnv</li> <li>• World Bank</li> </ul>	

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					Indicators	Frequency	Implementation	Monitoring	
					<input type="checkbox"/> Report of implementation of RAP with signatures showing community participation  Compliance with RAP provisions				
			Disruption of community activities and movement around the gully head	<input type="checkbox"/> NEWMAP-Edo SPMU and Contractors shall obtain all necessary authorizations and permits prior to the execution of the work through consultation with relevant authorities; <input type="checkbox"/> NEWMAP-Edo State Project Management Unit (SPMU) and Contractors shall develop and provide a work schedule that will avoid disturbing the traditional and religious life of communities; <input type="checkbox"/> NEWMAP-Edo SPMU and Contractors shall establish a communication program to inform communities of ongoing work and establish appropriate measures to minimize the disturbance caused by the work	Sighting and visual observation of the following: <input type="checkbox"/> Number of consultation held <input type="checkbox"/> Minutes of meetings held <input type="checkbox"/> Complaint Register <input type="checkbox"/> Compilation of authorization and permit given by recognized leaders of the resident community <input type="checkbox"/> Evidence of the work schedule of the project provided by the Contractor showing appropriate measures to minimize the disturbance of the livelihood, movement, and traditional / religious life of the community	Ongoing as deemed necessary during the construction works	<ul style="list-style-type: none"> <li>Contractor</li> <li>Site Manager;</li> <li>Site Engineer</li> <li>SPMU Project Coordinator</li> </ul>	<ul style="list-style-type: none"> <li>Edo State NEWMAP</li> <li>Edo State Ministry of Environment;</li> <li>FMEEnv</li> </ul>	
10	Construction	Construction of Baffle Chute to the bottom of the gully	Risk of chute failure by flow undermining gully head, overtopping or bypassing. The failure occurs when storm	NEWMAP –Edo SPMU shall ensure <input type="checkbox"/> Specialist is engaged to supervise the construction of the	Site inspection of the construction of the baffle chute to ensure compliance with design basis	Daily during the installation of the baffle chutes	Site Engineer; Site Manager; Contractor	Edo State SPMU Project Coordinator	

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					Indicators	Frequency	Implementation	Monitoring	
			runoff fails to enter the baffle chute properly especially when the runoff leaks and flow bypassing occur at the chute entrance	Chute to avoid the potential by undermining, overtopping or bypassing	and specifications				
			Occurrence of risks associated with large storm events that exceeds the design capacity of the Chute	NEWMAP –Edo SPMU shall ensure: <ul style="list-style-type: none"> <li><input type="checkbox"/> Capacity of the Chute to handle the conveyance of a large runoff event that exceeds storms of 1 in 50 years recurrence interval shall be assessed</li> </ul>	Conformity of the onsite installed baffle chutes with the design specification in the Detail Design Report D3-Ewu  Site inspection and onsite visual observation	Daily during the installation of the baffle chute	Site Engineer; Site Manager; Contractor	Edo State SPMU Project Coordinator	
			Loss of fertile top soil for infertile sub-surface soil that would not enhance vegetation establishment	NEWMAP –Edo SPMU shall ensure: <ul style="list-style-type: none"> <li><input type="checkbox"/> During the construction of Chutes, topsoil shall be removed and stockpiled before shaping the gully head. On completion of the filling the topsoil shall be spread to a depth of 150mm over the face and sides of the chute</li> </ul>	Site supervision and visual observation;  Number of stockpile of topsoil awaiting reuse as gully head filling material	Daily during construction of baffle chute	Site Engineer; Site Manager; Contractor	Edo State SPMU Project Coordinator	
			Risk of loss of life and damage of the proposed gully drainage infrastructure	NEWMAP –Edo SPMU shall ensure: <ul style="list-style-type: none"> <li><input type="checkbox"/> Chute shall be constructed on firm excavated soil rather than on the fill</li> <li><input type="checkbox"/> Ensure that storm water leaving the chute and outlet structure flows freely without causing undesirable ponding or scour</li> </ul>	Site inspection of the positioning of the baffle chute to ensure compliance with design specifications	Daily during and after construction as much as possible	Site Engineer; Site Manager; Contractor	Edo State SPMU Project Coordinator	
11	Construction	Construction of	Loss of agricultural	NEWMAP –Edo SPMU	Site inspection and	Daily during the	Site Engineer; Site	Edo State	

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					Indicators	Frequency	Implementation	Monitoring	
		Stilling Basin	lands and increase in the exposure of erodible soil	shall ensure that: <input type="checkbox"/> Staged earthworks approach shall be adopted by working in staged sections to ensure no more than a specified area of soil is disturbed or exposed at any point in time	inventory of the coverage area of the disturbed and exposed soil; Inventory of the size of agricultural land disturbed  Sighting of the complaint record relating to loss or disruption or destruction of agricultural land use	construction of the stilling basin	Manager; Contractor	SPMU Project Coordinator	
			Loss of valuable topsoil that the could be used for seeding vegetation	<input type="checkbox"/> Non-dispersive topsoil shall be stockpile to be used as final cover soil after the gully head has been filled to encourage vegetation growth and establishment	Routine site inspection of the location of stockpile of topsoil;  The number of stockpiled topsoil used for seeding plants	Daily during the construction of stilling basin	Site Engineer; Site Manager; Contractor	Edo State SPMU Project Coordinator	
			Workers exposure to risk of falls into excavated pit and occurrence of accident or injuries	<input type="checkbox"/> Gully remediation intervention shall be performed during the dry season when there is no flow of storm water from the catchment area above the gully head; <input type="checkbox"/> NEWMAP shall ensure that excavation and fill operations are conducted in compliance with all HSE measures in manners that do not endanger lives and properties.	Contractor's compliance with HSE Plan and Design Specifications;  Warning Signs;  Number of Accident incidents;	Daily during the construction of stilling basin	Site Engineer; Site Manager; Contractor	Edo State SPMU Project Coordinator	
			Risk of stilling basin failure and occurrence of flooding, overtopping	<input type="checkbox"/> NEWMAP shall ensure the stilling basin is designed to	Site inspection by a Construction Design Engineer of	Daily during the construction of the Stilling	Construction Design Engineer of <b>arecon</b> ; Site	Edo State SPMU Project Coordinator	

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
			resulting in stilling basing sweep out and downstream channel erosion	the correct capacity to handle the intended purpose in the management of a 1 in 50 years storm flows	aurecon during the construction of the stilling basin to ensure all the specifications in the Detail Design Report: D3 – Ewu are met	Basin	Manager; Contractor's Site Engineer		
12	Construction	Filling and reclamation of the gully head	Occurrence of accident and safety risk incidents	<p>NEWMAP shall:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Contractor's HSE Plan should be developed and implemented</li> <li><input type="checkbox"/> Undertake all earthmoving activities in steep sided gullies where undercut has occurred with great care, observance of safety measures and use of appropriate PPE</li> <li><input type="checkbox"/> Develop and ensure implementation of HSE plan</li> <li><input type="checkbox"/> Use earthmoving equipment with strict adherence to all recommended safety procedures</li> <li><input type="checkbox"/> All construction equipment, earthmovers and demolition equipment shall be located, guarded, shielded to prevent contact with the public</li> <li><input type="checkbox"/> Stockpile non-dispersive topsoil to be used as final cover soil after the gully head has been filled to encourage vegetation growth and establishment</li> </ul>	<p>Check the HSE Statistics in the HSE Report;</p> <p>Number of Accidents and Injuries;</p> <p>Evaluate the worker's use of PPE</p> <p>Carry out Routine Inspection on the project site</p>	Daily	HSE Manager of the Contractor; Site Manage and Engineer	ESO-NEWMAP SME; FMEEnv;	

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					Indicators	Frequency	Implementation	Monitoring	
13			Waste handling and disposal	NEWMAP shall: <ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure adequate sanitary facilities area provided during the construction and operation phases of the project;</li> <li><input type="checkbox"/> Ensure that good housekeeping is maintained on the project site and all areas used;</li> <li><input type="checkbox"/> Ensure that all areas of the project site used by the public is properly maintained and are free from debris, solid waste litter, equipment, materials;</li> <li><input type="checkbox"/> Ensure that solid waste management is addressed in Contractor's HSE Plan; and</li> <li><input type="checkbox"/> Ensure the Contractor develops and implements a Solid Waste Management Plan approved by NEWMAP and FMEEnv in compliance with appropriate World Bank Safeguard Policies</li> </ul>	Visual Observation of the general environmental sanitation of the site  Site inspection for the adequacy and placement of sanitary facilities and solid waste storage bins onsite  Sighting the Waste Tracking Logbook  Review the Project Waste Management Plan and Contractor's HSE Plan to assess the compliance of the contractor	Weekly	Contractor Manager; Site  Contractor Manager; HSE	NEWMAP ESO;  SME; FMEEnv  World Bank	
			Increase in turbidity and sediment load in downstream receiving water bodies	NEWMAP shall <ul style="list-style-type: none"> <li><input type="checkbox"/> Develop and implement a Storm Water Management Plan</li> <li><input type="checkbox"/> Ensure that storm water flows from upstream catchment of the gully head are safely diverted away from the gully head;</li> </ul>	In-situ measurement and lab analyses of water quality parameters: (pH, TDS, TSS, BOD5, COD, Turbidity, THC Heavy Metals)  Site investigation	Monthly	Independent Environmental Consultant; Contractor;	NEWMAP ESO; SME FMEEnv; World Bank	

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
				and <input type="checkbox"/> Ensure that the Ewu gully rehabilitation project is carried out during the dry season to prevent mobilization of sediment into downstream receiving water bodies	and visual observation  Check Contractor's compliance with Storm Water Management Plan				
14	Construction	Reshaping of the gully channel by cutting earth from gully side slopes to fill the gully channel floor	Contamination of downstream receiving water bodies by fertilizers, and pesticides as well as creation of excessive bare soils by herbicides if used for the establishment of the recommended plant species seeded to control soil erosion	NEWMAP shall <input type="checkbox"/> If necessary, authorize the use of selective herbicides with caution and precision to avoid excessive creation of large areas of bare soil and only use herbicide selected by a specialist to maintain the desired plant species	In-situ measurement and lab analyses of water quality parameters: (pH, TDS, TSS, BOD5, COD, Turbidity, THC Heavy Metals)  Site investigation and visual observation  Check Contractor's compliance with Storm Water Management Plan	Monthly	Independent Environmental Consultant; Contractor;	NEWMAP ESO; SME FMEnv; World Bank	
			Exacerbated gully erosion channel bed undermined and washing away of fill materials resulting in increased sediment load in receiving water bodies downstream	NEWMAP shall ensure that: <input type="checkbox"/> the shaping of the gully walls is carried out only in the dry season after the gully head has been established with a structure such as a Chute to prevent washing away of fill materials;	In-situ measurement and lab analyses of water quality parameters: (pH, TDS, TSS, BOD5, COD, Turbidity, THC Heavy Metals)  Site investigation and visual observation  Check Contractor's compliance with Storm Water Management Plan	Monthly	Independent Environmental Consultant; Contractor;	NEWMAP ESO; SME FMEnv; World Bank	

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					Indicators	Frequency	Implementation	Monitoring	
		Increase in the amount of disturbed areas created by earthmovers used in reshaping the gully side slopes	Risk of erosion of exposed gully side slopes and erosion of ground area above the gully channel divide	NEWMAP-Edo SPMU shall ensure that Contractors: <ul style="list-style-type: none"> <li><input type="checkbox"/> Stabilize cut and fill slopes with vegetative contour or anchored rock</li> <li><input type="checkbox"/> Develop nurseries for the recommended plant species to serve as sustainable plant source for gully erosion side slope stabilization throughout the life span of the infrastructure</li> </ul>	Site inspection and visual observation to find if side slopes are seeded with the recommended plant species;  The number of nurseries developed  The level of seeding of the side slope achieved	Daily during the slope stabilization with the seeding of the recommended plant species;	Site Engineer; Site Manager; Contractor	Edo State SPMU Project Coordinator	
			Loss of fertile top soil that could be used for seeding vegetation	NEWMAP-Edo SPMU shall ensure that Contractors <ul style="list-style-type: none"> <li><input type="checkbox"/> Stockpile non-dispersive topsoil with its leaf litter and organic matter, and use as final cover soil after the gully head has been filled to encourage vegetation growth and establishment</li> <li><input type="checkbox"/> Keep daily log of stockpile of topsoil scooped from the gully sides</li> </ul>	Sighting and visual observation of the number of stockpile of non-dispersive topsoil use for filling the gully head  Sight the daily logbook of stockpiled topsoil	Daily during the slope stabilization with the seeding of the recommended plant species;	Site Engineer; Site Manager; Contractor	Edo State SPMU Project Coordinator	
			Occurrence of bank erosion along reshaped gully channel slopes	NEWMAP-Edo SPMU shall: <ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure that Contractors carry out the placement and anchorage of the earth materials cut from the gully sides are done properly;</li> <li><input type="checkbox"/> Ensure that the soil materials used to fill the gully bed are well compacted in dry no flow conditions;</li> <li><input type="checkbox"/> Ensure that Contractors plant or seed the</li> </ul>	Sighting and visual observation of the gully channel side slopes and the channel bed for signs of poor compaction of soil materials;  Visual observation of the positioning of the plant species vegetative buffer use for soil erosion	Daily;	Site Engineer; Site Manager; Contractor	Edo State SPMU Project Coordinator	



S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
				recommended plant species in close growing positions immediately after placement of gully fill materials to serve as vegetative buffer strips to reduce the erosion of soil particles; <input type="checkbox"/> Ensure that Contractors perform the entire civil work of reshaping the gully sides/banks and the filling of the channel bed and gully head as one operation	prevention  Visual observation of the sequence of performance of gully side reshaping and the filling / compaction of the channel bed				
15	Construction	Placement of Gabion Drop Structures in gully channel to reduce longitudinal gradient to 0.05%	Disturbance of unnecessary large land areas for transportation of materials and heavy earthmovers	NEWMAP-Edo SPMU shall ensure that Contractors: <input type="checkbox"/> Disturb as little ground area as possible and stabilize disturbed areas immediately to ensure soil loss is prevented from such locations	Daily observation of ground area disturbed during transportation of gabion drop structures for placement	Daily	Site Engineer; Site Manager; Contractor	Edo State SPMU Project Coordinator	0
16	Construction	Erosion protection of gully banks by cutting and sloping the sides of the gully bank to a 1:2 gradient	Loss of fertile top soil which could be used for seeding vegetation	NEWMAP-Edo SPMU shall ensure that Contractors <input type="checkbox"/> Conserve topsoil with its leaf litter and organic materials in stockpiles and used this material as cover soil in the filled gully head and the stabilized bank slopes of the channel to promote the growth of local native vegetation	Sighting and visual observation of stockpiles of topsoil, how they are used in the project as final cover soil for seeding plant species recommended  Sighting of the picture gallery documented with date on the project	Daily and ongoing	Site Engineer; Site Manager; Contractor	Edo State SPMU Project Coordinator	0
			Risk of occurrence of accident or injury	NEWMAP-Edo SPMU shall : <input type="checkbox"/> Ensure that the Ewu gully erosion rehabilitation is carried out before the rainy season <input type="checkbox"/> Ensure that Contractors	Careful documentation of the date and season when the Ewu NEWMAP project started	Once at the commencement of the Ewu NEWMAP intervention	Site Engineer; Site Manager; Contractor	Edo State SPMU Project Coordinator	0

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
				plant the appropriate vegetation along the edge of the top of the slope to serve as a protective buffer for the slope faces. The greenbelt would serve provide a buffer between the slop face and resident structures in residential areas					
17	Construction	Reconstruction of damaged road	Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Use equipment with high combustion efficiency;</li> <li><input type="checkbox"/> Use dust suppressants on the project site</li> </ul>	<p>Ambient air quality monitoring for the following parameter:</p> <p>CO, NO<sub>x</sub>, SO<sub>x</sub> VOC and Particulate Matter, SPM, THC, VOC, CH<sub>4</sub></p>	<p>Monthly</p> <p>Daily</p>	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project Coordinator</li> </ul>	<p>Edo State Ministry of Environment</p>	
			Noise and vibration from vehicular movement	<p>NEWMAP-Edo SPMU shall ensure that Contractors</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Provide ear protective device to project workers at the site clearing stage;</li> <li><input type="checkbox"/> Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>	<p>Ambient noise and vibration level monitoring</p> <p>Daily Observation of large equipment onsite</p>	<p>Ongoing</p> <p>Ongoing</p>	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Independent Environmental Consultant</li> </ul>	<p>FMEv Edo State Ministry of Environment</p>	0
18	Construction	Reshaping the gully and installation of erosion protection	Water quality deterioration	<p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Gully reshaping and drainage infrastructure installations are done</li> </ul>	<p>Careful documentation of the date and season when the Ewu NEWMAP</p>	<p>Once at the commencement of the Ewu NEWMAP intervention</p>	<p>Site Engineer; Site Manager; Contractor</p>	<p>Edo State SPMU Project Coordinator</p>	0

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
		facilities to enable safe conveyance of storm water downstream of gully head		during dry season <input type="checkbox"/> Appropriate sediment control measures and devices are used by the contractors to prevent the mobilization of sediment in suspended solids into downstream water bodies	project started  Visual observation of the construction of the stilling basin, gabion drop structures and baffle chutes to ensure their placement is compliant with the design basis and specifications in the Detail Design Report: D3 - Ewu	Extensive daily site inspection and supervision by a qualified and experienced Construction Engineer during the construction and placement of the gully erosion control infrastructure			
			Risk of hearing impairment from increased noise and vibrations	NEWMAP-Edo SPMU shall ensure that: <input type="checkbox"/> Contractor provide ear protective device to project workers at the site clearing stage;  <input type="checkbox"/> Contractors install acoustic mufflers on large equipment where necessary to limit noise levels at fence line	Ambient noise and vibration level monitoring  Daily Observation of large equipment onsite	Ongoing  Ongoing	<ul style="list-style-type: none"> <li>Contractor</li> <li>Independent Environmental Consultant</li> </ul>	FMEv Edo State Ministry of Environment	
			Loss of wildlife	NEWMAP-Edo SPMU shall ensure that Contractors: <input type="checkbox"/> Establish a consistent route for construction equipment and materials to access the gully rehabilitation site and ensure adjoining areas are left undisturbed to provide opportunity for wildlife to migrate to unaffected areas;	Sighting and visual observation of the Right-of-Way selected for the construction of access road for transportation of materials to the gully channel.  Careful observation of the extent existing roads are used without disturbing farmlands existing vegetal cover	Daily observation throughout the gully erosion rehabilitation and placement of drainage and sediment control infrastructure in the gully channel and side slopes	Site Engineer; Site Manager; Contractor	Edo State SPMU Project Coordinator	

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
			Loss of valuable topsoil that could be used for seeding vegetation	NEWMAP-Edo SPMU shall ensure that Contractors: <ul style="list-style-type: none"> <li><input type="checkbox"/> Remove topsoil and store upstream within close proximity to the gully head in stockpiles out of reach of any form of channel flows ;</li> <li><input type="checkbox"/> Stockpile non-dispersive topsoil to be used as final cover soil after the gully head has been filled to encourage vegetation growth and establishment.</li> </ul>	Daily observation of the placement of stockpiles of topsoil and how they are finally used in the Ewu gully erosion site rehabilitation	Daily observation and documentation with photo gallery and video recording if necessary	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project Coordinator</li> </ul>	Edo State  Ministry of Environment	
19	Construction	Transportation of heavy equipment, construction materials and workers to the project site	Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles	NEWMAP-Edo SPMU shall ensure that Contractors: <ul style="list-style-type: none"> <li><input type="checkbox"/> Use equipment with high combustion efficiency;</li> <li><input type="checkbox"/> Use dust suppressants on the project site</li> </ul>	Ambient air quality monitoring for:	Monthly	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project Coordinator</li> </ul>	Edo State  Ministry of Environment	
			Noise and vibration from vehicular movement	NEWMAP-Edo SPMU shall ensure that Contractors: <ul style="list-style-type: none"> <li><input type="checkbox"/> Provide ear protective device to project workers at the site clearing stage;</li> <li><input type="checkbox"/> Install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>	Ambient noise and vibration level monitoring;  Comparison of ambient noise level to regulatory limit of 90dB(A)  Daily Observation of large equipment operating onsite  Examine the number of	Ongoing  Daily	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Independent Environmental Consultant</li> </ul>	FMEnv Edo SME ESO NEWMAP	

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
					complaints in the complaint register  Sight the records of equipment maintenance				
			Traffic congestion and increased risk of occurrence of traffic accidents and injuries	<ul style="list-style-type: none"> <li><input type="checkbox"/> NEWMAP-Edo SPMU and Contractors shall avoid impeding traffic and traffic disruption around the project site by:</li> <li><input type="checkbox"/> Adjusting work schedules so as not to disturb traffic;</li> <li><input type="checkbox"/> Establishing an adequate system of road signs and detour;</li> <li><input type="checkbox"/> Notifying communities of pending work scope, duration and location</li> <li><input type="checkbox"/> Avoid blocking public access roads;</li> <li><input type="checkbox"/> Using road signs to notify work in progress;</li> <li><input type="checkbox"/> Complying with road bearing capacity and repairing damage caused to roads during and at the end of the work;</li> <li><input type="checkbox"/> Circumventing access roads to gathering places in Ewu and neighbouring communities</li> </ul>	Daily observation of traffic volume and level of congestion	Ongoing	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• NEWMAP-Edo SPMU</li> <li>• SPMU Project Coordinator</li> </ul>	FME Env Edo State Ministry of Environment	
			Accidental release of fuels, oils, chemicals, hazardous materials etc., to ground in the construction laydown area during delivery of materials to project site	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Establish appropriate protocols for materials delivery and handling to ensure there are no spills;</li> <li><input type="checkbox"/> Develop HSE plan to address prevention</li> </ul>	Visual observation and site inspection for evidence of spillage of fuels, oils, chemicals, hazardous materials etc., to ground in the construction	Daily	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• NEWMAP-Edo SPMU</li> <li>• SPMU Project Coordinator</li> </ul>	FME Env Edo State Ministry of Environment	

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
				and containment of oil spills, chemicals and hazardous materials releases during all phases of the project; <input type="checkbox"/> Store and handle hazardous materials according to approved hazardous materials management plan <input type="checkbox"/> Ensure that all high risk areas that are potential sources of release of chemical contaminants such as: fuel and chemical storage areas; refueling areas; material stockpile areas; vehicle and equipment washing areas are located away from the gully erosion channel; <input type="checkbox"/> Situate fuel, oils and chemicals storage facilities on an impervious base within a bund capable to contain at least 110% of the volume stored, <input type="checkbox"/> Maintain transportation vehicles and machinery in good working order so as to avoid exhaust emissions as well as oil and fuel leaks <input type="checkbox"/> Report any oil/chemical spill should be reported to FMEv and Edo State Ministry of Environment	laydown area  Review the oil and chemical spillage incidence report  Site inspection of the storage facility used for fuel and other chemicals on the project site, whether bond containment wall is used or not  Inspect the Spill Prevention and Control Plan for assessment of compliance  Site inspection at the location demarcated for the storage and laydown of machinery and heavy vehicles				
20	Operation	Utilization of the rehabilitated gully site and installed storm	Risk of failure of the gully erosion installed drainage infrastructure to safely route storms of	NEWMAP-Edo SPMU shall: <input type="checkbox"/> Ensure that the design basis and specifications of the	Daily site inspection, supervision and monitoring by an	Daily during the operation and maintenance phase of the	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project</li> </ul>	Edo State Ministry of	

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
		water drainage infrastructure	1 in 50 years	proposed Edo State NEWMAP gully erosion rehabilitation project is accurately followed and achieved during the construction implementation	<p>experience construction engineer during the construction phase of the gully drainage and sediment control infrastructure installation to ensure that the design specifications are achieved</p> <p>Daily inspection of the drainage and sediment control infrastructure to ensure sound functionality and check for any form of scouring or undermining of any of the structures installed</p> <p>Inspection of the infrastructure within 24 hours of occurrence of any major storm or rainfall event to assess the integrity of the infrastructure and functionality</p> <p>Sighting and review of weekly reports on the status of the infrastructure especially during the wet season as well as during the dry season</p>	drainage and sediment control infrastructure	Coordinator	Environment	

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
			Risks from debris and sediment accumulation in the drainage channels in upstream catchment area of the gully head, Diversion Culvert, Baffle Chute, Gabion Drop Structures and Stilling Basin resulting in performance failure of the drainage infrastructure	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>□ Develop and implement on a regular basis, a systematic Ewu Esan Central Gully Erosion Channel and Drainage Infrastructure Management Plan to remove sediments, debris, solid waste materials and aquatic plants from the channel, prevent the incidence of undercutting and scouring of the drainage infrastructure</li> </ul>	<p>Daily inspection of the drainage and sediment control infrastructure to ensure sound functionality and check for any form of scouring or undermining of any of the structures installed</p> <p>Inspection of the infrastructure within 24 hours of occurrence of any major storm or rainfall event to assess the integrity and functionality of the infrastructure</p> <p>Visual observation to determine if there is any placement of debris or sediment accumulation in the gully erosion control infrastructure</p> <p>Sighting and review of weekly reports on the status of the infrastructure especially during the wet season as well as during the dry season</p>	Daily inspection during the operation and maintenance phase of the drainage and sediment control infrastructure	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project Coordinator</li> </ul>	<p>Edo State</p> <p>Ministry of Environment</p>	
			Risk of undermining and occurrence of scouring in the Baffle Chute could result in deteriorating performance of the structure	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>□ Scouring of the infrastructure and accumulation of sediment, litter and vegetation in drainage</li> </ul>	<p>Daily inspection of the drainage and sediment control infrastructure to ensure sound functionality and check for any form</p>	Daily inspection during the operation and maintenance phase of the drainage and sediment	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project Coordinator</li> </ul>	<p>Edo State</p> <p>Ministry of Environment</p>	



S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
				<p>infrastructure are some of the factors that can cause under-functioning of the infrastructure. To effectively and regularly monitor the operation and functionality of the gully erosion control devices by a dedicated Contractor Representative in collaboration with a Project Manager/Site Engineer from Edo State Project Monitoring Unit, a five-year maintenance contract should be added to the contractor's existing contract.</p>	<p>of scouring or undermining of any of the structures installed</p> <p>Inspection of the infrastructure within 24 hours of occurrence of any major storm or rainfall event to assess the integrity and functionality of the infrastructure</p> <p>Visual observation to determine if there is any placement of debris or sediment accumulation in the gully erosion control infrastructure</p> <p>Sighting and review of weekly reports on the status of the infrastructure especially during the wet season as well as during the dry season</p>	<p>control infrastructure</p>			
21	Operation	Maintenance of the gully drainage infrastructure	Risk of failure of the gully intervention from poor maintenance of the drainage infrastructure to achieve the desired project objectives such as (Creation of new gullies within the channel; breeding of vectors in the settling basin, undermining of the drainage infrastructure and scouring of the drainage	<p>NEWMAP-Edo SPMU shall ensure that Contractors:</p> <ul style="list-style-type: none"> <li>□ Develop and implement on a regular basis, a systematic Ewu Esan Central Gully Erosion Channel and Drainage Infrastructure Management Plan to remove sediments, debris, solid waste materials and aquatic plants from the</li> </ul>	<p>Daily inspection of the drainage and sediment control infrastructure to ensure sound functionality and check for any form of scouring or undermining of any of the structures installed</p> <p>Inspection of the infrastructure within</p>	<p>Daily inspection during the operation and maintenance phase of the drainage and sediment control infrastructure</p>	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project Coordinator</li> </ul>	<p>Edo State</p> <p>Ministry of Environment</p>	

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
			structure, etc.)	<p>channel, prevent the incidence of undercutting and scouring of the drainage infrastructure</p> <ul style="list-style-type: none"> <li>□ Conduct site inspection and monitoring as follows:                             <ul style="list-style-type: none"> <li>➤ Inspect erosion and sediment control devices installed at Ewu golly erosion intervention site within 24 hours of every rainfall or storm event;</li> <li>➤ The erosion, sediment and drainage control devices inspection should be by a person qualified and certified to perform this role. He could be a project manage, site supervisor, or engineer working in Edo State SPIM unit of NEWMAP.</li> <li>➤ The Ewu gully erosion control infrastructure inspection and monitoring to:                                     <ul style="list-style-type: none"> <li>✦ Ensure that the Ewu Esan Central Central Gully Erosion Channel and Drainage</li> </ul> </li> </ul> </li> </ul>	<p>24 hours of occurrence of any major storm or rainfall event to assess the integrity and functionality of the infrastructure</p> <p>Visual observation to determine if there is any placement of debris or sediment accumulation in the gully erosion control infrastructure</p> <p>Sighting and review of weekly reports on the status of the infrastructure especially during the wet season as well as during the dry season</p>				

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
				<p>Infrastructure Management Plan is appropriate for the gully erosion site and is being implemented efficiently;</p> <p>✚ Ensure the erosion - sediment control and drainage infrastructure are properly maintained.</p>					
			Disruption of the side slopes during routine maintenance of the gully channels	<p>NEWMAP-Edo SPMU shall:</p> <ul style="list-style-type: none"> <li>❑ Ensure special precautions are taken by Contractors when using backhoe to remove aquatic plants or sediment from the channel during maintenance;</li> <li>❑ Ensure that the earthmover with vented slotted or cross-drilled bucket that allow water to seep out is used for maintenance operations. Once a bucketful of sediment or aquatic vegetation is picked up, the bucket should be raised to allow most of the water to drain out over the gully channel</li> </ul>	<p>Visual observation to determine if there is any form of disruption or crack in the gully side slope</p> <p>Inspection of the state of establishment of the seeded plant species recommended for slope stabilization</p> <p>Sighting and review of weekly reports on the status of the infrastructure</p>	Daily inspection during the operation and maintenance phase of the drainage and sediment control infrastructure	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project Coordinator</li> </ul>	Edo State Ministry of Environment	



S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
23	Decommissioning	Waste handling and disposal	Solid Waste generation, handling and disposal problem	<p>fence line</p> <p>NEWMAP-Edo SPMU shall ensure that:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Solid waste management should be addressed in Contractor HSE Plan;</li> <li><input type="checkbox"/> Implement the Waste Management Plan;</li> <li><input type="checkbox"/> Promote waste reuse and recycling;</li> <li><input type="checkbox"/> Private Waste Collection Participant Accredited by the appropriate Solid Waste Management Authority in Edo State.</li> </ul>	<p>Visual Observation of the general environmental sanitation of the site</p> <p>Sighting the Waste Tracking Logbook</p> <p>Review the Project Waste Management Plan and assess the compliance of the contractor</p>	Weekly	Contractor Site Manager;	<p>NEWMAP ESO;</p> <p>SME; FMEEnv</p> <p>World Bank</p>	
			Poor housekeeping and environmental sanitation	<p>NEWMAP-Edo SPMU shall:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure the Contractor develops and implements a Solid Waste Management Plan approved by NEWMAP and FMEEnv in compliance with appropriate World Bank Safeguard Policies.</li> </ul>	<p>Visual Observation of the general environmental sanitation of the site</p> <p>Sighting the Waste Tracking Logbook</p> <p>Review the Project Waste Management Plan and assess the compliance of the contractor</p>	Weekly	Contractor Site Manager;	<p>NEWMAP ESO;</p> <p>SME; FMEEnv</p> <p>World Bank</p>	
24	Decommissioning	Transportation of solid waste, equipment and workers out of the project site.	Traffic congestion and increased risk of occurrence of traffic accidents and injuries	<p>NEWMAP-Edo SPMU and Contractors shall avoid impeding traffic and traffic disruption around the project site by:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Adjusting work schedules so as not to disturb traffic;</li> </ul>	Daily observation of traffic volume and level of congestion	Ongoing	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• NEWMAP-Edo SPMU</li> <li>• SPMU Project Coordinator</li> </ul>	<p>FMEEnv</p> <p>Edo State Ministry of Environment</p>	

S/No	PROJECT PHASE	PROJECT ACTIVITY	PROJECT IMPACT	MITIGATION MEASURES	MONITORING		RESPONSIBILITY		COST
					Indicators	Frequency	Implementation	Monitoring	
				<ul style="list-style-type: none"> <li><input type="checkbox"/> Establishing an adequate system of road signs and detour;</li> <li><input type="checkbox"/> Notifying communities of pending work scope, duration and location</li> <li><input type="checkbox"/> Avoid blocking public access roads;</li> <li><input type="checkbox"/> Circumventing access roads to gathering places in Ewu and neighbouring communities</li> </ul>					
			Ambient air quality deterioration from airborne dust particulates, fugitive emissions, exhaust of equipment/automobiles	NEWMAP-Edo SPMU shall: <ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure that Contractors use equipment with high combustion efficiency;</li> <li><input type="checkbox"/> Ensure Contractors use dust suppressants on the project site.</li> </ul>	Ambient air quality monitoring for:  CO, NO <sub>x</sub> , SO <sub>x</sub> VOC and Particulate Matter, SPM, THC, VOC, CH <sub>4</sub>	Monthly          Daily	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Site Manager;</li> <li>• Site Engineer</li> <li>• SPMU Project Coordinator</li> </ul>	Edo State  Ministry of Environment	
			Noise and vibration from vehicular movement	NEWMAP-Edo SPMU shall ensure that Contractors <ul style="list-style-type: none"> <li><input type="checkbox"/> Contractors provide ear protective device to project workers at the site clearing stage;</li> <li><input type="checkbox"/> Contractors install acoustic mufflers on large equipment where necessary to limit noise levels at fence line</li> </ul>	Ambient noise and vibration level monitoring  Daily Observation of large equipment onsite	Ongoing      Ongoing	<ul style="list-style-type: none"> <li>• Contractor</li> <li>• Independent Environmental Consultant</li> </ul>	FMEnv Edo State Ministry of Environment	
							<b>Cost for Items 5-24</b>	<b>N28,000,000.00</b>	

**NOTES ON COSTING ABOVE:**

1. Items 1 and 2 on the table above can be covered with a single monitoring visit. Thus, the assumption is that 2 representatives each from the SPMU, the State Ministry of Environment as well as 2 community representatives (2 from each communities i.e. Eguare and Enhanle communities) will be involved in the monitoring visit. The costs provided here include: per diem for project personnel from SPMU and the State Ministry of Environment, logistics costs (transportation, etc.). Transportation is put at N300, 000.00, per diem for the 4 personnel (2 each from the SPMU and the State Ministry of Environment) is put at N75, 000 /person for 2 days, equalling N600, 000.00. In addition, provision is made for allowances for community representative's @N25, 000/person (N100, 000.00). Entertainment of guests at consultation meetings and gifts for community heads is put at N300, 000.00 (N150, 000/community). This gives a total of N1, 300,000.00. At an exchange rate of US\$1: N350, this comes to US\$3,714.00
2. Impact mitigation and compliance monitoring are covered in items 5-24 in the table above. Generally, two sets of costs are covered here: The cost of impact mitigation monitoring, and compliance monitoring. Impact mitigation monitoring will be carried out by, a third party (independent) consultant, to be appointed by the SPMU. Monitoring will be carried out during pre-construction, construction and first 3 years of operations. There will be two monitoring visits during the pre-construction and construction phases, while there will be two monitoring visits per annum for the first 3 years of operation. Altogether, there will be eight monitoring visits. For each monitoring visit, a team of the consultants will work in conjunction with representation from the SPMU, State Ministry of Environment and the project contractors. The cost of each monitoring will consist of N2, 500,000.00 for consultant's costs, and N1, 000,000.00 for regulatory (SPMU and State Ministry of Environment costs). Thus, the total costs for items 5-24 as highlighted above, comes to N28, 000,000.00 (Twenty-eight million naira only). Converted to US\$ at an exchange rate of US\$1: N350, this comes to US\$80,000.00.
3. The participation of SPMU and the State Ministry of Environment is what comprises to monitoring and evaluation aspect of this project

## 6.6.2 Environmental Monitoring and Evaluation

### 6.6.2.1 *Environmental Monitoring and Evaluation*

The Monitoring and Evaluation proposed for implementation in the ESMP for the Ewu NEWMAP gully erosion intervention is designed to monitor specific indicators of the biophysical and social environments for the achievement of the following objectives:

- ❑ Proactively initiate strategies to identify any sign of environmental stress, deterioration or degradation within the Ewu watershed arising from the gully erosion site rehabilitation civil engineering works by scientific investigation of specific environmental monitoring parameters and comparing them to established background values stipulated by regulatory agencies;
- ❑ Provide assurance that the environmental impact mitigation measures recommended for implementation during the project phases are adequate for effective amelioration of the project impacts and indicate whether the respective impact monitoring parameters investigated are within the stipulated environmental limits of regulatory agencies;
- ❑ Provide early warning of environmental damage so that actions may be taken during the implementation of the NEWMAP intervention to reduce such harmful impacts;
- ❑ Ensure that regulatory standards for pollutants are not exceeded;
- ❑ Assure adequate stakeholder engagement and consultation in the implementation of the NEWMAP gully erosion rehabilitation project; and
- ❑ Verify the compliance of the project Contractors and NEWMAP Edo SPMU with regulatory requirements and the Environmental Management and Monitoring Plan proposed in this ESMP.

Consequently, the overall monitoring proposed for the Ewu NEWMAP intervention sets out to determine the effectiveness of the environmental and social impact mitigation measures in minimizing, ameliorating or preventing the occurrence of the project impacts. This will enable NEWMAP to establish that the mitigation measures adequately and benignly reduced the project impacts. To this end, the environmental and social



indicators that shall be mainstreamed into the overall monitoring and evaluation process for the Ewu NEWMAP intervention are as shown in **Table 6.5**, on the Environmental, Social and Health Impact Indicators.

Table 6.5: Environmental, Social and Health Components and Impact Indicators

Components	Impact Indicators
<b>Biophysical</b>	
Geology	Changes to geology, geomorphology, topography
Soil	Changes to physical and chemical properties and soil ecology
Surface Water	Changes to water quality indices, (physicochemical properties, hydrocarbons, metals);
Vegetation	Changes in vegetal cover due to excessive land disturbance during movement and operation of heavy equipment and vehicles; Changes to vegetation population, health, species abundance and diversity and impact on endangered and economic species, etc
Wildlife	Changes to wildlife assemblages, impact on endangered and economic species
Air	Emissions of NO <sub>x</sub> , SO <sub>x</sub> , PM, CO, VOC, greenhouse gases (CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O), ozone and changes to ground level concentrations of pollutants
Vibration and Noise	Change in ambient noise or vibration levels at sensitive receptors
Aesthetics	Physical presence of drainage and erosion control infrastructures,
<b>Social</b>	
Population	Changes in population indices, total population, gender ratio, age distribution
Infrastructure	Improvement or pressure on existing urban/rural infrastructure including waste handling facilities
Macro and Micro economy	Change in macro and micro economy, employment, standard of living, occupation
Social and Cultural Structure	Disruption in local authority and governance structure; change in social behaviours; intra and inter-ethnic clashes;
Physical and Economic Displacement	Permanent physical displacement from residence as a result of project land take, or activities; permanent or temporary displacement from land or water based livelihood activities; partial or whole severance from social and cultural networks
Cultural and Archaeological resources	Physical disturbance of shrines, burial grounds, archaeological resources or other desecration
Transportation	Alteration in means of transportation or ability to move efficiently
<b>Health Determinants</b>	
Pollution Related Health Effects	Increase in concentration of, and exposure to air pollutants of concern (NO <sub>x</sub> , SO <sub>x</sub> , VOC, CO, PM), contamination of surface waters and potable ground water, increased vibration and noise beyond regulatory limits, increased night time light beyond acceptable limits.
Communicable and Non Communicable Diseases	Change in incidence of communicable and non-communicable diseases or disease causing factors
Morbidity and Mortality	Changes in health of workers and of general public, change in security of the area
Health Care/Recreational Facilities	Changes in availability of and access to health care and recreational facilities
Psychosocial factors	Drug use/abuse, communal violence, crime, suicide, depression and prostitution; changing expectations of quality of life
Fertility	Changes to fertility levels, changes in birth rates
Accidents/Fires/Explosions	Changes to rate of occurrence and severity of accidents/fires/explosions

Upon completion of the field data collection, sampling and monitoring of selected parameters guided by appropriate Instrumentation, Standard Operating Procedures and Quality Control and Quality Assurance, laboratory analysis of field samples shall be performed. The evaluation of the resulting scientific data shall be based on the comparison of monitoring data with baseline data and recommended regulatory background standards to determine if the Ewu NEWMAP intervention has resulted in any form of environmental damage, stress, deterioration or degradation within the Ewu watershed or exacerbation of the background values of specific monitoring parameters considered.

#### 6.6.2.2 *Environmental Monitoring Plan*

The proposed environmental monitoring plan shall provide the platform for measuring the effectiveness of the proposed impact mitigation measures and the means for evaluating environmental performance of the NEWMAP Gully Erosion Remediation intervention in Ewu Esan Central, Edo State. The monitoring plan intends to document, track and report temporal changes in specific environmental monitoring parameters that could be associated with the proposed construction and installation of the drainage and erosion control infrastructure in the Ewu gully erosion site. In principle, positive or negative changes are expected in the environmental monitoring parameters over time, both in magnitude and direction, which would result in either positive or negative consequences. Hence the monitoring plan proposed herein seeks to identify the variations in the monitoring parameters engendered by the construction project activities and also the nature of the consequences of such changes whether beneficial or detrimental.

Visual inspections, field note writing, photograph records, environmental sampling, and in-situ measurements of environmental monitoring parameters for soil, water and air quality samples etc., are all the methods that will be employed during the monitoring and inspection activities. Thus the empirical sampling during environmental impact monitoring and qualitative analysis shall be distinct from the non-empirical monitoring

and visual inspection activities (qualitative monitoring) for mitigation measure compliance.

The outcome will clearly show the effectiveness of the impact mitigation measure implemented and lead to the evolution of more efficient control measures that will guarantee the environmental sustainability of the project throughout its lifecycle.

#### *6.6.2.3 Implementation Approach for the Environmental Monitoring*

**The two types of environmental monitoring will be undertaken in the process of implementation of this ESMP consists of:**

##### **1) Impact Mitigation Compliance Monitoring;**

The mitigation measure-monitoring component of the ESMP shall focus mainly on monitoring the compliance of the Principal Contractor and NEWMAP Edo SPMU with the impact mitigation measures recommended for implementation during the site preparation and construction phase project. The inspection activities to be performed is the non-empirical monitoring or qualitative monitoring involving visual inspection and documentation through photography and regular self-reported inspection and monitoring activities conducted by the Contractor and an Independent Environmental Consultant under the supervision of NEWMAP Edo State SPMU, FMEnv and Edo SME on daily basis to ensure compliance with the recommended mitigation measures. The Contractor's Site Manager must make the results of these inspections and monitoring activities available to NEWMAP Edo SPMU's Project Coordinator on a weekly basis.

##### **2) Environmental Impact Monitoring**

The Environmental Impact Monitoring process shall involve on-site investigation of the project area, adoption of scientific methodologies for key indicators of environmental and social impacts of the site preparation and construction project activities and laboratory analyses. In all cases, standard methods approved by the regulatory bodies (Federal Ministry of Environment, NESREA and World Bank) shall be followed. Adequate quality control and quality assurance measures shall be taken at every stage

of the ESMP implementation. Data obtained shall be subjected to relevant statistical analyses to show general trends and the extent of spatial variations in the parameters

The environmental impact monitoring component shall adopt scientific methodologies and standard operation procedures to monitor and capture, among other things, the occurrence of predicted and fresh unpredicted environmental impacts as well as effectiveness of the impact mitigation measures adopted. The field sampling and collection of environmental data shall cover the following areas:

- Environmental Characterisation
  - Air Quality Studies
  - Noise and Vibration Studies
  - Water (Surface water and Groundwater) Quality Studies
  - Vegetation and Wildlife Studies (Ecology)
  - Soil Studies
  - Sewage and Wastewater Management
  - Solid Waste Management
  - Landscape and Visual Effect/Aesthetics
- Socio-economics Survey
  - This survey will cover Ewu Esan Central community in the project area. The survey will focus on issues and concerns of the Ewu community and address other socio-economic issues that could result in Community strife and conflict with NEWMAP Edo SPMU and the site preparation and construction project activities.
  - Occupational Safety and Public Health Studies

The environmental monitoring plan proposed for the Ewu Esan Central NEWMAP gully erosion site rehabilitation ESMP is as stated in **Table 6.6** below.

**Table 6.6: Environmental components, monitoring parameters and frequency of monitoring for the project**

S/N	Environmental Component	Empirical Parameters /Non-Empirical Observations	Target Regulatory (FMEnv) Standards/Limits	Monitoring Frequency and Responsible Parties
1	<b>Air Quality</b> <u>Air Quality:</u> <input type="checkbox"/> Ambient Air Quality within Ewu Community upstream of the Gully Head <input type="checkbox"/> Ambient Air Quality within Ewu Gully Channel downstream of the Gully Head at 3 locations: (Close to the gully head; midway of the whole gully channel and farthest reach of the channel close to the receiving water body)	Combustion efficiency CO2	NS	Once in the first month and then once midway, and once at the end.  Two air quality sampling per day for 4 stations for 2 field visits at 2 days per visit (32 Samples)
		CO	Daily average of daily values 1 hour:10 ppm	
		TSP	Daily average of daily values 1 hour:250µ/m3	
		NOX	Daily average of hourly values: 0.04 - 0.05 ppm (75 -113 µ/m3)	
		SO2	Daily average of hourly values: 0.1 ppm (260 µ/m3)	
		THC	5 µ/m3	
		CH4	5 µ/m3	
		VOC	160 µ/m3	
		Noise	8 Hours Exposure limit: 90.0dB	Noise monitoring 2 times in four (4) locations per day in 2 field visits
2	<b>Water Quality:</b>  Water quality samples should be collected from the receiving water body downstream of the gully head and groundwater wells close to the project site	Temperature pH,	< 8.5	Once at the beginning of construction works and once at the end
		Salinity	NS	
		TDS	500 mg/l	
		TSS	500 mg/l	
		Turbidity	5 mg/l	
		Conductivity	NS	
		Calcium	10/10mg	
		Magnesium	5 mg/l	
		Iron	0.2 mg/l	
		Manganese	0.2 mg/l	
		Copper	NS	
		Aluminium	0.5 mg/l	
		DO	NS	
		BOD	NS	
		TOC	NS	
		THC	NS	
		TPH	NS	
		NO <sub>3</sub> ,	10 mg/l	
		PO <sub>4</sub>	NS	
Chloride,	250 mg/l			
Sulphate	250 mg/l			

S/N	Environmental Component	Empirical Parameters /Non-Empirical Observations	Target Regulatory (FMEnv) Standards/Limits	Monitoring Frequency and Responsible Parties
		Bicarbonate	NS	
		Organic Matter	NS	
3	Soil	Grain size/Textures, Soil Physico-Chemistry; TOC; Heavy Metals Microbiology:	NS	Three times at the beginning, midway and the end of construction works
4	Vegetation	Monitoring will cover vegetation health status, and re-instatement criteria; survey and verify the presence of any endangered or protected plant species and disturbed areas within the project site before site clearance and preparation	Not Required	Once before site clearing and preparation
5	Socio-economics	Employment status during construction works, public complaint and community relations	Not Required	Three times at the beginning, midway and the end of construction works
6	Waste Management	Waste handling and disposal Practices	Not Required	Weekly
7	Sewage and Wastewater Management	Sewage disposal and wastewater treatment /management practices	Not Required	Once in the first month and then once midway, and once at the end.
8	Landscape , Visual Effect/Aesthetics	Monitoring will cover changes in topography, soil erosion, trenching activities and general compliance with applicable mitigation measures	Not Required	Once in the first month and then once midway, and once at the end.
	<b>Transportation</b>	Alteration in means of transportation or ability to move efficiently	Not Required	Once in the first month and then once midway, and once at the end.
	<b>General Compliance Monitoring to check compliance with mitigation measures</b>	Monitor on weekly basis for three day per week	Not Required	Monitor general compliance of contractor with all required mitigation measures including Waste Handling.

Note: NS = Not Specified

## 6.7 ESMP Budget and Schedule of Work

### 6.7.1 ESMP Budget

The implementation of the mitigation compliance monitoring and the environmental /social impact monitoring recommended in this ESMP will inevitably require adequate funding. The cost implication for the implementation of the ESMP has been estimated and it's presented in this section. As indicated above, there are two key components of the ESMP that require funding. These are: Capacity Building costs, and Impact Mitigation and Compliance Monitoring Costs. The total cost for the implementation and monitoring, as well as the Capacity Building Activities add up to US\$ 132,857. The details of the cost estimation is as shown in **Table 6.7**

**Table 6.7: Summarized Cost estimates for the implementation of the Ewu NEWMAP ESMP**

S/No	ESMP Implementation Activity	Supervisory/Participating Stakeholder	Implementation Stakeholder	Estimated Budget	
				US Dollars	Naira
1	Capacity Building Costs	<input type="checkbox"/> Edo State NEWMAP Staff; <input type="checkbox"/> The Principal Contractor; <input type="checkbox"/> Site Personnel of the Principal Contractor; <input type="checkbox"/> Host Community Representatives	Independent Consultant	52,857.00	18,500,000.00
2	Impact Mitigation and Compliance Monitoring	Edo SPMU NEWMAP; SME; FMEnv; NESREA; FRSC; Edo State Waste Management Authority; Nigerian Police; World Bank	Independent Environmental Consultant appointed by Edo SPMU - NEWMAP	80,000.00	28,000,000.00
<b>Total</b>				<b>132,857</b>	<b>46,500,000.00</b>

### 6.7.2 Schedule of Work for ESMP Implementation

The tasks to be performed in the ESMP is integrated in the overall construction work schedule as shown in **Table 6.8**

**Table 6.8: ESMP Implementation Schedule of Work**

S/No	Activity	Responsible Stakeholder for Monitoring and Evaluation	Pre-Construction				Construction				Operation				
			1	2	3	4	5	6	7	8	9	10	11	12	
<b>ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN</b>			<b>(Months)</b>												
	Contract Award and Formal Disclosure of ESMP	NEWMAP													
	Inclusion of Environmental and Social Management Requirements in the Bid Documents	NEWMAP													
	Inclusion of ESMP in Contract Documents	NEWMAP													
	Review and Approval of Contractor's ESMP	FMEEnv and SME													
	Implementation of the RAP	NEWMAP													
	ESMP Capacity Building and Training Program	Contractor; NEWMAP; SME; FMEEnv													
	Implementation ESMP: Mitigation Measures Compliance Monitoring	Contractor; Independent Environmental Consultant													
	Environmental Auditing: Environmental and Social Impact Monitoring Aspect of ESMP Implementation	Contractor; Independent Environmental Consultant													
	Supervision of ESMP Implementation	NEWMAP													
	ESMP Implementation Report Compilation	Contractor; Independent Environmental Consultant; NEWMAP; SME; FMEEnv													
<b>CONSTRUCTION</b>															
	Competitive Bidding for Contract	Contractor													
	Contract Award and Signing	NEWMAP													
	Preparation and Submission of Construction Schedule	Contractor													
	Contractor Mobilizes to Site*	Contractor													
	Finalizing Size Layout Plan Construction	Contractor													
	Site Clearing	Contractor													
	Installation of Equipment and Drainage/Erosion Control Infrastructures	Contractor													
	Excavation, Borrowing, Filling, Backfilling and Compaction	Contractor													
	Civil Engineering Works	Contractor													
	Transportation of Construction Materials	Contractor													
	Operation of Gully Site Drainage and Erosion Control Infrastructure Installations	Contractor													
	Gully Erosion Site Stabilization with Vegetation Seeding	Contractor													
	Maintenance of Erosion Control Structures	Contractor													

**\*Construction works cannot begin until the RAP is implemented**



## **6.8 Contractual Award Measures**

The implementation of the recommended impact mitigation measures is a mandatory obligation of the Principal Contractor. For this reason, it is pertinent that the mitigation measures as described in this ESMP should be incorporated in the tender document with appropriate flexibility given to the Contractor to modify these mitigation measures to suite site characteristics. Consequently, the Contractor shall be legally committed to comply with all the requirements of the mitigation measures as indicated in this ESMP. To enhance the compliance of the Contractor, the mitigation measures should be translated into a suite of environmental and social specifications that are included in the contract award document. This will ensure that the obligations and commitment to implement the recommended mitigation measures are clearly communicated to the Contractor.

It should be explicitly stated in the tender documents that non-inclusion of the mitigation measures in the Contractor's proposal would lead to a disqualification of the proponent. Furthermore, the Contractor should demonstrate his understanding of the need for the implementation of an ESMP in the proposed NEWMAP gully erosion rehabilitation intervention project. Hence, the contract to be drawn with the successful bidder should contain the environmental management measures as the regulatory requirements to be complied with.

## CHAPTER SEVEN

### SUMMARY AND CONCLUSION

This Environmental and Social Management Plan (ESMP) has provided an effective approach for the implementation of the proposed intervention projects for the Ewu gully erosion site in Esan Central Local Government Area in Edo State. The ESMP also provided the action plans for the environmental and safeguards consideration. In addition to the various biophysical and anticipated project impact evaluations,

Generally, for problems such as erosion and flooding, proactive measures are substantially preferable to reactive measures, therefore basic preventive measures and watershed management activities are required. As indicated earlier, soil in Ewu area are easily eroded, therefore preventive management is required. Basically, the following are necessary:

- Storm water flows need to be managed so that they do not cause unwanted erosion problems, like the gully that has formed. Bad landuse practices in the catchment can lead to the erosion of soil from fields, which will then cause sedimentation of the channels downstream. This sedimentation leads to flooding in the areas downstream due to the reduced capacity of the downstream channels. Thus, settlement basins, which reduces sediment load in runoff need to be provided around the area, thus reducing the chances of gullies developing
- Erosion can be reduced by routing storm water around fields, contour ploughing, planting crops and minimizing the clearing of natural forest and bush that hold the soils and reduce peak flows effectively.
- Proper watershed management will include managing the peak flows in the catchment through maintaining natural watercourses and wetland areas that currently attenuate flows naturally. Thus the planning of future development needs to include the protection of these natural features.

- Where required, peak flows can be further reduced through the construction of detention ponds. These ponds are constructed to compensate for the unnatural increase in hardened areas, such as roofs and roads. Corridors and areas should be reserved for future and existing watercourses and detention facilities to prevent future flooding problems on properties that are currently undeveloped, but may be developed in the future.
- It is very useful and practical to use vegetation to improve the soil's resilience to erosion. The grass species to be planted are *Vetiveria zizanioides* and *Pueraria sp.* as approved by NEWMAP. The tree species is *Acacia sp.* This species, which has a wide distribution, can be a tree or a shrub. It is also used as a pioneer species in land rehabilitation, as it is very resilient and able to tolerate extreme temperatures and rainfall.

In addition to the foregoing, the following environmental and safety considerations are recommended in the course of Implementation of the Proposed Intervention Project in Eguare-Ewu Communities:

1. To arrest further damage to life and properties within the area of influence of the proposed intervention project in Ewu Community, there would be need to relocate the inhabitants of the houses bordering the gully head. The alternative to their relocation to safe distance is to carry out "Resettlement Action Plan – RAP" for the people and their livelihood. Following well-coordinated RAP program, the project affected people would need to be adequately compensated. This is envisaged to create conducive project implementation environment, ensure the safety of the project workmen and at the same time engendering the cooperation of the project affected people and indeed that of the entire Ewu community residents.
2. Within the mid-reach and lower end of the gully on both sides are crops/plants of economic, medicinal and cultural values. Proper enumeration and appropriate costing of these plants are desirable to

ensure the payment of commensurate compensation prior to the commencement of the intervention project. These crops form part of the livelihood of the project affected people and therefore, the loss of the peoples' livelihood to the project implementation would need to be carefully compensated for to enhance conducive project implementation environment, guarantee the safety of the project workmen and gain the support of the project affected people and indeed that of the entire Ewu community residents.

3. Engagement of Locals (skilled and unskilled), especially the youths cutting across the gender divides, as workmen for the intervention project is a panacea for peaceful, hitch free and successful intervention project implementation in the community. This is envisaged to encourage residents' support for the project and a means of economic empowerment/improvement to the community especially during the construction phase of the intervention project.
4. As much as it is possible and provided the desired goods and or services meet up the required standards meant for the intervention project's implementation, sourcing and procurement of some of the materials and services required at the intervention project's site during the intervention project's construction should be sourced and procured locally to further improve and or bring about economic empowerment of the locals. This will further ensure greater support for the project by the residents. Thus the safety of life and properties of the project's facilities would further be enhanced.
5. During the construction phase of the intervention project, significant increase is envisaged in traffic density into and out of Ewu community especially along the route leading into and out of the gully site. Adequate traffic planning and management arrangement should be put in place to reduce the possibility of road traffic accidents. The use of appropriate traffic warning signs, caution signs and related speed regulatory measures are required. The project drivers need to be

carefully trained on defensive, safe and cautious driving to avoid accidents.

6. There is need to hire and retain at the intervention project site, particularly during the project construction phase, a competent and certified Health, Safety and Environmental (HSE) manager, who will ensure the safety of workmen, project's sub-contractors and visitors to the project's site at all time. He is expected to maintain the log of project's workers on daily basis, keep records of injury, near-misses, man-hour utilized for the project, maintain First Aid Box at the project site that are well stocked of necessary medicals and also be in constant touch with the Retainer Clinic secured for emergency cases that may arise from time to time especially during the project construction phase.
7. Daily safety pet-talk (also called tool box discussion) should also be regularly held prior to the commencement of daily project activities with all the project workers on the need to ensure their safety, those of the project affected people and the project's contractors/sub-contractors and visitors alike. It is the duty of the site HSE Manager to arrange and present the daily safety briefing prior to the commencement of daily project activities.
8. The project construction site should be very carefully condoned off with conspicuous caution tape to warn non-project workers. This is necessary to reduce work site accidents, falls and related hazards.
9. The project campsite needs to be adequately secured with gate properly manned to ensure that non-authorized individuals are not allowed into the camp site.
10. Project construction works should be restricted to daylight so as not to disturb the residents through significant increase in the ambient noise and vibration levels that may emanate from the project construction activities. This is more so that the project site is located within built up area of the community.

11. A Manual detailing what should be done and what should not be done within the project camp site and at the project construction site should be prepared and made readily available to all the project workers, the sub-contractors and the visitors to the project site.

12. A clearly identified Mustering Station or Point should be created especially during the construction phase of the project. The appropriate use of the mustering point should be made known to all the project workers.

While Edo State and the SPMU have existing capability for environmental management, it is obvious that there is a need for capacity building, especially in terms of project monitoring and evaluation, as well as preventive/proactive environmental management. Thus, in addition to the recommended training in the ESMP section of this report, there is a need to make provision for additional capacity building for personnel of State Ministry of Environment and the SPMU environmental management unit. This will enhance their capability to manage the current project, as well as others that may emanate. In addition, the ability to undertake preventive environmental management can be enhanced through these.

If the ESMP and the general conclusion above are carefully implemented, it is envisaged that the pre-construction, construction, and commissioning phases of the planned intervention project will be devoid of accidents, while the possible project impacts will be greatly reduced. The successful implementation of the intervention project could then be envisaged.

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## **ANNEXES**

## **ANNEX 1**

### **LIST OF ATTENDANCE AT THE STAKEHOLDERS ENGAGEMENT HELD AT EGUARE EWU COMMUNITY**

STAKEHOLDER ENGAGEMENT FOR THE EDO-NEWMAP FLOOD AND GULLY EROSION PROJECT

ATTENDANCE LIST

NAME OF COMMUNITY..... EGUARE / EHANLEA - EKWU

LOCAL GOVERNMENT AREA..... E SAN CENTRAL

DATE..... 11 - 02 - 2017

S/NO	NAMES	POSITION IN THE COMMUNITY	TELEPHONE NUMBER
1			
2	Anthony I. Ikhiukhujere	Elder	08153335950
3	Yesufu Alchira	Elder	07066904402
4	Joseph Aburama	n	-
5	Niniyani Oghiens	Chief Imam	-
6	Alh. Zafary Oriabure	Elder	09033585083
7	Kashiata Osoba	n	0817036183
8	Chief R. Dangi	The Oyakure of Ewu	08038172479
9	Chief Ohue Inegbe	The Obase of Ewu	08037015603
10	Bernard Bello	Elder	-
11	J. E. Omizegbe	n	-
12	Alh. Khimèn Ebibhalo	Elder	-
13	Robinson Nmsa	n	08109441623
14	Nomochu Sale	n	08137289856
15	Agimelen Lawrence	n	08169926558
16	G. Omo Ajede	n	07034531298
17	Aguawebu Omasun	Youth	08074852337
18	Momodun Robinson	n	08147300054
20	Kasheta Osoba	n	-
21	Sufnyan Qiofah	n	-
22	Mutan Okoh	n	08069323107

23	Mac Akhate		Youth	
24	Abiodun Enakhamaton		n	08074106867
25	Yesufu Awisifo		n	080572672
26	Yesufu Ediale		n	
27	Yesufu Ginah Aisekhaomon		n	08052571015
28	Adrebi Omolamen		n	
29	Chyrchill Omolame		n	08138569443
30	Sunday Ifuah		n	08106059021
31	Amimam Ojigboh		n	
32	Mhijiadu Samu		n	
33	Okefah Tabaya		n	0808102347324
34	Friday Omi Ojigboh		n	08160361922
35	Francis Oko-bbolu		n	08153865116
36	Mustapha Esejobor		n	08114414865
37	Ehimen Mabik		n	08074549922
38	Musa Okosun		n	08039189956
39	Khikhojere Kungsluy		n	09050987614
40	Abu Oribikifoh		n	08054215649
41	Adamu Okohase		n	
42	Umoru Eliemkham		n	08146916372
43	Tawah Sywaster		n	08143240442
44	Friday Bello		n	08071460383
45	Josephine Akhate		n	07037829842
46	Pamling Omizegba (Mrs)		n	08142198289
47	Omosun Dorothy (Mrs)		n	08058065660
48	Akhmetie Samuel		n	08052617454
49	Pius Isereje		n	
50	Oaikhanmi Basire		n	080572672
51				
52				
53				

## **ANNEX 2**

### **PICTORIAL EVIDENCE OF EXISTING FEATURES AND THE FIELDWORK ACTIVITIES AT EWU GULLY EROSION SITE**





