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NEW KARUMA BRIDGE

(FINAL) ENVIRONMENT&SOCIAL IMPACT ASSESMENT REPORT

FEBRUARY 2015

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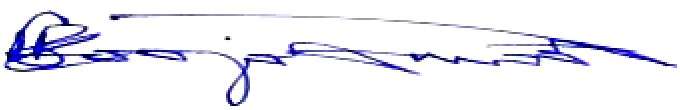

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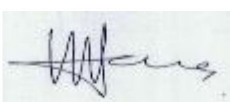

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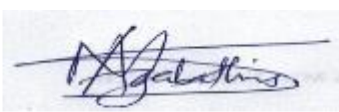

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

Background

The Kampala-Gulu Highway is the lifeline for the economy of the entire Northern Uganda including West Nile. The highway acts as a link to the northern part of Uganda providing the easiest route to move passengers and cargo and also providing the gateway to a number of neighbouring countries such as Democratic republic of Congo and the Republic of South Sudan.

On this highway, the existing Karuma Bridge is the only major structure/Bridge to cross the Nile River in this part of the country. However, the bridge which was constructed in 1963 to assist cotton farmers within the west Nile and has deteriorated for several years. Consequently, there is need for urgent planning for better infrastructure in the region. In addition, the existing bridge was designed and constructed according to the outdated design standard. Therefore, the existing bridge may necessitate seismic retrofitting to withstand earthquake excitations in accordance with current codes.

The existing Karuma Bridge

The existing Karuma Bridge is situated at 270 km north of Kampala, along the Kampala-Gulu road. Currently, the old/existing bridge is a three spans steel-concrete composite bridge with the following characteristics:

Two abutments with wing-walls, constructed with reinforced concrete, two piers constructed with reinforced concrete, Abutments and piers foundations: shallow foundations over the bedrock, Super structure: two I steel girders with longitudinal and transverse stiffeners and cross frames, Deck: reinforced concrete deck and Spans length : 20.5 m + 48.5 m + 15.7 m = 84.7 m.

Project Location of New Karuma Bridge

The new Karuma Bridge will be built at Karuma village in Kiryandongo and Nwoya districts approximately 600 m downstream the existing bridge and access roads on both sides of the river will be considered. The proposed x-section of the new Karuma (Nile) bridge is composed of two lanes 3.50+1.50m width and two footways 1.80m width with two pedestrian parapets for both side. Unlike what indicated for the minor bridges, for major bridges the shoulder is 1,50m-width. The total width is 13.60m.

Karuma access road

The new alignment leave the tar road just 355 m before the existing bridge at an elevation of 1032 m. Up to CH 1+800, the morphology is slightly rolling and the terrain are mainly sandy – clay, with some percentage of gravel and detritus always present. The thickness of this overburden varies between 0.8 – 1.5 m. underneath the weathered or slightly weathered gneiss has been always encountered.

Project Geology

Immediately upstream the existing bridge, the riverbed widens abruptly, therefore the reconnaissance for a favourable crossing has been conducted downstream. It has been observed that the riverbed and the river banks characteristics are quiet homogeneous up to 700 m downstream the existing bridge.

Project life span

The new Karuma and Masindi Bridges are classified as essential bridges (IC=1, these bridges must continue to function after earthquake). Since these bridges are classified as essential bridge, a service life of 120 years is expected.

Project construction

Three different options have been considered for the design and construction of the New Karuma Bridge. Given the main stream width and the banks morphology, three different solutions for the new bridge structure considered include: Option A: 3 spans composite I-girder bridge; Option B: tied arch bridge and Option C: deck arch bridge.

Justification for the new Bridge

The need for an efficient transport system which crosses the River Nile at Karuma will lead to livelihood improvement, better healthcare, better education, market accessibility and improved economic and social opportunities for the people in the Northern, Nile region and Uganda as a whole. It should be noted that this is the major road link to Southern Sudan and Congo hence facilitating international trade and boosting national economy. It's also a step forward to have an alternative Bridge to the existing Karuma Bridge so as enable improved infrastructure.

Study Approach

The study approach employed desktop studies. Field work was also done to follow up, ascertain and ground truth the information from the desktop studies. This was then followed by defining the study area. Area of Influence (AI) is considered to be those areas where project impacts are likely to directly and indirectly affect the existing environment (biophysical and socio economic components). Screening, Scoping, Field visits were made to the project areas to support the scoping process for potential impacts and to make arrangements for meetings with local authorities and communities along the project area. A scoping report was submitted to UNRA highlighting the outcomes of the scoping exercise and preparations for the detailed ESIA study.

This involved preparation of environmental impact identification checklist, acquisition and review of relevant documents, reports, maps/drawings. Secondary data was derived from the Local governments (LCs) and Analytical Reports from Uganda Bureau of Statistics and District Development Plans from the respective districts of Kiryandongo and Nwoya. Public/Stakeholder Consultations and Biodiversity Assessment were also carried out.

Karuma Wildlife Reserve

The proposed project area falls within the Karuma Wildlife Reserve (KWR) which is contiguous with the southern section of Murchison Falls National Park (MFNP). A section of KWR also serves as a 'buffer zone' to MFNP with controlled hunting permitted. It measures about 678 km^{2}in area and forms a long strip along the southern and eastern flanks of the Nile River and includes a 15km length of the Victoria Nile as far as Karuma Falls.

Vegetation and Land use

Because of the protected nature of the of the project area i.e. the Karuma wildlife reserve, the project site is still more or less virgin and the land cover is dominated by pristine vegetation. The upstream side of the highway at Karuma is dominated by commercial structures forming the Karuma Township, a bigger part of which falls within the project zone of direct impact.

Seismicity

The Karuma area is located north of the Western branch of the East Africa Rift System, within the Tanzanian Shield (carton). While the Shield separating the two branches of the rift system is of Precambrian origin, the rift system itself consists of asymmetrical basins bounded by alternate high angle normal faults or when unfaulted, monoclines, on the other side linked by comparatively high strain accumulation zones. The project site is located within the Shield, but is only 50-100 km from the western rift and about 70 km south of the Aswa Fault Zone, thereby potentially affected by the major tectonic in the region.

Traffic

The main traffic flowing through the project area is on the highway from Kampala to Gulu, Northern Uganda, which after crossing Karuma divides in two, one diversions goes to West Nile/Arua and the other to Lira and Gulu. The roads to Arua and Lira, both on the North Bank are outside the project site, thus traffic measurements were only considered for the traffic around Karuma Town, taking into account that on the left of the highway at this point is a protected area, the Karuma Wildlife Reserve.

Identification and Evaluation of Impacts

Potential environmental and social impacts have been identified per project phases and the associated main activities. The project phases are construction, operation and decommissioning. Some of the predicted impacts include the following:

Increased soil erosion, Noise and vibration, Contamination of the soil, Water pollution, Physical Cultural Resources, Occupational Health and Safety, Soil Compaction, Sources, transportation, Storage of construction materials, Construction Camps and Sites, Solid waste generation, Vegetation clearance, Disturbance to wildlife and Habitat, Employment opportunities, Provision of market for supply of construction materials, Ambient air quality, Noise and vibration, Construction Vehicular traffic movement, During construction, Water pollution from oil spills, Improved transport infrastructure, Improved travel safety and comfort, Increased revenue to local and central government, Tourism, Risk of human accidents and injuries, Risk of accidents wildlife animals, e.t.c.

Several mitigation measures have been proposed which include:

Install portable barriers to shield compressors and other small stationary equipment where necessary;

- Use of silent mechanical equipment i.e. equipment designed with low noise control elements;
- Ensure regular servicing of construction equipment
- Install oil trapping equipment in areas when there is a likelihood of oil spillage such as during the maintenance of construction equipment.
- Works will be planned, scheduled and performed in such a manner that the quality of water flowing from the site is at all times acceptable. Conditions will be maintained to protect the aquatic environment and other watercourses not only during construction, but also during periods of suspended construction activity.
- Place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal and disposed to designated site.
- The contractor shall also liaise with the respective Local Authorities for proper disposal of wastes as especially that generated at the construction camp at sites approved by the local authorities. Implementation of the waste disposal strategy will be on-going from project inception through to completion. Thus, the post construction waste is expected to be very minimal.
- Restoration of cleared areas, quarries which are no longer in use, spoil areas, construction roads, construction camp areas, borrow areas, stock. Landscaping and re-vegetation at the site will improve the aesthetics of the area.
- Compensation for the use of materials/acquisition will be paid to the owners of the material sites including areas were haulage routes will be established before commencement of actual bridge works.
- UWA through Karuma Wildlife Game reserve Warden to enforce strict code of conduct for workers so that they respect and adhere to the rules, including observing speed limits and other laws regarding national parks and protected areas.
- The contractor will work in line with the existing rules and regulations and also develop a tailored Traffic Management Plan that will address congestion minimization or elimination, timing of site activities with the other user‘s activities and notification of intent to use the roads in the area outside the normal practice.
- Minimise destruction of trees and vegetation; a clause should be included in the construction contract that requires the contractor to quantify the number of trees removed for the purpose of the new Karuma Bridge project and Restore vegetation immediately after the end of works;
- The contractor will develop a ‘Occupational Safety and Health Management Plan’ comprehensive OHS plan with clear assignment of responsibilities.

Environmental Social Management Plan (ESMP)

The main stakeholder responsible for implementing the plan will be the Contractor while, the developer i.e., Uganda National Roads Authority will co-ordinate and monitor all the work done by Contractor, Uganda Wildlife Authority (UWA), National Environment Management Authority (NEMA), Directorate of Water Resources Management (DWRM), Districts (Kiryandongo and Nwoya) and the Local Authorities will be the other stakeholders responsible for implementation and monitoring of the management plans.

Compliance monitoring

An environmental compliance monitoring programme will ensure that pre-construction commitments made to regulatory agencies, and other stakeholders are implemented. Compliance monitoring will ensure that preventive and environmental measures are in place throughout the project area.

Conclusion and Recommendations

This Environmental Social Impact Statement has assessed and presented mitigations for various impacts. The concept of this project focuses on ensuring that the proposed New Karuma Bridge and access road is contracted and operates efficiently and meets the requirements of the National Environment Authority, plus the different relevant policies. The ESIA recommends that the site is suitable for the New Karuma Bridge operations if the mitigation measures and environmental social management plans are implemented. UNRA is committed to constructing the New Karuma Bridge and will abide by all the conditions of approval given by NEMA in construction and operating the New Karuma Bridge.

LIST OF ACRONYMS

AADT	Annual Average Daily Traffic
BOD_5	Biochemical Oxygen Demand
CITES	Convention on International Trade in Endangered Species
ESIA	Environmental Social Impact Assessment
ESIS	Environmental Social Impact Statement
ESMP	Environmental Social Management Plan
FAP	Flood Action Plan
FGD	Focus Group Discussion
HEP	Hydro Electric power
HIV	Human Immunodeficiency Virus
IUCN	International Union for Conservation of Nature
KWR	Karuma Wildlife Reserve
LC	Local Council
MFNP	Murchison Falls National Park
NEA	National Environment Act
NEMA	National Environment Management Authority
OHS	Occupational Health and Safety
PPE	Personal Protective Equipment
PRA	Participatory Rapid Appraisal
RAP	Resettlement Action Plan
STI	Sexually Transmitted Infection
ToR	Terms of Reference
UNRA	Uganda National Roads Authority
UWA	Uganda Wildlife Authority
WHO	World Health Organization

IEC	Information Education Communication
MoH	Ministry of Health

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

The Kampala-Gulu Highway is the lifeline for the economy of the entire Northern Uganda including West Nile. The highway acts as a link to the northern part of Uganda providing the easiest route to move passengers and cargo and also providing the gateway to a number of neighbouring countries such as Democratic republic of Congo and the Republic of South Sudan.

On this highway, the existing Karuma Bridge which is the only major structure/Bridge to cross to cross the Nile River in this part of the country. However, the bridge constructed in 1963 to assist cotton farmers within the west Nile and has been deteriorated for several years. Consequently, there is need for urgent planning for better infrastructure in the region. In addition, the existing bridge was designed and constructed according to the outdated design standard. Therefore, the existing bridge may necessitate seismic retrofitting to withstand earthquake excitations in accordance with current codes.

1.2 Objectives of the Assessment

This assessment was conducted to ensure that the proposed new Karuma bridge incorporates environmental issues in the planning and design stages of the project in order to achieve an environmentally sound and sustainable development, which is of internationally acceptable standard.

The objectives of the environmental social impact assessment are:

- To provide baseline information on the physical and biological environment and social, cultural, demographic and economic characteristics of the population in the project area and downstream areas;
- To explain the need for the Environmental Social Impact Assessment and describe the physical characteristics, scale and design of the proposed New Karuma bridge;
- To examine the existing environmental characteristics of the proposed development activities and the project area likely to be affected by the development of the new Karuma bridge;
- To predict the possible environmental impacts of the proposed New Karuma bridge in Karuma Wildlife Reserve;
- To describe measures that will be taken to avoid, offset or reduce adverse environmental impacts; and
- To provide the public, Lead Agency and other stakeholders with information on the development activity that will assist them in making a decision on the proposed New Karuma Bridge.

- To identify and evaluate potential impacts associated with project implementation, and subsequent operation;
- To prepare scenarios and recommendations measures that will minimize adverse impacts and enhance beneficial aspects

1.3 Scope of the ESIA

The ESIA report was prepared on the basis of proposed engineering works, field investigations, stakeholder consultation, primary and secondary data collection, screening of all baseline environmental parameters, environmental quality baseline monitoring, and review of other similar project reports in Uganda. The study was taken up during September 2013-April, 2014. The ESIA covers the general environmental profile of the Project area including physical, ecological, environmental, social, physical cultural resources and economic resources.

The ESIA includes an overview of the potential environmental impacts and their severity, and proposes necessary mitigation measures and environmental management plan for each of the identified impacts.

1.4 Need for Environmental Impact Assessment

The proposed New Karuma Bridge is a development listed under Schedule 3, 2b of the National Environment Act (1995), among the projects requiring mandatory Environmental Impact Assessment before implementation. Therefore, this Environmental Impact Study is mandatory before the facility can be approved by NEMA for implementation.

The ESIA study on this project is therefore based on developments that are likely to or will have significant negative impacts on the environment so that they can be eliminated or mitigated during and after implementation.

The government policy ensures that the ESIA process should serve to provide a balance between environmental, social, economic and cultural values for the sustainable development. Therefore, the environmental and social concerns are integrated into all development policies, projects, activities and plans at national, district and local levels at early stages to avoid possible delays in the project implementation.

1.5 Project Aim and Justification

The Environmental Social Impact Assessment (ESIA) is an important tool for incorporating environmental concerns at the project level. ESIA should be carried out as early as the project planning stage, as part of feasibility thus it ensures that the project will be environmentally feasible for example it will not significantly impact the environment if measures are put in place.

The process of ESIA requires an in-depth analysis of the potential significance of environmental impacts from the project. ESIAs demand:

a) Comprehensive analysis of the potential impacts.

b) Works to be carried out to formulate practical mitigation measures;

c) In-depth valuation of impacts to screen and evaluate the best alternative; and

d) In-depth analysis to prepare an adequate environmental social management plan.

The ESIA studies aim at providing the decision makers with information regarding both the positive impacts and benefits, but most importantly the negative consequences related to the proposed development so as to enable them make an informed decision. The ESIA therefore provides the framework for enhancing the positive impacts and mitigating the negative ones. The ESIA process provides an opportunity to improve the transparency by involving the public and other stakeholders in the decision making process at the early planning phases of the project.

1.6 Approach to the Assessment /Methodology

Methodology for conducting this study was based on the Environmental Impact Assessment Guidelines (1997) and Regulations (1998) of the National Environmental Management Authority (NEMA).

The ESIA team used a number of techniques and methods at every stage of data gathering and information synthesis. However, the techniques and methods varied from one expert to another (social and bio-physical standard methods). These techniques and methods included literature review, stakeholder consultations, onsite measurements, observations, specialist studies and analysis. Some of these methods are further described below.

1.6.1 Environmental Scoping

Scoping was undertaken, the project falls under those that will automatically require a mandatory ESIA. The purpose of scoping was to determine the scope of work to be undertaken in assessing the environmental impacts of the proposed project.

Scoping defined the key issues that were covered by the ESIA and identified the critical environmental impacts of the project for which in-depth studies have been carried out. It also involved identification of project alternatives and stakeholders. Views gathered through the consultation and discussion with stakeholders were refined and included as part of the project ESIA terms of reference that were submitted to NEMA for approval.

The EIS has taken into account the issues raised in the scoping, and those raised by the various stakeholders during the consultation process. The ESIA study has also looked and analyzed the legal, policy and institutional framework for the EIA, project level alternatives, assessed the identified impacts and determined the significance of each impact and formulated mitigation measures that will minimize the negative or maximize the positive impacts.

The EIA has been carried out following national requirements as provided for in the National Environment Act, Guidelines for Environmental Impact Assessment in Uganda (1997), The Environmental Impact Assessment Regulations (1998); and safeguard policies and guidelines of partners and key lending institutions. Consideration has also been given to other applicable international requirements for such a project that might be relevant. A review of the policy, legal and Institutional framework is also provided.

1.7 Review of Literature

Background and secondary baseline information was obtained through comprehensive review of a large amount of literature. This was mainly done to obtain information related to the construction of Bridges especially in areas of great biodiversity importance, regulatory and institutional context relevant to the subject for purposes of gaining an in depth understanding of the goals, objectives and likely socio-economic and environmental benefits of the proposed project.

The aim was to appreciate the site socio- economic and biophysical environment and existing interventions from a fairly diversified perspective. Therefore, there was examination of biophysical, socio- economic and demographic data particularly compiled on the proposed project site.

1.8 Socio-Economic Assessment

This was conducted in order to understand the socio-economic impacts of the proposed New Karuma Bridge. The exercise was carried out using a number of different approaches and methodologies as was dictated by the different aspects and dimensions of the New Karuma Bridge project. The socio-economic survey employed both qualitative and quantitative methods of data collection. The research instruments were developed for purposes of capturing relevant socio-economic data to enable proper planning and designing of the proposed infrastructure development.

Key Informant Interviews, Community Consultative Meetings and Focus Group Discussions

Key Informant Interviews, Community Consultative Meetings and Focus Group Discussions were conducted targeting key people within the direct area of influence and with concerned bodies such as Uganda Wildlife Authority, Uganda National Roads Authority, NEMA, Kiryandongo, Nwoya district Local governments, Ministry of Water and Environment among others were interviewed.

1.8.1 Professional Judgment

In evaluation of technical issues related to the nature of the proposed Bridge project, the assessment team used its professional judgment and consultations with the different experts and stakeholders to interpret results from baseline studies and consultations.

1.9 Bio- Physical and Ecological Assessment

The assessment of the bio-physical aspects was carried out using the following sequence;

- Qualitative and quantitative assessment of the current state of the bio-physical environment of the proposed Bridge site;
- Identification and evaluation of positive and negative environmental impacts;
- Identification of the possible mitigation measures for the anticipated adverse bio-physical impacts; and
- Field survey techniques such as field observations, matrix and discussions with key informants were also used to determine the ecology of the proposed project area and the potential impacts of the proposed project on the biophysical setting.

- Sampling was also used for the biodiversity surveys.

CHAPTER TWO

2.0 METHODOLOGY FOR BASELINE ASSESSMENT

It is necessary to determine the baseline levels of appropriate environmental parameters, which are likely to be affected as result of construction and operation of the proposed project. Thus, collection of the baseline data of study area is a key step to understand the anticipated environmental impacts that are expected to accrue as a result of the proposed project is essential.

This section therefore provides an overall description of the methods and practices used for studying the ambient status of each environmental parameter in the study area while, result of the study for specific environmental parameter and assessment of various impact on them are discussed subsequently under Physical Environment, Biological Environment and Social Environment chapters. Studies were undertaken to generate baseline data on various parameters of environment including land, water, air, noise, flora, fauna and socio-economics.

All methods were structured for collection and organization of environmental baseline data and identification of environmental impacts.

2.1 Land Environment

2.1.1 Geology, Topography, Seismicity and Catchment area

The data regarding Geology, Topography and Seismicity of the project area and Catchment area of River Kyoga Nile up to the Project site was taken from the Detailed Engineering Report of the proposed New Karuma Bridge.

2.1.2 Hydro-Meteorology

Hydrology of the project has been also taken from the engineering/Design Report of the New Karuma bridge and contains the source of database and detail methodology adopted for deriving

i) Environmental flow,

ii) Ecological Demand Estimation

iii) Sediment Flow etc.

Data on rainfall, temperature and climatic condition has been taken from the meteorological stations that are closest to the project site.

2.1.3 Land use-Land Cover Classification

Information about the land use-land cover classification was obtained from NFA (National Forest Authority) Kampala, Uganda which was carried out using Landsat data of the year 1995. Land use describes how a patch of land is used (e.g. for agriculture, settlement, forest), whereas land cover describes the material (such as vegetation, rocks or buildings) that are present on the surface.

Accurate land use and land cover identification is the key to most of the planning processes.

2.1.4 Soil Classification

Soil resource mapping of the proposed project area was prepared from the basic data/map of soil obtained from the Makerere University, Uganda.

2.1.5 Air Quality

The sampling of the ambient air quality was made at three locations, the proposed new Karuma Bridge, The old/existing Karuma Bridge and Karuma village of the project area. Measurement of the air borne particulate matter were done using a Respirable Dust Sampler and Draeger air sampler and tubes measurement device CHP-71 designed for the chemical surveillance was used to analyse the gaseous pollutant (Carbon dioxide and Carbon monoxide, Sulphur dioxide (SO_2), Nitrogen oxides (NO_x). These tubes were exposed on-site so that the target gas diffused along the tube to an absorbent substance fixed at the sealed end of the tube. The tubes were closed at the end of the sampling period and the subsequent laboratory analyses determined the average concentration of the pollutant during the sampling period.

2.1.6 Noise and Traffic Density

Noise conditions were measured using Precision Integrating Sound Level Meter Type: 4 in one Digital Sound Level Meter, Model CEM DT 8820. The sampling was conducted near the residential area of Karuma Village and in the close vicinity of the project component area of the proposed new Karuma Bridge. The traffic data was taken at Karuma Bridge only during morning and evening hours and traffic density was calculated using number and types of vehicles plying on the National Kampala-Gulu Highway (at Karuma Bridge).

2.2 Biological Environment

2.2.1 Terrestrial Fauna Assessments

Field surveys were conducted for birds, mammals, reptiles, amphibians and butterflies to record species by walking along existing transects through the site area.

Information was also collected to identify critical habitats for the species and/or other attributes in the area that may be important for their continued survival. The project is located within the Karuma Wildlife Reserve and in the vicinity of Murchison National Park, great emphasis was laid to cover these protected area through survey especially the part of Karuma Wildlife Reserve. For cross referencing and interpretation of the data, secondary sources were also referred. Methodology of primary data collection for different faunal component is described in details as follows:

2.2.1.1 Butterflies

The butterfly fauna in the proposed project area were sampled through the systematic use of sweep nets. Sweep netting was done randomly. All species of butterflies encountered were recorded for abundance and diversity.

2.2.1.2 Herpetofauna

These were recorded as seen around the project site. Much of the herpertofaunal information was based on available secondary data. Amphibians and reptiles are mobile and can therefore be encountered outside their critical habitats.

2.2.1.3 Mammals

The surveys of mammals involved a general walk over through the project area observing for mammal presence, mammal signs, tracks and faecal material and wallow areas. Simple measure of presence or absence was used. Major sample points were placed 1 km apart along the area to be traversed by the access road at which observations were made to record mammal data (presence/absence or signs), habitat characteristics (e.g. nature of vegetation, presence of wallow or water). Standard trapping methodology was also used to survey small mammal diversity.

2.2.1.4 Birds

Bird information was based on the findings by the ESIA team for the proposed Karuma Hydro Electric power. Also other secondary information was consulted.

2.2.2 Aquatic Ecosystem

Aquatic ecosystem assessment covered baseline water quality, phytoplankton composition, distribution and relative abundance, species composition and spatial distribution of zooplankton, taxonomic composition, distribution and relative abundance of macro benthos, as well as species composition and distribution of fishes, and the fishery. Specific methods used in the assessment of particular environmental aspects and biodiversity groups included consultative engagement with relevant stakeholders in the aquatic resources management domain; literature search and desk review.

2.2.3 Terrestrial Floral Assessment

Since the project is expected to cover a small area, the plant survey was done using a point survey method and plants were identified and recorded at a single point. Those that could not be identified were collected and taken to the Makerere University herbarium for identification.

Conservation status of the species was also identified using IUCN threat categories. Deliberate effort was also made to document any traditional/local uses of plants (e.g. firewood) in the area to determine if there will be any major impacts as a result of the proposed project on plant resources availability. Sampling locations were recorded using the Global Positioning System (GPS).

2.3 Socio-economic environment

The methodology used for the socio-economic assessment included a review of related literature on policies, a socio-economic survey that is used to determine the vulnerability context of community members that are translated into negative or positive impacts as well as strategies that are proposed to help them cope or adapt to the negative impacts in order to improve their livelihood outcomes. Village Meetings were undertaken to allow local people describe problems and their priorities and aspirations under the proposed project. These meetings helped in initiating collaborative planning, sharing and verifying information gathered from fieldwork.

2.3.1 Cultural and Archaeological Assessments

The baseline studies for the cultural and archaeological assessments were carried out using;

- **Desktop Survey:** Literature review of the project and other similar development in the country as well as studies on archaeology, palaeontology, and socio-cultural aspect of the region in question.
- **Site Survey:** Field personnel walked across the project area for collecting data. The methods of data collection included; observations, recording, photographing, and documenting all identified cultural materials, and other environmental features likely to be impacted by the project.
- **Ethno-archaeological Study:** Meetings and interviews with stakeholders and the local people were the major source of information about the impact of the project on the current socio-cultural lives of the people living in and around the area.
- **Consultations and Interviews:** Consultations with area local community and cultural institutions, and with the Ministry of Tourism Trade and Industry on sites of archaeological importance and cultural heritage.

CHAPTER THREE

3.0 DESCRIPTION OF THE PROJECT

3.1 THE EXISTING KARUMA BRIDGE

The existing Karuma Bridge is situated at 270 km north of Kampala, along the Kampala-Gulu road.

Currently, the old/existing bridge is a three spans steel-concrete composite bridge with the following characteristics:

- Two abutments with wing-walls, constructed with reinforced concrete.
- Two piers constructed with reinforced concrete.
- Abutments and piers foundations: shallow foundations over the bedrock
- Super structure: two I steel girders with longitudinal and transverse stiffeners and cross frames.
- Deck: reinforced concrete deck
- Spans length : 20.5 m + 48.5 m + 15.7 m = 84.7 m

Figure 3.1: Existing Karuma bridge

Figure 3.2: Gneiss outcrops (left bank)

The longitudinal gradients of the existing access roads are as follows: left side (south) access 5 % and right side (north) access 6 %.

3.2 PROJECT LOCATION OF NEW KARUMA BRIDGE AND ACCESS ROADS

The new Karuma Bridge will be built at Karuma village in Kiryandongo and Nwoya districts approximately 600 m downstream the existing bridge and access roads on both sides of the river will be considered.

The proposed x-section of the new Karuma (Nile) bridge is composed of two lanes 3.50+1.50m width and two footways 1.80m width with two pedestrian parapets for both side. Unlike what indicated for the minor bridges, for major bridges the shoulder is 1,50m-width. The total width is 13.60m.

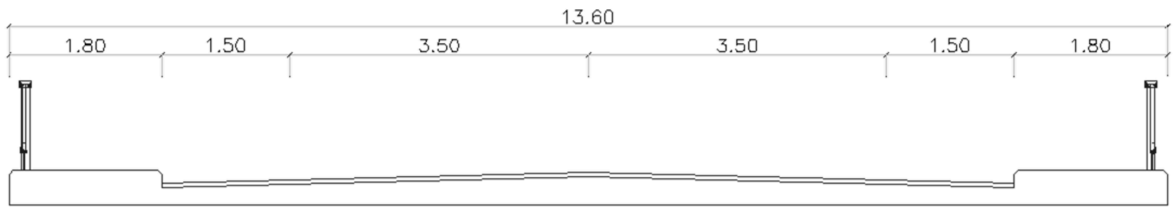

Figure 3.3: Design Cross section of the new Bridge

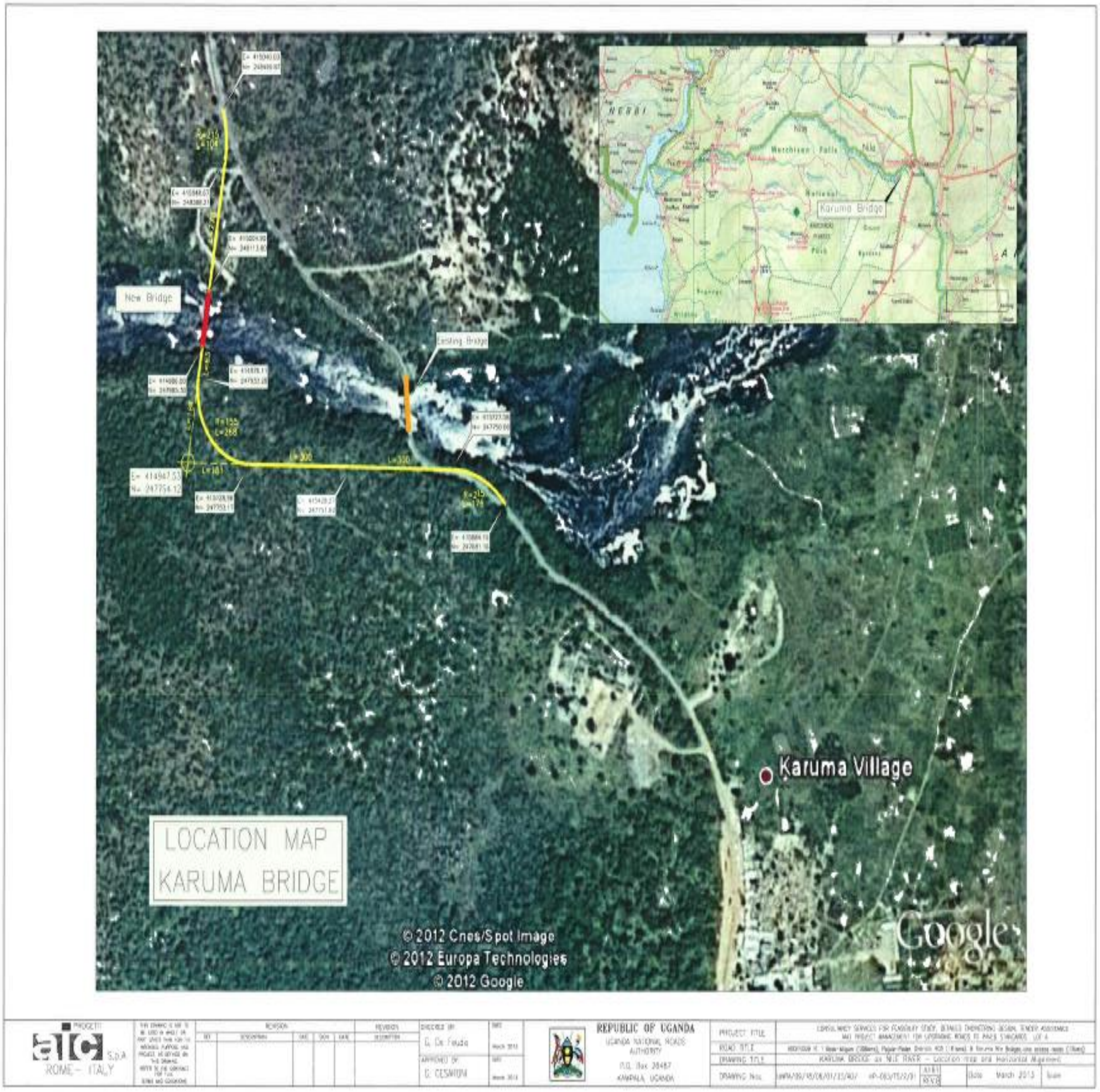

Figure 3.4: The new Karuma Bridge crossing

In the project area, a thick layer of ferallitic residual soil resulted by in situ physical and chemical weathering of the bed rock is present below a top layer of humus. The bedrock exposed in Karuma area consists of undifferentiated gneisses, referred to as the Gneissic Complex comprising of granitized and gneissic formations in the geological mapping of Uganda. The gneiss outcropping appears light grey to greenish grey, fine to medium grained, very hard, compact, thinly foliated and dissected by several sets of discontinuities. Bed rock outcrops are noticed to occur along the road cut section near the

Karuma existing bridge, below the abutments and piers foundations of the existing Karuma bridge and isolated outcrops are present in the river bed upstream and downstream the existing Karuma bridge.

Immediately upstream the existing bridge, the riverbed widens abruptly, therefore the reconnaissance for a favourable crossing has been conducted downstream. It has been observed that the riverbed and the river banks characteristics are quiet homogeneous up to 700 m downstream the existing bridge. Taking into account these considerations, the proposed alignment of the new bridge has been determined trying to optimize the geometric features of the access ramps (longitudinal gradient and horizontal curves radius).

The new crossing alignment has been positioned approximately 600 m downstream the existing bridge. The geometric characteristics of the new access ramps are the following:

- Length of the left side (northern) access : 1.020 m
- Radius of the left side access curves : 215 m and 155 m
- Length of the right side (southern) access : 380 m
- Radius of the right side access curve: 215 m.

In correspondence of the proposed new Karuma bridge alignment, isolated outcrops of the bedrock forming islands are present within the riverbed:

Figure3.5: Nile River downstream the existing bridge bank

Figure3.6: New bridge crossing site from the northern (bedrock outcrops)

Three different steel bridges with concrete deck were considered for the new Karuma Bridge. All steel structures will be constructed with weathering steel, best-known under the trademark of COR-TEN steel. This material allows forming a stable rust-like appearance when exposed to the weather agents for several years. This characteristic allows saving of the surface painting and maintenance costs. More details are provided in the Preliminary engineering and design report.

3.3 Bridge Design Hydrology

The geological situation of the riverbed is very favourable for the bridge foundations design. Taking into account the morphology of the riverbed and of the banks, the length of the new bridge was fixed at about 210 m. This length allows to pre-dimension three different solutions that not provide piers in the riverbed, where the water flow velocity is very high (rapids). Taking into account the basic hydraulic data of the Karuma hydropower project, while the power plant is functioning, only the mandatory environmental flow (100 m3/s) is going to flow in the natural riverbed. The discharge flow for power production (1.128 m3/s) will be diverted upstream and will be conveyed to the natural riverbed by tunnel 7 km downstream the new bridge site. If the power plant is out of production and the design flood occurs (4.700 m3/s), the overflow structure of the diversion structure will release in the natural riverbed 100 % of the design flood. Therefore the design flow for the new bridge should be equal to the design flood considered for the Karuma hydropower project (4.700 m3/s).

3.3.1 Project construction

The construction of the New Karuma Bridge has been illustrated in the following, three different bridge structures proposed. Given the main stream width and the banks morphology, three different solutions for the new bridge structure were considered:

- Option A: 3 spans composite I-girder bridge;
- Option B: tied arch bridge;
- Option C: deck arch bridge.

3.3.2 Project life span

The new Karuma and Masindi Bridges are classified as essential bridges (IC=1, these bridges must continue to function after earthquake). Since these bridges are classified as essential bridge, a service life of 120 years is expected.

3.4 Justification for the new Bridge

The need for an efficient transport system which crosses the River Nile at Karuma will lead to livelihood improvement, better healthcare, better education, market accessibility and improved economic and social opportunities for the people in the Northern, Nile region and Uganda as a whole. It should be noted that this is the major road link to Southern Sudan and Congo hence facilitating international trade and boosting national economy. It's also a step forward to have an alternative Bridge to the existing Karuma Bridge so as enable improved infrastructure.

3.5 Karuma access roads

The new alignment leave the tar road just 355 m before the existing bridge at an elevation of 1032 m. Up to CH 1+800, the morphology is slightly rolling and the terrain are mainly sandy – clay, with some percentage of gravel and detritus always present. The thickness of this overburden varies between 0.8 – 1.5 m. underneath the weathered or slightly weathered gneiss has been always encountered.

At chainage 1+810 at elevation of 1020 m, there is the edge of the Nile valley: from here the slope become very steep and we reach the river bed on the left bank at CH. 1+230 at an elevation of 997 m. The river bed show several outcrops of Gneiss and we remarked the presence of several small rocky outcrops in the river bed.

The right bank shows a smoother morphology, even if rock outcrops are everywhere. After a slightly steep slope, pk CH. 1+460 at elevation of 1020 m, the morphology became flatter, and rock outcrops disappear. The new alignment joins again the existing road at Ch. 1+720 at an elevation of 1031m. In this area trial pits didn't not find the bedrock.

3.5.1 Construction Material sites

One borrow area 3.1 km from Karuma centre have been studied. The preliminary evaluation of available quantity, show more than 100 000 m^3 of material.

In order to verify the possibility of opening a quarry for road aggregates, a site in Ugunga, at 14.7 km from Karuma centre and 7 Km from Djima, have been studied. In this area large granite outcrops are present and the quantity are certainly enough for construction purposes. 2 sample of rock quarry have been collected. Tests are currently on going.

It should be pointed out, the deep cut for access roads to new Karuna bridge site that are likely to be executed, could supply all the rock material needed for road construction.

3.5.1.1 Road Access Earthworks (rock excavation and fill)

The new Karuma Bridge involves road access construction. It is a total 1.800 m length new road construction made of 1.200 m long road south bank access and a 470 m long north bank access.

As for the access roads vertical geometry, given the difference in level of the two banks, each solution implies different earthworks volumes. In particular, being the south bank access at a higher level than the north bank, the project will imply rock excavation on the south access and fill construction on the north side.

In the evaluation of this parameter, rocky material for asphalt, concrete and of course the pavement structure was also considered and thus assigned different scores to each option.

3.5.2 Proposed road pavement materials

The proposed project inputs will involve the use of the following materials which will be largely collected from the vicinity but offsite. Royalties for material use will be paid to the owners of the materials and material sites. These include:

- Stone boulders which be necessary for sub-base formation;
- Earth materials which are for fill and embankments formations especially in low areas
- Murram/gravel materials;
- Stone aggregates of varying sizes;

- Stone dust which is ideal for priming and will be obtained from the stone quarries;
- Bitumen;
- Cement and bricks for headwall on culverts;
- Water to be abstracted from nearby streams and rivers after obtaining clearance from the Directorate of Water Development (DWD);
- Guard rails for safety mitigation in areas of sharp bends and tight corners;
- Iron bars for bridge works especially for the box culverts;
- Steel
- Timber planks for woodworks on bridges;
- Locally available sand;
- Roofing materials and housing construction in-puts; and
- Chemicals for laboratory use during materials testing.

3.6 Proposed Activities during Construction

The ESIA identified major activities during the construction and operational phases of the Bridge and road works.

3.6.1 Pre-Construction Phase

- Demarcation of the Bridge and road reserve (Surveying: all sections of the proposed route have been surveyed in detail;
- Markings and chainages has been done along the entire proposed route; and
- Identification of sources of materials and testing
- Determining appropriate site location for the contractors camp site for the storage of plant equipment, medical facilities/ clinic, workshop/maintenance workshop, fuel storage, dispensation field laboratory, construction materials, and related equipment storage;

3.6.2 Construction phase

- Asphalt plant, heating bitumen, screening and mixing of aggregates and related aspects;
- Construction of the support facilities in the camp site such facilities include access roads to the camp site, toilets, a perimeter fence and a generator house;

- Loading of the materials on to the trucks will be by equipment and labour and is recommended and during the transportation of the materials, its recommended that the trucks should be covered by tarpau lins to minimize wind blowing off loose soils from the trucks;
- Disposal of cut to spoil sub-grade materials especially from the river beds;
- Wastes(solid and liquid) generated as a result of construction activities and its management
- Earthworks including cut and fill in low and high areas where embankments will be needed for the formation of proper alignments;
- The material supply sites will be cleared off the vegetation and the overburden materials which will all be stock piled for the restoration of borrow pits after earth works;
- The transportation of the construction materials by use of trucks and Lorries. The routes to be used by the trucks are either existing or are to be constructed; therefore there will be minimal negative impact to the environment;
- Establishment of stone quarries for the processing and the supply of stone aggregates;
- Grading and compaction of the road using graders and plant equipment such as 8 ton rollers; and
- Installation of drainage infrastructures such as culverts, box culverts and other culverts of varying capacities depending on the need of the specific points; and construction of the bridge;
- Sub-base formation with stone boulders laid down for road foundation especially in the river banks; and laying and compaction of crushed stone base. The river banks will have its edges protected with gabions boxes with stones;
- Double Bitumen Surface Treatment (DBST) to attain the required paved standard in the carriage way and road shoulders;
- Roadside drainage infrastructures such off-shoot drains;

3.6.3 Decommissioning of the Road

The service life of 120 years of the Bridge is expected that means after the construction materials and other equipments will have to be removed. A decommissioning plan will be required as stipulated by NEMA EIA guidelines 1997. For Camp sites developed by the Contractor on closure, buildings and ancillary structures including equipment, lumber, refuse, surplus materials, and other such items shall be removed, adequate cover will be placed over the ash pit, the sceptic systems shall be removed or filled and the site reclaimed and re-vegetated. The contractor shall ensure that decommissioning is done within the acceptable limits as spelt out in the NEMA Certificate.

3.6.4 Operational Phase

- Installation of road furniture to enhance road safety;

- Rumble strips, edge to edge strips;
- Humps;
- Speed sign control sign posts;
- Traffic police to enforce traffic rules and regulations.

3.6.5 Wastes (solid and liquid)

The road works will generate largely wastes relating to the activities and use of the items named 3.5. The anticipated wastes to be generated will include the following:

- Kitchen waste and food debris;
- Waste oils and spillages;
- Human wastes and associated effluents from the campsite;
- Old tyres and related accessories;
- Other waste consumables such as filters;
- Medical wastes such as used syringes, cotton swabs, expired drugs and reagents;
- Junk and obsolete equipment;
- Bitumen spill and contaminants;
- Waste asphalt containers;
- Construction debris and boulders; and
- Associated household waste such as cloth rugs

CHAPTER FOUR

4.0 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

ESIA takes place within the legal and/or policy frameworks established by individual countries and international agencies. Its practice can be improved through a better understanding of the different arrangements that are made for ESIA provision and procedure, and how these can contribute to successful ESIA. Those developing or reviewing ESIA systems need to be particularly aware of the strengths and weaknesses of existing arrangements and the elements that can improve ESIA as a tool to achieve sustainable development.

4.1 Ugandan Policy Framework

The main policy statement on the environment for Uganda is the National Environment Management Policy (1994). The above policy was developed through an extremely consultative process in 1994 and its overall objective is to achieve sound sustainable development, by reconciling economic development and conservation of resources. The NEMP calls for concerted effort by all Ugandans, the various government and private sector structures both at national and local levels, to adopt policies and approaches that integrate environmental concerns into the economic, social and development plans, policies and programs into their sectors.

The NEMP (1994) became legalised by the National Environment Act Cap 153. This Act is a framework law aimed at laying down the basic legal provisions for managing the environment in Uganda.

4.1.1 The National Environment Management Policy, 1994

The overall goal of this policy is the promotion of sustainable economic and social development mindful of the needs of future generations and ESIA is one of the vital tools it considers necessary to ensure environmental quality and resource productivity on long-term basis. It calls for integration of environmental concerns into development policies, plans and projects at national, district and local levels. Hence, the policy requires that projects or policies likely to have significant adverse ecological or social impacts undertake EIA before their implementation. This is also reaffirmed in the National Environment Act, Cap153, which makes EIA a requirement for eligible projects like the New Karuma Bridge (*Third Schedule* of the National Environment Act, Cap153).

4.1.2 National Water Policy, 1999

The National Water Policy is one of the fundamental policies for the governance of water resources in Uganda. The overall policy objective is to manage and develop the water resources in a sustainable manner, so as to secure and provide water of adequate quantity and quality for all social and economic needs, with the full participation of all stakeholders, and so as not to leave the future generations any worse off than ourselves.

The leading institution on water issues in Uganda is the Ministry of Water and Environment, which implements a Water Action Plan and the National Wetlands Policy (1995). The plan ensures sustainable management of water resources.

4.1.3 The National Policy on Conservation and Management of Wetland Resources, 1995

The National Policy on conservation and management of wetland resources aims at curtailing loss of wetland resources and ensuring that benefits from wetlands are equitably distributed to all people of Uganda. In general, the policy calls for sustainable use, environmental sound management of wetlands, equitable distribution of benefits and application of EIA procedures on activities to be carried out in wetlands.

In order to operationalize the policy and to provide a legal framework for its implementation, wetland related issues have been adequately incorporated into the National Environmental Act, Cap153. This policy is relevant since the Nile River is surrounded by wetlands of ecological importance especially in the area up stream of the proposed site.

4.1.4 The Uganda Wildlife Policy, 1999

This Policy mainly aims to promote the long term conservation of the country's wildlife and biodiversity in a cost effective manner which maximizes the benefits to the people of Uganda. Presently, there are 10 Wildlife Reserves in Uganda. Under the conservation significance of Uganda's protected areas; Karuma Wildlife Reserve is listed to be of a supplementary importance with its most attributes common with Murchison Falls National Park (MFNP) which forms part of Murchison Falls Conservation Area. KWR is legally gazetted and managed under the primary jurisdiction of the Uganda Wildlife Authority. This policy provides strategies for developments within Protected Areas; these strategies are:

- To ensure that all developments and interventions within protected areas are subjected to appropriate environmental assessments;
- To ensure that all physical developments (such as buildings and roads) in Wildlife Protected Areas follow general management plan guidelines;
- To apply architectural design and construction practices that is of high quality and appropriate to protected areas to ensure conformity with the aesthetics of the area;
- To exclude industrial and agricultural development activities within National Parks and centrally managed Wildlife Reserves, including mineral exploration or extraction, quarrying for stones, and crop production;
- To undertake or commission environmental impact assessments for all proposed developments and environmental audits of all existing facilities, and impose necessary restraints based on their findings.

This policy is relevant to the proposed New Karuma bridge since part of the Karuma Wildlife Reserve will have to be disturbed to construct the bridge.

4.1.5 The Uganda Forestry policy, 2001

This policy provides that Uganda's forest biodiversity should be conserved and managed in support of local and national socio-economic development and international obligations and that the government will promote the rehabilitation and conservation of forests that protect the soil and water in the country's key watersheds and river systems. Some vegetation will be cleared for the establishment of both temporary and permanent project infrastructure, which could impact on forest resources and biodiversity.

4.1.6 The Tourism Policy, 2002

This policy is aimed at ensuring that tourism is a medium for poverty reduction. One of the identified strategies is wide distribution of revenue earnings with large-scale participation of the private sector, the communities and local governments. It is anticipated that through decentralization, local governments have the power to support sustainable use of natural and cultural resources for tourism development. As far as local governments are concerned, tourism (and conservation of resources) must be seen to pay its way before it will be accepted as a priority. The bridge falls within the KWR, hence management and monitoring plans have to be put in place to mitigate adverse impacts related to tourism activities but instead boost tourism.

4.1.7 The National HIV/AIDS policy

This policy provides the overall policy framework for the national HIV/AIDS response. It also recognizes special groups which include migrant workers and acknowledges the existence of commercial sex workers. It also recommends the need to identify strategies to address migrant workers in view of the challenges posed by their mobility and vulnerability to HIV/AIDS. It anticipated that during the implementation of the different phases of the New Karuma bridge, there will be an influx of people into the project area that will result into allot of interaction and may pose a danger of HIV/AIDS spread.

4.1.8 Gender Policy, 1997

The overall goal of this policy is to mainstream gender concerns in the national development process in order to improve the social, legal conditions of the people in Uganda and in particular, the women. This policy has a bearing on the project in terms of the requirements to safeguard the interests of female headed households that are likely to be among the Project Affected Peoples (PAP).

4.1.9 Energy Policy, 2002

The policy governing the downstream petroleum sub-sector is contained in The Energy Policy for Uganda, 2002. In this respect, the key policy objective is “To ensure an adequate, reliable and affordable supply of quality petroleum products for all sectors of the economy at internationally competitive and fair prices within appropriate health, safety and environmental standards”.

4.1.10 Uganda Resettlement/Land Acquisition Policy Framework, 2002

With regard to compensation and resettlement issues, the main pieces of legislation are the Constitution of Republic of Uganda/and the Land Act. The existing legislation emphasizes adequate, fair and prompt compensation. UNRA Resettlement/Land Acquisition Framework provides that:

- Compensation should be aimed at minimizing social disruption and assist those who have lost assets as a result of a road project to maintain their livelihoods. In accordance with Ugandan laws and standards, a disturbance allowance is to be provided to assist the project affected individual or family to cover costs of moving and locating to a new holding.

- Community infrastructure must be replaced and ideally be improved in situations where it was deficient. This includes installation of sanitary facilities, electricity generation systems, road links and provision of water.

4.1.11 The Public

One of the most important in the institutional framework for the formulation and enforcement of environmental policies, laws and regulations is the public. Increasingly, the public and environmentalists and lobby groups are taking a more active role in relation to influencing governments to initiate policies, laws and regulations for the protection of the environment and sustainable development. The active importance and role played by local environmentalists and environmental lobby groups in Uganda have increased in recent years, and can no longer be ignored by developers of new projects and large industries with significant effects on ecology and the environment.

Article 39 of the Constitution provides that "Every person living in Uganda has a right to a clean and healthy environment". NEA also requires certain projects to undergo environment impact assessments (EIA's). EIA's for projects with significant environmental impacts are subjected to public hearings. Relying on the powers given by the Constitution and the National Environment Act, the public, environmentalists and environmental lobby groups in Uganda are increasingly playing a key role in the formulation and enforcement of environmental policies, laws and regulations.

4.2 Legal Frame work

There are a number of legislations that deal with environmental management in Uganda both in general and specific terms, the most important of which is the Constitution of the Republic of Uganda (1995). The specific legislation that deals with environmental impact assessments is the National Environmental Act.

4.2.1 The Constitution of the Republic of Uganda, 1995

As the supreme law of the country, in its preamble it provides principles for the management of the environment. In its national objectives and directive principles particularly, Principle XXVII of the state policy stipulates that; the state shall promote sustainable development and public awareness of the need to manage land, air, water resources in a balanced and sustainable manner for the present and future generations. The contractor will take all possible measures to prevent or minimize damage and destruction of land, air and water resources due to pollution or other causes as a result of implementing the project.

The Constitution of the Republic of Uganda provides for, interalia:

- Article 39 provides for the right of every Ugandan to a clean and healthy environment;
- Article 237 (2) provides for the responsibility of government to enact laws that protect and preserve the environment from degradation and to hold in trust for the people of Uganda such natural assets as lakes, rivers, wetlands, forest reserves, game reserves and National Parks and;

- The right of every Ugandan to fair and adequate compensation in instances of the compulsory acquisition of land.

4.2.2 The National Environment Act Cap 153

Following the enactment of the National Environment Act Cap 153, the National Environment Management Authority (NEMA) was created and charged with the responsibility to oversee, coordinate and supervise environmental management in Uganda.

The National Environment Act, Cap 153 stipulates that an environmental impact assessment be undertaken by the developer where the lead agency, in consultation with NEMA, is of the view that the project:

- may have an impact on the environment,
- is likely to have a significant impact on the environment; or
- Will have a significant impact on the environment".

4.2.3 The Physical Planning Act, 2010

The principal Act on land use and land use planning in urban and rural areas in Uganda is the Physical Planning Act 2010. The Act provides for the establishment of a National Physical Planning Board (NPPB); to provide for the composition, functions and procedure of the Board to establish district and urban physical planning committees; to provide for the making and approval of physical development plans and for the applications for development permission; and other related matters.

According to section 37, of the Physical Planning Act 2010; where a development application relates to matters that require an environmental impact assessment to be carried out, the approving authority or physical planning committee may grant preliminary approval of the application subject to the application obtaining an environmental impact assessment certificate in accordance with the National Environment Act.

4.2.4 The Water Act Cap 152

The statute provides for the management of water in Uganda and is under the mandate of Directorate of Water Development (DWD) in the Ministry of Water, Lands and Environment. Section 31, subsection (1) of the Water Statute deals with prohibition of pollution to water and stipulates that a person commits an offence that, unless authorized under this Statute, causes or allows:

- Waste to come into contact with any water;
- Waste to be discharged directly or indirectly into water; and
- Water to be polluted.

The Act allows the Minister (of Water, Lands and Environment) to declare any area a sewerage area and appoint an authority to manage sewerage services in that area. This Act can be implemented through:

- Promote the rational management and use of the waters of Uganda through:

- Progressive introduction and application of appropriate standards and techniques for the investigation, use, control, protection, management and administration of water resources; Division (2);
- Coordination of all public and private activities which may influence the quality, quantity, distribution, use or management of water resources; Divisions (4), (8) and (9);
- The coordination, allocation and delegation of responsibilities among Ministers and public authorities for water resources management; Division (12),

a) Promote the provision of a clean, safe and sufficient supply of water for domestic purposes; Division (6);

b) Allow for the orderly development and use of water resources for all objective uses in ways which minimize harmful effects to the environment;

c) Control pollution and promote the safe storage, treatment, discharge and disposal of waste; Division (6) clause (34).

d) Providing compensation due to any damage caused by water resources management interventions, Division (6) clause (33).

4.2.5 The Uganda Wildlife Act, Cap 200

The Act establishes UWA as a body responsible for management of wildlife in Uganda, both inside and outside protected areas. The Act carries overall Schedules of the repealed Game (Preservation and control) Act and National Parks Act. The Act defines wildlife as any feral plant or animal of a species native to Uganda. It vests ownership of wild animals and plants in government for the benefit of all Ugandan people, a responsibility executed through Uganda Wildlife Authority. Contrary to popular belief, the Wildlife Act does not prohibit mining activities in conservation areas, rather it seeks to permit, control and monitor these operations in pursuit of sustainability and co-existence with wildlife and this is evidenced by Sections 5, 15, 19 and 21 of the Act. Section 15 provides for EIA as a decision making tool to the Authority (UWA).

The main objective of the Act is to ensure perpetual protection of wildlife resources and enable derivation of benefits. Need for sustainable management is recognized within the framework of effective planning and stakeholder participation.

In this regard, stringent measures have been proposed in this report and should be applied to ensure that the area is conserved. Uganda Wildlife Authority is an important stakeholder in this project and recommendations are made in this report on how they will be involved in the project implementation, monitoring and evaluation.

4.2.6 The Public Health Act (1964) Cap 151

Section 7 of the Act provides local authorities with administrative powers to take all lawful, necessary and reasonable practicable measures for preventing the occurrence of, or for dealing with any outbreak or prevalence of, any infectious communicable or preventable disease to safeguard and promote the public health and to exercise the powers and perform the duties in respect of public health conferred or imposed by this act or any other law.

Section 105 of the Public Health Act (1964) imposes a duty on the local authority to take measures to prevent any pollution dangerous to the health of any water supply that the public has a right to use for drinking or domestic purposes.

The Act details the siting of waste disposal facilities such as solid waste skips and septic tanks in relation to settlements and food points

4.2.7 Occupational Health and Safety Act, 2006

The Occupational Safety and Health (OSH) Act replaces the Factories Act (1964). It departs from the original listing of ‘don’ts’ and now has a new scientific approach in which the technical measures required in the protection of workers are spelled out to be put in place. In so doing, it is preventive in approach.

The Act provides for the prevention and protection of persons at all workplaces from injuries, diseases, death and damage to property. The OSH Act covers not just the ‘factory’ but also any workplace where persons are employed and its provisions extend not just to employees but to the self employed and any other persons that may be legitimately present in the workplace who may be exposed to injury or disease.

Employers must provide for the protection of workers from adverse weather, provision of a clean and healthy work environment, sanitary conveniences, washing facilities, First Aid and facilities for meals. The Act provides for safe access to the workplaces and safe work practices.

In Section 95, the Act requires employers to take preventive measures including administrative and technical actions to prevent or reduce contamination of working environment. Section 96 requires provision of material safety datasheets (MSDS) containing essential information regarding identity of chemicals, their hazards, safety precautions and emergency procedures. In section 97 an employer is required to ensure that containers of hazardous chemicals are labelled and appropriate chemical data sheets are available in the workplace.

4.2.8 The Land Act (1998)

Sections 43, 44 and 45 (1) and (2) of the Land Act (1998), Government or local government may acquire land in accordance with the provisions of Article 26 and clause (2) of Article 237 of the Constitution of the Republic of Uganda.

A person who owns or occupies land shall manage and utilize the land in accordance with the National Environment Statute 1995 and any other laws binding.

The Government or the local government shall hold land in trust for the people and protect natural lakes, ground water, natural streams, wetlands and any other land reserved for ecological purposes for the common good of the citizens of Uganda.

A local government may, upon request to the government, be allowed to hold land in trust for the people and the common good of the citizens of Uganda.

The Land Regulations (2001) have been put in place to operationalise the Land Act. The Regulations give details on how matters such as application for Certification of Occupancy, converting leasehold into freehold system, formation of Community Land Associations, procedures for paying annual ground rent by bona fide occupants to landlords, etc.

4.2.9 The Local Government Act, 1997

The Act establishes a form of government based on the district as the main unit of administration. Under Sections 36-45 of the Act, districts are given legislative and planning powers. They are also enjoined to plan for the conservation of the environment within their local areas. District Environmental Committees established under section 15 of the National Environment Act Cap 153 are supposed to guide the district authorities in that regard.

Local governments are responsible for the protection of the environment at the district level. This therefore, implies that local governments shall be consulted on projects to be located within their jurisdiction and on matters that affect their environment.

Consultations were made with Natural Resources Departments in Nwoya and Kiryandongo in order to capture their issues and concerns.

4.2.10 Labour Laws

This section reviews some sections of labour laws relevant to employment, industrial relations and workers' conditions in the proposed project. It should be noted that some of these laws are under review by Parliament.

The labour laws relevant to employment, industrial relations and workers' conditions during implementation of the project are set out in the Employment Act (2006) and Employment Regulations (1977), the Workers' Compensation Act (2000), Labour Disputes (Arbitration and Settlement) Act, (2006) and Labour Unions Act, 2006. The Employment Act (2006) gives a provision for a Labour Advisory Board that advises on matters affecting employment and industrial relations. Ugandan labour laws address matters below which will be important for employee management during road construction:

a. Contracts of Service;

b. Employment of children/ child labour;

c. Termination of Contracts;

d. Illness of employees;

e. Sexual harassment;

f. Occupational diseases;

g. First-Aid;

h. Dust and fumes;

i. Meals in certain dangerous trades;

j. Protective clothing and appliances;

k. Protection of eyes in certain processes;

l. Treatment of injuries and sickness;

m. Drugs and medical equipment;

n. Examination of employees; and,

o. Failure to provide for the sick.

4.2.11 Roads Act, Cap 358

This is a critical piece of legislation with respect to the Bridge and road projects. Standard road reserve requirements will therefore, have preference under the law and that UNRA, within this mandate may have to acquire such land in line with this standard requirements. Further, the Act allows the roads authorities to extract and take materials from the road reserve for the construction and maintenance of roads.

4.2.12 National Forestry and Tree Planting Act, 2003

The Act ensures that forests and trees are conserved and managed in a manner that meets needs of the present generation without compromising rights of future generations by safe guarding forest biological diversity and the environmental benefits that accrue from forests and trees. The Act facilitates greater public awareness of cultural, economic and social benefits of conserving and increasing sustainable forest cover. The new Karuma Bridge passes through forested sections of the Karuma Game Reserve, hence the importance of this Act.

4.2.13 Traffic Act, 2002

The traffic Act 2002 consolidates laws relating to traffic on all public roads. The Act also prohibits encroachment on and damage to roads including roads reserves and in this sense, this Act is relevant to the project.

4.2.14 Access Roads Act, Cap 350

The Access Roads Act regulates the rights of private landowners who have no reasonable means of access to public highways through adjoining land. The Act further provides for maintenance of access roads in a good and efficient state of repair and for payment of compensation to land owners of adjoining land in respect of the use of the land, the destruction of crops, trees and such other property. In essence, this means that bridge and access road construction should take into consideration access to the highways.

4.2.15 Explosives Act, Cap 298

The state owns all the rights to importation and storage of quarrying explosives and exercises this right through The Explosives Act (Cap 309 of the Laws of Uganda). It is mandatory for quarry operators to comply with this law. This Act regulates use and management of explosives for civil purposes. Under this Act, explosives are kept at a site approved by the Ministry of Internal Affairs (MoIA) and can only be transported to the blast site under Police escort. Charging of explosives and blasting are carried out under Police supervision. For stone quarrying where explosives will be used, provisions of this Act will be relevant to this project.

4.2.16 Petroleum Supply Act 2003

The Act provides for the supervision and monitoring of transportation, supply, storage and distribution of petroleum products by road construction contractors. The Act regulates licensing and control of activities and petroleum installations for protection of public health and safety and control of environmental pollution.

Section 3, Part (d) ensures public safety and protection of public health and the environment in all petroleum supply operations and installations.

According to this Act, "petroleum products" includes asphalts and bitumen, oils as well as conventional petroleum fuel. This Act will apply to management (construction, operation and decommissioning) of fuel handling facilities during bridge and road construction including fuel transportation, constructing and operation of storage tanks and consumption of petroleum products. Section 17(1) prohibits constructing a petroleum products installation without having obtained a petroleum construction permit. Section 18 provides guidance on process leading to securing this permit.

Section 32(1) requires owners of fuel facilities to comply with local and international public health and safety and environmental obligations prescribed by Uganda National Bureau of Standards (UNBS) and NEMA. In this regard, provision of impervious bunds around tank farms would be a standard obligation at fuel storage areas. Such bunds should have capacity enough to hold 100% volume of the largest tank in case of spill emergency. The bunds should be constructed such as to prevent soil contamination. By interpretation of this clause, fire safety at storage areas would also be a regulatory requirement. Of equal importance would be remediation of any contaminated areas on site, in interest of public health and contravention of all foregoing constitutes offences according to Sections 37 and 39 of the Act.

Part IV Chapter 17(a) prohibits any person from carrying out the construction or major modifications of an installation or facility without having obtained a petroleum construction permit under this Act. All foregoing provisions will be important for construction and operation of onsite fuel storage facilities during bridge and road construction.

4.2.17 Historical Monuments Act, Cap 46

This Act provides for the preservation and protection of historical monuments and objects of archaeological, paleontological, ethnographical and traditional interest. The historical monuments act, Cap 46 gives mandate to the Department of Museums and Monuments to collect document and preserve cultural relics that have values to the community, the nation and the international community. Chance find objects that may be found during the Karuma Bridge works will therefore, be reported to the Department of Museums and Monuments for advice and where necessary undergo a forensic assessment in case of any chance finds during works.

4.2.18 Mining Act, 2003

Bridge and Road construction has auxiliary activities including stone quarrying and borrows materials extraction. Such activities especially stone quarrying involve excavations or working where any operations are connected with mining including erections and appliance used in connection with such operations. These activities, therefore, are a subject of this Act.

Requirements under Part XI for the Protection of the Environment under the Act are therefore, relevant. Such requirements include Environmental Impact Assessment and Audits and Environmental standards for the prevention and minimization of pollution of the environment and waste management. Under section 110 (2b) gives guidance on restoration activities. It provides that the environmental restoration plan shall include a detailed timetable for accomplishment of each major step to be carried out under the restoration plan which may include reinstatement, levelling, re-vegetation, reforesting and contouring of disturbed land; the filling in, sealing, or fencing off of excavations, shafts and tunnels.

The Mining Act (Cap 148) limits human settlement to a radius of not less than 500 meters from a quarry site. This regulation will be important for independent ESIA studies to be conducted for each quarry sites selected by the contractor.

4.2.19 Draft National Air Quality Standards, 2006

Considering that construction equipment and machinery are powered by diesel/ gasoline engines, pollutants such as CO_2, NO_x, SO_x, VOC and particulates are expected to be emitted. The draft national air quality standards provide the following regulatory limits for these emissions.

Table 4.1: Regulatory air quality standards for selected pollutants

Pollutants	**Averaging time for ambient air**	**Standard for ambient air**
Carbon dioxide (CO_2)	8 hr	9.0 ppm
Carbon monoxide (CO)	8 hr	9.0 ppm
Hydrocarbons	24 hr	5 mgm-3
Nitrogen oxides (NO_x)	24 hr 1 year arithmetic mean	0.10 ppm
Smoke	Not to exceed 5 minutes in any one hour	Ringlemann scale No.2 or 40% observed at 6m or more
Soot	24 hr	500 µg/Nm-3
Sulphur dioxide (SO_2)	24 hr	0.15 ppm
Sulphur trioxide (SO_3)	24 hr	200 µg/Nm-3

4.3 OTHER RELEVANT REGULATIONS

A number of regulations have been put in place to operationalise the different legislative and policy provisions and requirements. The following regulations that apply to the implementation of the New Karuma Bridge have been reviewed.

4.3.1 The National Environment (Noise Standards and Control) Regulations, 2003

Part II regulation 6, specifies the acceptable permissible noise levels. Sub regulation (1) notes that; no person shall, for an activity specified in regulation 6, emit noise in excess of the permissible noise level, unless permitted by a license issued under these Regulations. Sub regulation (2) specifies that any person who contravenes sub-regulation (1) commits an offence.

Part III regulation 8 sub regulation (1) notes that; it is the duty of the owner of machinery or the owner or occupier of a facility or premises, to use the best practicable means to ensure that the emission of noise from that machinery, facility or premises does not exceed the permissible noise levels. Sub regulation (2) states that; the owner of machinery, or the owner or occupier of an industry or establishment shall install, at the premises, sound level meters for the measurement and monitoring of sound from the industry or establishment.

Part IV regulation 12 sub regulation (1) requires the owner or occupier of premises whose works or activities are likely to emit noise in excess of the permissible noise levels to apply to the Executive Director of NEMA in the form prescribed in Part I of the Second Schedule, for a license to emit noise in excess of the permissible levels. A license shall contain the following;

a) the plant or machinery to be used;

b) the hours during which the works or activities may be carried out;

c) the level of noise which may be emitted in excess of , the permissible noise levels;

d) the works or activities and the method by which they are to be carried out; and

e) the steps proposed to be taken to minimize noise resulting from the works or activities.

4.3.2 The National Environment (Waste Management) Regulations, S.I. No 52/1999

Regulation 4 (4), a person who generates domestic waste shall sort the waste by separating hazardous waste from non-hazardous waste in accordance with the methods prescribed under sub-regulation (3).

Regulation 12 (1) specifies that no activity shall be allowed to discharge or dispose of waste in any state into the environment, unless the waste has been treated in a treatment facility and in a manner approved by the lead agency in consultation with the Authority. Sub regulation (2) notes that anyone or agency operating a facility, which discharges or disposes of any waste, whether treated or not, into a disposal site or plant which is not approved or licensed in accordance with these Regulations commits an offence.

Regulation 13 (1) notes that any person intending to operate a waste treatment plant or disposal site shall apply to the Authority for a license.

Regulation 17(1), every person who operates a waste treatment plant or disposal site shall take all necessary measures to prevent pollution from the site or plant, including the erection of necessary works and instituting of mitigation measures.

4.3.3 The National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, No. 3/2000

Regulation 12 (1) and (2) of the regulations specify that, a person shall not carry out any activity in a wetland without a permit issued by the Executive Director of NEMA. Any person intending to carry out an activity listed in the Second schedule to these Regulations shall apply to the Executive Director for a permit.

Part IV regulation 34 (1) requires a developer desiring to conduct a project which may have a significant impact on a wetland, river bank or lake shore, to carry out an environmental impact assessment in accordance with sections 19, 20 and 21 of the Act.

4.3.4 The Water Resources Regulations (1998)

Regulation 3(1): A person who occupies, wishes to construct, own or control any works on or adjacent to the land referred to in regulation 10; may apply for a water permit.

4.3.5 The Water (Waste Discharge) Regulations (1998)

According to Regulation 4 (1) of the Water (Waste Discharge) Regulations (1998): No person shall discharge effluent or waste on land or into aquatic environment contrary to the standards established under regulation 3 unless he or she has a permit in the format specified in the First Schedule issued by the Director unless he or she has a permit in the format specified in the First Schedule issued by DWD.

The Executive Director of NEMA may, from time to time, give directions in writing to any person or class of persons, requiring applying specifically stated methods of cleaner production to achieve the goals of cleaner production stated in the directive.

4.3.6 Standards for Discharge of Effluent into Water or on Land Regulations, S. I. No 5/1999

Section 4 general obligation sub regulation (1) and (2) provides that every industry or establishment is required to install at its premises, anti-pollution equipment for the treatment of effluent chemical discharge emanating from the industry or establishment. Equipment installed should be based on the best practicable environmentally sound practice or according to other guidelines as the Executive Director may determine.

Section 6 sub regulation (1) of the Regulations provides measures for punishment in case one commits an offence. The offender is liable, on conviction, to imprisonment for a term not exceeding eighteen months or to a fine not less than one hundred and eighty thousand shillings and not more than eighteen million shillings or both.

4.3.7 Environmental Impact Assessment Regulations, 1998

These Regulations reinforce the EIA requirement and describe procedures to be followed in conducting EIA of projects. The regulations also charge the developer with the responsibility of ensuring that mitigation measures from the EIA are complied with. In this regard, therefore, UNRA has conducted the EIA in line with national requirements and will ensure that recommendations proposed are implemented.

These regulations require projects to undertake post assessment environmental audits to assure that predictions made during the assessment are properly managed. The regulations provide for self-auditing by the project owners (Section 31) and by NEMA (Section 32). The regulations require a project to undertake first audit not less than 12 months but not later than 36 months from project commencement, and submit findings thereof to NEMA.

4.3.8 The National Environment (Audit) Regulations, 2006

These Regulations apply to the undertaking of Environmental Audit Reports and the establishment of Environmental Management Systems within Lead Agencies. With respect to Environmental Audits, the Regulations state that "A person shall not carry out an environmental audit unless that person has been duly certified and registered in accordance with the National Environmental Practitioners (Conduct and Certification of Environmental Practitioners) Regulations 2003". An audit of the project will be undertaken in not less than 12 months but not later than 36 months from project commencement, and submit findings thereof to NEMA.

4.3.9 The National Environment (Control of Smoking in Public Places), Regulations 2004

Under this law, a public place is defined as, "any place to which members of the general public or segments of the general public ordinarily have access by express or implied invitation and includes any indoor part of a place specified in this schedule" and these places include, office buildings, work places, eating areas, toilets and public service vehicles. The regulations task owners of such places to designate "**NO SMOKING**" and "**SMOKING AREAS**" in premises hence these laws regulate smoking in public areas.

In regard to proposed new Karuma Bridge project, these regulations will apply to areas communally used by construction workers such as site offices, eating areas and camp sites. Fuelling areas and areas for storage of used oils, transport vehicles are other areas that shall be restricted. Requirements of these regulations should be fulfilled to avoid exposure of workers to tobacco SHS and attendant health risks.

4.3.10 The Traffic and Road safety (Rules of the Road) Regulations, 2004

Stipulates that Uganda police will be responsible for ensuring that law and order on the road is maintained. Section 5 on traffic regulation states that "The police can regulate the traffic as circumstances require" National Road Safety Council (NRSC) under the regulations are to:

(a) Encourage and provide training and education for road users;

(b) increase the road user's knowledge of particular hazards, how they arise and how to cope with them;

(c) Induce a more positive attitude to road safety through lectures, demonstrations, campaigns or any other means;

(d) To alter the road user's behaviour so that he or she does not put himself or herself or others at risk;

(e) To collect, prepare and disseminate educational material on road safety;

(f) To prepare and promulgate fully integrated programmes of public information and publicity by means of all appropriate media of mass communication;

4.3.11 The UNRA's Land Acquisition Management System, 2009

UNRA Land Acquisition Management system is compliant with ISO9001 and is the framework in which land acquisition for the road reserve (50 m in rural areas and 30 in urban areas. Compensation should be aimed at minimizing social disruption and assists those who have lost assets as a result of a road project to maintain their livelihoods. In accordance with Ugandan laws and standards, a disturbance allowance (30 % in less than 3 months and 15% for less than 6 months) is to be provided to assist the project affected individual or family to cover costs of moving and locating to a new holding; and community infrastructure must be replaced and ideally be improved in situations where it was deficient. This includes installation of sanitary facilities, electricity generation systems, road links and provision of water.

4.4 Environmental and Social Safeguards Policies of Development Partners

4.4.1 World Bank Safeguard policy and guidelines

The World Bank screens projects based on their potential environmental impacts, in order to classify them as A, B or C. The proposed project would be classified as a Category A project, owing to potentially significant environmental and social impacts, which triggered a full environmental assessment. World Bank (WB) requires environmental assessment (EA) of projects to be undertaken to ensure that development projects are environmentally sound and sustainable. The Bank's Environmental Assessment policy and procedures are described in Operational Policy/Bank Procedures - OP/BP 4.01. This policy is the umbrella policy for the Bank's environmental "safeguard policies". Other safeguard policies relevant to the project include: Natural Habitats (OP 4.04), Forests (OP 4.36), Physical Cultural Resources (OP 4.11), and Involuntary Resettlement (OP 4.12).

4.4.1.1 Environmental Assessment (OP/BP 4.01)

This Policy examines potential environmental risks and benefits associated with WB-financed investments and support integration of environmental and social aspects of investments into the decision-making process. The Policy gives guidance to the EIA process using appropriate instruments to assess, minimize and mitigate potentially adverse impacts. Based on type, location, sensitivity and nature of environmental impacts, it provides for categorization under environmental screening. The policy emphasizes conduct of EIA in compliance with Bank rules, national laws and international agreements, consultations with affected people local non-governmental agencies (NGOs) and disclosure of ESIA documents.

While the proposed project entails building of a new Karuma Bridge, this policy is triggered given that the project will include civil works and building of new structures in so far as negative localized environmental impacts are expected but preventable through responsive mitigation measures.

4.4.1.2 Physical Cultural Resources (OP 4.11)

The Policy ensures that Physical Cultural Resources (PCR) are identified and protected and national laws governing the protection of physical cultural property are complied with. Findings of physical cultural resources (PCR) survey indicate resources that might be chanced upon during bridge and road construction. The project's civil works may lead to accidental finds or physical cultural resources, or have potential to affect cultural resources. The ESIA provides guidelines for handling chance finds. Uganda has good legislative and normative framework (Historical Monuments Act of 1967 and National Environment Act Cap 153), under the oversight of the Department of Museums & Monuments with archaeologists having experience in procedures to recover "chance findings" in line with national regulations. UNRA will ensure that conservation of cultural resources is a demonstrable requirement in bidding documents and contracts for bridge civil works.

4.4.1.3 Involuntary Resettlement (OP 4.12)

The Policy provides affected people with opportunities for participation and assists displaced people regardless of legality of tenure in the efforts to improve their incomes and standards of living or at least to restore them. The new Karuma Bridge does not lead to involuntary resettlement or displacement. However, there is a possibility of land acquisition or displacement of land uses due to civil works and establishment of infrastructure. The specific sites or locations of some of the projects physical activities are not known. A Resettlement Action Plan (RAP) for the project will be carried out before the relevant civil works are initiated, should any be required. The RAP will also describe the land tenure arrangements and any risks that could affect land acquisition leading to involuntary resettlement and/or restrictions of access to resources and livelihoods and Uganda Government shall provide compensation to all affected persons, properties and resources if any.

4.4.1.4 Forests (OP 4.36)

The policy ensures that natural forest areas are not destroyed. The proposed alignment of the new Karuma Bridge and access road passes through a forested section of Karuma forest reserve and this policy will be triggered by the contractor during vegetation clearance of trees during construction. UNRA, the project proponent commits that localised clearance of forest resources will be properly planned with UWA during the construction.

4.4.1.5 Natural Habitats (OP/BP 4.04)

The Policy safeguards natural habitats and their biodiversity, avoids significant conversion or degradation of critical natural habitats and ensures sustainability of services and products which natural habitats provide to human society. Given the anticipated scale of the project, physical interventions, the project is anticipated to have potential significant adverse impacts on critical natural habitats, e. g. Karuma game reserve and conservation areas, or on natural habitats. The policy is triggered due to likely location of some project activities in protected areas. Identification of potential natural habitat issues have been built into the ESIA to ensure that project interventions that would have significant adverse impacts are identified, adequately consulted upon, and their impacts avoided, mitigated or compensated.

4.4.1.6 Projects on International Waterways OP/BP 7.50.

This policy will be triggered by the contractor during construction since the project crosses the Nile River which is an international water way. UNRA, the project proponent commits that the impacts will be localised and properly planned with other stakeholders during the construction. No major impacts on international waterways are envisaged.

4.4.1.7 Public Disclosure Policy (BP 17.50)

Category A and B projects of the Bank require financing of a project that has under gone a meaningful consultation between the borrower, project affected groups and local NGO's. Disclosure in form of consultations and language that is understandable and accessible to the groups being consulted. Once the borrower officially transmits the Category A EA report to the Bank, the bank distributes the summary to the executive director and makes the report available through its Info Shop.

4.4.2 African Development Bank

The African Development Bank (AfDB) is a another potential lender to the Government of Uganda, as such, there will be need for consistency in AfDB's Integrated Environmental and Social Assessment Guidelines (2003), as well as various cross cutting themes as they relate to the environment, community development, gender issues, broad community support, etc. Other AfdB Policies/Guidelines that will need to be recognized in undertaking the community engagement programme include:

Environmental Review Procedures for Private Sector Operations of the African Development Bank; and Policy on resettlement and involuntary Displacement.

The projects assigned to Category 1 are required to undertake a full Environmental and Social Impact Assessment (ESIA), including the preparation of an ESIA Report and Environmental and Social Management Plan (ESMP). These projects may also be improved by carrying out complementary studies that are not specifically required under the ESAP.

It is a requirement that the local population is informed of the results of the ESIA and their opinions about the proposed recommendations solicited. The ESIAs are released in the borrowing country project areas at some public places accessible to the potential beneficiaries, affected groups and local CSO. Once the ESIA is released in the borrowing country and submitted officially to the Bank, it is made available to the public through the PIC website and field offices.

For Category 1 projects (such as roads), AfDB will disclose an ESRS on its Info Shop. This document will not be disclosed locally. AfDB requires a 120-day International disclosure period.

4.4.3 Japan International Cooperation Agency (JICA)

JICA requires recipient governments to undertake studies and incorporate environmental and social considerations in the planning and decision-making processes. It also requires disclosure of information on environmental and social considerations by recipient governments, in order to ensure accountability and to promote participation of various stakeholders. JICA further requires a disclosure of the Scoping Reports and Draft Final Reports.

JICA aims to ensure compatibility with the guidelines of the World Bank, the Asian Development Bank and other International organisation regarding flow of procedure for environmental and social consideration with stakeholders, categorization for screening, and items for environmental assessment reports and resettlement action plans.

Top priority is given to the application of the law and regulations of the host country and other related parts for example its laws on environment and social considerations are insufficient compared to JICA Guidelines for its consideration are JICA Guidelines are applied.

4.5 Multilateral Environmental Agreements

Below are some of the Multilateral International Agreements or Conventions of potential relevance to the proposed project which Uganda signed and/or ratified.

4.5.1 Convention on Biological Diversity (CBD-Rio de Janeiro 1992)

This convention's main goal is to ensure the conservation of biological diversity and sustainable use of its components. Countries ratified to this convention are required to undertake ESIA for projects likely to have significant adverse effects on biodiversity and are required to develop national plans and programmes for the conservation and sustainable use of biodiversity.

The Convention has three main objectives all of which have implications for EIA, these are: to conserve biological diversity; the use biological diversity in a sustainable fashion and to share the benefits of biological diversity fairly and equitably (Art1). The Convention makes the following requirements in relation to EIA:

- Parties are required to use EIA effectively to avoid or minimize significant adverse impacts on biodiversity; (Article.14)
- Parties are also required to promote consultation on activities that are likely to significantly affect adversely the biodiversity of areas beyond the limits of national jurisdiction, by encouraging the conclusion of bilateral, regional or multilateral arrangements, as appropriate.

The Convention introduces Strategic Environmental Assessment (SEA) to assess environmental implications of policies and programmes particularly for those which major implications for natural resource use for example, transport, hydropower.

4.5.2 The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973

This convention seeks to ensure that international trade in species of wild fauna and flora does not threaten their survival in wilderness. Species on the CITES lists are considered of conservation concern.

The major role of CITES, 1973 is to prevent international trade from threatening the survival of wild fauna and flora. To achieve the above objective, CITES has established an international network for the control of international trade in live and dead animals and plants and of parts and derivatives thereof. Control of international trade in endangered species is primarily done through government permits/certificates required for such trade. Monitoring international trade is based on Trade Records.

The Convention functions as the result of permit system for species listed in three categories. Appendix I species include those threatened by extinction, which are or may be affected by trade.

Here, Appendix II species are those that may become threatened with extinction if trade is not strictly regulated. And Appendix III species include those species, which individual Parties to the Convention choose to make subject to regulations and which require the cooperation of the other Parties in controlling trade. This convention seeks to ensure that international trade in species of wild fauna and flora does not threaten their survival in the wilderness. Species on the CITES lists are considered of conservation concern.

4.5.3 The Ramsar Convention on Wetlands, 1971:

This convention on wetlands of international importance especially as waterfowl habitat (or Ramsar Convention 1971) as amended in 1982 and 1987 was ratified by Uganda in 1988.

The Ramsar Convention seeks to ensure the wise use of all wetlands and provides for the more stringent conservation of those wetlands listed in the List of Wetlands of International Importance. It also seeks to promote the conservation of wetlands and waterfowl and compensate for any loss of wetland resources. The Ramsar Convention (and protocols there under) has provisions for EIA on activities to be conducted on wetlands. Article 3.1 requires contracting parties to formulate and implement their planning so as to promote the conservation of the wetland included on the list and as far as possible the wise use of wetlands in their territory. Article 3.2 requires parties to arrange to be informed at the earliest possible time if the ecological character of any wetland in its territory and included in the list (or wetlands of international importance) has changed, is changing or is likely to change as the result of technological developments, pollution or other human interference.

Resolution VII.16 adopted by the 7th Conference of the Contracting Parties, San *José, Costa Rica,1999)* calls upon contracting parties to ensure that projects, plans, programmes and policies with the potential to alter the ecological character of wetlands (Ramsar list) or impact negatively on other wetlands within their territories are subject to rigorous impact assessment procedures including public involvement (of local communities likely to be affected).

The convention provides further that contracting parties with shared wetlands an drivers with shared wetlands and river basins encourage cooperation approaches to impact assessment with neighbouring countries. EIA should not be restricted merely to the site of the proposed development, or the defined wetland, but should address external other elements such as upstream/downstream influences, and should have regard to interactions between all components of water systems at the catchments level. This convention on wetlands of international importance especially as waterfowl habitat (or Ramsar Convention 1971) as amended in 1982 and 1987, was ratified by Uganda in 1988. The Murchison Bay wetland system at the northern tip of Lake Albert is an important bird habitat and spawning ground for Lake Albert fisheries. This wetland and the Victoria Nile stretch up to Murchison Falls are designated a Ramsar site (Site No. 1640. Date designated: 15/09/06). However, this site is far from the proposed site for the New Karuma Bridge.

4.5.4 The Stockholm Convention on Persistent Organic Pollutants

It's a convention that gives information on chemicals that are known to be persistent in the environment and how they should be managed. It seeks to protect human health and the environment from POPs: organic (carbon-based) compounds that resist degradation in environment, have low water but high fat solubility and bio accumulate in fatty tissues. Examples include dioxins and furans, PCBs and are toxic to humans and wildlife. In respect to the proposed Bridge project, POPs would arise from open-air combustion of waste especially if this is done at workers camp. At workers camps and other sites during construction, open-air combustion of waste therefore should be avoided.

4.5.5 Strategic Approach to International Chemicals Management (SAICM)

This is relevant to chemicals management provides a policy framework to guide efforts to achieve the Johannesburg Plan of Implementation goal that, by 2020, chemicals will be produced and used in ways that minimize significant adverse impacts on environment, human health and thus avoiding risk to public and environmental health

4.5.6 The Convention on the Conservation of Migratory Species of Wild Animals, 1979

This convention aims to conserve terrestrial, marine and avian migratory species throughout their range. The Convention on conservation of migratory species of wild animals, (1979), in Article3.4 requires parties to under take appropriate measures to prevent the endangering of migratory species. In that regard, EIA and SEA serve as important tools for implementing Article 3.4 of the protection of migratory species specified in Appendix 1 of the convention.

4.5.7 The United Nations Environment Programme (UNEP) Principles on Shared Natural Resources, 1978

These are principles regarding natural resources shared by two or more States. They are based on the principles of good faith and the spirit of good neighbourliness. Principle 4 recommends that states undertake “environmental assessment before engaging in any activity with respect to shared natural resources which may create a risk of significantly affecting the environment of another state or states sharing that resource”.

4.6 THE REGIONAL EIA AND REGULATORY FRAMEWORK

4.6.1 The Nile Basin Initiative and its Investment Programs

The Nile Basin Initiative (NBI) is a partnership initiated and led by the riparian states of the Nile River through the Council of Ministers of Water Affairs of the Nile Basin states (Nile Council of Ministers, or Nile-COM). The NBI seeks to develop the river in a cooperative manner, share substantial socioeconomic benefits, and promote regional peace and security. Cooperative water resources management is complex in any international river basin. In the Nile Basin, which is characterized by water scarcity, poverty, a long history of dispute and insecurity, and rapidly growing population sand demand for water, it is particularly difficult. The NBI started with a participatory process of dialogue among the riparians that resulted in their agreeing on a shared vision—to achieve sustainable socioeconomic development through the equitable utilization of, and benefit from, the common Nile Basin water resources.

Recognizing that cooperative development holds the greatest prospects for bringing benefits to the entire region, and aware of the challenges, the Nile riparians took an historic step in establishing the Nile Basin Initiative. Formally launched in February1999, the initiative provides an institutional mechanism, a shared vision, and a set of agreed policy guidelines to provide a basin wide framework for cooperative action.

The Strategic Action Program represents the Nile riparians' strategic approach to achieving sustainable socio-economic development in the basin through "equitable utilization of, and benefit from, the common Nile Basin water resources." The Strategic Action Program provides the means for translating this shared vision into concrete activities through a two-fold, complementary approach:

- Lay the groundwork for cooperative action through a regional program to build confidence and capacity throughout the basin (the Shared Vision Program)
- Pursue, simultaneously, cooperative development opportunities to realize physical investments and tangible results through sub-basin activities (Subsidiary action programs) in the Eastern Nile and the Nile Equatorial Lakes regions

4.7 Administrative and Institutional Frame work

4.7.1 National Environment Management Authority

The National Environment Management Authority (NEMA) was created following the enactment of the National Environment Statute (NES) in 1995, and is charged with the responsibility to oversee, coordinate and supervise environmental management in Uganda. Since its formation in 1996, NEMA has put a strong emphasis on developing environmental policies, laws and guidelines as evidenced by the large number of environmental regulations that have been enacted over the last few years.

NEMA's overall goal is to promote sound environmental management and prudent use of natural resources in Uganda through its objectives including:

- To develop environmental policies, laws and guidelines for regulating the environment;
- To enforce environmental standards and regulations;
- To build capacity for environmental planning management and monitoring within partner institutions and districts;
- To monitor the environment and disseminate accurate and up-to-date environmental information;
- To ensure integration of environmental concerns into planning at the centre, the district and local levels; and
- To promote awareness programs and increase public knowledge about environmental issues.

4.7.2 Uganda Wildlife Authority

Uganda Wildlife Authority (UWA) is a statutory body established by the Uganda Wildlife Act 2000. It became operational in August 1996 after the merger of the then Game Department with the Uganda National Parks. UWA is a key stakeholder in this New Karuma Bridge since the project components are within the KWR and its mandate is to:

- Management and conservation of wildlife in Uganda, both in and outside the wildlife protected areas (PAs) i.e. National Parks, Wildlife Reserves and Wildlife Sanctuaries.
- Promoting public participation in wildlife management using mechanisms such as wildlife use rights, as a means of eradicating poverty, through community conservation programs, and promoting wildlife as a form of land use.
- Ensuring the protection of rare, endangered and endemic species of wild plants and animals, through provision of appropriate wildlife policies, management plans and promotion of wildlife management best practices.
- Ensuring timely and appropriate response to reported problem animals, in collaboration with the concerned communities and respective local authorities.
- Enhancing economic benefits from wildlife management through promotion of tourism.
- Implementing relevant international treaties, conventions, agreements or other arrangements to which Uganda is a party.

In line with the mandate, UWA's mission is to conserve and sustainably manage the wildlife and the protected areas of Uganda in partnership with neighbouring communities and other stakeholders, for the benefit of the people of Uganda and the global community". UWA is responsible for the management of 10 National Parks, 12 Wildlife Reserves (including KWR) and 7 Wildlife Sanctuaries and provides guidance over the management of 5 Community Wildlife Areas.

4.7.3 Wetlands Management Department

The Wetlands Management Department (WMD) under the Ministry of Water and Environment (MW&E) takes the lead on all the day-to-day management issues of Wetland resources in Uganda. It implements the Wetlands Policy in collaboration with other lead agencies notably NEMA.

At district level, a Department of Environment (headed by the District Environment Officer) coordinates wetland work and an attempt has been made in various districts to have a Wetland Officer appointed. Even at village level, one of the members of the village council takes care of the environment and wetland related issues.

4.7.4 The National Water and Sewerage Corporation

National Water and Sewerage Corporation (NWSC) is mandated to supply water and provide sewerage services as a water and sewerage authority under the National Water and Sewerage Corporation Act, Water Supply Regulations, 1998 and Sewerage Regulations, 1999.

4.7.5 National Physical Planning Board

This is mandated with all matters related to physical planning. The board advises government on physical planning issues, causes physical plans to be prepared at national, regional, district, urban and Sub County levels, hears appeals lodged by persons and local governments on decisions of local planning committees approves regional, urban and district physical development plans and recommend to the minister national plans for approval, and advises the minister on which areas to gazette/ declare as planning areas.

4.7.6 The Ministry of Water and Environment

The Ministry of Water and Environment (MoWE) has the overall responsibility for initiating national policies and for setting national standards and priorities for water resources management and environmental regulation. A multidisciplinary team representing stakeholders and constituting the Water Policy (WPC) advises the Minister on the above functions and is mandated to initiate revisions to legislation and regulations. The key functions of the MoWE are to promote the rational and sustainable utilization and/or development of the water resources while conserving relevant surrounding watershed environment in Uganda. They are several divisions within the MoWE and these are:

- The Directorate of Water Development (DWD) which is in charge of the promoting the rational management and use of water resources of Uganda by coordinating and regulating activities that may impact water quality and quantity.
- Quality and quantity of water in water courses is monitored and regulated by the Directorate of Water Resources Management (DWRM), which also issues permits for water abstraction and effluent disposal.
- The Wetland Department (WD) is another technical unit in the Ministry which advises government on technical matters and policies related to sustainable wetland conservation and management.
- The Department of Meteorology is responsible for providing climate and weather information to any stakeholders engaged in national development activities in Uganda.

The key concerns during the implementation of the New Karuma Bridge are water quality and quantity and water abstraction. The New Karuma Bridge should not lead to the interference with the natural and normal hydrology of the Nile River as well as the quality of water resources..

4.7.7 The Ministry of Gender, Labour & Social Development

MGLSD is the leading and coordinating agency for the Social Development Sector. In collaboration with other stakeholders, MGLSD is responsible for community empowerment, protection and promotion of the rights and obligations of the specified vulnerable groups for social protection, employment and gender responsive development. The new Karuma Bridge has a lot of issues related to labour and social development. The ministry in collaboration with the Contractor and other stakeholders will work towards the implementation of the labour, employment and occupational safety and health provisions as provided for under the regulatory instruments within this Ministry.

4.7.8 The Ministry of Tourism, Wildlife & Heritage

UWA and the Department of Museum and Monuments who are key stakeholders in the New Karuma Bridge fall under. The Department of Museum and Monuments is responsible for policy formulation, planning and coordination of conservation and development of museums and cultural heritage while the Wildlife Conservation Department is one of the three Departments that constitute the Directorate of Tourism, Wildlife and Museums and monuments. Another department is the Tourism Development Department. The Wildlife Conservation sector draws its mandate from the Constitution of the Republic of Uganda, 1995 under the National objectives and directive principles of State policy XXIII and XXVII; Articles 39 and 189 (1); and Uganda Wildlife Act (Cap.200). UWA, UNRA, MoWE in collaboration with the Ministry of Tourism, Wildlife and Heritage will implement the recommendations provided in the monitoring and management plans for The New Karuma Bridge especially within the wetland area to ensure that appropriate technology is implemented for wildlife conservation and tourism development.

4.7.9 Ministry of Tourism, Wildlife and Heritage also serves as:

- The Uganda's management authority for the Convention on International Trade in endangered species of fauna and flora(CITES);
- National focal point for the Convention on Migratory Species (CMS);
- Uganda's focal point for the Lusaka Agreement on the Cooperative Enforcement Operations
- Directed against Illegal trade in fauna;
- National focal point for African-Eurasian Water bird Agreement (AEWA) and;

4.7.10 The Ministry of Lands, Housing & Urban Development (MoLHUD)

The mandate of the Ministry of Lands, Housing & Urban Development (MoLHUD) is to ensure rational and sustainable use, effective management of land and orderly development to urban and rural areas as well as safe, planned and adequate housing for socio-economic development. MoLHUD is responsible for providing policy direction, national standards and coordination of all matters concerning lands, housing and urban development. MoLHUD is also responsible for putting in place policies and initiating laws that ensure sustainable land management promote sustainable housing for all and foster orderly urban development in the country.

Land Administration and Management fall under the Directorate of Land Management. The general functions of Land administration and management include: land management, registration, mapping, surveying and valuation of properties, coordination and supervision. It is also responsible for the facilitation of policy, legal and regulatory framework development, land dispute resolution (with emphasis on alternative dispute resolution), provision of public information on land rights,

Geomatics and land information, promotion of good governance, effective and efficient delivery of land services, and planning for implementation of land sector reforms. The National Physical Planning Board is responsible for ensuring orderly, progressive and sustainable urban and rural development through appropriate physical planning. The department of Survey and Mapping is responsible for the establishment of survey and geodetic controls, quality checks of cadastral jobs, survey of government land and international boundaries, production and printing of topographical maps.

4.7.11 The Ministry of Works and Transport

The Ministry of Works and Transport (MoWT) is responsible for construction and maintenance of trunk roads in Uganda. Wherever a road development would have effect on private property, Government of Uganda and development partners require equitable compensation to minimise social disruptions or negative effects on people's livelihoods arising from road construction. Compensations assist people who lose assets as a result of a road project to maintain their livelihood through income restoration.

4.7.12 The Ministry of Agriculture, Animal Industry and Fisheries

The Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) through the Fisheries Department is responsible for promoting sustainable management of fish and fisheries resources in Uganda. Given that water contamination may affect fish breeding grounds and fish stocks in the Nile River, MAAIF should come for inspection and enforcement of standards especially regarding aquatic life habitat.

4.7.13 Uganda National Road Authority (UNRA)

Uganda National Roads Authority (UNRA) was established by The Uganda National Authority Act, No. 15 of 2006 and became operational on 1st July 2008. The mandate of UNRA has the developer is to maintain national road system, advise Government on general roads policy and contribute to addressing transport concerns. In this project UNRA is both a developer and lead agency. As a lead agency, UNRA manages national roads infrastructure and is responsible for mitigation of impacts associated with road development. As a developer on the other hand, UNRA is required to comply with national environmental laws including undertaking EIA for road projects.

4.7.14 National Forestry Authority (NFA)

The body responsible for forests in the country will closely monitor the activities of the project at the forested areas as mandated to ensure that it will not be adversely affected.

4.7.15 Petroleum Supply Department

The mandate of the Petroleum Supply Department and the Midstream Petroleum Unit (MSU) is to promote, regulate and monitor petroleum supply in Uganda in an environmentally safe and sustainable, free and competitive market. The main policy goal of the Department is to meet the petroleum products needs of the Ugandan population for social and economic development.

4.7.16 The Local Administrative Structures

The district land boards of Kiryandongo and Nwoya are responsible for land allocation at local government level in regard to this project. All sub-components of the proposed project fall within jurisdiction of Kiryandongo, and Nwoya Districts. Various district offices whose functions would be relevant to the project include offices of the Environmental Officer, Wetlands Officer, District Planner, Community Development Officer, District Director of Health Services, Forestry Officer, Agricultural Officer, District Water Officer and District Engineer. Equally important are village level local council administration (LCI) in Karuma. Leaders at these levels of local administration are closer to residents and therefore important in effective community mobilization, sensitization and dispute resolution.

CHAPTER FIVE

5.0 BASELINE ENVIRONMENTAL CONDITIONS OF THE PROJECT

5.1 Biophysical Setting

Studying the Biophysical setting of the ecosystem is essential to understand the impact due to project development activities on existing flora and fauna of the area. The present study was undertaken to document the baseline information about the environment in the study area so as to understand the changes as a result of proposed activities and to suggest measures for maintaining the conditions. Other information is based on the existing literature about the physical, flora and fauna of the area.

5.1.1 Vegetation and Land use

Because of the protected nature of the of the project area i.e. the Karuma wildlife reserve, the project site is still more or less virgin and the land cover is dominated by pristine vegetation. The upstream side of the highway at Karuma is dominated by commercial structures forming the Karuma Township, a bigger part of which falls within the project zone of direct impact.

5.1.2 Climate

Here an assumption that the climate of the area is similar to that of the neighbouring meteorological stations. Hence data was got from Masindi, Lira and Gulu meteorological stations. Another comparison was made with the Nwoya district climate data from the Nwoya district Development plan. The climate of the project area is characterized by dry and wet seasons with rainfall distributed in two wet seasons, namely: March to June and August to November. Average annual rainfall received is 1500 mm. The project area has a bimodal rainfall pattern with a short dry spell in July and one long dry season from late November to early March.

Mean monthly rainfall ranges from 14 mm in January to 230 mm in August. Micro-climate of the area is hot and humid with average relative humidity of 60%, mean maximum temperature of 29°C, mean minimum temperature of 22°C and wind speeds of 8 kph.

5.1.3 Geology

The project site is located within the Tanzanian Craton, bounded by the Western and Eastern branch of the East African Rift System and a series of normal faults. While the shield separating the two branches of the rift system is of Precambrian age, the rift itself consists of asymmetrical basins bounded by alternate high-angle normal fault segments on one side & a series of smaller normal faults. Major rock mass are undifferentiated gneisses of the Precambrian age and are composed of granitic gneisses and well foliated darker gneisses with a biotite and hornblende content with several NE trending amphibolites dykes. Structural geology of the area is controlled by tectonics associated with the East African Rift System. The Project area is located within the Shield area, but only 50-100 km from the western rift system & about 70 km south of the Aswa Fault zone.

The Project area is predominantly made of undifferentiated Basement Complex comprising granitoid gneisses including elements of Aruan Gneiss (2,600 Ma), possibly some older charnockites on the north side of the Albert Nile and intrusive granite and granitoid gneisses (Nyanzlan - Kavirondian granites) on the southern side. Supra-cratonic sedimentary sequences belonging to the Bunyoro Group of unknown age but stratigraphically younger than the Aruan over the Basement Complex.

The Bunyoro Group is part of a poorly exposed assemblage of sedimentary rocks exposed in Bunyoro (Hoima and Masindi) and Lango (Maruzi County) on the north side of Lake Kyoga. The other dominant cover sequence constituting the Kyoga Group is exposed around Teso. The Bunyoro Group is made up of shales and phyllites with larger quantities of grit and arkose higher in the succession and also tillites. The litho-assemblage of this group is gently folded, unmetamorphosed and underlain by the undifferentiated Basement complex. Outcrops of this group are recorded at the junction of the Kampala - Gulu Highway and the Masindi - Masindi Port road, between Kafu Bridge and Kigumba on the Bunyoro side, while a lens abuts the Albert Nile in Maruzi County on the Lango side.

Banded gneisses (with a tendency to be flaggy and micaceous) occur downstream of the confluence of River Juma with the Nile; gneiss with biotite occurs around the headwaters of river Ayago and an unnamed river east of river Kamchio; while amphlbolitic gneisses underlie areas around River Kiba. Migmatites exhibiting contorted foliations is noticed at the bend in the Nile further downstream of west of River Juma.

Powell (1956) described that exposure of Basement Complex as confined to the Nile and the mouths of its tributaries, which have cut down below the peneplain surface and its laterite cover. The peneplain surface around Kamdini appears to step along an escarpment line normal to the Nile about one and a half miles west of the River Juma. Above the Karuma Falls, the laterite extends to the Nile water level. At the Kamdini Hydrological Department gauging station, laterite ironstone at the top of 30 ft bank passes downwards into reddish clay.

The basement rocks in this area are gneisses and granulites, often very rich in biotite and amphibole. They are well foliated and generally composed of bands rich in minerals of micaceous habit (amphibole, mica, and chlorite) alternating with bands rich in quartz and feldspar.

The lithounits exposed in Karuma area are undifferentiated gneisses, referred to as the Gneissic Complex comprising of granitized and gneissic formations in the regional geological map of Uganda. Bed rock outcrops are noticed to occur along the road cut section near the Karuma Bridge and on either banks of the Kyoga Nile River. Within the river bed, isolated outcrops of the bed rock forming islands are present in the upstream and downstream reaches of the proposed bridge axis.

5.1.4 Geomorphology

The area represents a mature topography and the project area may be subdivided in to three categories, such as, Peneplain, denudation slopes and river valley. On the north and south banks of the river Kyoga Nile, the area extending between Murchison Falls (d/s of TRT outfall) and Lake Kyoga (u/s extent of the reservoir), is predominantly near flat terrain giving rise to peneplain topography. Small raised grounds forming hummocks and ridges are also noticed at different locations, giving rise to rolling topography. Ground elevations in the project area vary between EL. 960 m to EL. 1075 m.

5.1.5 Seismicity

Eastern Africa's seismicity is dominated by the East African rift system potentially; this rifting represents the initial or incipient stages of a continental separation. As is also known, the rift system bifurcates around the Tanganyika Shield (now more often termed the Tanzania Craton) into a western and an eastern branch, with the western one terminating near Lake Eyasi, where there is an increase in seismicity.

There has been considerable debate concerning the exact tectonic configuration of the East African Rift System, including spreading rates, directions, geometry and amount of extension (Rosendahal et al., 1992). What remain clear, however, is that the rift system has developed through a NW - SE extension along the main branches (Fairhead and stuart, 1982; Daly et al., 1989).

The rift zones along the western branch are marked by narrow lakes floored by thick piles of fluvial, clastic sediment. The earthquake activity along this branch is very pronounced (Kebede and Kulhanek, 1991), whereas magmatism is restricted to a few small arches between the lakes. In contrast, rift zones along the eastern branch are largely filled with volcanic and volcanoclastic materials and magmatism is generally perceived to be an integral part of the rifting process.

The Tanganyika – Malawi rift zones are composed of half graben basins linked in complex ways by accommodation zones which generally trend obliquely to the rift axis, and sometimes obliquely to the NW – SE extension direction. Half grabens alternate polarities where the rift crosses Proterozoic dislocation sources. Sedimentary fill reaches at least 4-5 Km, and the sediments are mostly Cenozoic in age, but patches of permo-triassic sedimentary rocks are believed to occur within both rift zones.

The Karuma area is located north of the Western branch of the East Africa Rift System, within the Tanzanian Shield (carton). While the Shield separating the two branches of the rift system is of Precambrian origin, the rift system itself consists of asymmetrical basins bounded by alternate high angle normal faults or when unfaulted, monoclines, on the other side linked by comparatively high strain accumulation zones.

The project site is located within the Shield, but is only 50-100 km from the western rift and about 70 km south of the Aswa Fault Zone, thereby potentially affected by the major tectonic in the region. The major earthquakes events occurred in Uganda are given in the **Table 4.1**

Table 5.1: List of Major Earthquakes in Uganda

Date of occurrence	Epicentre	Magnitude	Socio-economic losses
09 July 1912	Kitgum, close to Aswa Shear zone	6.7	Partial destruction of buildings in northern Uganda
02 October 1929	Toro, Western Rift	5.9	Change of water colour in hot springs, occurrence of landslides
18 March 1945	Sembabule (40 KM NORTH OF Masaka town) close to	6.0	Entebbe seismograph put out of order, five persons died and destruction of

	Katonga shear Zone.		some buildings.
20 March 1966	Toro, Western rift	6.6	150 people died & over 1300 persons injured; loss of properties worth $ 1 million
07 September 1990	Lake Victoria, near Kampala	5.0	Destroyed semi-permanent buildings
09 October 1991	Butiaba Port, Lake Albert, Western Rift	5.3	Destroyed semi-permanent buildings
05 February 1994	Kisomoro, Toro, Western Rift	6.2	Eight people died, destruction of property worth $ 61 million

The studies revealed that for the rift zone, an earthquake of 6 magnitude or larger can be expected

5.1.6 Water

Catchment area

River Nile's total length from its source to the outfall in the Mediterranean Sea is 6,695 km and from Lake Victoria to the outfall is 5,584 km. The Catchment area of the entire Nile river basin is 2.9 million sq km. Within its basin there are five major lakes: Victoria, Kyoga, Albert, Edward & Tana.

5.1.7 Hydrology and Drainage

The project area is well-drained; most parts lie in the watershed of the Nile River which takes its source from Lake Victoria (largest lake in Africa).

5.1.8 Air Quality

There is no permanent environmental monitoring station in the study area; however site specific monitoring was conducted in September 2013.

Results indicated that the air quality in the Project area was good during the period of evaluation. There are no industrial pollution sources in the vicinity of the Project, and apart from the highway traffic, the traffic density in the area is not high. Apart from the residential and commercial areas that are on the right side of the highway at Karuma Town, the area is generally not populated with the project lying in the protected and well vegetated KWR stretching on the left side of the Highway. Results of air quality monitoring are presented in the table 4.2 below.

Results in table below are based on Time Weighed Average (TWA). Exposure Standard - Time Weighted Average (TWA) is the average airborne concentration of a particular substance when calculated over a normal eight-hour working day, for a five-day working week indicating the permissible limits of the air pollutants.

Table 5.2: Air quality in the New Karuma bridge study area

S.N.	Location	Dust $PM_{10}mg/m^3$	COppm	SOxppm	NOxPpm
1.	Karuma Bridge	0.15	2.0	BDL	BDL
2.	New Karuma Bridge site	0.13	1.5	BDL	BDL

Standard as per NEMA, TWA	**10**	**9.0**	**0.15**	**0.10**

(Source: URTC Field survey)
ppm: parts per million, *BDL: Below Detection Limit,*

NEMA = National Environmental Management Authority

TWA = Time weighted average

Table 5.3: Recommended TWA values for different gases

Parameter	Recommended TWA Value Standard (NEMA)	Potential Health Risk
Carbon dioxide (CO_2)	9ppm	Headache, fatigue, dizziness, shortness of breath, inability to concentrate
Carbon monoxide (CO)	9ppm	Headache, fatigue, decreased alertness, nausea, rapid breathing.
Particulate matter(dust)	10mg/m^3	Allergies, throat irritation, irritation of the respiratory track.
Sulphur dioxide (SO_2)	0.15 ppm	Irritation to eyes and respiratory systems, aggravate respiratory diseases.
Nitrogen Dioxide (NO_2)	0.10 ppm	
Noise (dB)	85	Hearing loss, reduce productivity and contribute to discomfort and stress.

(Source: URTC Field survey)

5.1.9 Noise

Table 5.4: maximum Exposure time in hours per employee per working day

Noise (dB(A)	Maximum exposure time in hours per employee and per working day
More than 87 but not more than 90	8
More 90 but not more than 92	6
More than 92 but not more than 95	4
More than 95 but not more than 97	3
More than 97 but not more than 100	2
More than 100 but not more than 102	1.5
More than 102 but not more than 105	1

More than 105 but not more than 110	0.5
More than 110 but not more than 115	0.25
More than 115 *	000

(Source: The National Environment (noise standards and control) Regulations, 2003.First Schedule, Part II.)

* Exposure to continuous or intermittent noise louder than 115 dB (A) should not be permitted.

Table 5.5: Maximum permissible limit of vibration exposure to noise permitted in the workplace in Uganda.

Geometric mean of octave Band frequency, Hz	Octave band cut-off frequencies, Hz		Maximum permissible limits of Velocity	
	lower	Upper	Effective value m/s)	Pressure level of effective value,(db
8	5.6	11.2	5.00 x10^{-2}	120
16	11.2	22.4	5.00 x10^{-2}	120
31.5	22.4	45	3.50 x10^{-2}	117
63	45	90	2.50 x10^{-2}	114
125	90	180	1.80x 10^{-2}	111
250	180	355	1.20 x 10^{-2}	108
500	355	710	0.90 x 10^{-2}	105
1000	710	1400	0.63 x 10^{-2}	102
2000	1400	2800	0.43 x 10^{-2}	99

Source: The National Environment (noise standards and control) Regulations, 2003.First Schedule, Part II.

Note: Octave is the interval between two sounds having a basic frequency ratio of two. The interval, in octaves, is the logarithm to the base two of the frequency ratio

5.1.10 Traffic

The main traffic flowing through the project area is on the highway from Kampala to Gulu, Northern Uganda, which after crossing Karuma divides in two, one diversions goes to West Nile/Arua and the other to Lira and Gulu. The roads to Arua and Lira, both on the North Bank are outside the project site, thus traffic measurements were only considered for the traffic around Karuma Town, taking into account that on the left of the highway at this point is a protected area, the Karuma Wildlife Reserve.

5.1.11 Terrestrial Flora

5.1.11.1 Flora

The dominant plant family was Fabaceae constituting 15.1% of the total species followed by Poaceae and Euphorbiaceae with 14.3% and 7.8% respectively. Families with monospecies were 29 included Ulmaceae, Sterculiaceae, Salvadoraceae, Sapindaceae, Sapotaceae, Scrophulariaceae and Myrtaceae. The most abundant tree species included *Albizia coriaria, Albizia grandibracteata, Albizia zygia* while among the shrubs and herbs the most abundant species included, *Hyparrhenia diplandra, Hyparrhenia filipendula, Hyparrhenia rufa, Imperata cylindrica, Indigofera arrecta. Senna spectabilis* were the most abundant alien invasive plant species recorded in the project area during the study.

Plant communities

There are two major plant communities that were distinguished during the survey. These include wooded grassland, and riverine forest vegetation. Within the wooded grassland were sub-communities dominated by various plant species.

a) Riverine forest vegetation

Riverine forest vegetation mainly refers to the plant communities found along the banks of River Nile. The project site vegetation is mainly dominated by *Albizia zygia, Acacia hockii, Acacia polyacantha and Rhus natalensis*.

b) Wooded grassland vegetation

This type of vegetation is generally inside the Karuma Wildlife Reserve. The predominant woody plant species in the wooded grassland included *Acacia polyacantha, Acacia hockii, Acacia sieberiana, Albizia coriaria, Albizia zygia, Combretum molle, Combretum colliunum, Strychnos innocua, Grewia mollis* and *Vitex doniana.* The dominant graminoids include *Chloris gayana, Eragrostis acemosa, Hyparrhenia filipendula, Hyparrrhenia rufa, Panicum maxium and Sprobolus pyramidalis.*


Figure 5.1: Woodland communities

There are three plant sub communities that are observed within the wooded grassland. These included the thick woody vegetation sub community especially along the access route dominated by *Terminalia glausescens, Acacia polyacantha, Bridelia micrantha* and occassionaly *Milicia excelsa.* The vegetation along the proposed access route is dominated by *Phoenix reclinata* and *Albizia zygia* along the wetter sections.

Second is the *Grewia mollis* dominated sub-community that was associated with *Combretum molle, Combretum collinum* and scattered plantation of *Terminalia glausescens* trees. Dominant graminoids included *Sporobolus pyramidalis, Panicum maximum* and *Chloris gayana.* This occupies much of the northern bank of the project site.

Another conspicuous plant sub-community is the *Vepris nobilis*associated with species including *Lannea schimperi, Sclerocarya birrea, Mallotus oppositifolius, Sapium ellipticum,* and *Pseudarthria hookeri*. This sub-community is also associated with *Dalbergia melanoxylon,* which is redlist plant species (IUCN, 2010) but not categorized as globally threatened.


Figure 5.2: Vegetation within the project area

5.1.11.2 The Ethnobotany in the study area

Some of the plant species in the project area are reported to be used by the local inhabitants for various purposes. A list of some commonly occurring plant species recorded during the survey with their miscellaneous uses is given in **Table 5.1** below.

Table 5.6: Recorded Plants with ethno botanical importance

Scientific name	Local name (Luo)	Use
Acacia sp.	Okutoi	Root infusion used for gastro-intestinal problems
Bidens pilosa	Ononot	Leaves infusion used as antiseptic for wounds
Kigelia africana	Yago	Fruit infusion used in post-natal problems

Momordica foetida	Bomoo	Leaf infusion used to treat gastro-intestinal problems
Solanum spp.	Ocwiga	Used as vegetable
Amaranthus sp.	Dodo	Used as vegetable

5.1.12 Terrestrial Fauna

Terrestrial fauna covers a wide variety of the taxa from vertebrates and invertebrates. In the context of present study status of mammals, birds, amphibians, reptiles and butterflies in the study area have been assessed. Information about the fauna aspect presented in this chapter has been collected during the field visits using direct and indirect sightings method; transact method and Interaction with the local residents.

Butterflies

Invertebrates serve an extremely important role in the community. Studies indicate that insects, as a whole, have a large influence on plant diversity and particular species of insect serve keystone functions in the community. Butterflies satisfy most selection criteria for use as bio indicators therefore they are indicators of good ecosystem health. Butterflies respond quickly to environmental changes and there is now considerable amount of data on how particular species contend with alterations in land-use, and thus may play a valuable role in ecological monitoring. The influence of seasonality on the presence or absence of adults of certain species, and on their morphology, as well as knowledge of species ecology must always be considered.

98 species of butterflies have been recorded in the study area. No species of significant conservation concern are recorded. No IUCN category species were recorded, a number of habitat specific species, for example 17 forest specific species. However these species are not restricted in Karuma area only and are found in the whole country.

5.1.12.1 Herpetofauna

Amphibians comprise three major groups: frogs and toads (order Anura), salamanders and newts (order Caudata) and caecilians (order Apoda or Gymnophiona) (Frost, *et al*., 2006) of which about ninety eight (98) species have been recorded in Uganda. They are most abundant and common in habitats such as wetlands where they fulfil their amphibious habits and are therefore well suited to serve as biological indicators. Their taxonomy is relatively well known and stable compared to lower taxa such as insects though not as well-known as the higher taxa, and their ecology is only partly understood. They occupy a broad geographical range and a large number of habitat types. They are entirely dependent on the existence of the right kind of habitat.

Some amphibian fauna such as *Amietophrynus vittatus* are known to be common inhabitants of the littoral and ecotone zones of lacustrine ecosystems and have been found to be useful indicators of how far inland the flood zones of the lakes and rivers extend.

Reptiles are composed of snakes, skinks and lizards, terrapins, tortoises, geckoes, chameleons, crocodiles among others for which 150 species are known in Uganda. Most reptiles are versatile and can be good indicators of serious habitat degradation. In such case, the otherwise common groups of reptiles such as skinks and lizards disappear because of the habitats disturbance or destruction. Most reptiles are specialists and have unique niches. Some snakes specialize on feeding on molluscs, others on frogs, while others specialize on rodents. Chameleons are known to specialize on insects while lizards feed on a whole array of arthropods, and sometimes birds, birds' eggs or even their own. Some reptiles, such as the water cobra, *Naja melanoleuca*; the water snakes, *Grayia* sp.; and the marsh snakes *atriciteres*sp are important predators of fish and amphibians.

The Nile crocodile, *Crocodylus niloticus* uses aquatic ecosystems for its habitation and feeding and is always found in proximity to water. The Nile monitor, *Varanus niloticus* constantly uses the wetlands fringing aquatic ecosystems as a habitat and constantly visits the littoral zone to feed on fish.

Amphibian and Reptilian Fauna of the Study Area

Thirteen amphibian species were recorded in the study area and within the range of the proposed project. All the species recorded are of Least Concern (LC) according to the IUCN red listing (http://www.redlist.org) because they either have a very wide distribution, tolerant to a broad range of habitats or presumed to have large populations, except for *Bufo vitattus* that is considered Data Deficient (DD).

Sixteen reptilian species are recorded in the study area. The Nile Crocodile- *Crocodylus niloticus* is recorded as Least Concern (LC) according to the IUCN red listing (http://www.redlist.org) and is also a CITES appendix II listed species for Uganda. All the other species have been not yet evaluated as per IUCN.

There are no critical habitats for amphibians, reptiles or other animal groups because these could be found elsewhere within the vicinity of the proposed New Karuma Bridge.

Table 5.7: Amphibian and Reptilian Fauna of the Study Area

No	Species	Common Name	IUCN Status
1.	*Afrixalus osorioi*	Osorio's Spiny Reed Frog	Least Concern (LC)
2.	*Amietia angolensis*	Angola River Frog	Least Concern (LC)
3.	*Bufo gutturalis*	African Common Toad	Least Concern (LC)
4.	*Bufo vittatus*		Least Concern (LC)
5.	*Hemisus marmoratus*	Marbled Snout-burrower	Least Concern (LC)
6.	*Hoplobatrachus occipitalis*	Crowned Bullfrog	Least Concern (LC)
7.	*Hyperolius pusillus*		Least Concern (LC)
8.	*Hyperolius viridiflavus*	Common Reed Frog	Least Concern (LC)
9.	*Kassina senegalensis*		Least Concern (LC)

10.	*Leptopelis bocagii*		Least Concern (LC)
11.	*Phrynobatrachus natalensis*	Natal Dwarf Puddle Frog	Least Concern (LC)
12.	*Ptychadena porosissima*		Least Concern (LC)
13.	*Xenopus victorianus*	Mwanza Frog	Least Concern (LC)

Table 5.8: Reptilian fauna within the Project Study Area

No	Species	Common Name	IUCN Status
1.	*Agama agama*	Orange-headed Agama	Not Evaluated
2.	*Bitis gabonica*	Gaboon Viper	Not Evaluated
3.	*Bitis nasicornis*	Rhinoceros Viper	Not Evaluated
4.	*Chamaeleo gracilis*	Gracile Chamaeleon	Not Evaluated
5.	*Crocodylus niloticus*	Nile Crocodile	Least Concern (LC)
6.	*Dendroaspisjamesoni kaimosae*	Western Forest Green Mamba	Not Evaluated
7.	*Geochelone pardalis*	Leopard Tortoise	Not Evaluated
8.	*Hemidactylus brooki*	Brook's Gecko	Not Evaluated
9.	*Kinixys belliana*	Bell's Hinged Tortoise	Not Evaluated
10.	*Leptotyphlops scutifrons*	Peter's worm Snake	Not Evaluated
11.	*Naja melanoleuca*	Forest/Water Cobra	Not Evaluated
12.	*Python sebae*	Rock Python	Not Evaluated
13.	*Thelotornis kirtlandi*	Twig Snake	Not Evaluated
14.	*Typhlops lineolatus*	Lineolate Blind Snake	Not Evaluated
15.	*Typhlops punctatus*	Spotted Blind Snake	Not Evaluated
16.	*Varanus niloticus*	Nile Monitor	Not Evaluated

5.1.12.2 Mammals

Mammals (especially the larger species) represent a group of animals which together with birds quickly draws the attention of Wildlife Reserves and Park Managers as well as the wider community. They are often easy to be spotted in the right habitats, for which reason they support tourism and impacts on or from them such as poaching, crop raiding and damage as well as injuries to people could represent significant issues.

Small Mammals

Small mammals could present a very useful taxon for measuring impacts on habitats to biodiversity. Their population turnover is faster than that of larger mammals and given their shorter life span impacts on the mammalian fauna can easily be measured based on them. At least 15 species of small mammals including rodents, insectivores and bats have been recorded in the study area **(Table 5.).** None of the species of conservation category as per IUCN was recorded in the study.

Table 5.9: Small Mammals species recorded in the study area of the New Karuma Bridge

No.	Species Name	Common Name	IUCN Status
1.	*Lavia frons*	Yellow-winged Bat	Least Concern
2.	*Crocidura hildegardeae*	Hildegarde's Musk Shrew	Least Concern
3.	*Dendromus mesomelas*	Brant's Climbing Mouse	Least Concern
4.	*Aethomys hindei*	Northern Bush Rat	Least Concern
5.	*Aethomys kaiseri*	Kaiser's Bush Rat	Least Concern
6.	*Grammomys dolichurus*	Common Thicket Rat	Least Concern
7.	*Lemniscomys striatus*	Common Striped Grass Rat	Least Concern
8.	*Lophuromys flavopnctatus*	Eastern Brush-furred Rat	Least Concern
9.	*Lophuromys sikapusi*	Common Brush-furred Rat	Least Concern
10.	*Mastomys hildebrandtii*	Northern Savanna Multimammate Rat	Not Evaluated
11.	*Mus minutoides*	Pygmy Mouse	Least Concern
12.	*Mus triton*	Grey-bellied Pygmy Mouse	Least Concern
13.	*Hystrix cristata*	Crested Porcupine	Least Concern
14.	*Xerus erythropus*	Geofrey's Ground Squirrel	Least Concern
15.	*Gerbilliscus validus*	Northern Savanna Gerbil	Least Concern

5.1.12.3 Large Mammals

Together with previously known records Karuma wildlife reserve, the project area has over 15 species of medium to large sized mammals of which only 11 species were recorded in the study area during the recent study of the Karuma project **(Error! Reference source not found.).** Of these only Buffalo eemed to occur in fairly large concentrations, the number of hippo tracks also suggested intense use by the species. All other species did not appear to be in high densities in the area of impact. The concentration of the larger mammals is in the Karuma WR section and only anecdotal records and reports in the community area. Of the species recorded the Elephant and Hippos are considered vulnerable using the IUCN criteria (IUCN 2010).

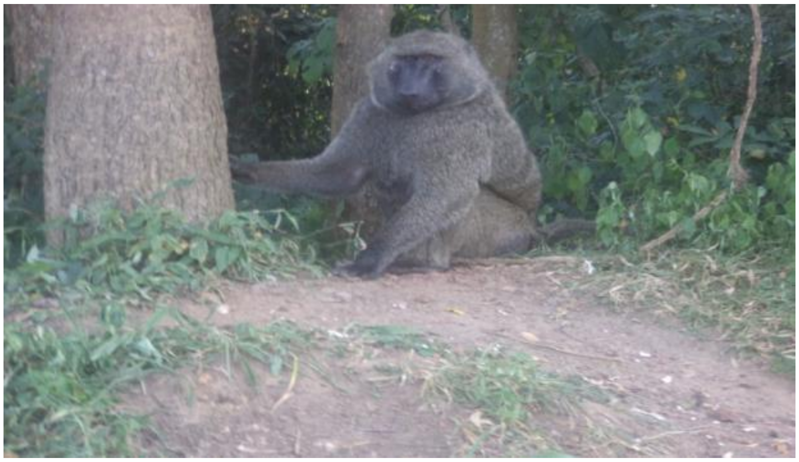

Figure 5.3: Primates in the project area

Table 5.10: Large Mammals species recorded in the study area of the New Karuma bridge

No.	Scientific name	English name	IUCN Status
1.	*Chlorocebus pygerythrus*	Vervet Monkey	Least Concern
2.	*Papio Anubis*	Olive Baboon	Least Concern
3.	*Colobus guereza*	Guereza (Black & White) Colobus	Least Concern
4.	*Loxodonta Africana*	African Elephant	Vulnerable
5.	*Orycteropus afer*	Aardvark (Ant Bear)	Least Concern
6.	*Potamochoerus porcus*	Red River Hog	Least Concern
7.	*Hippopotamus amphibius*	Hippopotamus	Vulnerable
8.	*Syncerus caffer*	African Buffalo	Least Concern
9.	*Tragelaphus scriptus*	Bushbuck	Least Concern
10.	*Sylvicapra grimmia*	Common (Bush) Duiker	Least Concern
11.	*Ourebia ourebi*	Oribi	Least Concern

5.1.12.4 Human disturbance

The community area is already cleared of mammalian concentrations although the reports from local communities and UWA rangers indicated that animals occasionally cross from the KWR into the community land. Members of the local community are already under arrangements with UWA to allow controlled access into the reserve to harvest resources including wood products for fuel and poles.

5.1.12.5 Avifauna

Birds are sensitive indicators of the health of the environment and sustainability, reflecting trends in other biodiversity, being responsive to change, high in food chains, inexpensive to survey and the best known and most popular component of wildlife (Birdlife international). Species with a preference for some level of forest cover dominated the records and in addition a few water birds are also recorded in the study area. Together, seven species of conservation concern (Brown Snake Eagle, Spot-flanked Barbet, White-headed Saw-wing, Grey-capped Warbler, Papyrus Gonolek, Golden-backed Weaver, and Cardinal Quelea) are known to occur in the study area.

Table 5.11: Bird species of particular conservation concern

No.	Scientific name	English Name	Status	Habitat	Regional threat status	IUCN Status
1.	*Circaetus cinereus*	Brown Snake Eagle	R(B)		R-NT	Least Concern
2.	*Tricholaema lacrymosa*	Spot-flanked Barbet	RB		R-RR	Least Concern
3.	*Psalidoprocne albiceps*	White-headed Saw-wing	RB, AfM/NB	f	R-RR	Least Concern
4.	*Eminia lepida*	Grey-capped Warbler	RB	fW	R-RR	Least Concern
5.	*Laniarius mufumbiri*	Papyrus Gonolek	R(B)	W	R-NT/RR	Near Threatened
6.	*Ploceus jacksoni*	Golden-backed Weaver	RB	W	R-RR	Least Concern
7.	*Quelea cardinalis*	Cardinal Quelea	RB		R-RR	Least Concern

Status: habitat and threat category are based on Wilson (1994) and Carswell *et al* (2005); RB – resident breeder, R (B) - resident, breeding not proved (but likely), AfM/B - intra-African migrant, breeding, NB - not breeding
Habitat: - W - always resident in or near water, w - often resident or observed in or near water, F - Forest resident, f - resident in and near forests

Regional threat status (based on Carswell *et al* 2005) R-NT - regionally near-threatened, R-RR- species of regional responsibility

5.1.13 Protected Area

Area of wildlife conservation concern falling in the vicinity and downstream of proposed project are discussed below.

Karuma Wildlife Reserve

The proposed project area falls within the Karuma Wildlife Reserve (KWR) which is contiguous with the southern section of Murchison Falls National Park (MFNP).

A section of KWR also serves as a 'buffer zone' to MFNP with controlled hunting permitted. It measures about 678 km^2in area and forms a long strip along the southern and eastern flanks of the Nile River and includes a 15km length of the Victoria Nile as far as Karuma Falls. The vegetation of the area falls under Acacia-*Combretum savanna*. It is characterised by deciduous trees dominated by *Terminalia* and *Combretum*. The ground layer is dominated the grasses *Hypparhenia* and *Brachiaria*. From an ecological point of view, the riverine vegetation along the flanks of the Nile within the reserve area are species rich and support several faunal species.

Murchison Falls Protected Area

Murchison Falls National Park is Uganda's largest national park. It measures approximately 3,893 sq km. Together with the adjacent Bugungu Wildlife Reserve and the Karuma Wildlife Reserve, the park forms a Murchison Falls Protected Area which is spread nearly in the area of 5,072km^2 (Table 5.**).**

Table 5.12: Area of the different component PAs of MFPA

Wildlife Estate	Sq. km
Murchison Falls National Park	3,893
Bugungu Wildlife Reserve*	501
Karuma Wildlife Reserve	678
Total wildlife estate	**5,072**
***Budongo Forest**	
Budongo overlap with Bugungu	135
Budongo overlap with Karuma	99
Budongo outside UWA estate	591
Total area Budongo Forest	**825**

The protected Area supports an exceptional diversity of plant communities, equalled in Uganda only by Queen Elizabeth National Park. (Source: Karuma HEP report)

Increasing decline of wildlife populations across the African continent is increasing the significance of MFPA as a safe enclave for large mammals, particularly elephants, buffaloes, giraffes, kob, hartebeest and hippopotami. It is a habitat to the last viable breeding populations of Nile crocodile and Rothschild's giraffe and has Uganda's largest population of Jackson's hartebeest, and other important species including the soft shelled turtle and the chimpanzee. A total of over 450 Bird species are recorded from the MFPA and also supports a host of migrants, both palaearctic and continental. Therefore, MFPA has been internationally accorded a high level of conservation priority by the World Conservation Union (IUCN).

MFCA where the KWR falls is endowed with unique and special features and attributes of local, national and international significance which includes landscapes that are of tourist and cultural value.

5.2 SOCIO-ECONOMIC ENVIRONMENT

5.2.1 Project location

The proposed new Karuma Bridge and Access Road Project across River Nile, falls in Kiryandongo and Nwoya Districts of Uganda. The proposed construction area falls in the Karuma Wildlife Reserve.

Kiryandongo district is located on the main Gulu-Masindi Highway, bordered by Nwoya District to the north, Oyam District to the northeast, Apac District to the east, and Masindi District to the south and west. The district is part of Bunyoro sub-region, which is coterminous with Bunyoro Kingdom.

Nwoya is a district found in Northern Uganda. It is located between longitude 31-32 degrees East; latitude 2-3 degrees North. It is bordered by Amuru District in the North, Gulu District in the East, Buliisa District in the South West, Masindi and Kiryandongo Districts in the South, Oyam District in the South East, and Nebbi District in the West.

The Kampala-Karuma-Pakwach-Nebbi-Paidha-DRC Road and the Kampala-Karuma-Pakwach-Nebbi-Arua-DRC Road, which pass through Karuma Bridge, give access to the Democratic Republic of Congo and Sudan, thus potential for, cross border trade.

5.2.2 Population

The population of Kiryandongo District according to the 2002 national census was about 187,700 with an average household size of 5 persons, while the census results of the 2002 population and housing census indicated that the total population of Nwoya District was 41,010 of which 99 percent lived in rural areas. The population density was 10 persons per square kilometer, while the average household size was 4.5 persons.

5.2.3 The Settlement Pattern

Spatial distribution of population in Nwoya and Kiryandongo districts is uneven and is sparsely populated. National parks, game reserves and ease of accessibility to social and economic infrastructures have largely determined population distribution in the districts. Soil fertility factors have not greatly influenced the settlement pattern since much of the soils everywhere support most of the crops grown in the area. However physical features like hills, rivers, forests and swamps have played significant roles in influencing the population settlement patterns. The physical features provide natural resources for social and economic activities but have not attracted settlements nearby.

5.2.4 Occupation

The economy of the area is predominantly agricultural with the majority of the population dependent on subsistence farming and light agro-based industries. Hence most of people earn their livelihoods in the agricultural sector in particular crop farming.

5.2.5 Agriculture

Crop production is the major economic activity within Kiryandongo and Nwoya areas, employing about 90% of the population. Arable land is very fertile and makes up about 70% of the total land area. However, less than 10% of the land is utilized yearly. The limited utilization of land is partly due to the traditional and subsistent agriculture being practiced. The result has always been low household income and food insecurity.

The traditional cash crops are cotton and tobacco, but due to decreasing prices and limited access to markets, their production had declined rapidly. The major food crops are maize, finger millet, sorghum sweet potatoes, cassava, groundnuts, simsim, beans, peas and sunflowers. These major food crops now constitute what we call the non-traditional cash crops.

5.2.6 Gender Issues

In Kiryandongo and Nwoya districts, gender issues continue to be of great concern at household level as well as at institutional level. Across the sectors and institutions, gender gap has continued to exist and main gaps between the girl child and women can be sighted in unequal participation in development programmes, low levels of literacy, disparities in employment, high dropout rates, limited ownership, access and control of resources especially land. This implies that women are exploited and lag behind in development. Women productivity is also severely constrained by the fragmentation of their time and responsibilities and lack of access to essential inputs including knowledge.

5.2.7 Health and Disease

Access to health service remains low in Kiryandongo and Nwoya districts. The District is yet to achieve the government target of a Health center in every Parish. The existing facilities need extra improvement. There are many health-related problems in the Districts which are attributed to the inadequate health services and these include malaria, STIs, cholera epidemic among others. A high prevalence of infectious and communicable diseases and Malnutrition among the general population especially in children under 5 contributes to the heavy burden of disease.

The proposed project area does not have an established health centre. The area has only drug shops, of which the major shops are Ot yat Karuma medical centre and Panorama Drug shop. The nearest major hospitals includes: Kiryandongo and Anaka Hospitals.

5.2.8 Education Infrastructure

Within the project areas, the nearest schools include: One government aided (Karuma primary school) and Karuma Senior Secondary School and Little Angels Nursery & Primary School. Many of the education facilities comprise of unfinished buildings.

5.2.9 HIV/AIDS

HIV/AIDS is still a big problem in the project areas. The prevalence rate declined from about 11.9% in 2003 to about 7.5 %, which is still high. The downward trend is the fruit of the concerted efforts by all stakeholders, especially in the area of HIV/AIDS education. HIV/AIDS has affected the productive and reproductive segments of the population, creating a big population of HIV infected individuals and ultimately a crisis of orphans.

The high rate of HIV/AIDS prevalence poses the greatest challenge to health and well-being of the project areas. HIV/AIDS has placed a burden on the household resources through raising medical expenditures. The epidemic has hit the traditionally labour-intensive agricultural systems. As a result, HIV/AIDS has contributed significantly to household poverty. It is a general conviction that low income status of the population coupled with limited productive activities has direct bearing on the high HIV/AIDS infection rate in the project areas. Other factors behind the high infection rate are associated with increased social hardships, household poverty and insecurity.

5.2.10 Access to Safe Drinking Water

In the project areas, the safe water coverage in Nwoya stands at 50% of the population and in Kiryandongo, the total population with access to safe drinking water is estimated to be 55.3 %.

5.2.11 Housing

Most of the dwellings are temporary in nature. The type of material used for the floor include: earth, sand, and cow dung. However most housing near the project area in Karuma trading centre are permanent in nature, made of iron sheets and burnt bricks.

Figure 5.4: Karuma Trading Centre

5.2.12 Fishing

UWA has signed a MoU with local community for accessing the Nile River for fishing under the Karuma Permit Fishing Area. However, only a minority group of people are engaged in fishing as compared to agriculture especially crop husbandry.

6.0 TOWN CENTRES

Karuma town acts as a transit route for vehicles traveling to Southern Sudan and Congo with goods and passenger vehicles. There are also a number of shops dealing in the sale general merchandise, restaurants and bars.

6.1.1 Energy sources

According to the socio-economic survey, majority of the households (80%) use firewood for cooking and only a few use charcoals, while Kerosene is used for lighting purposes. UWA has signed a MoUs with the communities around the KWR which has provided a right to locals for accessing the conservation area for fire wood collection.

6.1.2 Physical Cultural Resources

There are no physical cultural resources that were found or reported within the project area of influence for the new Karuma Bridge and access roads. However several studies have been conducted within the project area, Karuma Village and Alwoo Village during the ESIA for Karuma power project which is about 3km from Karuma trading Centre and about 4 Kms from the proposed new Karuma Bridge project.

The following observations were made for the cultural values that were found and reported;

The cultural heritage in the project area is predominantly that of the Luo ethnic people. The Palwo is a cluster of the Luo ethnicity and is the tribe that settled in the area around 1856 when the Luo ancestors conquered the Chwezi and settled in the area. The Palwo have three outstanding clans (kaka) that is, Pa wi, Awora, Pajab. The three major clans are further subdivided into over 49 other clans.

Traditionally the Palwo were spiritual people and had a great attachment to the river, most communities that settled along the river had particular spots at the river bank that were sacred sites where certain rituals were carried out. The river was and still is so important to the locals since it was the prime source of water for domestic use and fish to supplement their food diet. The cultural rituals included ousting evil spirits, thanks giving and attainment of blessings.

In the past all the clan had shrines referred to as Abila. However spiritual spots along the river is the Manana shrine mapped at elevation of 3505 ft, N 02° 14’ 69.8”; E 32° 15’11.2” The site is characterized by natural features of trees and rocks by the river bank, used by the Manana clan for rain making, spiritual healing and other ritual activities. The other is Pajira located at elevation 3364ft, N 02° 15’ 19.6”, E 32° 15’ 61.7”. Then there is another site at the Musurubene at elevation of 3352ft, N 02° 15’ 15.8” E 32° 15’ 61.3”. There is also a site south of the Musurebene known as the Pataka site.

On the northern bank in the village of Nora, cultural valued sites were identified to be around the River banks. The other valued spot of cultural significance in the northern bank is known as Buru Lobo. This is a clay mining spot which is evidence of the traditional activity of pottery. These cultural sites bare a historical potent and have been held with high regard in the traditional setting of the community, the activities carried out in these sites have been passed on to the existing generation by their predecessors. As to the traditional practices, most of them have since faded owing to the massive religious evangelization in the area.

6.1.3 Burial sites

In Karuma trading center, there is a cemetery located next to the Catholic Church mapped at N 02°13' 59.8", E 32°14' 53.2". Other burial sites were located at the homestead at N 02° 14' 16.7", E 32° 15' 02.7" and at N 02° 14' 24.5", E 32° 15' 00.4".

6.1.4 Archaeology of the Project area

The test pits dug measured 1x1m and 50cm deep located at coordinates elevation 3466 ft, N 02°14'84.6",E 32°15'67.8", 3527ft, N 02° 14'59.6" and E 32° 15'45.1", 3439 ft, N 02° 14'40.3", E 32°15'00.7" and close to the road in the KWR at elevation of 1047m, N 02°14'11.3", E 32°14'43.4".. This pits had a low yield of humic soils, clay, pot shad but plenty of gravel and small pebbles (stones).

More test pits were sunk at N: 02°14'01.5", E: 32°14'22.2", N: 02°13'54.3", E: 32°14'06.7", N:

02°13'48.5", E: 32°13'52.9" and N: 02°13'38.3", E: 32°13'29.5". Most of the finds from the excavations belonged to the late Iron Age period.

Archaeological features of pottery were also found at GPS coordinates N: 02°14'698'', E: 32° 15' 112", elevation 3505 ft. from the Manana shrine. Pottery site in the school compound of Karuma Primary School was mapped at GPS: elevation: 1053m, N: 02°14'07.5", E: 32°14'57.5". The site was characterized by roulette pottery scatters exposed in the middle of the school compound without grass cover. Another archaeological site was recorded at GPS; N: 02°13'57.7", E: 32°14'13.1". This site was characterized by pottery and a possible tuyere.

6.1.5 Significance

The evidence of time and the contributions of all periods should be respected in conservation. The material of a particular period may be obscured or removed if assessment shows that this would not diminish the cultural heritage value of the place. In these circumstances such material should be documented before it is obscured or removed. The roulette pottery types belong to the later Iron Age period and very much still in use in most parts of the area and the country at large, however not much information could be analyzed since they were not in situ. The results of test pits in the area at different coordinates yielded only a few pottery shards in very few numbers. The later Iron Age pottery type dominated most of the recovered find. This means that, archaeological significance of most of the sites is low as the local people still make the above pottery type.

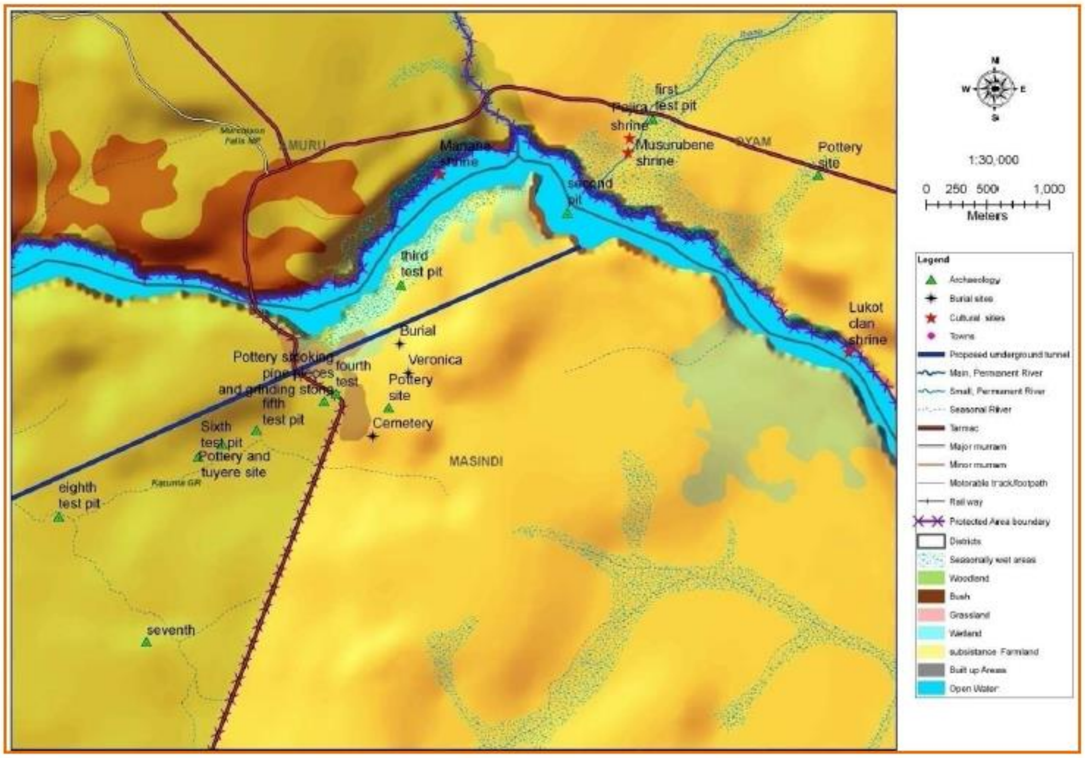

Figure 6.1: Map depicting sampling sites for Archaeological Sampling

(Source: Karuma HPP Report)

6.1.6 Tourism

The new Karuma Bridge and access road falls within Karuma Wildlife Reserve and in vicinity of Murchison Fall National Park and includes landscapes that are of tourist and cultural value. On the whole, Murchison Falls Protected Area where the Karuma Wildlife Reserve falls is endowed with unique and special features and attributes of local, national and international significance.

Notable are Murchison Falls on the River Nile which is an icon of national and exhilarating visitor experience. Murchison Falls Protected Area has a rich cultural heritage manifested by historical stone-age settlements along the Nile and is significant for domestic education and recreation function particularly benefiting school children, university students and wildlife club members.

According the Murchison General Management Plan, the protected area has been divided into zones which prescribe priority uses to which various geographical areas of the protected area should be put. The Falls Zone is proposed for inscription on the World Heritage site with tourism activities including walking safaris, fly camping and sport fishing. The Intensive Tourism Zone comprises of two parts.

The Western Tourism Area that will offer boat trips into the Nile Delta from Delta Point, walking safaris along Tanyi and Nyamsika Rivers and the traditional game drives in the Buligi circuit.

The second area, the Chobe Tourism Area which accommodate a campsite on the South Bank of the Nile within Karuma Wildlife Reserve close to Gwara Gate and the Chobe Lodge. Chobe Lodge has signed a 30 year agreement with Government to run up-market tourism activities within the Murchison Falls Protected Area.

The agreement was entered into on the 27th January 1996. The main tourism opportunities include non-concession sport fishing. However, within KWR there is little tourism activity due to intact vegetation cover which does not favour game drives/view and also due to the tsetse flies in the area.

The area remains as a stopover enroute to other parts of Murchison Falls National Park

CHAPTER SEVEN

7.0 PUBLIC CONSULTATIONS

Public involvement is a fundamental principle of the EIA process. Timely, well planned and appropriately implemented public involvement programmes will contribute to EIA studies and to the successful design, implementation, operation and management of proposals. Specifically public involvement is a valuable source of information on key impacts, potential mitigation measures and the identification and selection of alternatives. It also ensures the EIA process is open, transparent and robust, characterised by defensible analysis.

Experience indicates that public involvement in the ESIA process can and does meet these aims and objectives. Many benefits are concrete such as improvements to project design. Other benefits are intangible and incidental and flow from taking part in the process. For example, as participants see their ideas are helping to improve proposals, they gain confidence and self-esteem by exchanging ideas and information with others who have different values and views.

This chapter provides details of the public consultation and participation activities undertaken during the ESIA for the New Karuma Bridge. The project area includes mainly two districts of Kiryandongo and Nwoya hence emphasis was placed on a fully-inclusive, open and transparent public participation process in the transfer of information regarding the New Karuma Bridge project. A number of stakeholders are involved in this project ranging from the Lead Agencies, district officials, sub county officials, the community and other stakeholders.

7.1 Mobilization

In order to plan for the stakeholder engagement exercise, stakeholder analysis and mapping was undertaken. Based on the different interest of the stakeholders, **Table 7.1** below outlines the stakeholders groups that were consulted by the members of the ESIA team and their sub-consultants and summary of the information requirement.

7.2 Purpose of public Consultation

Stakeholder consultation process was conducted to provide stakeholders with an opportunity to raise concerns and comment on the potential impacts and merits of development. Their input was captured in order to focus the assessment on key concerns, and to better understand expectations of the affected population. Stakeholder consultation is fundamental to the development of the EIS in the following ways:

- Information is shared in a meaningful and timely manner to enable the public to provide considered feedback;
- The EIA team is fully able to understand and characterise the potential environment and socio-economic impacts of the project; and

- It enables the Project to develop effective mitigation measures and management plans that are sensitive to the local context.

7.3 Project Stakeholders

Project stakeholders include individuals, groups or organizations that will be affected by or may influence the project either positively or negatively. During Scoping, an initial list of project stakeholders was developed. This list has been reviewed and updated on an on-going basis to ensure that it is comprehensive and accurately represents the array of stakeholders. Key Stakeholder Groups

- Uganda National Roads Authority (UNRA)
- Ministry of Works and Transport
- Ministry of Water and Environment
- Ministry of Energy and Mineral Development
- UWA
- Local Governments (Kiryandongo and Nwoya)
- NEMA
- Community leaders and Local community members of Karuma Village

7.4 Overview of the Consultation Process

The stakeholder consultation process was designed to conform to the Ugandan national legislation. Initial consultation was undertaken during site reconnaissance, at which time the ESIA project team met with select key stakeholders and the public.

7.5 Major issues and Outcome of the consultations

During the consultations, issues highlighted included:

- Education and awareness training for construction workers on working within protected areas
- Strict obedience to the rules and regulation of the protected areas
- Proper mitigation measures especially while working at the river banks
- Consultation of all the stakeholders and local authorities in the project area
- Restoration/Preservation of the environment after construction
- Employment of the locals of the area and integrating all gender roles during construction

- Awareness and prevention strategies of the workers on HIV/AIDs prevalence of the workers and the community living near the project area
- Proper measures of compensation involving the local community and all local leaders during payment of owners from materials acquisition.
- Decommissioning plans should be strictly done to enable restoration of the environment.
- UNRA, UWA and the Contractor should work hand in hand to implement the management plan

7.6 KEY STAKE HOLDER'S ROLES

The following tasks relating to stakeholder consultation were undertaken as part of this EIA: The Consulting Team did have discussions with Uganda National Roads Authority and other stakeholders to have background information documented and discussed with potential stakeholders. The purpose of the background information was to convey information about the proposed project and allow stakeholders the opportunity to raise any issues or concern regarding the proposed project Study phase and also inform the design team.

7.6.1 NEMA (Competent Authority)

NEMA is the key authority and it is responsible for the approval of the scoping and Terms of Reference for the study and the final approval of the ESIS (issuing certificate). NEMA is also responsible for overall supervision through it environmental inspectors to ensure that the developer/proponent is in line with the suggested mitigation measures for the likely adverse impacts identified in the ESIS report and attached as development conditions for the certificate issued.

7.6.2 The Developer (Uganda National Roads Authority)

The proponent is responsible for the preparation of an Environmental Social Impact Statement (ESIS) which is then submitted to NEMA for approval. The proponent is also responsible for implementation of the project and in the process of implementing the development; will be required to put in place all the required mitigation measures for development. The proponent will supervise the implementation of the Environmental Social Management Plan (ESMP).

7.6.3 Local Governments (Kiryandongo, Nwoya)

Local Councils in these districts are mandated by Law under the Local Governments Act of 1997 to protect the environment within its jurisdiction. Therefore, the environmental officers will be required to follow up the activities of the proposed development to ensure that environmental and public health considerations are all taken care off.

Environmental issues such as pollution (noise, dust), solid wastes and worker's safety are the responsibility of Local Council Environment offices as per the National Environmental Act Cap 153. Therefore both districts of Kiryandongo and Nwoya are responsible through their Environment Officers.

7.7 Consultations with Road committees

UNRA offices of Masindi and Gulu were both visited and consultations made. According to the new legal regime, there is need to have road committees. By the time of the assessment most of the road committees were in place though there participation is still minimal due to several challenges. UNRA is mandated to clarify the roles and financing of these road committees and provisions made for regular sensitization and meetings. They should be informed of their crucial role in the implementation of the road project especially in the following aspects:

- Environmental and social management activities
- Involvement of the local communities on sensitization and awareness HIV/STD's
- Protection of trees and reserves from destruction without compensation
- Traffic Safety awareness to and Safety of road furniture.

CHAPTER EIGHT

8.0 PROJECT ALTERNATIVES

In the context of this ESIA, analysis of project alternatives refers to the performance of the natural and socio-economic resources with or without the project or with or without the implementation of the measures of this ESIA.

The need for analysis of project alternatives is based on being able to judge the sustainability in time, as a complement to the evaluation phase of the project, it is considered relevant to establish the behaviour of the environment into the future. For this purpose, the following project construction alternatives were examined:

8.1 DESIGN ALTERNATIVES

8.1.1 Option A (steel-concrete composite bridge)

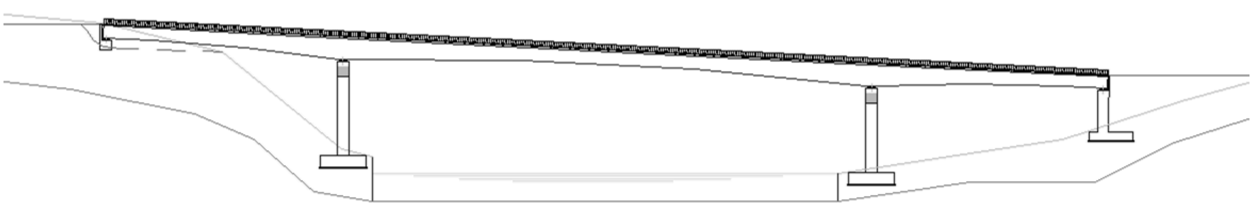

Figure 8.1: Steel-concrete composite bridge

Beam theory shows that the I-shaped section is a very efficient form for carrying both bending and shears loads in the plane of the web. On the other hand, the I-shaped section has a reduced resistance in the transverse direction, and is also inefficient in carrying torsion. When I-girders are assembled with longitudinal and transverse stiffeners and cross frames, the entire structure reacts as a box-girder. The following figure shows a typical portion of a composite superstructure: I-girders with stiffeners cross frames and a concrete deck connected by shear studs.

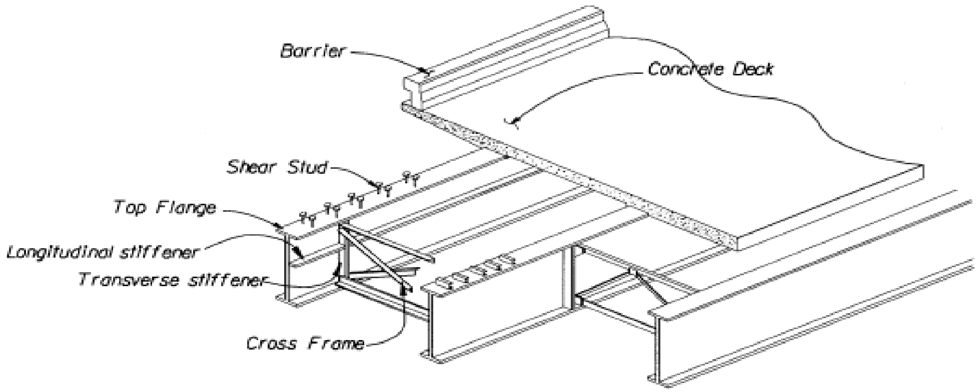

Figure 8.2: Composite I-girder Bridge.

All the bridge steel structures will be constructed with "weathering steel", best-known under the trademark COR-TEN steel. This material is a group of steel alloys forming a stable rust-like appearance when exposed to the weather agents for several years. This characteristic allows saving of the surface painting and maintenance costs.

The method of erection for composite I-girder bridge is very simple; in fact this superstructure can be assembled on the river banks and then lifted and moved by cranes.

8.1.2 Option B (Tied arch bridge)

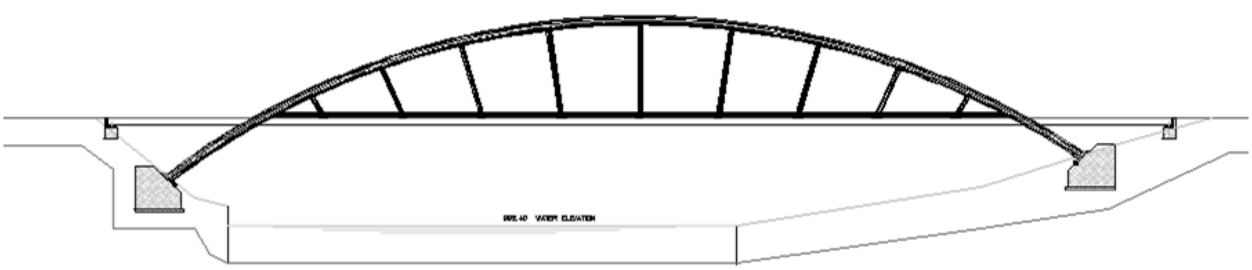

Figure 8.3: Tied arch bridge

A bridge is classified "tied arch" when the reactive horizontal forces acting on the arch ribs are supplied by a tension tie at the deck level of a through arch. The tension tie is usually a steel plate girder and, depending on its stiffness, it is capable of carrying a portion of the live loads. Since no horizontal forces are transferred to the abutments, the foundations cost can be minimized. In addition, since the superstructure does not depend on horizontal compression forces for its integrity, tied-arch bridges can be prefabricated offsite, and subsequently floated, hauled or lifted into place. This spectacular erection method is very economical. When this erection method is not possible owing to particular site constraints, alternative erection methods are available using temporary erection bents or tieback cables.

There is no question that arch bridges are beautiful, functional, and a pleasure for the motorist to drive over. Long-span arch bridges over deep valleys have no competitors as far as aesthetics is concerned.

8.1.3 Option C (deck arch bridge)

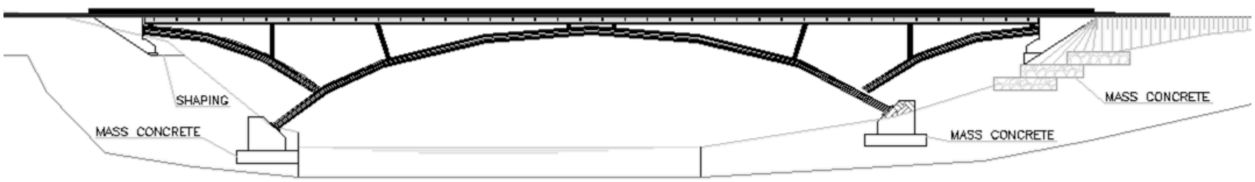

Figure 8.4: Deck arch bridge

The third option considered for the new Karuma Bridge is a deck arch bridge. This solution is when the bridge deck is located above the arch's crown. The deck arch is also known as a true or perfect arch.

The deck arch bridge, theoretically, is one in which only a compressive force acts at the centroid of each element of the arch. It is actually impossible to have a true arch bridge except for one loading condition. The arch bridge is usually subject to multiple loadings (dead load, live load, temperature, etc.) which will produce bending moment stresses in the arch rib that are generally small compared with the axial compressive stress.

The main structure is composed by two planes of vertical arch-ribs and by composite I-girder beam for deck. The bridge is accomplished with a reinforced concrete slab.

8.1.4 Option D (Cable Stayed Bridge)

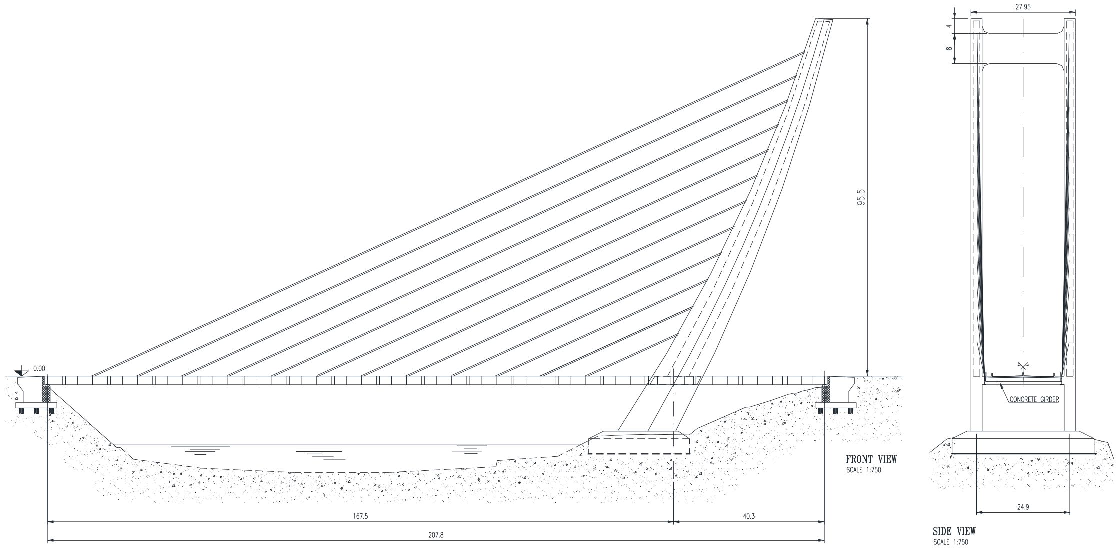

Figure 8.4 Cable Stayed Bridge

The forth option considered for the new karuma Bridge was a side-spar Cable Stayed Bridge. The main structure is composed by one steel towers, steel-concrete composite deck with I-shape for principal steel beams and concrete slab. The cable stayed span is 168 metres, while the lateral span is 41m. The lateral span is a cantilever structure while the cable stayed has a half-harp configuration. The tower bends toward the cantilever span and it is 111 metres in height from the ground. The deck's overall width is 20,75m and its structure is steel-concrete composite structure. The 12 stays are 24° on the horizontal and anchor the deck at 12 metres.

8.2 MULTI-CRITERIA MATRIX ANALYSIS OF PROJECT ALTERNATIVES

In order to have an objective-exhaustive comparison of the three proposed options for the new Karuma Bridge, the Consultant has elaborated a multi-criteria matrix. In this matrix different parameters are introduced, to take into consideration each option's different technical aspects. For each of these parameters, a numerical weight, with a compliance points from 0 up to a maximum of 5 is assigned, in order to consider advantages and disadvantages that each solution implies.

Six parameters were thus considered in the matrix as follows:

1) Flow capacity

2) Road access earthworks

3) Environment and Aesthetics

4) Costs

5) Maintenance

6) Launching Operations

8.2.1 Flow capacity

This parameter takes into consideration the geometrical characteristics of the proposed solutions in comparison to the hydraulic behaviour of the river and its flow speed. In particular, since the Nile river flow speed is high, the presence of piers on the river banks or in the main stream represents a specific aspect to be considered.

Among the proposed solutions the only one implying piers is Option A Composite I-girder Bridge. The piers will be built near the river banks and for this the minimum score (1) is assigned to this Option.

On the contrary, Option B: Tied Arch Bridge foresees temporary structures close to or in the water during construction and therefore a score (3) has been assigned to this option while for this parameter the maximum score (5) has been assigned to Option C: Deck Arch Bridge.

Table 8.1: Piers presence on River Banks

PIERS PRESENCE ON RIVER BANKS			
Options / Phase	Composite I-girder Bridge	Tied Arch Bridge	Deck Arch Bridge
a) construction phase	YES	YES	NO
b) serviceability life	YES	NO	NO

The final conclusions for the score assignment of the parameter in object, for each solution, are stated in the following:

- Option A: Composite I-girder Bridge score: **1**
- Option B: Tied Arch Bridge score: **3**
- Option C: Deck Arch Bridge score: **5**

8.2.2 Road Access Earthworks (rock excavation and fill)

The new Karuma Bridge involves road access construction. It is a total 1.800 m length new road construction made of 1.200 m long road south bank access and a 470 m long north bank access.

As for the access roads vertical geometry, given the difference in level of the two banks, each solution implies different earthworks volumes. In particular, being the south bank access at a higher level than the north bank, the project will imply rock excavation on the south access and fill construction on the north side.

In the evaluation of this parameter we have also considered the need of rocky material for asphalt, concrete and of course the pavement structure and we have thus assigned different scores to each option as follows.

Option A - composite I-girder bridge solution, implies a 8.5 m high embankment on the north bank , while Option B - tied arch bridge does not require any embankment and Option C - deck arch bridge also imply a 8.5 m high embankment for a longer section.

- Option A: Composite I-girder Bridge embankment volume (m^3): **2475**
- Option B: Tied Arch Bridge embankment volume (m^3): **0**
- Option C: Deck Arch Bridge embankment volume (m^3): **9600**

We have also estimated the pavement structure's layers volumes shown in the following table:

Table 8.2: Pavement structure's layers

PAVEMENT LAYER	THICKNESS (m)	WIDTH (m)	LENGHT (m)	TOTAL (m^3)
Wearing Course (Asphalt concrete)	0.05	7	1680	588.0
Granular Base	0.20	10	1680	3360.0
Granular Sub-base	0.30	10	1680	5040.0
			Tot. (m^3)	8988.0

Basing on the above illustrated considerations, the total quantities (m^3) are as follows:

Table 8.3: Total quantities (m^3) required for the options

OPTIONS	ROCK EXCAVATION (bank A) (m^3)	REQUIRED (m^3)	EXCESS (bank B)
A- Composite I-girder Bridge	59450	2475+8988	47987
B- Tied Arch Bridge	88555	0+8988	79567
C- Deck Arch Bridge	30275	9600+8988	11687

Basing on the above the higher score is assigned to Option C having this lower excess and the lower score is assigned to Option B having this higher excess as follows:

- Option A: Composite I-girder Bridge score: **3**
- Option B: Tied Arch Bridge score: **2**
- Option C: Deck Arch Bridge score: **5**

8.3 Environment and Aesthetics

Aesthetic qualities result from the appropriate arrangement of visual design elements which are used to evaluate a visual composition. These design qualities are intangible; they are perceived qualities that arise from relationships of design elements.

Basing on the high importance of the "aesthetic" parameter, the Consultant proposes to introduce 10 sub-parameters that can be weighted to define "aesthetic". The score will be minimum of 0 and maximum 1, particularly score 0 will be assigned to the option that doesn't have any correspondence with aspect, score 0.5 will be assigned in case of partial correspondence and score 1 will be assigned in case of total correspondence with aspect.

The rate for aesthetic" parameter will be calculated with the following formula:

Aesthetic = $\frac{a)+b)+c)+d)+e)+f)+g)+h)+i)+j)}{2}$

The aspects evaluated by the Consultant and relative assigned score are:

a) Order

Order is the arrangement of design elements so that each element has a proper place and function so the whole works together as a unit without confusion.

b) Proportion

Proportion is a method of creating a sense of order by assigning appropriate relative sizes to the various elements. The goal is appropriate proportions between the various parts of a structure: between its height, width, and depth; between solids and voids; between surfaces and openings; and between areas of sunlight and shadow.

c) Rhythm

Rhythm is a method of creating a sense of order by repeating similar elements in, on or around a structure. When these elements create a natural flow which is satisfying to the eye, rhythm is created. It requires that the elements have some similarity of visual characteristics in addition to a modulated placement. In bridges, major rhythms are created by the repetition of similar shapes.

d) Harmony

Harmony means that elements of a design have visual similarity. The relationship must be complementary. If planes or lines in a design have more dissimilar characteristics than they have similar characteristics, they are not likely to be perceived as harmonious.

e) Balance

Visual balance is the perceived equilibrium of design elements around an axis or focal point. Rather than a physical balance, it may refer to equilibrium of abstract elements of design, such as masses, visual weights or texture.

f) Contrast

Contrast relieves the monotony of simple harmony by complementing the characteristics of some design elements with their opposites. This adds a heightened awareness of each other. Contrast often takes the form of dramatic differences in color or light and shadow.

A second principle of contrast is that of dominance, where one of two contrasting elements commands visual attention over the other. One becomes the feature and the other becomes the supporting background. A dominant theme is essential in organizing the design into a pleasing aesthetic experience.

g) Optical Perception

What people perceive is not always what is there. Our vision is susceptible to manipulation and illusion. Designers can use illusion to improve the appearance of an element.

h) Unity

Unity provides the observer with a sense of wholeness. This is generated by some central or dominating perception in the composition. It encompasses the perfect application of all the other qualities, and it refers to the combined effects of all other aesthetic qualities applied simultaneously. Unity is the condition, or state, of full resolution of the site and project functions. It implies harmony where all of the elements are in accord, thus producing an undivided total effect.

i) Material Composition

Construction materials are very important to define the bridge aesthetic.

In the case in object, the main material used in all solutions is steel, but the difference between "weathering steel", best-known under the trademark COR-TEN steel foreseen for the steel-concrete composite bridge and the other two arc-steel solution, cannot be neglected.

j) Landscape and environmental Compatibility

The last parameter to take into account in the aesthetic bridge assessment is its landscape compatibility. This aspect is not only referred to the bridge shape and composition, but has to be referred to the insertion of the structure in the surrounding landscape.

Table 8.4: Total weighted scores for the options

Options / Criteria	Option A- Composite I-girder Bridge	Option B- Tied Arch Bridge	Option C- Deck Arch
a) Order	0,5	1	1
b) Proportion	1	0,5	1
c) Rhythm	0	1	0,5

d) Harmony	0	1	1
e) Balance	0,5	1	1
f) Contrast	0	1	1
g) Optical Perception	0	1	0,5
h) Unity	0,5	1	1
i) Material Composition	0,5	1	1
j) Landscape and environmental Compatibility	0	0,5	1
TOTAL	**3**	**9**	**9**

TOTAL SCORE	**1,5**	**4,5**	**4,5**

Basing on the above following total scores were assigned to each option:

- Option A: Composite I-girder Bridge score: **1.5**
- Option B: Tied Arch Bridge score: **4.5**
- Option C: Deck Arch Bridge score: **4.5**

8.4 Cost

In order to assign this score, each option's construction cost was estimated. The following table presents the summary of each option's cost:

Table 8.5: Construction cost estimates

Option	Total Cost (UGX)	Total Length (m)	Unit Cost (UGX/m)
A- Composite I-girder Bridge	57.071.960.543,05	**210**	**271.771.240,70**
B- Tied Arch Bridge	108.564.031.425,18	**202**	**537.445.700,12**
C- Deck Arch Bridge	106.992.241.016,57	**216**	**495.334.449,15**

Basing on the above, the lower score is assigned to option B and the higher to Option A:

- Option A: Composite I-girder Bridge score: **5**
- Option B: Tied Arch Bridge score: **1**
- Option C: Deck Arch Bridge score: **1.5**

8.5 Maintenance

For any structure maintenance is the "key" for a durable life. For steel structures in particular, maintenance is also more important and need specific competences especially for welded or bolted connections.

In this regard, three different aspects have been taken into account:

a) operations of bolts tightening ;

b) Bearings maintenance Operations (possible replacement, routine maintenance, etc.)

c) Routine maintenance operations referred to the deck (grids, drains and down-pipe cleaning, etc.)

The rate for "maintenance" parameter was then calculated by means of the following formula:

Maintenance = $\frac{a)+b)+c)}{3}$

As for the bolts tightening, given that the only bolted connections are in Option A, this was assigned the lower score (1) while the highest (5) was assigned to option B and C, since they don't present bolts at all.

As for the bearings maintenance operations, the lower score (1) was also assigned to Option A as this has a larger number of bearings while score (3) has been assigned to Option B: Tied Arch Bridge, that implies bearings only on the abutments and the highest score (5) is for Option C: Deck Arch Bridge, which does not have bearings. With regard to the routine maintenance operations to be done on the deck, the same score (4) has been assigned to all option, having each desk the same structural characteristics.

Table 8.6: The summary of the scores for each option is shown in the following table:

Options / Criteria	Option A- Composite I-girder Bridge	Option B- Tied Arch	Option C Deck Arch
a) tightening bolts	1	5	5
b) bearings	1	3	5
c) ordinary maintenance	4	4	4
TOTAL	**6**	**12**	**14**
TOTAL SCORE	**2**	**4**	**4,5**

Basing on the above the following total scores are assigned to each Option:

- Option A: Composite I-girder Bridge score: **2**
- Option B: Tied Arch Bridge score: **4**

- Option C: Deck Arch Bridge score: **4,5**

8.6 Technology/Launching Operation

Each option implies specific methodology and technology for the construction technique (crane, derrick, launching-gantry, etc). Lower score was assigned to the option implying more complicated launching operation or temporary structures construction.

Therefore, Option A was assigned the highest score (5) because it does not require temporary structure and small cranes to assemble the bridge-segment can do the work; the lowest score (1) has been assigned to Option B that needs temporary structures near or in the river bed, to support the arc and deck installation, with the use of large cranes; an intermediate score (2) is for Option C that implies temporary structures just for the arcs ribs erection and not for the whole bridge as in option "B", with the use of big cranes.

Basing on the above, the score for this parameter is as follows:

- Option A: Composite I-girder Bridge score: **5**
- Option B: Tied Arch Bridge score: **1**
- Option C: Deck Arch Bridge score: **2**

8.7 Comparison matrix

The following table presents for each option, the result of each of the six (6) parameter evaluation and the total scores assigned to each option

Table 8.7: Total scores assigned for technology operation

Parameters / Option	Flow Capacity	Road Access Earthworks	Environment & Aesthetics	Costs	Maintenance	Launching Operations	Total
A) Composite I-girder Bridge	1	3	1.5	5	2	5	**17.5**
B) Tied Arch Bridge	3	2	4.5	1	4	1	**15.5**
C) Deck Arch Bridge	5	5	4.5	1.5	4.5	2	**22.5**

From the matrix above the best option is Option C Deck arch Bridge having a total score of **22.5**.

8.8 No Project Option

The no project option implies that the proposed project is not implemented. However, choosing the no project option will mean no improvement to the existing Karuma Bridge which currently is old and needs an alternative. It would also mean curtailing development of the country since continuous use of the old bridge would become dangerous to the road users and their property and this in turn affects the national economy.

In summary, the construction of the new Karuma Bridge outweighs the no option alternative since it will lead to livelihood improvement, better healthcare, better education, market accessibility and improved economic and social opportunities for the people in the Northern, Nile region and Uganda as a whole hence more feasible and the project should go ahead with the implementation.

CHAPTER NINE

9.0 POTENTIAL IMPACTS OF PROJECT

9.1 ENVIRONMMENTAL IMPACTS

A logical and systematic approach was taken for impact identification. The aim was to take account of all of the important environmental/project impacts and interactions, making sure that indirect and cumulative effects, which may be potentially significant, are not inadvertently omitted. This process began with screening and continued through scoping, which identified the key issues and classified them into impact categories for further ESIA study.

9.1.1 Identification and Evaluation of Impacts

The construction of proposed the New Karuma bridge will have significant potential impacts on the environment. The positive impacts are likely to enhance the environmental conditions while the negative impacts can be severe if they are not identified during the project planning stages and appropriate mitigation measures designed.

Potential environmental and social impacts have been identified per project phases and the associated main activities. The project phases are construction, operation and decommissioning. The process of impact identification aimed at ensuring that all potential impacts were identified. Simple checklists with a matrix of issues /impacts in relation to various project activities in different phases were used to identify potential impacts.

Evaluation and analysis of impacts was carried out according to national and internationally accepted procedures, where each identified impacts were analyzed individually according to a number of criteria including descriptions of their magnitude, extent; duration; and probability of occurrence; the value of the affected environment; likely degree of recovery of the affected area.

The evaluation aimed at identifying the most significant impacts, which would require interventions in terms of mitigation and enhancement measures.

9.1.2 Significance Rating of Impacts

The overall significance of the impacts was defined based on the result of a combination of the consequence rating and the probability rating.

Table9.1: Description of impact significance ratings

Significance rating	Implication
Low	Should not have an influence on the decision to proceed with the proposed project, provided that recommended mitigation measures to mitigate impacts are implemented

Medium	Should influence the decision to proceed with the proposed project, provided that recommended measures to mitigate impacts are implemented
High	should strongly influence the decision to proceed with the proposed project regardless of mitigation measures

9.1.3 Rating of Identified Impacts

9.1.3.1 Construction Phase Impacts

The main activities during mobilization phase of the project will be the transportation of construction equipment to the site, construction of camp sites, and establishment of sources of locally available sources of natural construction materials. The potential impacts during construction phase are related to impacts on the physical, biological and socio-economic environments. Significance rating of the potential construction phase impacts are summarised in the table below and discussed in subsequent sub-sections.

Table 9.2: Significance rating of potential construction phase impacts

Environmental aspect		Consequence					Significance rating	
Impact	**Nature**	**Extent**	**Intensity**	**Duration**	**Rated**	**Probability**	**Without mitigation/ enhancement**	**With mitigation/ enhancement**
Physical Environment								
1. Increased soil erosion	(-)	Local	Low	Short-term	Low	Probable	Low	Low
2. Noise and vibration	(-)	Local	Low	Short-term	Low	Definite	Medium	Low
3. Contamination of the soil	(-)	Local	Low	Short-term	Low	Probable	Medium	Low
4. Water pollution	(-)	Local	Low	Short-term	Low	Probable	Medium	Low
5. Physical Cultural Resources	(-)	Local	Low	Short-term	Low	Probable	Medium	Low
6. Occupational Health and Safety	(-)	Local	Medium	Long-term	High	Definite	Medium	Low
7. Soil Compaction	(-)	Local	Low	Short-term	Low	Definite	Medium	Low
8. Sources, transportation, Storage of construction materials	(-)	Local	Low	Short-term	Low	Probable	Low	Low
9. Construction Camps and Sites	(-)	Local	Low	Short-term	Low	Definite	Medium	Low
10. Solid waste generation	(-)	Local	Medium	Short-term	Low	Definite	Medium	Low
Biological Environment								
11. Vegetation clearance	(-)	Local	Low	Short-term	Low	Definite	Low	Low
12. Disturbance to wildlife and Habitat	(-)	Local	Low	Short-term	Low	Highly Probable	Low	Low
Socioeconomic Environment								
13. Employment opportunities	(+)	Regional	High	Long-term	High	Definite	High	High
14. Provision of market for supply of construction materials	(+)	Regional	Medium	Short-term	Medium	Definite	Medium	High
15. Ambient air quality	(-)	Local	Low	Short-term	Low	Definite	Low	Low
16. Noise and vibration	(-)	Local	Low	Short-term	Low	Definite	Medium	Low

Environmental aspect		Consequence					Significance rating	
Impact	**Nature**	**Extent**	**Intensity**	**Duration**	**Rated**	**Probability**	**Without mitigation/ enhancement**	**With mitigation/ enhancement**
17. Construction Vehicular traffic movement	(-)	Local	Low	Short-term	Low	Definite	Medium	Low

9.2 Potential Positive Significant Impacts during planning and design phase.

9.2.1 Employment opportunities

With the planning and design phase of the proposed development/project of the New Karuma Bridge, there will be increase in activities at the project area translating into employment opportunities for both professionals and unskilled workers. Indirectly, there are the associated jobs in business services, wholesale, retail trade and transport.

9.2.2 Creation of awareness

During the planning and design phases of the proposed Project, the community is informed of the Project and their views sought on what they think about the Project. In this way, awareness will be created for both the community and the developer. The developer will be in a position to put into practice the advice from the community when planning and designing the Project.

9.2.3 Impact on quality of life

People working on this project will earn an income which will have a direct impact on standards of living as there will be increased disposable income. Example is that of labour workers who will be earning a good salary.

9.2.4 Business improvement

The project area will provide an outstanding opportunity to expand the business base as a result of increased potential consumers of goods and services.

9.2.5 Negative impacts during planning and design phase

It is envisaged that there will be minimal negative impacts during the planning and design stage of the Project development, however this are insignificant to the project.

9.3 POSITIVE IMPACTS DURING CONSTRUCTION

9.3.1 Employment opportunities

With the construction of the proposed New Karuma bridge, there will be employment opportunities for both professionals and unskilled workers, beneficial both from the economic and social point of view. It's estimated that about 70 skilled workers and another 120 unskilled workers will be employed. Economically, it means labour will be used in production. Socially these people will be engaged in productive employment.

Several workers including casual labourers, masons, carpenters, contractors and engineers are expected to work on the site during construction period. Semi-skilled, unskilled labourers and formal employees are expected to obtain gainful employment during the period of construction.

9.4 POTENTIAL NEGATIVE IMPACTS DURING CONSTRUCTION

Major issues considered included concerns raised during public consultations with stakeholders and impacts assessed during site visits and baseline studies conducted.

9.4.1 Noise and vibration levels

Noise levels during the construction phase will increase due to the movement of excavation/construction machinery and vehicles, clearing of trees from the proposed Karuma area, construction activities i.e., construction of labour camp, onsite office, construction material plants etc, will lead to land clearance.

High noise levels are likely to prevail for a few days due to the movement of vehicles and tree cutting machines, cranes and other machines, levelling vehicles such as Dozers, etc. The main sources of noise during construction period are:

- Site preparation, dredging, land reclamation, levelling, construction of the breakwaters, piling, transportation of material, handling of material, other engineering works like riveting, hammering, cutting, welding etc., operation of power shovels, concrete mixing plants will add up the noise level of the area.
- The construction vehicles for loading and unloading, fabrication, handling of equipment and materials are likely to cause an increase in the ambient noise levels. The areas close to the site like the Karuma Wildlife Reserve Camp and Karuma Village will be affected.

The impact will be short term duration and only prevail during the construction time which will be restricted to day time. The impact will be localised and low if mitigation is applied.

9.4.2 Ambient Air quality

The nearest residential Air Sensitive Receivers (ASRs) in the nearby village, are not less than 200m from the boundary of the project area. Possible construction phase air quality impacts will include:

- Fugitive dust arising from site clearance, construction activities, movement of construction materials over the site area, and wind erosion of open sites and stockpiling areas;

Air pollution from the above-named sources is likely to affect site workers and the surrounding neighbouring establishments. In extreme situations, this may lead to respiratory problems among the workers and neighbours but, it is not envisaged to be the case given the magnitude of the proposed activities.

The impact will be localised, the occurrence will be Short-term and significance is low if mitigated.

9.4.3 Physical Cultural Resources

There are no known physical cultural resources within the vicinity of the proposed Karuma Bridge. It should be noted that though various other physical cultural resources are located within Karuma Village, these are not within the project area of influence hence no major impacts.

The impact significance is likely to be low with a short term rapidity of occurrence and can be avoidable.

9.4.4 Water Pollution

During the construction phase, there is a high possibility of siltation of water quality in the river Nile water due to site clearance and other excavation works especially in areas with a rock bed, although if well managed, it will be negligible.

Waste water, if drained untreated, will lead to pollution. Paints, oil & oil sludge too may come in contact with lake/river water and hence could degrade the water quality. These liquid wastes, if allowed to seep into the ground, could affect the ground water quality. This in turn, will have an adverse effect to the other users downstream; who utilize this source for drinking and other household purposes. However, adequate drainage and waste handling facilities have been included in the project site design to ameliorate such risks.

Dredging operations, land reclamation and construction of the breakwaters could all affect the water quality within the surrounding project areas in terms of increased turbidity of the water and increased pollution due to dredged or spilt contaminants. Oily wastes will be generated from equipment used in construction work and could pollute the waters.

Possible water quality impacts during the construction phase would include:

- Temporary elevation in concentration of suspended solids (SS) and generation of sediment plumes, release of organic and inorganic contaminants and nutrients during dredging and filling;
- Increase in Suspended Solid levels and turbidity arising from the new Karuma bridge construction site runoff and wastewater generated from construction activities, and
- Change in sediment deposition rate that could affect the ecological sensitive receivers in the vicinity to the construction area.

The extent of the impact will be local, the occurrence will be Short-term and significance is low if mitigated, however can be medium if not properly mitigated.

9.4.5 Solid waste generation

Solid wastes generated during construction include: packaging wastes (mainly paper, polythene, plastics, and tins), cuttings and trimmings off materials and construction wastes among others. Dumping around the site will interfere with the aesthetic status and has a direct effect on the surrounding community and Karuma Wild life since animals roam around the project area. Disposal of the solid wastes off-site could also be a social inconvenience if done in the wrong places. The off-site impacts could be aesthetic, creation of breeding grounds for vermin, pollution of physical environment and invasion of waste pickers/scavengers.

The extent of the impact will be local, the duration of the impact occurrence will be Short-term and significance is low if mitigated, the intensity of occurrence is medium however can be medium if not mitigated.

9.4.6 Contamination of the soil

Soil contamination may take place due to movement of vehicles or solid wastes generated from the labour camp set up during the pre-construction stage. This impact is significant at locations of construction camps, stockyards etc. and adequate means must be taken to ensure that all operations avoid potential land contamination.

During construction phase, construction vehicles are parked and serviced and are likely to contaminate the soils in case of leakages or spillage of fuel and lubricants. Refuse and solid waste from labour camps can also contaminate the soil.

Unwarranted disposal of construction spoil and debris will add to soil contamination. It is also important to assess the quality of dredge material for heavy material and oil contamination.

Contamination of soil during construction will be local, the duration of the impact occurrence will be Short-term and significance is low if mitigated.

9.4.7 Soil Erosion

Most of the construction activities including site clearance, excavation and construction of access roads will lead to soil exposure. Run off during heavy rains from the cleared and unprotected excavated areas could result in increased suspended and dissolved solids and hence reduced water quality of the Nile River if not well managed.

The impact will be local, the intensity and significance will be low while the duration will be short term.

9.4.8 Soil Compaction

Soil compaction caused by vehicles transporting construction materials or construction machinery is likely to affect Soil, flora, fauna and surface water leading to increase in surface run off, giving the soil greater erosive capacity, loss of soil microbes, destruction of aquatic flora and fauna.

The impact will be local, the intensity and significance will be medium while the duration will be short term.

9.4.9 Vegetation Clearance

Vegetation will be cleared during construction of the proposed New Karuma Bridge and its access roads, operation of new borrow pits and construction of support infrastructure and buildings. The site has a number of Muvule trees which is an endangered plant species or species of ecological significance. The vegetation of the area is still intact since it is located within the KWR. The Current vegetation of the project site is not modified. It also doubles as a riverine forest with a number of important plant species. Care has to be taken therefore to clear only places necessary and try to preserve the other areas as much as possible.

The impact will be local; the significance will be high without mitigation and medium with proper mitigation while the duration will be short term.

9.4.10 Disturbance of Wild life and Habitat

Increased construction traffic and over-speeding may affect the animals, causing accidents. Wildlife movement may also be negatively impacted, especially of animals that use the area for grazing. This impact on the KWR protected wildlife species is short term and low if proper mitigation methods are applied.

Destruction of habitat especially for aquatic animals that rely on the Nile River habitat (amphibians and fish species, etc.) in the immediate vicinity of the proposed new Karuma bridge and its piers. The other species living in clear water will become rarer in these parts. These impacts are limited to less than 200 metres on both sides of the bridge, and will not fundamentally disrupt the ecology of the river's fish species and other wildlife habitat. *The significance is low and the impact will be localised and short term.*

9.4.11 Occupational Health and Safety of Workers

The construction sites are potentially dangerous places and health, safety and occupational impacts are likely to occur unless addressed in both the immediate vicinity of the new Karuma Bridge, work sites and workshops. Such impacts include: Burns (handling welding/hot works, etc), Injury from fly rock e.g. at quarry sites or debris, Noise and body vibration from equipment

OHS impacts will potentially occur at any point during construction and while some accidents could be low in significance, others might be grave leading to disability or loss of life of construction workers.

The impact will be of a medium intensity and short-term occurring only during the construction phase. Significance of this impact is therefore predicted to be low to medium.

9.4.12 Sources, Transportation and Storage of Construction Materials

The sites for sources of material (borrow sand and rock areas) will have a number of potential negative impacts including: Noise, soil and material handling and erosion problems, loss off vegetation, pounded water provides the breeding sites for disease vectors, Traffic and safety concerns, dust at sites and along access roads; siltation and oil pollution of down-stream areas; among others. All operations in the pits will create short-term operational adverse effects to the surrounding areas.

During the new Karuma Bridge and access road construction, there will be need to stockpile and store assorted materials at or near construction site to ensure uninterrupted access to supplies. This could lead to pollution of land and watercourses by spilling and wash away of materials. This impact can occur anywhere along the receptors such as soil and water resources near storage sites, KWR and local communities dependent on affected environmental resources.

This impact is localised, duration is a short term level of occurrence with medium term intensity and low significance level.

9.4.13 Construction camps and work sites

Camp and equipment yard will require land to develop, temporarily altering land use. Their operation will generate domestic and hazardous waste (waste oil) which if improperly managed will contaminated local environmental resources (soil, water) and pose health risks to the wildlife animals and the public. Wild animals and other domestic animals could die from feeding on camp waste such as peeling commingled with plastic carrier bags.

Unrestored camp and yard sites would cause aesthetic blight and remnant contamination from fuel, oil or unused bitumen. Workers camps are also associated with fuel storage and dispensing, vehicle maintenance areas and workshops, offices and generator houses, vehicle wash bays and waste management/disposal. All these have potential for environmental contamination of Soil and water resources near storage sites, Communities near camp site, Bridge construction crews (in case of OHS accidents and fire outbreak).

Socially, if the contractor does not maintain a strict “no fraternization” policy, workers’ camps could be hotspots for prostitution or illicit sexual relationships, breaking marriages and causing disquiet in adjoining community.

The camp sites will be temporary; accommodating about 70-120 staff and some heavy equipment (e.g. graders, front loaders and trucks). The locations of the site camp and equipment yard are not known at the moment.

This is a local impact with a short-term duration, avoidable, and its significance is medium if mitigation measures are not adhered to however can be low if correct measures are followed.

Table 9.3: Significance rating of potential operation phase impacts

Environmental Aspect		Consequence					Significance rating	
Impact	**Nature**	**Extent**	**Intensity**	**Duration**	**Rated**	**Probability**	**Without mitigation/ enhancement**	**With mitigation/ enhancement**
Physical Environment								
Water pollution from oil spills	(-)	Local	Low	Long-term	Low	Definite	Low	Low
Socioeconomic Environment								
Improved transport infrastructure	(+)	Regional	High	Long-term	High	Definite	High	High
Improved travel safety and comfort	(+)	Regional	Medium	Long-term	Medium	Definite	Medium	High
Increased revenue to local and central government	(+)	Local	Medium	Long-term	Medium	Definite	High	High
Tourism	(+)	Local	Medium	Long-term	Medium	Definite	Medium	High
Risk of human accidents and injuries	(-)	Local	Medium	Long-term	Medium	Definite	Medium	Low
Risk of accidents wildlife animals	(-)	Local	Medium	Long-term	Medium	Definite	Medium	Low

9.5 Potential Negative Impacts during operational phase

9.5.1 Water Pollution from Oil Spills

During operation of the bridge, some dust particulates and oil spills are envisaged by the moving vehicles and other forms of transport especially locomotive engines. Most of the locomotives in use are very old without reliable repair and maintenance. These spills may affect the water and soil quality in the surrounding areas due to runoff.

This impact is localised with short term duration with low significance level

9.5.2 Risk of Accidents to Wildlife animals

The new Bridge passes through the KWR, if speed limits and proper measures are not put in place, the wild life animals may be affected by speeding vehicles.

This impact duration is a short term with low significance level

9.5.3 Risk of human Accidents and Injuries

Such accidents may happen due to reckless driving, lack of appropriate signage warning the road users and pedestrian crossing along the bridge. Such accidents may also occur due to sharp curves and obstructed visibility.

In absence of provision of appropriate and adequate personal protective equipment (PPE) maintenance workers especially are likely to be injured during their operations.

This impact is local with a medium intensity; however the occurrence will be a long term with low significance level if mitigated.

9.6 Potential Positive Impacts during operation

9.6.1 Improved transportation infrastructure

The proposed new Karuma Bridge will provide access to the regional and international transportation system boosting connectivity and international business. It is expected that the proposed project will result into improved and reliable services for both passengers and goods majorly using the northern route to Southern Sudan. The development potential of the Northern and the West Nile sub region is substantial and depends upon the provision of adequate infrastructure linking to other districts like Gulu, Arua. Lira among others.

The impact will be during the post construction phase of the project. Significance of this impact is therefore predicted to be high and its intensity of occurrence is long term.

9.6.2 Tourism

Acceleration of tourism potential of the different scenic features around the project areas like Murchison Falls National Park, Karuma Wildlife Reserve, Karuma Falls among others and in the long-term, the improved access is likely to impact on cultural and tourism sites in these areas, thereby trickle effect to the communities.

The impact significance is therefore predicted to be medium and its occurrence is long term.

9.6.3 Improved Travel Safety and Comfort

Improved and reliable services will consequently lead into improved travel safety and comfort to passengers using the route.

The impact significance is therefore predicted to be high and its occurrence is long term.

9.6.4 Increased Revenue to Local and Central Governments

Through enhanced use of the route, a lot of business potential is likely to thrive. Payment of relevant taxes, rates and fees to the government and the local authorities by transporters and business entities will contribute towards the national and local revenue earnings hence boosting the local and national economy. *The impact significance is therefore predicted to be high and its occurrence is long term.*

CHAPTER TEN

10.0 MITIGATION AND ENHANCEMENT MEASURES

This Chapter highlights the mitigation and enhancement measures for the expected negative impacts of the proposed New Karuma Bridge. The potential impacts and the possible mitigation measures have herein been analyzed.

10.1 MITIGATION OF PRE-CONSTRUCTION IMPACTS

Impacts during this phase of the Project are not significant. However, the Design team shall take necessary measures to document any concerns and address them onsite-occur basis. In that regard the design team shall incorporate all environmental expectations and the team shall develop all inclusive Environmental Social Management Plan (ESMP).

10.2 MITIGATION OF CONSTRUCTION RELATED IMPACTS

The following measures should be considered as mitigation measures for the negative impacts associated with the proposed project during construction phase.

10.2.1 Air, noise and dust

Significance of air and noise impacts depends on whether the Project would increase emissions and noise level over the existing ambient levels.

Noise impacts would be considered significant if the Project would result in the following:

- Exposure of persons to or generation of, noise levels in excess of standards established in the local general plan or noise, or applicable standards;
- Exposure of persons to, or generation of , excessive ground-borne vibration or ground-borne noise levels;
- Substantial permanent increase in ambient noise levels in the Project vicinity above level existing before the Project; and
- Substantial temporary or periodic increase in ambient noise levels in the Project vicinity above level existing before the project.

The Proponent through the Contractor shall put in place several measures that will mitigate noise pollution arising during the construction phase. The following noise-suppression techniques will be employed to minimize the impact of temporary construction noise at the Project site.

- Install portable barriers to shield compressors and other small stationary equipment where necessary;
- Use of silent mechanical equipment i.e. equipment designed with low noise control elements;

- Ensure regular servicing of construction equipment
- Limit trucks and other small equipment to minimum idling time and observe a common sense approach to vehicle use and encourage workers to shut off vehicle engines whenever possible;
- Provision of appropriate personal protective equipment;
- Construction work to be carried out during the day; and
- Consider labour based technologies that will limit heavy machinery use.

The following measures can help mitigate the emissions and dust generation likely to arise during the construction phase:

- Minimizing the number of motorized vehicles in use;
- Rehabilitate disturbed areas (if any);
- Wet all active construction areas as and when necessary to lay dust; and
- Undertake staff training and allocate roles to trained/responsible staff members.
- Use PPE like masks when people are working.
- Where necessary, fence the project site to minimize blowing air in order to reduce the spread of dust.
- Cover construction materials (sand, gravel, cement, etc) on transit and on site.
- Restrict activities to core construction area.

10.2.2 Water Quality and pollution

All waste water from the proposed development should be collected at a central place and be adequately treated before discharge into the environment.

Install oil trapping equipments in areas when there is a likelihood of oil spillage such as during the maintenance of construction equipment.

Works will be planned, scheduled and performed in such a manner that the quality of water flowing from the site is at all times acceptable. Conditions will be maintained to protect the aquatic environment and other watercourses not only during construction, but also during periods of suspended construction activity

Mitigation measures to be considered for water quality control during dredging and filling operations would include:

- Installation of silt curtains during dredging works;

- Construction of the wall in the early stages of the reclamation to effectively confine sediment release during dredging and filling;

- Reduction of the dredging rate, use of tightly closed grabs, and control of grab descent speed to minimize disturbance to the seabed and sediment loss during dredging and raising of grabs;

- After completing bridge, cleaning up whole temporary constructions on shore as well as under the river, including steel, redundant concrete, surrounding frame and equipment such as excavators, bucket, crane, etc.

10.2.3 Solid waste management

It is recommended that construction waste be recycled or reused as much as possible to ensure that materials that would otherwise be disposed-off as waste are diverted for productive uses. In this regard, the Contractor will ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed-off.

The Proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal and disposed to designated site.

Restriction of burning at project site, providing camp sites with portable toilets, collect sludge from septic tank and remove toilets after finishing and collecting waste into proper storage yard, keeping temporarily and transporting the waste to designated sites shall be regularly done.

Additional recommendation for minimization of solid waste during construction of the proposed Project include the use of durable, long-lasting materials that will not need to be replaced often, thereby reducing the amount of construction waste generated over time.

10.2.4 Construction Camps and Work sites

In general a camp would require approximately 5-10 acres of land. The Contractor will need to pay rent to the landowners as agreed prior to construction. In setting up a workmen’s camp, consideration must be given to water availability and fuel supplies.

The contractor shall also liaise with the respective Local Authorities for proper disposal of wastes as especially that generated at the construction camp at sites approved by the local authorities. Implementation of the waste disposal strategy will be on-going from project inception through to completion. Thus, the post construction waste is expected to be very minimal.

These may include oil/fuel drums used as storage containers and parts of machinery. The fuel storage facilities and machinery used will be hauled to the plant yard and kept for future re-use.

The Contractor must consult with the local authorities to identify acceptable potable water sources so that there is no conflict with the local people.

In case of the need for drilling bore holes, the Contractor should follow the right procedures for obtaining abstraction permit from the Directorate of Water Resources Management.

The camps should not be located at isolated points where they will attract periphery businesses, and provide a nucleus for the growth of unplanned settlements hence locate them at centres like were most of the services are readily available.

Wastes should be disposed in areas designated areas by local authorities and monitored. Solid wastes should be segregated into metals, paper, plastics and organic waste, so that scrap metal can be sold, reused, and organic waste and paper can buried or burned as appropriate. Plastics should be stored on site and should be taken for recycling. Wastes that do not fall into these categories should be disposed of by a licensed waste handler.

Ventilated Improved Pit (VIP) latrines must be carefully located and designed because of the high water table in some areas. The location of the VIP latrines in the camp should preferably be downhill of potable water sources, or 30 m from any surface water body, and protected from runoff. Communal bathrooms/lavatories leading to soak way pits are another option.

It should be noted that the camp where maintenance is undertaken should have a hazardous waste storage facility as part of the camp infrastructure, which should be well designed and licensed by NEMA.

10.2.5 Vegetation Clearance, Soil compaction and landscaping

The Contractor shall prepare a Landscaping and Re-vegetation Plan which shall include the following:
Restoration of cleared areas, quarries which are no longer in use, spoil areas, construction roads, construction camp areas, borrow areas, stock. Landscaping and re-vegetation at the site will improve the aesthetics of the area.

Pile areas, working platforms and any areas temporarily occupied during construction of the works shall be undertaken using landscaping, provision of adequate drainage and re-vegetation;

All areas disturbed by construction activity, including temporary access roads and tracks, shall be landscaped to reflect natural contours, restore suitable drainage paths and encourage the re-establishment of vegetation;

Construction workers should not clear vegetation for use as fuel wood as it will exacerbate more clearing.

10.2.6 Sources, Transportation and Storage of Construction Materials

Dust-generating activities (e.g. drilling, crushing and transportation) may be reduced or suspended during windy conditions. Haulage trucks will be covered with tarpaulin to prevent dust and material escape. During tipping and heaping of quarry and other materials a system of water sprinkling will be used to suppress dust. Heaped quarry and other materials will be periodically dowsed with water to suppress dust against wind erosion. Haulage will be restricted to day time to prevent noise nuisance to the communities and the high risk of accidents in the night (Quarry and other construction materials will be sourced from existing approved sites by NEMA)

Compensation for the use of materials/acquisition will be paid to the owners of the material sites including areas were haulage routes will be established before commencement of actual bridge works and this will be based on the current land value or property.The borrow and quarry areas shall be reinstated after use and the general procedures are as follows:

- The excavation is filled with excess spoil and stockpiled overburden
- The fill in the pit is compacted
- The compacted fill is re-contoured, ensuring that drainage is free flowing
- Stockpiled topsoil is spread lightly over the compacted, re-contoured fill
- The filled pit is then reseeded with indigenous grasses and/or trees
- Before reinstatement, separate stockpiles for topsoil, overburden, gravel, should be encouraged as this will help in the restoration exercise, etc.
- The remaining rock and other surfaces will be terraced.
- As part of the contract, the old borrow pits that were opened for maintenance works and that have been abandoned, or will be abandoned, should also be rehabilitated.
- All stone quarry sites will be subjected to a standalone EIA prepared by a qualified and registered EIA specialist, in advance of the source being exploited while borrow pits will undertake a Project Brief, as required by *Third Schedule* of National Environment Act, Cap 153 and section 18 (2) of the National Environment (Conduct and Certification of Environmental Practitioners) regulation 2003. It should be a contractual requirement for the contractor to integrate quarry restoration plans in the general project implementation. To this effect, the contractor should ensure:

  i. That site restoration as road construction commence concurrently so that cut to spoil is used to fill up quarry sites.

  ii. Height and orientation of the quarry face need to be controlled if reinstatement is to be effective

  iii. Access road to quarries if not needed by local community should be scarified and re-vegetated.

  iv. Site restoration should utilize native vegetation species and replanting undertaken during rainy season to ensure high re-vegetation success.

v. Rock blasting should utilize licensed blasters and all explosives handled as per national security requirements.

vi. Quarry operator should warn local communities before scheduled blasts by using sirens or drive-by announcements with a megaphone.

vii. After a day's blasting operations, the quarry operator should assess any property damages in communities neighbouring quarry and commit to effecting equitable compensation.

- Further, the contractor will be required to plan access routes to borrow pits and hard stone quarries ahead of excavation. The Contractors should be prevented from opening up several routes to one material site which would have severe implications on environmental degradation around the excavated area.

10.2.7 Physical Cultural Resources

As stated earlier there are features or objects deemed or declared monuments of historical importance either within or nearer to the site boundary, and no listed archaeological sites. Potential impact upon areas/ items of significant cultural heritage on land is considered minimal, as there would be no physical encroachment or interference with known cultural heritage areas.

However in case of any chance finds: The department of Museum and Monuments will be responsible for only nationally identified significant cultural and historical sites while the local communities are responsible for their cemeteries, traditional and physical cultural resources according to the societal norms.

If any significant physical cultural resources are encountered during the construction, the department of Museum and Monuments should be contact for further guidance.

The World Bank's requirements regarding property cultural aspect are detailed in Operation Policy Framework 4.11 and shall be applicable to the upgrading of the road if any significant cultural aspects are found within the road reserve or within the project area during construction.

If the chance finds occur, they will be handled according to the existing cultural and national requirements (Historical Monuments Act, Cap 46).

Under the Uganda law, any chance finds should be reported to the Department of Museums and Monuments of the Ministry of Tourism, Wildlife and Heritage and the Chief Administrative officer (CAO). If the finds are not of interest to the Department of Museums and Monuments, they should be reburied on a site set aside for such purpose. If they are unknown human remains, such should be handled in line with the cultural norms with the involvement of local leaders and religious leaders.

The Implementing Agency (UNRA) staff will ensure that the Contractor is adequately briefed about the chance finds procedures before commencing works. Procedure on how to handle chance finds of physical cultural resources should be included in all civil works contracts.

If the Contractor discovers any physical cultural resources, such as archaeological sites, historical sites, remains and objects, including graveyards and/or individual graves during excavation or construction, the Contractor shall:

- Stop the construction activities in the area of the chance find;
- Delineate the discovered site or area;
- Secure the site to prevent any damage or loss of removable objects until the responsible local authorities or the Department of Museums and Monuments of the Ministry of Tourism, Wildlife and Heritage take over;
- Notify the supervisory Project Engineer who in turn will notify the responsible local authorities and the Department of Museums and Monuments of the Ministry of Tourism, Wildlife and Heritage immediately (within 24 hours or less).

Responsible local authorities and the Department of Museums and Monuments of the Ministry of Tourism, Wildlife and Heritage would then be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the staff of the Department of Museums and Monuments of the Ministry of Tourism, Wildlife and Heritage.

Decisions on how to handle the finding shall be taken by the responsible authorities and the Department of Museums and Monuments of the Ministry of Tourism, Wildlife and Heritage. Such a decision will be documented in writing. This could include changes in the layout (such as when finding irremovable remains of cultural or archaeological importance) conservation, preservation, restoration, and salvage.

Works may resume only a written decision is received by the Contractor and the Implementing Agency (UNRA).

10.2.8 Disturbance to Wild life

UWA through Karuma Wildlife Game reserve Warden to enforce strict code of conduct for workers so that they respect and adhere to the rules, including observing speed limits and other laws regarding national parks and protected areas.

Illegal hunting of wildlife by construction workers as a source of food should be strictly prohibited.

Limited construction vehicle speeds during delivery of construction materials to the site should be controlled within the project areas in addition to proper waste management

10.2.9 Construction Vehicular traffic movement

The contractor will work in line with the existing rules and regulations and also develop a tailored Traffic Management Plan that will address congestion minimization or elimination, timing of site activities with the other user‘s activities and notification of intent to use the roads in the area outside the normal practice.

The contractor will also engage the other road users to ensure his and their safety, timely operations and integrity to the environment as a whole.

10.2.10 Soil erosion

In order to protect vegetation from destruction maximum care should be taken in selection of detours and access routes to borrow pits and quarries. Design and construction of black spots along the access roads and detours should cause minimal damage to the natural vegetation.

Protect large and medium sized trees within the project area and avoid its removal during establishing detours and material sites;

Minimise destruction of trees and vegetation; a clause should be included in the construction contract that requires the contractor to quantify the number of trees removed for the purpose of the new Karuma Bridge project and Restore vegetation immediately after the end of works;

The use of chemicals, herbicides etc., to clear vegetation shall be forbidden due to the heavy pollution they cause to the soils, ground and surface water and that they are toxic to humans and animals.

The developer and contractors should confine activities to the core project area to minimize the area of impact. Construction activities in environmentally sensitive areas should preferably take place in the dry season.

10.2.11 Occupational, Health and Safety

Ugandan regulations require that workers exposed to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day wear hearing protection. Related OHS safeguards are comprised in (Uganda’s) Occupational Safety & Health Act (2006) and Employment Act, 2006.

To reduce the incidence of occupational accidents, adequate training and education sessions will be organised for all workers as regards to the health and safety precautions associated with such developments. Personal Protective Equipment (helmets, earmuffs, gloves, etc) shall be made available to employees and their usages enforced. Non-compliant staffs will be appropriately reprimanded. As a matter of principle, the contractor will ensure that Safety First is the rule that governs all activities and operations within the camps and along the route. The operational areas including the areas around heavy machinery and construction camps will be appropriately secured from public intrusion.

The contractor will develop an ‘Occupational Safety and Health Management Plan’ comprehensive OHS plan with clear assignment of responsibilities which should among others address the following:

- Provision of all workers with requisite protective gear.
- Provision of onsite toilet and washing water for workers.

- Provision of "No smoking" signs in office, communal places construction camps as well as high risk areas prone to fire hazards e.g. near fuel tanks.
- Ensure adequate fire safety, fire exists and fire assembly points at camp.
- Provision of signage reminding use of PPE at appropriate locations in the project area including ancillary work sites.

General Specifications for Road and Bridge Works 2005 (Series 1000- General, Section 1800, pg 1000-43) require contractors to comply with national byelaws related to HIV/AIDS, OHS, and gender equity as follows:

- OHS- Public Health Act, Workers Compensation Act, Employment Decree,
- HIV/AIDS: National Multi-sectoral HIV/AIDS Policy,
- Gender equity: National Gender Policy.

The specifications require contractors to ensure the following:

- safe constructional plant, equipment and work methods
- safe handling, storage, transport and disposal of materials in a way that avoids risk to workers
- provision of protective gear
- hiring a full time "Accident prevention officer" or safety officer
- conducting safety awareness among all workers
- control harmful insects/ vectors (including mosquitoes and houseflies)
- reporting accidents to supervising engineer and police
- control contagious diseases (e.g. Cholera) through proper sanitation and awareness
- control occupational hazards related to:
  - ✓ physical hazards (noise, vibrations, high temperature)
  - ✓ chemical hazards
  - ✓ mechanical hazards (moving equipment)
  - ✓ electrical/ explosion hazards
  - ✓ ergonomic injuries (poor working postures, heavy loads, etc)

- ✓ poor sanitation in workplace or living environment of workers

- Contractor will also develop HIV/AIDS and gender management plans.

10.3 MITIGATION OF OPERATION PHASE IMPACTS

Overall management of this Project will have a direct impact on its sustainability and ultimate success. The negative impacts associated with the Project during the operation phase will be mitigated as discussed below:

10.3.1 Risk of human accidents and injuries

To reduce the incidence of occupational accidents, adequate training and education sessions will be organised for all workers as regards to the health and safety precautions associated with such developments. Personal Protective Equipment (helmets, earmuffs, gloves, etc) shall be made available to employees and their usages enforced. Non-compliant staffs will be appropriately reprimanded. As a matter of principle, the contractor will ensure that Safety First is the rule that governs all activities and operations within the camps and along the route. The operational areas including the areas around heavy machinery and construction camps will be appropriately secured from public intrusion.

Place signage at appropriate distances and locations and enhance visibility to road users.

10.3.2 Risk of accidents to Wild life animals

UWA through Karuma Wildlife Game reserve Warden to enforce strict code of conduct for workers so that they respect and adhere to the rules, including observing speed limits and other laws regarding national parks and protected areas.

Illegal hunting of wildlife by construction workers as a source of food should be strictly prohibited.

Limited construction vehicle speeds during delivery of construction materials to the site should be controlled within the project areas in addition to proper waste management.

10.3.3 Water pollution

Conditions will be maintained to protect the aquatic environment and other watercourses not only during construction, but also during periods of operation. After completing the bridge, cleaning up whole temporary constructions on shore as well as under the river, including steel, redundant concrete, surrounding frame and equipment such as excavators, bucket, crane, etc.

Regular monitoring of the water quality shall be carried out.

CHAPTER ELEVEN

11.0 ENVIRONMENTAL SOCIAL MANAGEMENT PLAN (ESMP)

11.1 OVERVIEW

This Environmental Social Impact Statement takes into consideration the applicable local and international standards and best practices. The ESMP is presented in this Chapter and summarizes the key impact elements identified and measures, the actions to be taken by various parties and the monitoring activities. An indication of the time scale for implementation and cost involved is also provided. The parties should formulate procedures and practices and maintain records as required by NEMA. The effectiveness of the ESMP shall be monitored and assessed during checks, for all inspections and the end of the Project when an overall audit of the works shall be carried out.

The main stakeholder responsible for implementing the plan will be the Contractor while, the developer i.e., Uganda National Roads Authority will co-ordinate and monitor all the work done by Contractor, Uganda Wildlife Authority (UWA), National Environment Management Authority (NEMA), Directorate of Water Resources Management (DWRM), Districts (Kiryandongo and Nwoya) and the Local Authorities will be the other stakeholders responsible for implementation and monitoring of the management plans.

Monitoring is recommended in the context of ensuring that ecosystem function is maintained at a level equal to or better than pre-construction conditions. All environmental monitoring programmes shall be undertaken under the supervision of the National Environment Management Authority (NEMA), Uganda Wildlife Authority (UWA) and the respective Districts. This will ensure compliance to the environmental mitigation plans during construction, operation and maintenance of the New Karuma Bridge. The scope and responsibility of the main stakeholders responsible for implementing the plan are discussed below:

11.2 ROLE OF CONTRACTOR

a) Implement the recommendations in the approved ESIA document, particularly the required mitigation measures and the environmental management and monitoring plans, and the owners environmental and social management framework;

b) Acquire approval conditions provided by NEMA (approval certificate), and permits from lead agencies, Department of Petroleum Supplies (Construction permit, operating license for storage and dispensing facilities of petroleum products), Ministry of Water and Environment; NEMA (River Bank Use Permit);

c) The Contractor should then prepare a Contractor’s Environmental, Social, Health and Safety Action Plans to comply with the above requirements. This should include an implementation framework, including staffing and budget.

d) The Contractor will also consult general public and disclose information in relation to construction scheduling, traffic management, public health and safety, and the results of Environmental monitoring.

e) All expenditure and costs related to complying with Environmental safeguards as applicable to construction and development of the New Karuma Bridge would be met by the Contractor.

11.3 Role of Developer (Uganda National Roads Authority)

The Developer will monitor compliance of the Contractor through its implementation agency, and a stakeholder wide monitoring group comprising technical staff from government institutions (NEMA, MoWE, MoWT, UWA, Ministry of Tourism, Heritage and Wildlife Ministry of Lands, Housing and Urban Development etc) and Civil Society.

11.4 Duties of the Consultant Supervisors' Environmental Officer/Monitor

It will be the duty of the Supervising Consultant's Environmental Officer/Monitor to review on-going construction plans with regards to their potential for adverse impacts to work being undertaken during the construction of the proposed project.

The Environmental Monitor or his designate will be on site daily during the initial start-up of construction of the roads especially the Environmentally Sensitive Area (swamp crossing). At a minimum, weekly site visits are required if construction crews are working on site. If no construction is taking place, the Environmental Officer/Monitor will visit the site on a fortnightly basis to ensure all mitigative measures are operating as intended.

The environmental Officer/Monitor will be responsible for the following activities:

Review work schedules with respect to environmental management and monitoring;

- Monitor fuel delivery procedure regularly and check all equipment on site on a regular basis;
- Check condition and operational efficiency of all sediment control facilities. In accordance with the Sediment and drainage management plan;
- Supervise the implementation of the environmental and social management plan and all the other required plans;
- Develop environmental orientation meetings.
- Work with UNRA's Safeguards Unit in supervising and guiding construction contractor(s).
- Undertake scheduled site supervision of state of environmental compliance as documented or executed by the contractor's environmental officer.
- Any other specific duties are prescribed in terms of reference developed for the supervising consultant by UNRA.

- Work closely with Station Engineers to establish and sensitize Road Committees.

11.5 DUTIES (TOR) OF THE CONTRACTOR'S ENVIRONMENTALIST

- Preparation of a standalone ESMP linking environmental and social activities of the Bridge and road works in line with guidance issued by UNRA.
- Monitoring and ensuring compliance of all the contractors workers to the requirements of the contract and this ESMP;
- Monitoring and ensuring compliance to all Government of Uganda orders, rules, laws and regulations with respect to environmental and social matters;
- Day to day monitoring of environmental matters – this will include wider environmental aspects including matters not directly concerned with the actual construction such as contractors camps, off-site temporary storage and temporary works areas;
- Working with the Contractors Health and Safety Officer to manage community liaison issues and oversee the effective management of the project grievance mechanism as defined in Section 1800 of the special specification and the original ESIS;
- Working with the Contractors Health and Safety Officer and the Clients nominated subcontractor to facilitate the successful delivery of the project HIV/AIDS programme as defined in Section 1800 of the special specification.
- Working closely with the Engineers Environmental Specialist to ensure full compliance with all environmental and social aspects of this ESMP, the contract documents and any other Government of Uganda rules, regulations, orders or community requests as necessary and as required.
- Awareness raising and training of contractor staff with respect to environmental issues; this will include notification of the severe penalties for non-compliance with instructions which may include dismissal.
- Preparation of a monthly environmental monitoring report. This monthly report will be submitted to the Engineer for initial approval and will also require approval by the UNRA Environmental Specialist.
- Attend all monthly site meetings and will report on their findings – problems, issues and corrective action taken – all of which will be included in the monthly report format.
- Any other matters or issues relating to environmental and social aspects of the works as defined by the Engineer.

- Review ongoing construction plans with regards to their potential for adverse impacts, particularly if work is being undertaken in environmentally sensitive areas. Full-time employee of the contractor, the Environmentalist will be on site daily.
- Coordinating archaeological inspection and monitoring by a specialist archaeologist from the Department responsible for museums and monuments. This will also involve conducting cultural heritage tool box talks to construction personnel as advised by the Specialist Archaeologist.
- Maintain a log of community complaints/ grievances related to cultural heritage and corrective actions taken to address them.
- Plan environmental and social activities to be implemented alongside construction works.
- Ensure that planned activities are implemented, monitored and reported to supervising engineering consultant.
- Ensure community concerns are addressed
- Prepare monthly reports to be submitted to UNRA indicating environmental activities that were undertaken.
- Prepare a Final Mitigation Report at the end of the project

11.6 DUTIES OF THE HEALTH SAFETY EXPERT

- The duties of the Health Safety Officer will be to ensure that occupational health and safety issues are well complied to
- Advise the Contractor on types and measures of personal protective equipment
- Ergonomics' of the working conditions
- Close work as a team member in implementing environment management and Monitoring Plan

11.7 REPORTING

The Environmental Officer/Monitor will maintain regular contact with the Resident Engineer and will submit weekly monitoring reports detailing the following:

- A description of construction activities that may affect the environment;
- Any non-compliance (with contract conditions, regulations and guidelines) and any subsequent work stoppage;
- Unexpected environmental concerns and corrective measures;

- Amendments to the Environmental Management and Monitoring Plan or any other required plans;
- Any reports required by any of the other plans; and
- Tracking of issues causing environmental concern
- Any unresolved concerns will be carried over to the next reporting period until the issue has been resolved. This will allow for the tracking of issues until it is confirmed the issue/concern has been resolved.

11.8 PROJECT STAGING

Construction activities will be carefully planned and scheduled in a manner that ensures the avoidance or absolute minimization of environmental impacts. The Resident Engineer will be familiar with and be able to identify those areas and times that present environmental issues and will prepare schedules and the work methods accordingly. Schedules will be forwarded to the Environmental Officer/Monitor at least one week in advance of commencement of each operation.

11.8.1 Temporary Work Stoppage

Prior to initiating work stoppages, any mitigative and environmental protection measures required to safeguard the environment and the project during work stoppages will be completed.

If potential adverse environmental impacts are observed during work stoppage periods, required environmental measures to avoid or minimize impacts will be initiated.

11.9 ENVIRONMENTAL QUALITY ASSURANCE PROGRAM FOR CONSTRUCTION

11.9.1 Project Site meetings

The Consulting Engineer's Environmental officer/Monitor will be involved in regular project meetings with the Resident Engineer and the Contractors Representative. The purpose of such regular meetings will be to outline the schedule of upcoming construction and proposed activities, and to review the activities of the previous two weeks

In the event that the Environmental Officer/Monitor or Resident Engineer deem the compliance regarding environmental requirements to be inadequate at any time during the Project, the frequency of the biweekly regular meetings will be increased accordingly.

11.9.2 Compliant/Non-compliant Criteria

A non-compliant activity is any activity that does not comply with the requirements of the Environmental Management and Monitoring Plan, The Contractor should comply with the National Environmental Cap, 153 and the laws of Uganda.

The ESMP for the proposed New Karuma Bridge is detailed in the table below.

Table 11.1: Environmental Social Management Plan (ESMP)

Impacts identified	Mitigation Measures	Responsibility	Time of Mitigation	Costs-Uganda Shillings
Environment and social management plan during Construction phase				
Solid waste generation	• Ensure promptly cleaning of construction wastes. • Reusable construction wastes should be piled up in the scope of site clearance for collection and the transportation to designated re-use site. • Non-reusable construction wastes should not be kept in the construction area and to be transported to designated site. • Strictly forbidding all actions of burning refusal at project site. • To provide regulation on solid waste management at construction site, specifying strict prohibition of discharging solid wastes in uncontrolled manner to the surrounding environment and to the river flows. • Provide camp site with portable toilets, collect sludge from septic tank and remove toilets after finishing construction. • Collecting waste into proper storage yard, keeping temporarily and transporting the waste to designated sites - dump sites or waste treatment points. • Ensure efficient use of construction materials to avoid unnecessary waste.	Contractors, Supervising Consultant, UNRA	During construction	
Increased soil erosion	• Rehabilitation of the sites/re-vegetation • Movement/passage by pedestrians in the rehabilitated sites should be controlled to minimize trampling of the soil. • Contractors should confine activities to the core	UNRA Contractors	During construction	

Impacts identified	Mitigation Measures	Responsibility	Time of Mitigation	Costs-Uganda Shillings
	project area to minimize the area of impact. • Construction activities should preferably take place in the dry season.			
Soil and water pollution from oil spills	• Install oil trapping equipments in areas when there a likelihood of oil spillage such as during the maintenance of construction equipment. • Perform routine checks	Contractors	During construction	
Vegetation clearing	• Clearing should not exceed areas not used for construction specifications • Construction workers should not clear vegetation for use as fuel wood as it will exacerbate more clearing. • Re-vegetate/planting of trees	UNRA,UWA Contractors	During construction	**50,000,000**
Disturbance to wildlife	• Illegal hunting of wildlife by construction workers as a source of food should be strictly prohibited. • Limit vehicle speeds during delivery of construction materials to the site. Speeds should be controlled within prescribed KWR sections. • Limit construction to as short a time as possible and it should not take place during the daytime when the visual range is substantial.	UNRA, UWA Contractors	During construction	
Water pollution control	• After completing the bridge, cleaning up whole temporary constructions on shore as well as under the river, including steel, redundant concrete, surrounding frame and equipment such as excavators, bucket, crane, etc. • Minimize of effects to surface water and deposit. <u>Minimizing of effects in bridge design work</u> • Bridge design should take into account the inherent uncertainties of climate change to ensure long term sustainability of the	Contractors UNRA MoWE	During construction	**150,000,000**

Impacts identified	Mitigation Measures	Responsibility	Time of Mitigation	Costs-Uganda Shillings
	infrastructure by building robust and resilient systems; • Include reinforcement at risk structures particularly to protect bridges from scouring; • Bridges should be designed to accommodate higher flood; and • During monitoring, inspects signs of any effects that bridge structures may be having.			
Increase of noise levels	• Use of PPE like earplugs to those working in or close to the project site. • Ensure regular servicing of construction equipment • Use low noise generating equipment • Confine activities to core project area • Avoid construction at night • In case of blasting inform the people surrounding the site of the plan (schedule and time) to arrange life activities accordingly	UNRA Contractor	During construction	
Dust pollution	• Use PPE like masks when people are working. • Where necessary, fence the project site to minimize blowing air in order to reduce the spread of dust. • Watering the project site to reduce the dust • Cover construction materials (sand, gravel, cement, etc) on transit and on site. • Restrict activities to core construction area.	UNRA Contractor	During construction	
Risks of accidents and Injuries to workers	• Set up safety rules at sites • Provide first aid kit • Provide and ensure use of PPE to workers • Construction workers should be well trained on safety measures • Prepare emergency rescue plans	UNRA Contractor	During construction	**100,000,000**

Impacts identified	Mitigation Measures	Responsibility	Time of Mitigation	Costs-Uganda Shillings
	• Conduct frequent safety audits to check status and compliance with safety measures			
Risks and hazards	• Fence the construction site to strictly avoid other people from construction site • Put signs and warnings in the construction site in all risky areas • Ensure safety measures are followed	UNRA Contractor	During construction	**50,000,000**
Employment opportunities	• Ensure people from local community are given priority where appropriate • Provide information about the availability of employment opportunities and qualifications needed • Training to be provided to workers recruited from local communities with minimum qualifications to equip them with necessary skills	UNRA Contractor	During construction	
Provision of market for supply of construction materials	• Encourage and motivate contractors to buy locally available construction materials	UNRA Contractor	During construction	
Gains in local, national and regional economy	• To implement this project efficiently to enhance the benefits from a better transport system.	UNRA Contractor	During construction	
Chance Finds of Physical Cultural Resources (PCRs)	• Project activities involving earthworks must include an approved Chance Finds procedure in construction contracts, to cover the possibility of discovering physical cultural heritage in the course of excavation. • Project activities involving earthworks must include an approved Chance Finds procedure in construction contracts, to cover the possibility of	UNRA, Contractors Ministry of Tourism, Heritage & Wildlife		

Impacts identified	Mitigation Measures	Responsibility	Time of Mitigation	Costs-Uganda Shillings
	discovering physical cultural heritage in the course of excavation			
Environment and social management plan during operation phase				
Water pollution from oil spills	• Buy and ensure regular serving of locomotives • Install new oil traps	UNRA	During operation	
Risk of human accidents	• Place signs and signals at appropriate distances and locations • Use of properly installed guard rails	Contractor UNRA	During operation	
Risk of accidents to Wildlife animals	• Collaborate with local authorities and UWA in identifying appropriate locations for crossings and install mitigation measures	UWA, UNRA	During operation	
Risks of accidents and Injuries to workers	• Provide first aid kit • Provide and ensure use of protective gears to workers • Ensure safety measures are followed	UNRA Contractor	During operation	
Improved travel safety and comfort	• Implement the project as proposed	UNRA Contractor	During operation	
Increased revenue to local and central governments	• The Government to ensure efficient use of tax collected in its development programmes	UNRA	During operation	350,000,000 Million Uganda Shillings

11.10 ENVIRONMENTAL MONITORING PLAN

During project implementation, a framework in the form of a plan is proposed to ensure efficient and effective undertaking of the mitigation measures. Environmental monitoring is used as a tool in relation to environmental management as it provides the basis for rational management decisions regarding impact control. By using the information collected through monitoring, environmental mitigation and benefit enhancement measures can be improved and the works or operation will be modified or halted when necessary. Therefore, the objectives of this environmental monitoring programme include:

- To monitor changes in the environmental conditions as a result of implementing the New Karuma bridge Project;
- To check on whether mitigation and benefit enhancement measures have actually been adopted, and are proving effective in practice;
- To provide a means whereby any impacts which were not clearly defined/identified/evaluated or unforeseen at the time of preparation of this ESIA can be identified, and to provide a basis for developing appropriate and additional impact mitigation measures to take into account those newly evaluated impacts;
- To provide information on the actual nature and extent of key impacts and the effectiveness of mitigation and benefit enhancement measures which, through a feedback mechanism, can improve the planning and execution of other similar projects.
- To ensure that personnel exercise due diligence in carrying out activities

The proposed environmental monitoring programmes shall include:

a) Compliance monitoring

An environmental compliance monitoring programme will ensure that pre-construction commitments made to regulatory agencies, and other stakeholders are implemented. Compliance monitoring will ensure that preventive and environmental measures are in place throughout the project area.

Compliance monitoring is undertaken for a project to ensure that appropriate regulations and company specifications are implemented during project development. Activities relevant to all phases of the project (i.e., construction, operation and decommissioning) are subject to the provisions of relevant regulations and guidelines.

Compliance monitoring will be performed by UNRA personnel that are familiar with the applicable regulations and will ensure that activities be planned and conducted with the knowledge and understanding of standard specifications. Monitoring will ensure that any planned activity during project development is not in contravention of the regulations or UNRA specifications. In the event of noncompliance, UNRA personnel overseeing compliance monitoring will immediately report the activity to UNRA, and implement measures to achieve compliance. Monitoring during operations will be conducted during normal working hours. General environmental conditions in the project area and surrounding areas will be monitored. New developments or activities near bridge facilities will also be monitored to assess any encroachment onto the MFNP and KWR.

b) Baseline monitoring

Pre-construction (i.e. baseline) monitoring will be conducted to characterize a variety of parameters associated with environmental components, and facilitate finalization of the conservation area. Baseline monitoring provides a basis by which changes in parameters associated with environmental components can be determined by comparing with the results obtained from the compliance and environmental effects monitoring program.

c) Environmental effects monitoring

Environmental effects will be monitored in order to assess the accuracy of any predictions made in the ESIA concerning potential impacts. After project implementation, potential environmental effects of construction will be monitored. Site visual examinations of the environmental features along the Nile River and protected area (MFNP and KWR) will be conducted to identify potential problem areas. This will facilitate the assessment of recovery trends and zones that may require additional restoration activities. Soil and water sampling programmes in the project area will be developed to monitor site conditions in order to establish site specific rehabilitation programmes where need will arise. Monitoring may include documentation on the following:

a. Aquatic habitat;
b. Species at risk (Fish, Wildlife and Forestry);
c. The effect of vibrations associated with blasting and or drilling activities on the aquatic environment (especially on wild animals and fish) and surrounding areas;
d. The quality of selected surface waters draining potentially disturbed areas.

Environmental monitoring ensures that the impacts have been accurately predicted and that appropriate mitigation measures are being implemented as planned and that they have the expected effects. An environmental monitoring program has been proposed for the New Karuma Bridge and it is detailed in the table below:

Table 11.2: The proposed Environmental Monitoring Plan for the New Karuma Bridge

S/N	Impacts	Mitigation	Monitoring Indicator	Method for Monitoring	Frequency of Monitoring	Responsibility	Monitoring Cost (Us Dollars)
	Pre- Construction Phase						
1	Vegetation clearance	• Restrict vegetation clearing to the area required • Re-vegetate affected sites	Area of land deforested	Patrol observation	Weekly	Contractor UWA UNRA	60,000,000
2	Disturbance to wildlife	• Use noise proof equipment • Ensure that work is not carried out at night	Species of wildlife in extinction Noise level at site	Survey Noise measurement	Quarterly Weekly	UWA UNRA	-
3	Contamination of the surface water/sedimentation	• Use barriers or other measures to prevent sediments and contaminants at interface with water	Water quality (turbidity, Ph, BOD, DO)	Water sample analysis	Weekly	UNRA MoWE Contractor NEMA	100,000,000
4	Loss of flora and fauna habitat including endangered species	• Minimize site clearance to the area required for civil work • Use light and noise proof equipment	As in 1&2	As in 1&2	As in 1&2	UWA UNRA NEMA	-
5	Soil Erosion	• Ensure that excavations and ditches are refilled	As in 1&2	As in 1&2	As in 1&2	UNRA Contractor	

S/N	Impacts	Mitigation	Monitoring Indicator	Method for Monitoring	Frequency of Monitoring	Responsibility	Monitoring Cost (Us Dollars)
		• Re-vegetate/plant trees in the area cleared					-
6	Noise Pollution	• Use light and noise proof equipment	As in 2	As in 2	As in 2	UNRA, NEMA	-
7	Water pollution	• Avoid dumping wastes into the surface water	As in 3	As in 3	As in 3	NEMA Contractor MoWE	-
	• **Construction Phase**						
8	Erosion due to machinery tracks, damage to stream banks	• Avoid creating and/or leaving ditches as much as possible • Where ditches or excavations are unavoidable, ensure the site is reclaimed and natural trees/vegetation replanted	As in 1	As in 1	As in 1	UWA UNRA Contractor	12,000,000
9	Contamination of surface water when hydraulic oil, motor oil or other harmful mechanical fluids are spilled or dumped	• Perform routine check on vehicles and machines daily, and ensure proper maintenance • Treat and scoop soil	Vegetal cover Soil microbial	Field observation Soil test	Monthly	UNRA Contractor	150,000,000

S/N	Impacts	Mitigation	Monitoring Indicator	Method for Monitoring	Frequency of Monitoring	Responsibility	Monitoring Cost (Us Dollars)
		any time fluid drip is noticed					
10	Loss of soil microbes and destruction of aquatic flora and fauna	• Same as above	As in 9	As in 9	As in 9	NEMA Contractor	-
11	Concrete slab rectangular piers footing may affect the flow velocity of the river and may lead to silting	• Redesign and make the pier footing triangular and/or bury the footing below the water bed	Physical evidence of buried piers footing Absence of siltation	Site observation Photograph	One-off	UNRA Contractor	50,000,000
12	May compact soil, affect slope stability and cause silting and water pollution	• Ensure that engineering design and best construction practices are adhered to • Ensure that construction debris are disposed and kept away from contact with surface water	Absence of waste materials	Site Inspection	Weekly	UNRA Contractor	25,000,000
13	Workers could be at risk from exposure to hazardous materials	• Use of PPEs should be enforced	Workers wearing PPE Type of PPEs	Site inspection	Weekly	UNRA Contractor	50,000,000

S/N	Impacts	Mitigation	Monitoring Indicator	Method for Monitoring	Frequency of Monitoring	Responsibility	Monitoring Cost (Us Dollars)
			available				
14	Risk of fall/public safety from the bridge is likely in the absence of railing	• Provide railing on both sides of the bridge	Physical evidence of railing in installed	Site observation Photograph	One off	UNRA Contractor	100,000,000
15	Noise from movement of machinery and people will threaten flora and fauna habitats in the Park	• Ensure that work is completed early • Avoid working at night to limit noise and habitats disturbance	Delivery Compliance schedule , Observation	Site Monitoring	Daily	UWA UNRA Contractor	-
	Operation Phase						
16	The existence of the Bridge will increase human traffic/movement in and out of the Park which will threaten the integrity of the Park vis-a-viz increased accidents of wildlife at the new bridge	Monitor and enforce park management rules Construct additional ranger posts Involve community people and leadership in operation Carry out conservation education	No of arrest made No of ranger post in place Level of community involvement No of animals killed	Patrol Inspection Interview Patrol and Recording	Daily Monthly Monthly Monthly	UWA Contractor Local Authority	10,000,000
	Monitoring of Positive Impacts						

S/N	Impacts	Mitigation	Monitoring Indicator	Method for Monitoring	Frequency of Monitoring	Responsibility	Monitoring Cost (Us Dollars)
17	Employment of locals	-	No of locals employed	Record Survey	Monthly	UNRA	8,000,000
18	Income of households	-	Increase income	Survey	Quarterly	UNRA	
19	Improvement in Tourism	-	Increased tourists	Survey	Quarterly	UWA	
20	Improved Transport Infrastructure	-	Increased route use	Survey	Quarterly	UNRA	
21	Payment of environment and social safety officer	36 month each	Increased monitoring	3,000,000	Monthly	UNRA Contractor	216,000,000
Total Cost of Monitoring							**781,000,000 Million Uganda Shillings**

11.11 MANAGEMENT PLANS

11.11.1 Cultural resources management plan (CRMP)

11.11.1.1 Introduction

Cultural heritage management during new Karuma Bridge construction will be a responsibility of the contractor.

11.11.1.2 Purpose

This plan will serve the following purposes:

- It translates commitments in the ESIA into implementation procedures with respect to protection of cultural resources during road upgrade,
- Serves as a key tool the contractor can utilise to manage and monitor preservation of resources of cultural heritage significance.
- Provide transparency to stakeholders that commitments made actually being fulfilled.

This CRMP plan provides:

- Responsibilities for implementation of the plan,
- Impact management measures to be implemented,
- Verification and monitoring,
- Records and reporting requirements.

11.11.1.3 Objective of CRMP

Through its contractors, UNRA seeks to ensure that socio-cultural impacts are minimized as far as possible. Thus the broad objective of this CRMP is to describe approach and procedures to be undertaken by the contractor with regard to protection of cultural resources.

11.11.1.4 National & international regulatory requirements

This plan is to be executed in compliance with Uganda's The Historical Monuments Act, 1967. Sub-section 12(1) of this Act requires any portable object discovered in the course of an excavation to be surrendered to the Minister who shall deposit it in the Museum.

Safe guard policies and guidelines of development partners such as World Bank Operational Policy 4.01 Environmental Assessment and Operational (11.03) for Cultural Property which defines cultural property as “sites having archaeological, paleontological, historical, religious and unique natural values”. The World Bank guidance relies on careful design and implementation of projects and considers EIA one of the main processes to ensure that development activities do not lead to unacceptable damage to cultural heritage.

11.11.1.5 Roles & responsibilities

Roles and responsibilities in this management plan are described below:

Role of UNRA (Safeguards Unit under Directorate of Planning)

The Safeguards Unit in UNRA should be responsible for:

i) Provision of overall direction for implementation and performance of the plan

ii) Provision of assurance to UNRA that the plan is satisfactorily implemented and effective.

11.11.1.6 Role of Contractor's Environmental Officer

i) Communicating contents and requirements of this plan to contractor

ii) Workforce sensitization to ensure that all workers are aware of their responsibilities

iii) Coordinating inspection and monitoring by an archaeologist from the Department responsible for museums and monuments. (The environmental office should keep in close contact with the archaeologist throughout the construction period).

iv) Implementation of measures recommended by archaeologist for management of any "chance finds" encountered.

v) Conduct cultural heritage tool box talks to road construction personnel as advised by the Specialist Archaeologist.

vi) Maintain records (daily log) related to archaeological finds during construction.

11.11.1.7 Role of Archaeologist

It is proposed that a specialist archaeologist will be contracted (on a non-permanent basis) from the department responsible for museums and monuments in the Ministry of Tourism, Wildlife and Heritage.

Roles of the archaeologist will be:

Archaeological monitoring for all ground disturbing activities

Advice/ guidance to the contractor with respect to halting or moving construction activities if earthworks encounter archaeological features.

Conducting preliminary assessment of all previously unidentified archaeological features encountered and submission of these to the national museum.

Provision of advice on the significance and management of unidentified archaeological features encountered.

Processing/ excavation of any unidentified subsurface archaeological features encountered in accordance with standard procedures recommended by the Department of Museums and Monuments.

Maintain watching briefs during opening up any new borrow sites or deep excavations at any location during construction, with clear procedures for protection and documentation of any “chance finds” encountered.

Maintain monitoring records of all unidentified archaeological features encountered.

Develop set of points to be discussed in “Tool Box” sessions to create awareness among construction crews on “chance finds”/ archaeological features. (Note that as part of their sensitization, workers will be required to cease work if they encounter archaeological features and report to Contractor’s Environmental Officer who will notify the Resident Engineer).

Write a post-construction report for UNRA upon completion of construction.

11.11.1.8 Role of Contractor

The contractor will be required to:

i) Heed advice from the specialist archaeologist in respect to halting earthworks / ground disturbing activities when signs of buried artifacts are encountered.

ii) Provide cultural heritage tool box talks to road construction crews as advised by the specialist archaeologist.

11.11.1.9 Impact management

During road construction, measures to avoid damage to previously unidentified subsurface archaeological features will be based on “watching brief” by an archaeologist, vigilance of the contractor’s environmental officer and awareness of construction crews.

“Watching brief”

This will be the primary element of the management and protection of cultural heritage during road construction. It will be conducted by an archaeologist from the Ministry of Tourism, Wild life and Heritage & it consists of passive visual investigation during ground breaking at excavation sites (quarry and borrow sites). Archaeological resources to be monitored and protected by this inspection programme include:

- Artifacts and other remains of past historic and prehistoric occupation,
- Unmarked human burials,
- Cultural and natural soil matrix in which artifacts or other remains were deposited and preserved.
- Structural remains e.g. foundations, storage pits, fortifications, etc.

Objective of "Watching brief"

The objective of the "watching brief" will be:

- To record subsurface archaeological features discovered during earth-moving activities (especially at borrow sites),
- Provide advice to the contractor and UNRA on significance of subsurface archaeological features discovered.
- Provide advice to the contractor on areas where ground disturbing construction activities may continue or where necessary need to be "worked around" or stopped.

Activities during "Watching brief"

The following measures will be implemented during the "watching brief":

- Prior to commencing any construction activities, the contractor will give a brief to the specialist archaeologist about site(s) they plan to excavate.
- The specialist archaeologist will conduct a walkover to identify site's archaeological sensitivity through characteristics such as soil type, topography, etc.
- The specialist archaeologist will witness/ observe site clearance, soil stripping and excavations for presence of subsurface archaeological features.

In the event that an archaeological feature is encountered, the following actions will be executed.

a. The specialist archaeologist will immediately inform the contractor of presence of a subsurface archaeological feature. The contractor will immediately inform the Resident Engineer.

b. Upon halting work, the specialist archaeologist will perform preliminary assessment (archaeological field work evaluation) of the subsurface discovery so as to evaluate its importance, hence develop a strategy to ensure recording and preservation of the encountered feature.

c. Results of this preliminary assessment will be communicated to the contractor and Resident Engineer who should inform UNRA.

d. For a discovery of ***minor*** importance, construction may be halted for a short period of time (hours) until a preliminary assessment is completed through the following process:

- The specialist archaeologist will direct the Contractor to halt construction
- The specialist archaeologist should record the discovery

- The specialist archaeologist will direct Contractor to resume work
- The discovery will be reported and transported to the national museum

For a discovery of ***local*** or ***major*** importance, disruption to construction activities could be longer and trigger this process:

- The specialist archaeologist will direct contractor to halt and move construction activities.
- The specialist archaeologist will inform the Contractor and contractor's Environmental officer of the significance of the discovery.
- The Contractor will inform the Resident Engineer of construction time likely to be lost. The Resident Engineer will communicate this information to UNRA.
- If additional archaeologists are necessary to assess this discovery, the specialist archaeologist will communicate this to the Department responsible for museums and monuments in the Ministry of Tourism, Wildlife and Heritage.
- The site will be demarcated, sealed off until the assessment is completed.
- The team of archaeologists will advise both UNRA and the Ministry of the importance of the discovery and provide recommendation for further investigations and protection measures.

11.11.2 Occupational health and safety (OHS)

The Section covers measures and methods which the Contractor shall put in place to ensure occupational health and safety (OHS), to prevent the spread of HIV/AIDS and STIs and to ensure equal employment opportunities for men and women as well as addressing their specific gender needs.

GENERAL

The Contractor shall comply with among others the following Statutory Regulations, rules and bylaws with respect to OHS, HIV/AIDS and STI prevention and Gender equity:

1) **OHS:** The Public Health Act, the Factories Act, the Workers' Compensation Act, the Trade Union Decree, the Employment Decree and other statutory regulations, rules and bylaws that may be enacted from time to time by Government in respect of OHS.
2) **HIV/AIDS**: The National multi-sectoral AIDS control approach (MAC) and the National Strategic Framework (NSF) for the HIV/AIDS prevention and care, which obligate line Ministries and the private sector to ensure that people living with HIV/AIDS are not discriminated against at the work places.

3) **Gender Equity**: The Local Government Act and National Gender Policy (1997) and the Social Development Sector Strategic Investment Plan (2003) which provide for a legal basis for protecting women and their rights and to ensure affirmative action on the basis of gender.

Together with the above, the Contractor's attention is also drawn to any current international protocols or convention on OHS in which Government of Uganda is a signatory to. In compliance with above mentioned government and international regulations on OHS, HIV/AIDS and Gender equity and on the basis of available social impact assessment studies related to the project, the Contractor shall prepare an OHS, HIV/AIDS and Gender Management Plan which shall include details of measures he/she proposes to adopt in a bid to:

a) Prevent and reduce accidents and injuries to the staff and workers and minimise health hazards to the adjacent community and general public.

b) Prevent the spread of HIV/AIDS and STIs between his staff, labourers and the immediate local community.

c) Care for workers and staff who are infected with HIV/AIDS and STIs including provision of counselling and clinic services.

d) Encourage the recruitment of men and women as well as addressing their specific gender working and living needs in the road construction environment.

e) The OHS, HIV/AIDS and Gender Management Plan shall be submitted to the Engineer not later than 4 weeks after the notice to commence the Work.

11.11.3 Occupational health and safety management plan

The Contractor shall ensure, so far as is reasonably practicable, the health, safety and welfare at work of his/her employees including those of his/her sub-contractors and of all other persons on the Site. The Contractor shall comply with the Factories Act, the Public Health Act, the Worker's Compensation Act and other Statutory Regulations, rules and byelaws regarding occupational health, safety and gender. In this respect the Contractor shall liaise with the various local authorities.

The Contractor's responsibilities shall among others include the following:

(a) Safe constructional plant, equipment and methods of work

This covers the provision and maintenance of constructional plant, equipment and systems of work that are lighted, safe and without risks to health. This shall include maintaining equipment, engines, and related electrical installations in good working order; maintaining a clean and tidy work space; providing guards and rails, signals and lighting; providing work site rules, safe working procedures and allocating appropriate places to carry out the work.

(b) Safe handling, storage, transport and disposal

This covers the execution of suitable arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage, transport and disposal of articles and substances.

The Contractor must ensure that all stores are located such as reduce risks to the workers on site and arrangements for the safe use, handling, storage, transport and disposal of articles and substance are made before work commences to the satisfaction of the Engineer.

(c) Protective clothing, equipment etc.

This covers the provision of protective clothing and equipment, first aid stations with such personnel and equipment as are necessary and such information, instruction, training and supervision as are necessary to ensure the health and safety at work of all persons employed on the Works all in accordance with the Laws of Uganda. The Contractor shall provide, at his/her own expense, the protective clothing and safety equipment to all staff and labour engaged on the Works to the satisfaction of the Engineer.

Such clothing and equipment shall include, at a minimum:

- high visibility vest for workers directing traffic;
- protective boots and gloves for the workforce undertaking concrete mixing work;
- protective boots, gloves and masks for the workforce performing bituminous pavement works;
- protective footwear, gloves, goggles, and dust mask for the workforce undertaking screening, crushing or grinding;
- protective footwear and hard hats for the workforce engaged in bridge construction and in all locations subject to rock fall;
- Ear protectors and dust mask for the workforce engaged in rock drilling or in using vibrating equipment such as rollers and compactors.

If the Contractor fails to provide such clothing and equipment, the Employer shall be entitled to provide the same and recover the costs from the Contractor.

(d) Safety Officer

The Contractor shall designate a qualified Safety Officer (Accident Prevention Officer) from one of his/her senior staff who has specific knowledge of safety regulations, experience of safety precautions on similar works and who shall advise on all matters affecting the safety of the workforce and on measures to be taken to promote such safety.

The Safety Officer shall work full time directly on the project at the construction site. He/she might have other obligations in relation to similar topics, e.g. environment, social and/or medical aspects including HIV/AIDS prevention, as long as at least half time is devoted to Occupational Health and Safety.

The Safety Officer shall have specific training in the Contractor's safety and health management system and procedures, practice, etc. and before commencement of the Works, the Safety Officer shall receive training in (or receive a refresher course in) industrial first aid (or the equivalent).

The Safety Officer shall routinely provide workers with training in safe work practices and general awareness of potential danger situations to avoid injuries. Trained first aid personnel, transport for sick or injured workers, and a first aid kit shall be available at each site at all times. The Contractor shall establish emergency evacuation procedures to enable a rapid response to accidents.

(e) Safety courses

All employees shall be given training on how to ensure their own personal safety and on ways to reduce the accident risk on those sites where large, mobile heavy vehicles and equipment or equipment with moving parts are in use. The Safety Officer shall provide training in safe work practices and general awareness of potential danger situations to avoid injuries. In addition, all employees handling dangerous/toxic materials shall be trained on how to handle dangerous/toxic materials.

All the Contractor's personnel shall, before starting to work, have an induction course on safety and health at the site. The information and training shall be on the site and have duration of at least two hours. It shall be conducted in English and, if necessary, also in relevant local language to ensure that all personnel can understand the information and instruction. The Site Manager shall take part in at least the first part of the training. He/she shall present the Contractor's safety policy and goal, the responsibilities and roles in relation to safety and health of all individuals, and the more specific responsibilities and roles of key staff (Site Manager, Safety Officer, superintendents, foremen, and others).

The topics of the course can be, but is not limited to be:

- Contractor's safety policy and goal.

- Organisation of safety and health work and the responsibilities and roles of the Site Manager, the superintendents/supervisors/foremen, the Safety Officer and of each individual worker.

- Mandatory use of personal protective equipment on the Site.

Specification of the type of equipment, where and when to use it and how it shall be used, stored, cleaned and maintained correct.

- Placement and content of first aid equipment.

- How to use the equipment and information on who are specially trained in first aid and how to contact them.

- How to transport an injured person to a medical doctor or to the hospital.

- Safety rules for the site, e.g. in relation to the use of different equipment, tools, vehicles, fuel, oil, chemicals, explosives and abrasives.

- Cleaning, housekeeping and maintenance of the site, including vehicles, equipment, tools, workshops, houses etc.

- If work permits are required for specific tasks.

- Manual handling, transport, storage and disposal of equipment, goods, etc. in a safe way preventing accidents and too heavy burdens.

- How to ensure that equipment, goods, etc. will not be an obstacle imposing a risk to other persons due to inadequate placement and protection of it.

- Welfare facilities and access to drinking water and water in case of skin burns on the site when handling asphalt.

- Procedure for specific instruction when working with new work function, machinery, tool, chemicals, etc.

- The use of safety signs and protective barriers.

- Safe use of fuel, oil, chemicals, explosives.

- Prevention of dust generation and exposure.

- Road safety aspects, sign posting and principles and measures for minimising the risk of traffic accidents.

- HIV/AIDS prevention (only an introduction, more information shall be provided within one month of the employment on the Site).

- Consequences of breach of discipline and not complying with rules.

Different induction courses can be held for different types of workers ensuring the correct weight on relevant topics, e.g. vehicle operators, workers in the quarry, workers in the asphalt plant, work shop workers.

A Safety Booklet written in English shall spell out the most important aspects of occupational safety and health. The Safety Booklet may take its starting point in the Contractor's general description of safety and health, but it shall be very specific for contract works. The safety booklet shall be handed to all staff at the introduction course and used as training material. More training material might be relevant to use at the induction course.

(f) Safe access

The Contractor shall provide and maintain access to all places on the Site in a condition that is safe and without risk of injury.

(g) Sanitation

The Contractor shall provide adequate waterborne sanitation; and refuse collection and disposal, complying with the Laws of Uganda, all local Bye-laws, to the satisfaction of the Engineer, for all houses, offices, workshops and laboratories erected on the camp site or sites.

(h) Latrines and other sanitary arrangements

The Contractor shall provide an adequate number of suitable latrines and other sanitary arrangements at sites where work is in progress to the satisfaction of the Engineer and the Medical Officer in the area.

(i) **Control of harmful insects**

The Contractor shall execute appropriate measures in consultation with the Public Health Authority to control within the Site, including the camp sites, mosquitoes, flies and pests including the application of suitable chemicals to breeding areas. Insect repellents and mosquito nets, preferably pre-treated, shall be supplied in areas of high malaria risk.

(j) Reporting of accidents

The Contractor shall report details of any accident to the Engineer and the Uganda Police, if appropriate, as soon as possible after its occurrence.

(k) Contagious diseases

The Contractor shall manage the risk of spreading contagious diseases (e.g. cholera, tuberculosis) through awareness raising programmes, especially when workers come from outside the locality. The Contractor shall manage the risk of harassment and sexual assaults, especially for the female workers. The Safety Officer or Health Services shall inform the workers and the community about the danger of communicable diseases included those transmitted by insects, water, faecal / oral and sexual contact. Prophylaxis shall be provided to all workers free of charge if recommended by the Public Health Authority.

The Contractor shall comply with Government regulations in case of epidemic outbreaks.

(l) Occupational health hazards

The Contractor shall reduce occupational health hazards, such as:

(i) Physical hazards (continuous noise and vibrations, prolonged stay in high temperatures).

(ii) Chemical hazards (exposure to fumes, chemicals and dust including solvents, paints, exhaust gases and possible carcinogens such as bitumen).

(iii) Mechanical hazards (unguarded or exposed moving objects and other dangers from the use and operation of machines).

(iv) Risk of accidents with hand tools (slips, falls, eye injuries) heavy items (the accidental dropping of heavy items) and vehicles.

(v) Thermal hazards (heat stroke from long hours working in direct sunlight and burns due to contact with hot items (e.g. heated bitumen or the burner).

(vi) Electrical, fire or explosion hazards.

(vii) Ergonometric risk factors (personal injuries associated with poor working postures, heavy lifting, repetitive work, repetitive hand arm vibrations, manual transport).

(viii) Sanitation hazards (including contaminated drinking water, poor food practices, improper waste disposal, unhygienic toilet and washing facilities, contact with solid and/or biological waste).

The means of reducing the occupational health hazards shall include:

(1) Using vibration-reduced and sound-reduced equipment.

(2) Providing shade at stationary work places and at welfare facilities.

(3) Having only trained and experienced persons use dangerous chemicals and operate the machines.

(4) Providing safety awareness training for all workers.

(5) Providing easily movable equipment to reduce risk of injury associated with heavy lifting or strenuous work.

(6) Varying job functions (to avoid excessive repetitive motions).

(7) Providing on the Site, throughout working hours, adequate and easily accessible supplies of safe drinking water (including water supply to the Engineer's offices and laboratories), access to washing facilities (because of chemical and biological hazards), proper eating places and waste disposal facilities. The water for drinking and cooking purposes shall be filtered, boiled or treated as necessary for human consumption. All water sources used shall be approved by the Engineer. The Contractor's attention is drawn to the fact that no separate payment will be made for the provision of water and the Contractor shall include in his/her rates and lump sum items for the provision of all water required in and for the Works.

(8) Provide adequate signing, fencing and guards to ensure that unauthorised persons shall be kept off the Site. This is especially relevant for the dangerous parts of the Site, e.g. the quarry, the asphalt plant, the storage areas for oil, fuel, chemicals, machines, the car park, the work shop, near deep holes, bridges, villages and power lines.

(9) The Contractor shall keep the site free from all unnecessary obstructions, and shall store or dispose any equipment or surplus of materials. The Contractor shall clear away and remove from the site any wreckage, rubbish and temporary works which are no longer required.

(10) The Contractor is responsible for providing safe passage around and through the work site for all kinds of traffic, including non-motorised traffic and pedestrians. Traffic signs, traffic control signals and barriers shall be used for direction and control of traffic and to inform drivers of the importance to slow down and drive carefully. The signs shall be reflectorised or adequately illuminated at night in a manner approved by the Engineer. The goal is to minimise road accidents in general, including accidents involving pedestrians and persons living, working and playing next to the construction site.

(11) Vehicles shall at all times be maintained in accordance with original manufacturer's specifications and service manual. This will ensure low noise generation, low emission of diesel particulate emission and that the vehicle will not result in accidents due to inadequate maintenance. Special inspection and maintenance is required for brakes, steering wheel, light, horn, tyres, oil and water. Seat belts shall be installed and used. All heavy vehicles shall have reverse warning signal. The operators shall be instructed in avoiding spillage, not overturning or overloading and not to drive at too fast speed. Operators shall be protected against the sun and a cabin shall protect against injuries if the vehicle is tipping around.

(12) All accidents shall be recorded and analysed by the Contractor in order to prevent similar accidents in the future. The Contractor shall notify the Engineer immediately any accident occurs, at the latest within 24 hours. Accident records shall be submitted to the authorities according to regulations, but also send to the Engineer.

(13) Special precaution shall be taken when working close to the overhead power lines. Special instruction shall be given to operators of vehicles working close to the power lines. Signs and barriers shall also be placed adequately to prevent from accidents.

(14) The Contractor shall comply with the regulation on explosives. The Contractor shall not use or bring onto the site explosives of any kind without the prior consent in writing of the Engineer. The explosives shall be stored in a manner and quantities acceptable to the Engineer in magazines provided by the Contractor at suitable positions. The Contractor shall be responsible for the prevention of unauthorised issue or improper use of explosives brought on the site, and shall employ only experienced and responsible men to handle explosives for the purpose of the works.

The shots shall be properly loaded, tamped and where necessary, the Contractor shall use heavy blasting nets. Blasting shall be restricted to such periods as the Engineer may agree to. If in the opinion of the Engineer, blasting would be dangerous to persons or property, or to any finished work, or is being carried out in a reckless manner, he/she may prohibit it and require excavation by other means. Use of explosives by the Contractor in large blasts as in seams, drifts, shafts, pits or large holes is prohibited unless authorised in writing by the Engineer.

(15) Internal quarry roads shall be kept free of obstacles and spillage shall be removed. The crusher and other very noisy equipment shall be placed in a distance and with noise shield/embankment, so personnel working other places on the site will be exposed to as low noise level as possible. If persons are working at the crusher, they must either be in a separate cabin (noise insulated) or wear noise and breathing protection. Personnel working at noise levels above 90 dB (A) shall wear hearing protection. If dust cannot be controlled, the persons shall wear filter masks.

Experienced operators, who have received special instruction on safe methods of operating the vehicle, shall operate dozers, dumpers and other heavy vehicles.

(16) The Contractor shall take every precaution to avoid fire and health hazards at the asphalt plant. He/she shall always ensure that:

- Bitumen is heated only to temperature required for the particular application,
- Hot bitumen never comes in contact with water,
- Suitable protective clothing and gloves are used when handling hot bitumen,
- Dust is reduced to a minimum.

(17) The Contractor shall by daily inspections monitor if:

- The specified personal protective equipment is used,
- The working area is tidy and clean with no unnecessary obstacles
- Dust generation and exposure is sufficiently low and if the area is wetted.
- There are any new workers on the site, or planned to be hired in the near future, and therefore a need for induction courses
- Signing, barriers and fencing are adequately in place.

The Contractor (Safety Officer) shall at least on a monthly basis monitor and carry out a report on the result of the monitoring. The report shall be submitted to the Engineer and include:

- Number and type of accidents, and preventive measures implemented to minimise future similar accidents.
- Number of workers who have attended (and not attended) an induction course.

- Number of workers who have received special training because they started on a new work function, and the total number of workers who should have received such training.
- Number of workers who have participated in the HIV/AIDS awareness training.
- Stock of personal protective equipment.
- Maintenance of the vehicles: tyres, brakes, light, steering wheel, oil, water.
- Is first aid equipment in place with sufficient number of each item
- The change in number of workers and their work functions.

11.11.4 HIV/AIDS and STI prevention management plan

The Contractor's Management Plan for HIV/AIDS and STI shall include details of the measures he/she proposes to adopt to combat the spread of HIV/AIDS and sexually transmitted Infections (STI) between his/her staff, labour and the local community. The plan shall also outline workplace policies and programmes for employees living with HIV/AIDS, information and awareness campaigns and effective screening and counselling policies for STI and HIV/AIDS cases of his/her project staff.

The contractor will work closely with Uganda Aids Commission and MoH to put in place non-discriminatory workplace measures to protect the employees living with HIV/AIDS and to ensure that they are treated and counselled. Prevention measures will also be established to protect others against any risk of illness and injury, which can result in HIV/AIDS infection and transmission.

The Contractor shall advise all site staff and labour of the danger and impacts of STI's in general and HIV/AIDS in particular. To this end, the Contractor shall conduct information, education and consultation (IEC) campaigns at least every other month, targeting the aforementioned site staff, labour, and the immediate local communities. The Safety Officer or another of the Contractor's staff may carry out the awareness training if qualified; otherwise a person from outside (e.g. from Hospital) may be hired to carry out the awareness training.

The Contractor shall throughout the Contract provide, maintain, and operate at least one STI and HIV/AIDS clinic on each site or make alternative arrangements with an existing suitably qualified and equipped local clinic. Each clinic shall be suitably staffed and equipped for the screening, diagnosis and counselling of STI and HIV/AIDS cases of the project staff and labour. The Contractor shall pay the clinic to provide free treatment for general STI cases for his/her workers, whereas the HIV/AIDS cases shall be referred to the national HIV/AIDS programme coordinated by the Ministry of Health (MoH).

The Contractor shall throughout the Contract liaise with MoH and designated local representatives to report progress and coordinate the STI and HIV/AIDS alleviation measures on Site with the MoH national programmes.

The Contractor shall also make available 100 condoms per year for each member of the above mentioned site staff and labour.

All of the above provisions shall be provided free of charge for the workers.

11.11.5 Gender management plan

The Contractor's Management Plan for Gender shall include description of recruitment policy and procedures, awareness raising meetings, gender sensitive working conditions and facilities to be provided at the workplace, and participatory gender sensitive monitoring.

The Contractor shall throughout the contract period liase with both government and non-government organisations at all levels dealing with gender and social development issues. The local leaders and Community Development Officers shall be contacted to advise and mobilise communities during the recruitment process.

The Contractor shall ensure that recruitment procedures and working conditions/facilities are gender sensitive and in particular that:

1) Announcement notices of equal employment opportunities are posted in visible and popular places in the local communities and that such notices also reach women and youth leaders.

2) Both men and women are represented in any information and consultative meetings held at the site and that gender and social issues are raised and analysed.

3) Equal payment is made to men and women for similar work and that payment of wages is made to the workers and not to representatives.

4) Flexible working hours are introduced to the extent possible to take account of multiple roles of women and cultural norms.

5) Separate toilet and accommodation facilities are provided for women, including sanitary facilities and shades for children of working mothers.

The Contractor shall submit monthly reports of labour attendance disaggregated by gender, and the Contractor shall use gender compliance monitoring and evaluation forms to assess and report how gender concerns are addressed in recruitment, promotion, payment, provision of gender sensitive facilities, on-the-job training, etc.

11.11.6 Erosion and Sediment Control Plan

This document describes environmental protection measures to prevent erosion and sedimentation.

Protection measures during the construction of the proposed new Karuma Bridge and access roads is to control sediment and runoff and specific sediment and drainage control plans for all areas of disturbance are hereby proposed and herein.

11.11.6.1 Sediment Control and Water Quality

Works will be planned, scheduled and performed in such a manner that the quality of water flowing from the site is at all times acceptable. Conditions will be maintained to protect the aquatic environment of the River Nile not only during construction, but also during periods of suspended construction activity.

Permanent and temporary soil erosion control features will be constructed at the earliest practicable time, and will be inspected daily during adverse weather conditions or when construction operations are proceedings in Environmentally Sensitive Area (River banks). Control measures will be capable of continuous operations during working and non-working hours, and are subject to approval by the Supervisor's Representative.

During periods of inclement weather, operations should cease, or construction methods will be modified or re-located to an alternative site within the project area to avoid siltation of watercourses.

The Consulting Supervisor's Environmental Officer/Monitor will conduct regular water quality monitoring for changes in turbidity as result of construction as part of the quality assurance program.

The installation of culverts will be conducted in the dry whenever possible to reduce the risk of sedimentation to the swamp.

During preparation of stream diversions, culverts installations and other dewatering where drainage could readily reach a watercourse, all effluent and silt-laden water will be discharged to sediment control method for removal of sediment prior to its release into that watercourse. This requirement also applies to the control of discharge resulting from curing areas of recent concrete pours for drainage structure headwalls. The direct discharge via seepage of untreated, silt-laden water or other deleterious substance into any watercourse is prohibited.

Riparian Areas

Maintaining adequate buffer zones and employing sediment control measures will protect the wetland area/River banks.

Erosion Control

Once land clearing of the modified vegetation and construction has begun, erosion control is the first step in effective management of sediment. While erosion is a natural process that shapes the landscape, the proposed construction works can accelerate the process and cause significant volumes of material to be transported and potentially adversely impact aquatic resources.

Erosion potential is driven by topography, soil type, ground and surface water conditions and climatic conditions. The sites at risk for shallow slope movement should be identified and appropriate control measures applied to minimize the potential for slope movement. Effective and proactive erosion control is more effective than sediment intercepting and trapping. The following steps to effectively control erosion are:

Schedule construction activities at sensitive sites for times when the risk is minimal

- Where possible construction activities in areas of high erosion potential will be planned for the dry season of the year; and
- Equipment movement in erosion prone areas during periods of heavy precipitation will be restricted.

Retain as much existing vegetation as possible

- Construction drawings identify areas of clearing and grubbing and are designed to minimize the loss of vegetation;
- Clearing of vegetation will be minimized at equipment storage and marshalling areas and other material storage areas;
- Avoid exposing sensitive soils;
- Show on construction drawings “close-cut” clearing methods rather than clearing and grubbing; and
- The ROW clearing and grubbing boundaries will be flagged to ensure areas are not unnecessarily cleared.

Re-vegetate/protect cleared areas and bare soils

- Topsoil exposed, stockpile or storage areas should be stripped to the subsoil and stored for use in the reclamation phase;
- Seed or re-vegetate cut and fill slopes and disturbed natural slopes. Seeding can be effective temporary measure for erosion control;
- Protect temporary fills, stockpiles or exposed soils adjacent to streams with slope blankets or covers. Plastic sheeting, geo-textiles and other manufactured products can be used as covers. Angular rocks may be suitable in protecting sensitive soils; and
- Use mulches and other organic stabilizers to minimize erosion until re-vegetation can be re-established.

Establish permanent erosion control as soon as possible

The most important aspect of erosion control is to apply permanent stabilization and re-vegetation as soon as possible. As soon as areas are graded to final slope lines and levels, and construction traffic no longer needs to access an area, permanent erosion control measures must be put in place.

Sediment Control

During construction works, it will be impossible to protect all newly exposed soils from erosion; therefore it is important to also apply sediment control measures at the same time as the erosion controls. Sediment control typically focuses on managing water run-off from erosion prone areas. Water carrying sediment must be directed away from entering waters that contain aquatic organisms. Steps to control sediment that have been proposed to be used by the Contractors include:

Control and collect runoff from erosion prone areas

- Minimize runoff velocities and erosive energy;
- Maximize the length of flow paths for precipitation or surface runoff to minimize energy of flow or employ structures such as check dams and ditch blocks.;
- Construct interceptor ditches and channels with low gradients to minimize secondary erosion and transport; and
- Discharge sediment-laden waters to re-vegetated areas where sediment can be filtered out before the water reaches any watercourses.

Retain sediments on site with sediment control structures

- Use correctly installed silt fences and other barriers;
- Provide bed-load clean-outs at culverts and ditches;
- Construct sediment traps in areas where ditch water must be intercepted to ensure sediment is not transported into watercourses;
- Construct sediment traps of sufficient size to handle the anticipated runoff.

Monitor and Maintain

- Regularly monitor erosion and sediment control measures to ensure that they are working effectively;
- Additional checks are required after rain events
- Maintenance of sediment control devices includes the removal of accumulated sediments to maintain collection capacity; and

- Have extra geo-textile (silt fencing), and/or gravel on hand to repair or install new sediment control structures as required

Sediment Control Methods

The following are suggested sediment Control Measures:

1. Sediment Barriers

A temporary, usually permeable obstruction left in place or constructed from a variety of materials to block general overland flow or small concentrated (ditch) flow to minimize sediment transport from a construction area. They can consist of vegetated leave strips or be constructed from materials such as, stones, geotextiles (silt fence), or earth dike. All are installed to form a barrier to reduce the velocity of runoff that allows the sediment to settle out. While these types of barriers do not require formal design, they must be installed properly to be effective and must be monitored regularly, particularly after rainfall.

2. Silt fence barriers

Are most effective for containing and filtering overland flow but can also be used in ditches but for small drainage areas only. In locations with concentrated flow the silt fence must be reinforced with a wire mesh backing and the drainage area should not exceed 1 ha.

3. Stone Barriers

These are typically used in ditches as both a barrier to filter sediment and to reduce water velocities. Natural; gravels or crushed stone can be used with a maximum size of 250mm. Dams should be no more than 1m high and the barrier width should be 0.5m wide for every 0.5 ha. of drainage area

Equipment Storage and Maintenance Yards

- Land areas cleared for these areas will be the minimum required area;
- The boundary of these areas will be flagged prior to clearing;
- Topsoil (organic layer) are highly erodable and should be stripped and stockpiled for site reclamation once these sites are not longer required;
- Exposed soils with potential to cause sedimentation will be stabilized;
- Ditches will be constructed to direct water along the perimeter to the area, and sediment control features will be incorporated into the ditches, as required;
- Sediment control barrier such as silt fencing will be set up to contain sediment on site; and,

- If necessary, settling ponds will be established down slope to allow sediment to settle out of the ditch water before it is released into the environment.

Material Storage Areas

These areas require similar treatments as described for the storage and maintenance yards;

- Topsoil should be stripped and stored for use in site reclamation;
- Stock piled soils need to be protected to prevent erosion. Plan growth occurring rapidly will prevent this, or a polyethylene cover can be used to cover the pile temporarily.
- Ditch water velocities must be minimized by ditch design and the use of silt barriers; and
- Direct silt laden water into vegetated areas or into sediment raps to filter out sediment before it reaches developed areas.

Responsibility

The contractor is responsible to ensure sedimentation and erosion is mitigated throughout the work site. This includes responsibility for sediment and erosion control including construction, installation, maintenance and removal of any mitigation and/or control measures. Therefore, he will provide the Supervisor's Representative and the Environmental Officer/Monitor a "Sediment Drainage Management Plan" whereby he provides a commitment to comply with the Standard Specifications.

The Environmental Officer/Monitor will monitor sediment mitigation and control measures to provide quality assurance.

Table 11.3: Environmental Approval and Tasks Responsibility

Approval / Task	Agency & Regulation/Guideline	Responsibility
Sediment Control	Standard specification and ESMP	Contractor
Reclamation	Standard specification and EMMP	Contractor

Reporting Structure and Contacts

The contractor is responsible for reporting to the Supervisors Representative and the Environmental Officer/Monitor for any incidents of sediment releases into watercourses. Significant uncontrolled releases are considered spills and will be managed according to the Spill Contingency and Response Plan.

11.11.7 Waste Management Plan

This plan will ensure that waste generated during construction is handled in a way that protects t he environment and complies with applicable regulations. The following are some of the materials that can be expected to generate during construction:

- Vegetation stripping;
- Concrete forms;
- Containers for various construction materials (e.g. asphalt, concrete and steel);
- Pallets;
- Plastics;
- Waste oil, filters, lubricants and hydraulic fluids;
- Concrete;
- Food; and
- Sewage

The plan addresses open burning, refuse disposal, recycling, reuse, sewage disposal, and camp (yard) waste disposal practices.

General Waste

All organic and inorganic materials will be placed and/or disposed of so as not to directly or indirectly impact any watercourse or groundwater. The placement and disposal of all such products and materials will be done in an environmentally acceptable manner.

Any waste material that is inadvertently disposed in or adjacent to watercourses or other designated environmentally sensitive areas will be removed immediately in a manner that minimizes adverse impacts, and the original drainage pattern will be restored.

All wastes which are not designated, as combustible waste to be burned on-site, will be recycled, disposed of in an approved landfill, or transported to an approved disposal facility by a licensed waste handler.

Construction debris will not be allowed to accumulate on the construction site but will be collected promptly and regularly removed from the site. Waste materials will be placed and stored in suitable containers. Storage areas and containers will be maintained in a sanitary condition and shall be covered to prevent spreading of wastes by water, wind or animals.

Solids, sludge's and other pollutants generated as a result of construction or removed during the course of treatment or control of wastewaters will be disposed of in a manner that prevents their direct or indirect discharge to any watercourse or ground waters.

Though such measures may be used, sound environmental practices encourage waste management practices that lead to recovery and recycling (National Environment (Waste Management) Regulations 1999).

In situations where by material generated as a result of clearing and/or grubbing may not be burned on-site, the disposal method must be approved by the Resident Engineer or the Consultant Supervising Environmental Officer/Monitor.

Under international agreements and the National Environment (Waste Management) Regulations 1999, open burning of waste is discouraged in favour of waste minimization, resource recovery and recycling. The waste management system of materials that can be recycled, reused or recovered should, therefore, be based on attainment of the aforementioned principles right from collection at source. UNRA, therefore, encourages waste management practices for its projects that will aid resource recovery and recycling

Stripping

All waste and surplus material will be disposed in designated and approved areas. Not less than fifteen days prior to disposing of any waste or surplus material, the Environmental Officer/Monitor will be provided the locations, nature of the material being disposed, and stabilization technique.

Excavate material will be properly drained, spread and trimmed to a stable slope not exceeding 1.5 to 1, in a manner which minimizes disturbance of watercourse and vegetated areas. All waste sites will be re-vegetated immediately after creation of the waste disposal site, or else suitable temporary erosion control measures, such as tarps or plastic, shall be used until re-vegetation is undertaken.

- Topsoil material resulting from stripping or associated operations should be stockpiled in raised areas, so as to avoid being washed away by any sudden storm.

- Use of berms, sediment basins, mulches and grasses, slope drains and other erosion control mechanisms will be required to avoid emission of high concentration of sediments into wetlands, swampy areas and other particular sensitive areas where cut and fill have been done especially in hilly areas

- The removal of used up material after work and the leveling of the soils/cut to spoil be done frequently after works and this can be stored in proper places and used in the reinstatement of burrow and quarry sites

Riparian Areas

- Minimize the width of the riparian area cleared.

- Wherever possible use “close cut” rather than clearing and grubbing.

- Stabilize exposed soils immediately to minimize erosion in the riparian area.

- Apply erosion and sediment control measures such as cross ditches, and berms to divert overland flow off and away from exposed riparian areas and collect water in ditches where it can be discharged into a settling pond or trap.
- Installation of culverts at all “drain” crossings must consider the potential to intercept groundwater or other surface runoff. The appropriate sediment containment measures should be considered and available for installation if required.

Waste Oils and Special Wastes

waste oils, special wastes, and refuse generated during the servicing of equipment (e.g., air and oil filters, hydraulic fluids, petroleum products) will be stored, transported and disposed of in accordance with the national environment (waste management) regulations 1999 and section 1713 cleanup and disposal of waste materials of the General Specifications For Road and Bridge Works January 2005 and will not be disposed of by dilution, burial or incineration.

Where possible, waste oil, lubricants and other waste materials generated during the servicing of equipment and machinery will be recycled. The dumping of oil or other deleterious materials on the ground or in a watercourse is strictly prohibited.

Refuse generated during the servicing of equipment will be removed from the site and disposed of in an approved facility.

According to the National Environment (Waste Management) regulations 1999, licenses for the storage of such facilities, its transportation by licensed transporters and that such waste is transported to facilities licensed by NEMA and the contractor should always put this into his planning

Concrete Wastes

Fresh concrete or cement will be isolated from any designated watercourse for 48 hours after placement. Containers or trucks carrying cement or fresh concrete will be washed at site approved by the Resident Engineer. Concrete waste, including wastewaters from batching or cleaning, will only be disposed of at approved and designated disposal sites. Cement-contaminated wastewater from cleaning or mixing is to be considered toxic, and must be prevented from entering any watercourse for at least 48 hours to allow the water to reach neutral pH.

The Resident Engineer shall apply regulations as spelt in the National Environment (Standards for discharge of effluents on water or land) Regulation 1999 and the National Environment (Waste Management) regulations 1999 and this include:

- Types of wastes (All categories of hazardous and non-hazardous waste) hence Sorting and disposal of domestic waste (i.e. from camps etc): Section 4 (4):

- A person who generates domestic waste shall sort the waste by separating hazardous waste from non-hazardous waste in accordance with methods prescribed under sub regulation 3; a generator of domestic waste may, without a license issued under these regulations, dispose of non-hazardous waste in an environmentally sound manner in accordance with by-laws made by a competent local authority.
- The regulations also call for cleaner production methods and operations (Section 5) including recovery and reuse and reclamation and recycling.
- A person intending to transport waste or store waste must apply of a license from NEMA. It is an offence to transport or store waste without a license.
- A person intending to operate a waste treatment plant or disposal site must apply for license from NEMA. It is an offence to operate a waste treatment or disposal site or plant without a license.
- The issue of the license is conditional upon a detailed application and assessment of impacts as part of the ESIA study.
- If storage of waste is only temporary pending final disposal, a license is required (under regulation). e.t.c

Food Waste

All food wastes will be collected and stored in containers and disposed of at a site approved by the local authorities. UNRA encourages waste management practices for its project that will aid resource recovery and recycling

Sewerage Disposal

Sanitary wastes will not be discharged into watercourses or on the soil surface except under approval. All temporary toilets will be equipped with approved septic tanks having safe drainage or with closed holding tanks that are emptied only into approved treatment plants or sewerage tanker truck. All temporary toilets used on site will be placed in environmentally acceptable areas, and will be secured to avoid or minimize damage from animals or vandalism.

If a camp is developed, regardless of size, the sewerage system shall be of a standard that meets all local health standards.

Table 11.4: Environmental Approval and Task responsibility

Approval / Task	Regulation/ Guideline	Responsibility
Open Burning Permit	NEMA	Contractor

Potable & Camp / supply Water Permits	NEMA	Contractor
Sewerage Disposal Permits	NEMA	Contractor
Refuse Disposal Permits	NEMA	Contractor
Fuel Storage Permits	NEMA	Contractor

Table 11.5: Reporting Structure and Contacts

Contact	Name	Office	Alternate
Supervisors Representative NEMA			
Environmental Monitor			

11.11.8 Safety manual

The contractor should each have a safety manual which stipulates the company's health and safety policy. It addresses the general requirements of the employer and employee, the structure by which these requirements are to be met, and the induction of new employees in terms of safety (covering, for example, accident procedures, fire and medical emergency procedures, responsibilities, reporting, information dissemination).

The safety manual should address safe working procedures in very great detail. It should deal with, inter alia , handling of oils and other chemicals, cleaning of plant and equipment, earthworks and excavation, electrical safety, emergency procedures, safe use of equipment, hygiene/housekeeping in the contractor's or workmen's camps, prohibition of use of weed killers for clearing vegetation, fire procedures/precautions, fire risk assessment, flammable liquid safety, disposal of hazardous chemicals, recycling of waste oils and lubricants, protective clothing, tools, occupational safety(e.g. exposure to dust ,noise and air pollution)

The safety manual should also provide a checklist of issues that require monitoring.

It is recommended that each contractor prepares a safety manual (or revises his existing one), and that the manual is followed and referred to constantly. A Health, Safety, and Environment Officer should be appointed to work on the site, and he/she must be familiar with the requirements and guidelines contained in the manual.

11.11.8.1 Emergency response plan

There are a number of activities that the contractors will engage in that may result into accidents, where the situation may become an emergency. These include the preparation of asphalt, blasting of rock, or accidents involving plant and equipment. There is also a risk of fire from cooking at the workmen's camps, or from careless storage, handling or disposal of oil product.

Bearing this in mind, the contractors should prepare an Emergency Response Plan (ERP), which can be included in the Safety Manual. The ERP should focus on, inter alia:

- Health and safety training;
- Evacuation procedures;
- Public relations during an emergency

11.11.9 Borrow pit/Quarry management plan

The purpose of the borrow pit / quarry management plan is to:

i. Explain the need for the proposal (on the development) and describe the physical characteristics, scale and design of the borrow pit or quarry;

ii. Examine the existing environmental character of the proposed site and the area likely to be affected by the borrow pit or quarry;

iii. Predict the possible environmental impacts of the borrow pit or quarry;

iv. Put in measures that will be taken to avoid, offset or reduce adverse environmental impacts;

v. Incorporate measures that will be taken to enhance the habitat at the borrow pit or quarry;

Preparation, organization and excavation of borrow pits

The material will be extracted mechanically without the use of explosives. Investigation and laboratory testing of the material from the pits was undertaken during the preliminary engineering phase and their suitability confirmed for use as sub base material with chemical improvement. Currently all these borrow pits are either fallow or under cultivation, and are either individually owned or by an institution. Thus the Contractor will have to acquire this land temporary, and pay for the material being excavated.

Where possible borrow pits in the road reserve and adjacent to the road should be used. These avoid the need for access roads and additional access roads and additional turning areas for equipment. Exploitation activities should be planned so that:

- The borrow pit can be exploited fully with removal of maximum amount of material;
- Environmental damage by drainage and erosion is minimized both during and after excavation. The borrow pit should be developed so that it drains effectively during works
- The overburden is stockpiled so that it will not hinder future extension, and so that it can be eventually used to reinstate the borrow pit.
- The best material is taken where the material quality is variable within the pit.

<u>Backfilling borrow pits</u>

After the construction/gravelling works have been completed and the borrow pit will not be used again for the current road works, the site should be restored to a condition that is satisfactory to the owner. However, the pit may not be left open for further excavation by the owner, nor for use as a water pan unless approved by relevant authority.

Table 11.6: Borrow pit management Plan

Action/Activity	Responsibility
Ensure adequate compensation in accordance with relevant laws and/or a mutually agreed term is made at all times throughout the cycle of the project to local residents affected by the project. All compensation agreements whether permanent or temporary, are to comply with the requirements in Section 40, of the Land Act, whereby the husband signs the agreement, witnessed by the wife and by a member of the family (e.g. child of majority age). Further all compensation agreements are to be witnessed by an official of the Local Government and 2 copies of all compensation agreements are to be submitted to /UNRA.	Contractor/Environmental Officer for the Contractor/UNRA and Ministry of Lands Housing and Urban Development and Local Councils
Ensure that all excavations made are fenced off and warning signs put in strategic places in order to reduce the risk of straying animals and humans falling into the pits.	Contractor/Environmental Officer for the Contractor/UNRA and Local Councils/DEO
Ensure that the levels of noise generated from the various activities at the site comply with the National Environment (Noise Standards and Control) Regulations 2003. Borrow area operation should be limited to daylight hours only.	Contractor/Environmental Officer for the Contractor/UNRA/DEO and Local Councils
Ensure that the workers are adequately protected from exposure to excessive dust and noise, or injury through provision of appropriate gear including ear-muffs, masks, safety boots, and safety helmets. Workers will be trained on the value and use of	Contractor/Environmental Officer for the Contractor/UNRA/ Department of Occupational Safety and Health/DEO

Action/Activity	Responsibility
PPE and the consequences of failing to use the equipment. A three –step enforcement system will be communicated to the workers, thus: Violation 1 for non-use: a warning; Violation 2 for non-use: dismissal from work for the day; and Violation 3 for non-use: permanent dismissal from work.	
Ensure that the speed of the traffic transporting the borrow products is regulated, and appropriate road signage installed at various road junctions and access road leading to and from the project site, in order to minimize accidents. Further, speed humps should be placed at regular intervals along habited sections. Speed limits in such places shall be 30 km/hr.	Contractor/Environmental Officer for the Contractor/UNRA/Traffic Police/Local Council/ DEO
Ensure proper and progressive restoration of the Borrow area site after gravel extraction through remediation of borrow pits, landscaping, and grass planting where appropriate. The restoration process shall not be limited to only time of closure, but will apply at various stages to those locations where the contractor will have extracted murram.	Contractor/Environmental Officer for the Contractor/UNRA/DEO and Local Councils
Ensure that proper drainage system to handle storm water run-offs is put in place so that soil/land erosion and deposition of materials originating from the Borrow area in areas surrounding the Borrow area site is controlled. NO eroded soils and NO surface-water runoff (generated on the Borrow area site) should move away from the Borrow area.	Contractor/Environmental Officer for the Contractor/UNRA/DEO

Action/Activity	Responsibility
Ensure that interference and inconvenience to any community in the neighborhood is avoided, and that the concerns of any such community regarding the operation of the Borrow area, are addressed frequently and in consultation with the local leadership, the District Environment Officer, NEMA and other relevant lead agencies. A committee including the LC I leadership, elders, and district officers is set up to deal with complaints of the community after their consent to the terms of reference is sought.	Contractor/Environmental Officer for the Contractor/UNRA/DEO and Local Councils
Suppression of dust should be undertaken at the Borrow area site and on the haulage route. A water browser should be used to sprinkle water along the haulage route and in the borrow area.	Contractor/Environmental Officer for the Contractor/UNRA/DEO and Local Councils

11.11.10 Spill Contingency Plan

This document describes spill contingency measures the response plan for the new Karuma Bridge and access roads. The plan is designed to reduce impacts to the environment in the event of spill through ensuring materials are available and established procedures followed.

The purpose of the Spill Contingency Plan is to provide a course of action, which will be implemented to a low a prompt and orderly response to spills that may occur during construction works. A spill of liquid, or gaseous substance, which would impair the usefulness of the land, water or air where it is released, will be responded to by the procedures outlined in the contingency plan.

This plan is intended to provide guidance to provide in the event of a spill. The areas of responsibility of the various personnel who will directly be involved are outlined to provide clear direction of what each person should be doing at the time of an emergency. The Environment Officer/Monitor in consultation with the Supervisor's Representative will review this plan regularly. The review date will be recorded and kept on file.

Spill Response Plan

This section is designed to provide the reader with the methods of handling spills and the reporting procedures required.

All spills, major or minor shall be reported. Workers will report all spills to their supervisors or Environmental Officer/Monitor who will in turn report to the Supervisor's Representative.

Minor spills

Minor spills are those that can be easily and safely handled by those people in the area, and generally by the persons initiating the spills. The spills are generally within the confined area, are small in nature, have minimal health and safety risks, and have no chance of migrating into the environment.

Major spills

These would be spills of greater potential than minor spills and have potential health and safety risks. When In Doubt, Treat The Spill As Major.

Spill Response Equipment

Spill equipment will be provided and located in a designated response storage facility. Any persons adjacent to a water course will have a spill kit present. Any used spill abatement and clean up materials will be promptly replaced.

Spill Response Duties

All response team will be composed of the Environmental Officer/ Monitor and personnel from the construction site. All personnel will be trained to notify the designated leader in the event of a spill. The general response to a spill is as follows;

- Report spill
- Stop source, if possible
- Contain spill with materials
- Protect area
- Remove material
- Reclaim area
- Spill report

Documentation of spills

All spills will be documented in the environmental logbook retained by the Environmental Officer/ Monitor. A detailed report will be prepared within two (2) weeks of the occurrence. The report will include the details of the spill and all remedial action taken. The report will include all the details of the spill and all the remedial action taken. The report will be submitted to the Supervisor's Representative and provided to the Contracting Authority.

Guidelines for spill Containment and cleanup

Construction personnel will be educated in the following procedures in the event of spill. Immediate actions to be undertaken by personnel at the spill site include the following:

Be alert; ensure personal safety and safety of others.

Assess the hazard to persons in the vicinity of the spill.

Assess whether the spill can be can be readily stopped or brought under control:

- Where safe to do so, stop the flow of the spilled material
- Gather information on the status of the situation
- Report the spill without any delay
- Resume any safe, effective action to contain, clean up, or stop the flow of spilled product

In order to promote prompt and proper management and cleanup spills, some general guidelines on containment and cleanup are reviewed. It is important from both a Safety and Environmental perspective that prompt and proper clean up of spills are undertaken. Spill characterization may be determined by the review of sources including the following:

- Sedimentation or erosion.
- Chemical packing labels
- Chemical form (solid, liquid, powder)
- Chemical container method (drum, tank)
- Material Safety Data Sheets (if available)

Proper handling is important for protection. Once the spill is identified, it is necessary to review the appropriate management procedure. This must take into account the types of materials, their physical and chemical properties, and also the correct methods of neutralization, handling and/or containment.

Specific Materials on Road Construction Projects

The following response actions are outlined for specific spills that, however unlikely, could occur during road construction.

Petroleum/Gasoline

Petroleum/Gasoline may be stored on-site for use in light vehicles. A list of the hazards associated with Patrol/ gasoline, spill response, fire response and recovery methods are listed below. Varsol Spills will be treated as petrol/gasoline spills. Petrol/gasoline spill is:

- Highly flammable

- Explosive when in vapour foam
- Easily ignited by flame or spark; lighter than water (floats on water)
- Toxic to humans by ingestion
- Toxic to aquatic organisms

The initial response to petrol/gasoline spill will be:

- Stopping the flow at the source if possible.
- Eliminating all possible sources of ignition (e.g. extinguish cigarette ,shut off motors)
- Evacuating danger area
- Carefully considering the hazards and merits of trying to contain the spill if it is safe to do so and obvious benefits of containment is apparent (e.g. contain if flowing towards the a water course.) otherwise leave gasoline to spread and evaporate
- Notifying the Environment Officer/ Monitor/ or the Supervisor's Representative.

In the event of fire, the response will be:

- Using CO_2 , dry chemical, foam or water spray (fog);
- Using jet streams to wash away burning gasoline.
- Diverting the gasoline to an open area and let it burn under control.
- Using water to cool the tank surfaces.
- Being aware of re-ignition if the fire is put out before all the gasoline is consumed.

Petrol/gasoline can be recovered in the following manner:

- Unburnt gasoline can be soaked up by sand or pit moss or by commercial sorbets.
- If necessary, contaminated soil will be excavated and incinerated at a site approved by local authorities,
- Gasoline entering the ground can be recovered digging sumps or trenches and pumping from below water table.
- **Petrol/gasoline can be disposed of in the following manner.**
- Evaporation incineration under controlled manner.

Other Fuels and Petroleum Products

Fuel and petroleum products spills will be contained using local earth material and /or sand bags. Spill cleanup equipment specifically designed for petroleum products are to be located at the camp an in the maintainable shop. Dangers associated with fuel oil spills include:

- Risks associated with flammability.
- Mildly toxic by ingestion, highly toxic if aspirated.
- Moderately toxic to aquatic organisms.
- Harmful to waterfowl
- Floats on water.
- Spills or leaks of all light and medium oils, including fuel oil at storage facilities will be responded to by the following steps:
- Identifying the source of the leak or spill
- Stopping flow if possible
- Eliminating open flame ignition processes.
- Containing the spill.
- Notifying the Supervisor's Representatives

Initiating Spill Response Plan

In the event of tank rapture, the containment berm is designed to contain the full capacity of the tank. This will allow the oil to be contained and pumped out into salvage tanks. Contaminated soil from the site will be excavated, and transported to a treatment facility or treated on site by air sparging. Spilled diesel fuel can be covered by commercial sorbents or by sand straw or peat moss. If necessary, contaminated soil will be excavated and incinerated at a site approved by local authorities. Digging sumps or trenches and pumping from below water table can recover diesel fuel saturated soil. Fuel spills on land will be responded to by the following procedures:

- Construction of earth berm down slope of the running or seeping fluid.
- Plastic taps may be placed at the base of the berm to allow the fuel pool on the plastic tarp for easy capture with absorbent pads,
- Pads may be squeezed into empty drums and re-used.
- Larger pools may be pumped back into the drums.

- Special care will be taken to prevent the fuel from entering the water body or water where it will: have greater negative impact
- Contaminated soil and vegetation may have to be removed and disposed off by incineration at a site approved by the local authorities.

Fire Response methods for Diesel Fuel includes:

- CO_2, dry chemical, form, or water spray.
- Water to cool tank surface.
- Diversion of the diesel to an open area and let it burn of under control.
- Awareness of re-ignition if the fire is put before all diesel fuel is consumed
- Fuel spills on water will be contained immediately to restrict the extent of the floating fuel.

The methods, which may be used to contain the fuel include:

- Booms deployed to contain the spill.
- Absorbent pads used to capture small spills on watercourse.
- A skimmer to recover oil contained by boom and then pumps the recovered fuel into empty fuel drums.
- Culverts (CMP's or plastic) to permit water flow while capturing and collecting fuel. The culvert can be surrounded with absorbent material to capture any fuel on the water surface.

Acid spills

Spills of acid will be contained using sand bags and neutralization can be accomplished using either soda ash or lime. Both the sand bags and lime will be stored at maintenance yard. Following neutralization, the area will be carefully flushed with water. Any water used for flushing a spill shall be contained, recovered and disposed of in an approved manner.

Concrete and/or Concrete Waste Water

During any course of concrete pour within 15 metres of, or in work areas below the high water level of any water course, carbon-dioxide cylinders will be ready for use in the event of concrete or concrete leachate discharges into the water course. The carbon-dioxide will be used to neutralize any concrete leachate that inadvertently discharged into the water course.

11.11.11 Traffic management Plan

a) Programme for control of traffic

The Contractor shall submit to the Engineer a detailed Traffic Control Plan. Such Plan shall be approved by the Engineer before the Contractor commences work, and shall show amongst other things the method of protection of the public and give details of the hours of operation, location, types and numbers of traffic safety devices, barricades, warning signs, flagmen and the like. The Traffic Control Plan shall be in accordance with and complementary to the Programme of Works submitted by the contractor.

The frequency and duration of delays to traffic while passing through, over or across the Works, shall be kept to a minimum. They shall, in no case exceed half an hour and should normally be less than 20 minutes. Any method of working which requires road closures in excess of 30 minutes shall be the subject of 48 hours prior notice to and agreement of the Engineer, who may refuse to allow such closure in default of due notice.

The Contractor shall take particular care, when passing traffic through his/her Works, that all excavations and other hazards are properly protected with barriers and are illuminated at night.

In the preparation of this Traffic Control Plan, the Contractor should take into consideration the following:

Further, the passage of public traffic on sections of a road may be allowed prior to the "Taking-Over Certificate" where this is clearly in the interest of the public and the traffic can be accommodated on the road surface in a safe manner without damage to structures or pavement layers and without undue disruption of the Contractor's work. The Contractor shall be responsible for the control of public traffic over such sections, including temporary traffic control facilities.

(d) Minimum vertical clearance

The minimum vertical clearance over any section of a diversion shall be 5 m.

(e) Property and survey beacons

Where possible, diversions shall be constructed so as not to damage or displace property or trigonometrically- survey beacons. In exceptional cases where this is not possible, the Contractor shall notify the Engineer in good time so that he/she may arrange to have them suitably referenced before they are displaced.

(f) Access to properties

The Contractor shall also provide and grant access to persons whose properties fall within or adjoin the area over which he/she is working, and in this respect the Contractor’s attention is drawn to the Conditions of Contract.

(g) Approval of diversions

The need for details concerning all diversions shall be approved by the Engineer before the construction of such diversions commences, and the Contractor shall satisfy himself/herself before bidding that he/she can make arrangements in respect of any diversions as may be necessary for the safe and convenient passage of traffic.

(h) Temporary Works

The diversions provided by the Contractor shall include the construction of temporary gates, grid gate, fences, drainage works and other incidentals considered by the Engineer to be necessary.

(i) Public services

The Contractor, in co-operation with the Engineer, shall make arrangements for all public services such as power lines, telephone lines, water mains, etc, to be moved where required for the construction of diversions and he/she shall be solely responsible for the safety of such services. No payment will be made for any additional expenses caused by delays in moving such services. Where the moving of services is not required, the Contractor shall clearly indicate where such services cross the diversion so that these points will be clearly visible to the operating staff.

Construction of diversions

(a) General

Where in the opinion of the Contractor it is preferable not to pass traffic through the Works, the Contractor will, upon previous approval of the Engineer, be allowed to construct and maintain diversions provided that such diversions are passable to traffic at all times.

The length of the diversions shall be of the shortest practical length having regard to gradient and obstruction and shall be sited as agreed between the Engineer and the Contractor.

Where required in the Special Specifications or by the Engineer, temporary diversions shall be provided with bituminous surfacing in accordance with the requirements of the Special Specifications or of Series 4000 (Ministry of Works and Transport General Specifications for Bridge and Road Works), or as may be prescribed by the Engineer.

(b) Widths, gradient, camber

For the diversion of an existing trunk road, the carriageway width of the temporary road shall be the width of the existing carriageway or 6.0m whichever is the lesser. If wider diversions are required, such widths shall be specified in the Special Specifications or on the Drawings.

For the diversion of a minor public road or a private road, the width of the temporary carriageway shall be the same as the existing carriageway, or such lesser width as agreed by the Engineer.

Where in the opinion of the engineer, it is impracticable to provide a two-lane diversion, a single lane carriageway not less than 3.0 m wide with traffic control and passing places shall be provided.

The verges of the diversion shall be cleared and maintained clear for a width of at least 1.5 m beyond the edge of the carriageway or such lesser width as the Engineer may agree.

The temporary traffic diversions shall have a minimum horizontal radius of 30 metres and a maximum gradient of 8 percent unless otherwise agreed to by the Engineer in exceptional cases. Any acute intersection of gradient shall be properly graded to a smooth vertical curve, to the satisfaction of the Engineer.

12.0 CONCLUSION AND RECOMMENDATIONS

This Environmental Social Impact Statement has assessed and presented mitigations for various impacts. The concept of this project focuses on ensuring that the proposed New Karuma Bridge and access road is contracted and operates efficiently and meets the requirements of the National Environment Authority, plus the different relevant policies. The ESIA recommends that the site is suitable for the New Karuma Bridge operations if the mitigation measures and environmental social management plans are implemented. UNRA is committed to constructing the New Karuma Bridge and will abide by all the conditions of approval given by NEMA in construction and operating the New Karuma Bridge.

The following recommendations are made with respect to the proposed development.

- Complete project environmental audit and submit it to NEMA during the project construction and after decommissioning to ensure that all the proposed mitigation measures have been complied with;
- That construction of all facilities in the proposed project is carried out in accordance with approved plans and laws;
- That any unforeseen impacts shall be immediately notified to the environmental supervising team to ensure that they are minimized.

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APPENDIX 1- LIST OF PEOPLE CONSULTED DURING THE ESIA PROCESS

Name	Designation	Concerns
Mrs.NyiracyizaJackline	Ministry of Tourism, Wildlife and Heritage- Department of Museums and Monuments- Conservator History Archaeology	The KWR is a protected area The cultures of the people within the area of the project should be consulted, and there cultures should be respected. Contractor to take strict measures during construction to avoid disturbance to animals A construction plan /schedule should be submitted to UWA in order to monitor the activities Staff should be trained on the rules and regulations Poaching and Hunting is prohibited
Mrs.Khayongo Barbra Clara	General Health Inspector. Ministry of Gender, Labour and Social Development- Department of Occupational Safety and Health	Occupational health and safety of the workers and the neighbouring community should be key. Sensitisation of the people and workers should also be done before the project takes place
Mr.MageziAkiiki	Assistant Commisioner-Metereology Department	Climate issues should be considered in relation to the project activities. The climatic data should be looked at for each specific area
Eng. Eva Katusabe	Senior Engineer in charge of Construction	The department has guidelines and manuals on what is expected to be undertaken by the consultants and contracts during the design and implementation

Name	Designation	Concerns
		of the projects. It is therefore expected that occupational. Health and safety issues should be addressed in the EIA and also ensure that UNRA closely liases with the Ministry in terms of compliance. Employment is one, major aspects and the employment Act, 2006 should be made reference to when recruiting employs. Institutional collaboration is critical and UNRA should budget for this in their monitoring of construction works.
Niwamanya Shallon	Petroleum Officer (Environment) Petroleum Supply Department 0774422616	Issues to do with oil spills and the protection of the environment against oil leaks especially the water resources should be contained in the oil/spill management plan and transportation of fuel should be in acceptable standards. Storage areas should be clearly designated
Ituka Gilbert	Wetland Officer Policy and Monitoring 0712556824	Protection of wetland during construction should be key and the monitoring of activities in these areas should be routine. For the Karuma Bridge construction, the River Banks should be protected from scouring and sedimentation
Jimmy Adwek Makmot	Gulu UNRA Station engineer 0772510590/0702510590	Contractors should be informed on the regulations and ESMP should be followed The ESIA should contain comprehensive mitigation

Name	Designation	Concerns
		measures for the works
Mr.Rukundo	NFA-Environmental Impact Assessment Specialist	We have much interest on the natural forest because of its rich diversity and it's not easily replaceable like the plantation forests hence the works should avoid destroying the were possible Biodiversity should clearly be shown in the ESIA. UWA should be consulted and work in hand during construction .Issues raised by them should be taken seriously
Director Conservation John Makombo	Uganda Wildlife Authority	The project traverses KWR which is part of the Murchison Falls Conservation Area. The Contractor should follow directions given by UWA, hunting of animals is illegal
Mrs.Kyoburungi Gwen	Principal Water Officer-Directorate of Water Resources and Management (DWRM)	The Contractor should apply for a permit for water abstraction if he is to use surface or underground water A discharge permit should be sought from the Directorate The design should take care of water resources and management in general more especially when working near Rivers.
Mr Stephen Sherura	Ag. Principal Petroleum Officer	The concerns of oil spillage during construction and post construction.

Name	Designation	Concerns
		Location of petroleum facilities, storage, handling of tar for the Contractor's operations to be in conformity with existing laws and regulations. Access for petroleum facilities i.e station to be obtained from UNRA A contractor to have in place a health and safety policy and ensure that contingency and emergency response plan is effective
Mr. Evelyn Kyomukama 0772855100	Warden In Charge Karuma Wildlife Reserve	The contractor should always alert UWA of intended activities and timing. UWA shall be able to share ideas on the workings and advise the contractor. The contractor together with his staff will be briefed on the don'ts and do's of the area.
Owor Thomas 0782564297	Staff KWR	The project is welcome and our support will be readily available
Okello Watson 0773113131	Staff KWR	Consultations with UWA should be key before any planned activities.
Opio Severino	Local Council 1 Karuma	Local People should be given priority for employment Materials are also available It will boost the income of the people in the area.

Name	Designation	Concerns
		People are eagerly waiting for the project to start so that they can participate

APPENDIX 2: NOISE QUALITY STANDARDS

FIRST SCHEDULE

MAXIMUM PERMISSIBLE NOISE LEVELS

PART II

Regulation 6(2)

Maximum Permissible Noise Levels (Continuous or intermittent noise) from a Factory or Workshop

Column 1	**Column 2**	**Column 3**
Leq dB (A)	Duration (Daily)	Duration (Weekly)
85	8 hours	40 hours
88	4 hours	20 hours
91	2 hours	10 hours
94	1 hour	5 hours
97	30 minutes	2.5 hours
100	15 minutes	1.25 hours
103	7.5 minutes	37.5 minutes
106	3.75 minutes	18.75 minutes
109	1.875 minutes	9.375 minutes

Noise Levels shall not exceed a Leq of—

(i) Factory/Workshops 85 dB (A)

(ii) Offices 50 dB (A)

(iii) Factory/Workshop Compound 75 dB (A).

PART III

Regulation 6(3)

Maximum Permissible Noise Levels for Impact or Impulsive Noise

Column 1	**Column 2**
Sound Level dB (A) (Lmax)	Permitted number of Impulses or Impacts *per* day
140	100
130	1,000
120	10,000

PART IV

Regulation 6(4)

Maximum Permissible Noise Levels for Construction Site

Column 1		Column 2	
Facility		Maximum noise level permitted (Leq) in dB (A)	
		Day	Night
(i)	Hospital, schools, institutions of higher learning homes for the disabled, etc	60	50
(ii)	Buildings other than those prescribed in paragraph (i).	75	65

PART VIII

Regulations 6(8)

Maximum Permissible Noise Levels for Accelerating Vehicles

Column 1		**Column 2**
	VEHICLES CATEGORY	**MAXIMUM SOUND LEVEL IN dB (A)**

1.	Vehicles intended for carriage of passengers and equipped with not more than nine seats, including the driver's seat	78
2.	Vehicles intended for carriage of passengers, and equipped with not more than nine seats, including the driver's seat and having maximum permissible mass of more than 3.5 tones:-	
a	With an engine power of less than 150KW	80
b	With an engine power of less than 150 KW	83
3.	Vehicles intended for carriage of passengers and equipped with more than nine seats including the driver's seat: vehicles intended for carriage of goods:-	
a	With a maximum permissible mass not exceeding 2 tonnes.	79
b	With a maximum permissible mass exceeding 2 tonnes but not exceeding 3.5 tonnes.	80
4.	Vehicles intended for the carriage of goods and having a maximum permissible mass exceeding 3.5 tonnes.	
a	With an engine power of not less than 75 KW	81

b	With an engine power of not less than 75 KW but less than 1.50 KW.	83
c	With an engine power of not less than 150KW	84