ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT

FOR

PROPOSED CONSTRUCTION OF KUTULO/MALBE WATER PAN AND IRRIGATION SCHEME PROJECT in Kutulo Sub-County, Mandera County

(Ref: NEMA/MDR/PR/5/2/395)

Submitted to:
The Director General, NEMA-Kenya
P. O. Box 67839-00200, Nairobi.

Proponent

Chief Officer,
Depart. of Irrigation, Water Harvesting & Storage
Mandera County Government
P.O Box 13 – 70300 Mandera

Lead Expert

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NEMA Registration Number: 1440

May 29, 2020

Certification:

I, Achuti Mochama, certify that the information provided in this Environmental Impact Assessment Study Report for the Proposed **Kutulo/Malbe Water Pan and Irrigation Scheme Project in Kutulo Sub County, Mandera County**

Signed: …….....Date: ……...
Achuti Mochama
P.O. Box 270-00100, Nairobi, Kenya
Telephone Contact: +254-726911043
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Lead Environmental Expert

Submission of Study Report

I, ……

on behalf of the Proponent submit this Environmental Impact Assessment Study Report for the **Proposed Kutulo/Malbe Water Pan and Irrigation Scheme Project in Kutulo Sub County, Mandera County**. To the best of my knowledge all information contained in this report is accurate and a truthful representation of all findings as relating to the project.

Signed…….…… Date: …….……...
For:
Chief Officer,
Department of Irrigation, Water Harvesting and Storage
Mandera County Government
P.O Box 13 – 70300 Mandera
Proponent

SUMMARY

The proposed Kutulo/Malbe Water and Irrigation Scheme Project is to be implemented in Mandera Kutulo Sub-County, Mandera County. The County is one of the 47 counties in Kenya, located in the north eastern part of the country and borders Ethiopia to the North, Somalia to the East and Wajir County to the South. The county has a population of 867, 4576 and covers an area of 25,991.5km². The County is subdivided into six sub counties: Mandera West, Mandera South, Banisa, Mandera North, Mandera East, and Lafey and 30 wards.

The Mandera County Government is proposing the construction of the proposed Kutulo/Malbe Water pan and Irrigation Scheme Project. The project is to be implemented on a gross area 600ha (1500 acres) with net irrigable area of 404 ha (1000 acres). The proposed scheme is located at Malbe Village, Kutulo Sub County of Mandera County. Upon completion of water Pan Construction, the harvested water shall be used for Irrigation. The Project funding is from World Bank through Kenya Devolution Support Programme and Mandera County Government.

The project objective is to strengthen the resilience against drought through provision of irrigation water by development of smallholder community irrigation scheme to enable farmers to grow crops and minimize losses that would otherwise be experienced during drought in the semi-arid lands.

This Environmental Impact Assessment document is aimed at providing a description of existing environmental situation in the project areas, identification of the relevant legal and administrative framework, revealing the potential beneficial and adverse impacts associated with project implementation and defining the measures that are appropriate to enhance the potential beneficial impacts and to prevent mitigate or minimize potential adverse impacts.

The methodology used in identifying the likely significant environmental effects of the proposed project included desk review of the existing available materials (design documents and available literature to collect the environmental baseline data) as well as field works conducted on proposed site (site-specific surveys conducted during design development) and public consultation.

The legislations cited and reviewed in for this project include: EMCA (Water Quality) Regulations 2006, EMCA (Waste Management) Regulations 2006, Wildlife (Conservation and management) Act, Public Health Act (Cap 242), Water Act 2002, Agriculture Act (Chapter 318), Forest Act, 2005, Labour Laws of Kenya, Physical Planning Act, 1999, Penal Code (Cap. 63), Public Procurement and Disposal Act 2005, Building Code 2000 and Land Planning Act (Cap. 303) among others.

The baseline conditions of the project affected area were studied based on the results of the investigations conducted by design consultant as well as through studying available materials and literature.

The likely adverse environmental impacts during the construction phase will include the following: degradation of soil, landscape and soil erosion due to improper disposal of excavated materials and construction waste; spillage of oil and other substances during the construction; pollution of water resources and soil by construction run-offs; use of temporary construction sites (access roads, camps, machinery sites, storage facilities, etc); use of borrow pits; extraction of aggregate material, such as gravel, sand, rock; temporary air pollution related to increased truck traffic during the construction, release of dust from digging-loading works and heavy machinery operation; noise and vibration disturbances; safety hazards during implementation of construction works.

The likely adverse environmental impacts during the operation phase include: emissions to atmosphere associated with operation of heating system and subsequent emission of pollutants originated during burning of fuel; impacts on water and soil as a result of improper maintenance of water supply and wastewater system, drainage system, vehicles and equipment, safety hazards associated with improper operation or absence of fire-fighting system; waste disposal issues associated with improper categorization and utilization/disposal of domestic and medical waste generated in the hospital.

The likely adverse impacts mentioned above can be prevented, minimized and additional loads on natural resources can be minimized by timely and due implementation of mitigation measures provided in the Environmental Management Plan (EMP). The following is the summary of the adverse impacts with their mitigation measures:

Air pollution

- Prohibit idling of vehicles at site during excavation
- Spraying water on dusty materials/workplace
- Regular maintenance of construction plant and equipment
- Enclosing the site where possible
- Wetting all active construction areas as and when necessary to lay dust;
- Appropriately cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard;
- Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites; and
- Sweep when necessary (with physical sweepers) all paved access roads, parking areas and staging areas at construction sites.
- The engine size of the construction equipment shall be the minimum practical size;
- The number of construction equipment operating simultaneously shall be minimised through efficient management practices;
- Construction equipment shall be maintained in tune per the manufacturers specifications;
- Vehicle idling time shall be minimized; and
- Equipment shall be properly tuned and maintained

Land, water and soil degradation/Contamination (Oil and chemical spill)

- Proper storage, handling and disposal of oil and wastes from machinery
- Discourage servicing of machinery and vehicles on site except on containment area

Soil Erosion

- Remediate contaminated soil
- Landscaping
- Ensure management of excavation activities
- Control activities especially during rainy conditions
- Provide soil erosion control and conservation structures where necessary
- Proper disposal of excavated loose soil

Fire Risks

- To enhance health and safety preparedness among workers
- Ensure equipment is in good working condition

- Put up emergency response contracts
- Put up Emergency Response Procedures notification instructions
- Put up simple instructions on how to handle fires, products spills LPG incidents, armed robbery and product contaminations
- A fire evacuation plan must be posted in various points of the project site including procedures to take when a fire is reported. All workers must be trained on fire management and fire drills undertaken regularly.
- A fire assembly point must be identified and labeled accordingly.

Visual intrusion hindrance from dust and smoke that hinders sighting.

- Use of commercial bill boards to keep construction activities out of sight from the immediate neighborhood
- Expedition of construction as far as is technically viable so as to minimize adverse visual impact
- Landscaping and gardening to restore biodiversity and aesthetic property of the project

Occupational Health & Safety risks

- Ensure proper waste collection and disposal
- Provide first AID kit at site
- Sensitize residents/workers on environmental management
- Eliminate breeding of mosquitoes
- Workers should be trained on occupational health and safety and first Aid administration
- Train staff on petroleum product handling
- Sensitize workers on HIV and AIDS
- Encourage residents to maintain high standards of personal cleanliness; Keep the premises and its environment (surroundings) clean always.
- Investigate cause of an accident at the workplace and keep record of accidents that occur at the workplace.
- Review cause of an accident and develop response, such as variation of OHS plans and strategy or risk awareness to all employees.
- Implement controls as stated in the OHS strategy.

Noise and vibrations from machinery and vehicles

- Construction activities to be restricted to daytime
- Workers in the vicinity involved in high level noise to wear respective safety and protective gear i.e. earplugs.
- Low noise selection of machinery
- Enclose the site
- Use low noise equipment
- Install portable barriers to shield compressors and other small stationary equipment where necessary;
- Use of quiet equipment (i.e. equipment designed with noise control elements);
- Limit pick-up trucks and other small equipment to a 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 personnel protective equipment;

Waste generation & handling risks

- Ensure detailed design and specifications are undertaken so as to minimize the generation of waste during construction and the durability of materials is considered
- Locate material and stockpiling areas within the construction corridor until its ultimate destination is determined. Appropriately manage stockpile areas and storage areas
- Dispose non-recyclable construction materials at a licensed waste facility and avoid fly-tipping. Ensure used furniture and equipment from decommissioning is sold off/reused or donated to charity where possible. Otherwise dispose of at an appropriately licensed landfill. Recycle steel off cuts or scrap or send it to scrap metal recycler
- Recycle any ballast that cannot be reused as ballast and remove excess ballast and clean fill off site for reuse, as possible

Impacts on Terrestrial and aquatic ecology

- Erect temporary fencing around the construction zones in accordance with an approved site management plan;
- Right-of-way boundaries and sensitive areas shall be clearly marked with flagging tape prior to clearing.
- Right-of-way clearing will be limited to the area required for construction, operation and maintenance of temporary diversion routes and permanent alignment.

Land related impacts

- Formulating a detailed Resettlement Action Plan (RAP) process.
- Identify and list all the Project Affected People (PAP) by type of losses and extent of project stages in an Entitlement Matrix.
- Consult Affected Persons (AP's) on, and offer choices among technically and economically feasible resettlement alternatives.
- Compensate those affected according to the official market rates.
- Provide allowances and other assistance to make a smooth transition after displacement.
- Implement an institutional structure or a mechanism for monitoring and evaluating the compensation/resettlement process.

Cultural heritage management issues

- To recognize, respect and protect cultural and natural heritage and social bonding during Design Phase, Construction Phase and Operation Phase of the Project.
- Ensure community participation in decisions regarding heritage conservation, and realize that the cultural and spiritual importance of heritage sites and properties may be very location-specific.
- Educate workers on the cultural sensitivities in the host communities.
- Culture clash -Identify with the host communities during festivals

Soil management and conservation issues

- If contaminated land is identified further investigate and develop a remediation plan;
- Develop appropriate management and disposal methods for contaminated soils and other materials;
- Dispose of contaminated soils to authorized facilities on-site or off-site in accordance with disposal permits;

- Design fuel, oil and chemical storage areas in accordance with Kenyan Standards;
- If dispersive soils are necessary to be incorporated as construction material, undertake appropriate treatment of the soil first;
- Undertake appropriate measures required to stabilize the soil moisture content of shrink and swell soils;
- Manage works during the wet season and erosive rainfall events bearing in mind that mud slips can occur and can be hazardous.
- Appropriately manage works and avoid increasing the risk of erosion;
- Manage soils that are at risk of becoming waterlogged;
- Manage acidic and alkaline soils;
- Rehabilitate disturbed areas once construction is completed;
- Develop and implement erosion and sediment control management plan;

Management movement of vehicles, people and machines.

- Construction activities should be done only during the day
- Place sign posts at strategic point to notify public of the development,
- Put speed caution labels to avoid accidents
- Where possible encourage the use of environmentally friendly fuels such as lead-free fuels
- Provide adequate parking facilities within the premises
- Prohibit parking of construction vehicles along access road
- Firm to deploy adequate security personnel to guide traffic, parking and movement within the compound
- Install heavy truck turning signs at safe distance along pipeline road (during the construction period for transporting construction materials)

Child protection measures

- Workers sensitization on child protection issues
- Workers signing code of conduct
- Constructing entertainment facilities at the camps to reduce interaction with children outside the camps
- Verification of age through national identification cards/passports for workers
- Build capacity of village volunteer child monitors to enhance awareness on child protection in their respective catchment areas
- Setting up of hotline for reporting incidences of child abuse and the number posted at strategic places within the project area
- Encourage village volunteer child monitors to work closely with the office of chief and department of children on issues of child protection
- Involve grievance redress mechanism committees, NGO's and department of children to support child protection processes.
- Engage HIV/AIDS sub-contractor to sensitize children on dangers of early sexual debut, child marriage and HIV/AIDS and other STIs.

Grievance management measures

- Involving the Resident Engineer and Project manager in the grievance redress mechanism processes.
- Building capacity of GRM committees to receive and handle grievances

- Facilitate the GRM committees to handle a wide range of grievances in their respective areas
- Expose GRM committees to paralegal training to improve capacity to arbitrate grievances
- Strengthen the capacity of GRM committees to handle such tools as stakeholder register, feedback form, grievance form, commitment register and grievance log form

Climate change mitigation

- Sprinkling water along the dusty prone areas to avoid dust from covering the existing vegetation
- Growing trees and flowers in the campsite. Also plans are underway of planting trees at the areas affected by the project at the end of the project
- Bush clearing is only restricted to the road reserve and the borrow pit areas. Some trees are spared at the borrow pit
- Use of firewood and charcoal is highly discouraged
- Burning of dry solid waste is not allowed
- Waste is properly managed at all project sites
- Portable clean and safe water is provided at the offices and water taps are installed at the strategic areas at the campsite and the crusher site. The workers will be provided with the washing bays at their residential areas.
- There is a water resource management plan to ensure sustainable management of the scarce resource

The EIA Study Project Report concludes that the construction of the Project should be undertaken and makes the following key recommendations:

- The development is undertaken since the project is environmentally friendly with its surroundings
- The identified impacts, mitigating measures and environmental monitoring & management plans should be implemented as part of project monitoring and evaluation activities.
- During the implementation of the project, positive impacts such as labour sourcing from the local community where possible should be enforced to improve economic gains for the population.
- All project staff members should be trained on the effective application of technology to reduce negative environmental impacts.

Thus, on behalf of the study team, I recommend that NEMA should consider issuing a license for the implementation of the project.

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ACRONYMS ANDABBREVIATIONS

^{0}C	Degrees Celsius
AMS	Agricultural Mechanization Stations
AEZ	Agro-Ecological Zones
ESIA	Environmental and Social Impact assessment
EMCA	Environmental Management Coordination Act
EMP	Environmental Management Plan
GOK	Government of Kenya
KCSAP	Kenya Climate Smart Agriculture Project
KWS	Kenya Wildlife Services
KP	Kenya Power
L.Us	Livestock Units
mm	Millimeters
NEMA	National Environment Management Authority
NDMA	National Drought Management Authority
NPIU	National Project Implementation Unit
NPEP	National Poverty Eradication Plan
OSHA	Occupational Safety & Health Act
PCC	Public Complaints Committee
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
RPLRP	Regional Pastoral Livelihood Resilience Programme
TOR	Terms of Reference
WHO	World Health Organization
WB	World Bank
WRA	Water Resources Authority
WSB	Water Service Board

1 INTRODUCTION

1.1 Project background

The proposed Kutulo/Malbe Water and Irrigation Scheme Project is to be implemented in Mandera Kutulo Sub-County, Mandera County. The County is one of the 47 counties in Kenya, located in the north eastern part of the country and borders Ethiopia to the North, Somalia to the East and Wajir County to the South. The county has a population of 867, 4576 and covers an area of 25,991.5km^2. The County is subdivided into six sub counties: Mandera West, Mandera South, Banisa, Mandera North, Mandera East, and Lafey and 30 wards.

The Mandera County Government is proposing the construction of the proposed Kutulo/Malbe Water pan and Irrigation Scheme Project. The project is to be implemented on a gross area 600ha (1500 acres) with net irrigable area of 404 ha (1000 acres). The proposed scheme is located at Malbe Village, Kutulo Sub County of Mandera County. Upon completion of water Pan Construction, the harvested water shall be used for Irrigation. The Project funding is from World Bank through Kenya Devolution Support Programme and Mandera County Government.

The project objective is to strengthen the resilience against drought through provision of irrigation water by development of smallholder community irrigation scheme to enable farmers to grow crops and minimize losses that would otherwise be experienced during drought in the semi-arid lands. More specifically the objective to be achieved shall be as inter alia:

i) Food security and nutrition
ii) Improve livelihood to Kutulo community
iii) Supply of clean water for irrigation
iv) Employment
v) Improvement to social infrastructure

Prior to the EIA study, we prepared and submitted a project report to NEMA No. NEMA/MDR/PR/5/2/365 upon whose review, the Authority recommended that the Proponent undertakes a full EIA study to provide an in-depth analysis of the environmental impacts associated with the development project as well as to materialize harmony with the interested and affected stakeholders.

These terms of reference for the EIA Study have been drawn and submitted to NEMA, upon whose approval the EIA study commenced. The goal the study was to ensure that the potentially adverse environmental and social impacts of the proposed project can be minimized while the positive impacts are enhanced.

Environmental concerns have now been integrated in the planning, implementation and operation processes of the proposed projects; to examine the impacts of the proposed project operations and activities to the general environment. In addition, it is now mandatory for projects of such nature to carry out Environmental and Social Impact Assessment (ESIA), to enhance Sustainable Environmental Management as well as providing Environmental and Social Management Plan; during implementation and operation phases.

In order to achieve this goal, the Proponent engaged environmental experts to carry out the relevant ESIA project study of the area and give recommendations regarding the proposed project construction.

This study report therefore provides relevant information on Environmental & Social Impacts of the proposed project and its related infrastructure.

1.2 Terms of Reference

An Integrated Environmental Impact Assessment study report has been prepared under Environmental Management & Coordination Act (EMCA 1999, 2018 edition) and subsequent EIA draft regulations. It has taken into account *inter alia* environmental, social, cultural, economic, legal, safety and health considerations. It has achieved the following objectives:

1. Presented the project description and the scale of the impacts;
2. Identified and analyzed alternatives to the proposed project, which are the proposed project, the no-project option and one other project alternatives;
3. Proposed mitigation measures to be taken during and after the implementation of the project; and
4. Developed an environmental management plan with mechanisms for monitoring and evaluating the compliance and environmental performance.

To achieve the listed objectives, the following activities were carried out:

- Evaluated the potential environmental impacts of the project and the mitigation measures to be undertaken during and after the implementation of the project.
- Assessed action plan for the prevention and management of possible accidents during the project cycle.
- Evaluated plan to ensure the health and safety of the workers and the neighboring communities. Identify and predict the physical, ecological, economic and social-cultural impacts of the proposed project.
- Conducted an environmental impact assessment (EIA) by identifying both positive and negative impacts and the most appropriate interventions during construction, operation and decommissioning.
- Evaluated activities that shall be undertaken during the project construction, operation and decommissioning phases.
- Established the materials to be used, products and by-products, including waste to be generated by the project and the methods of disposal.
- Collected baseline socioeconomic data of the proposed project area and potential impact expected from project construction, implementation and operation from existing secondary data sources.
- Developed an environmental monitoring program (EMP) during construction, operation and decommissioning. It presents plans to minimize, mitigate, or eliminate negative effects and impacts and has describe how this plan will be implemented.
- Identified and contacted stakeholders and facilitated public consultation
- Gathered and provided any other data and information that has been useful in the study.

1.3 Study presentation

This study report has been submitted to the Authority, it details following information, among others:

- The nature of the project, the objectives of the project; proposed location of the project including the coordinates;
- A concise description of the national environmental legislative and regulatory framework d
- Description of the environment likely to be affected by the project;

- Project description on the technology, procedures and processes to be used in the implementation of the project; the materials to be used in the construction and implementation of the project; the products, by-products and waste generated by the project;
- Environmental impacts analysis of the project including direct, indirect, cumulative, irreversible, short-term and long-term impacts anticipated, social analysis, economic analysis and cultural analysis;
- Integration of climate change vulnerability assessment, adaptation and mitigation actions;
- Analysis of alternatives including project site, design, technologies and processes and reasons for preferring the proposed site, design, technologies and processes;
- An environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment; including the cost, time frame and responsibility to implement the measures;

2 STUDY METHODOLOGY

In conducting the study, both desktop and field investigations were adopted. The assessors reviewed the literature applicable to the construction and operations of the pan and the legal framework governing/ regulating the same. The assessors gathered the relevance data through field observations, reconnaissance survey, use of questionnaires and interviews, desktop studies and detailed physical inspection of the site and the surrounding areas.

2.1 Approach to the Assignment

The approach to this assignment is two-fold

- Environmental Assessment and
- Environmental Management Planning

2.2 Methodology for collecting and evaluating information

2.2.1 Field Reconnaissance & scoping

The study team explored the impacts per component, i.e. project area and irrigation area

2.2.2.2 Desk Studies

This gathered baseline/background data on chosen project site and impacts such as noise levels, air quality, water and ground water quality, aesthetic quality, etc. and legal framework that establishes the environmental value, protection and monitoring criteria for chosen data. Review Expected Project Actions from Design team members i.e. the embankment & inundation, alignment, geotechnical, hydrology, social, and other such findings.

Impact forecasting and proposal for minimization, mitigation, remedy and control strategies – Insights have been woven from multiple sources — survey, researched EIA's of similar projects from within and other countries, expert opinion, executive interviews, and personal experience — into a coherent and executable actions during design, construction or operation.

Stakeholders Interviews, Field Data and Information Gathering through Interviews of affected persons and members of similar interest groups e.g. farmers and Household Surveys (HHS) in sample affected communities. Application of Information and Data Collected in Impact Assessment Study compilation and Consolidation.

1.1 Methodology for presentation of information

Mitigation measures for the adverse environmental impacts presented in a table format of the Environmental Mitigation & Management Plan (EMMP) in columns of Potential Impact, Proposed Mitigation, Time Frame, Party Responsible & Cost of Mitigation.

2.4 Reporting

Findings of the scoping and screening study were used in a full ESIA study, whose findings are presented in this report.

3 PROJECT DESCRIPTION

3.1 Nature of the project

Kutulo/Malbe Water pan and Irrigation Scheme Project will provide water needed for irrigation purposes, livestock keeping and sanitation. The construction activities will include clearing the reservoir area of vegetation and excavation to accommodate water storage. Excavated material will put at a place near the pan which will be used to build the embankment which will be built with side slopes. Seepage reduction materials will also be used as wall linings and pan bed. A spillway/overflow channel to dispose of surplus water will be designed with a free board. A silt trap will be constructed to a minimum of 10m between the end of interception drain and pan area. Upon construction, cattle will not be allowed to enter the pan; therefore, dry fencing and irrigation farm fencing will reinforce protection.

Kutulo Irrigation scheme shall adopt a drip system, Sprinkler and a furrow system of irrigation. The project design incorporates various activities that may pose relatively significant environmental impacts which require mitigation measures to be put in place. These activities include:

- Project awareness and public participation
- Bush clearance and Land leveling
- Feasibility study and survey
- Farmers profiling and group formation
- Farmers capacity building and training
- Water Pan Excavation (Earth excavation works)
- Plumping works
- Construction and installation of elevated storage tanks
- Installation of drip and sprinkler infrastructures systems.
- Flood protection works
- Access road works
- Fencing
- Land tillage and Farming

3.2 Objectives of the project

The proposed project has the overall objective of ensuring sustainable food security and nutrition to community of Kutulo/Malbe village and Mandera County at large.

In this area rainfall unreliability has been a major challenge. Drought and food insecurity are prevalent in the project area. The greatest challenge facing the locals in food production is scarcity of water. Water is the key element in economic, social and cultural development of any society. Local people are faced with challenges of food production and increasing population that needs to be fed. One possible solution to this problem is to increase water availability for use in the proposed project.

To improve their welfare or livelihood implies that land resources must be developed and utilized for viable agricultural production through irrigation. Proper irrigation farming in addition to water management is necessary for full exploitation of the area's agricultural potential. The irrigation potential for the area is great but only a few hectares have been used under subsistence dry land farming. The project will bring optimal utilization of local irrigation potential, attainment of food self-sufficiency through sustainable production and security, improvement of income generation,

employment and wealth creation. This will be in line with country's vision 2030 and the latest Big four agenda.

3.3 Location and size of the project

The proposed scheme is to be established on 404 ha. The project site is 4km south of Kutulo town at Malbe village while Kutulo town is about 300km from mandera town.

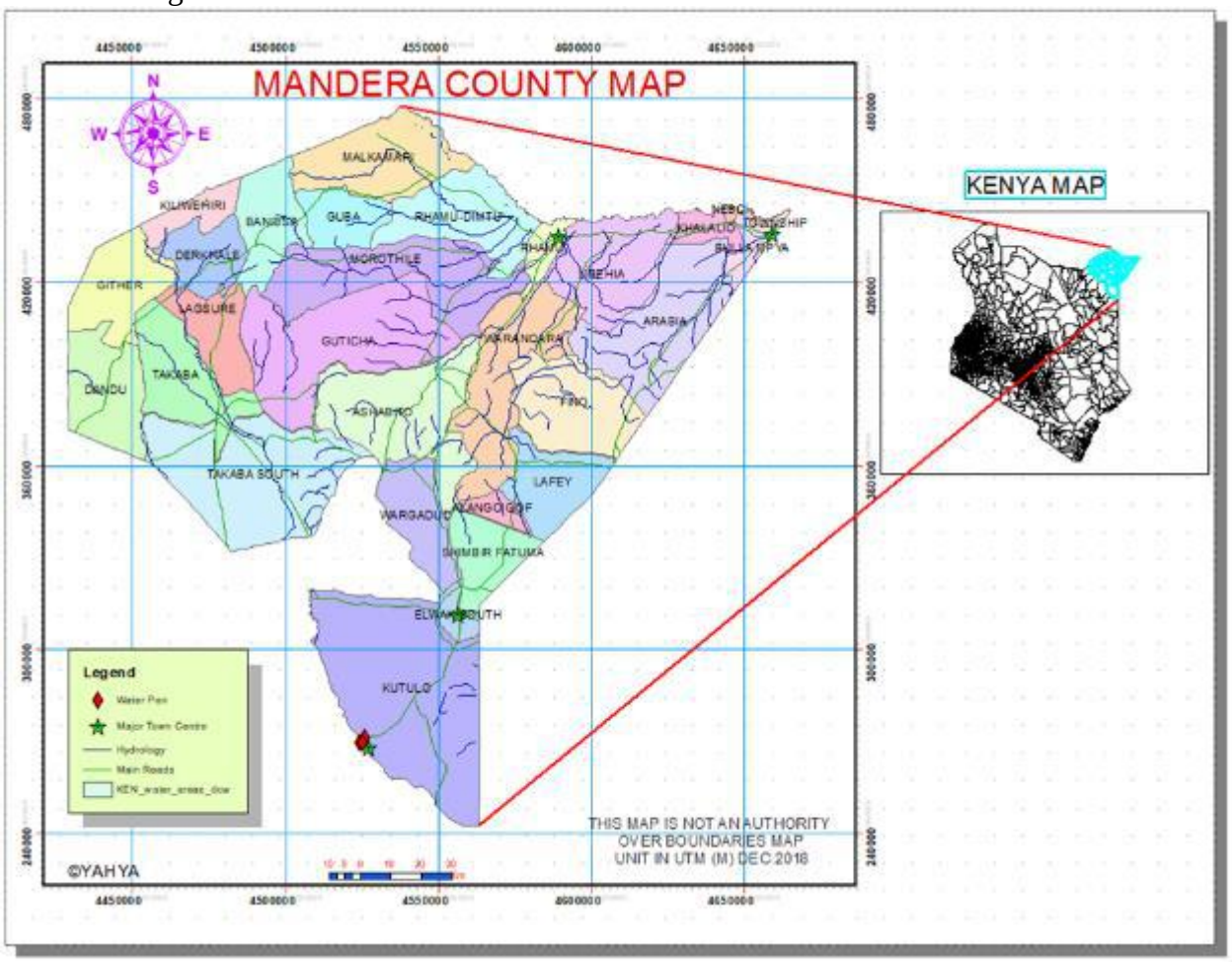


Figure 1: Site and Mandera County Map

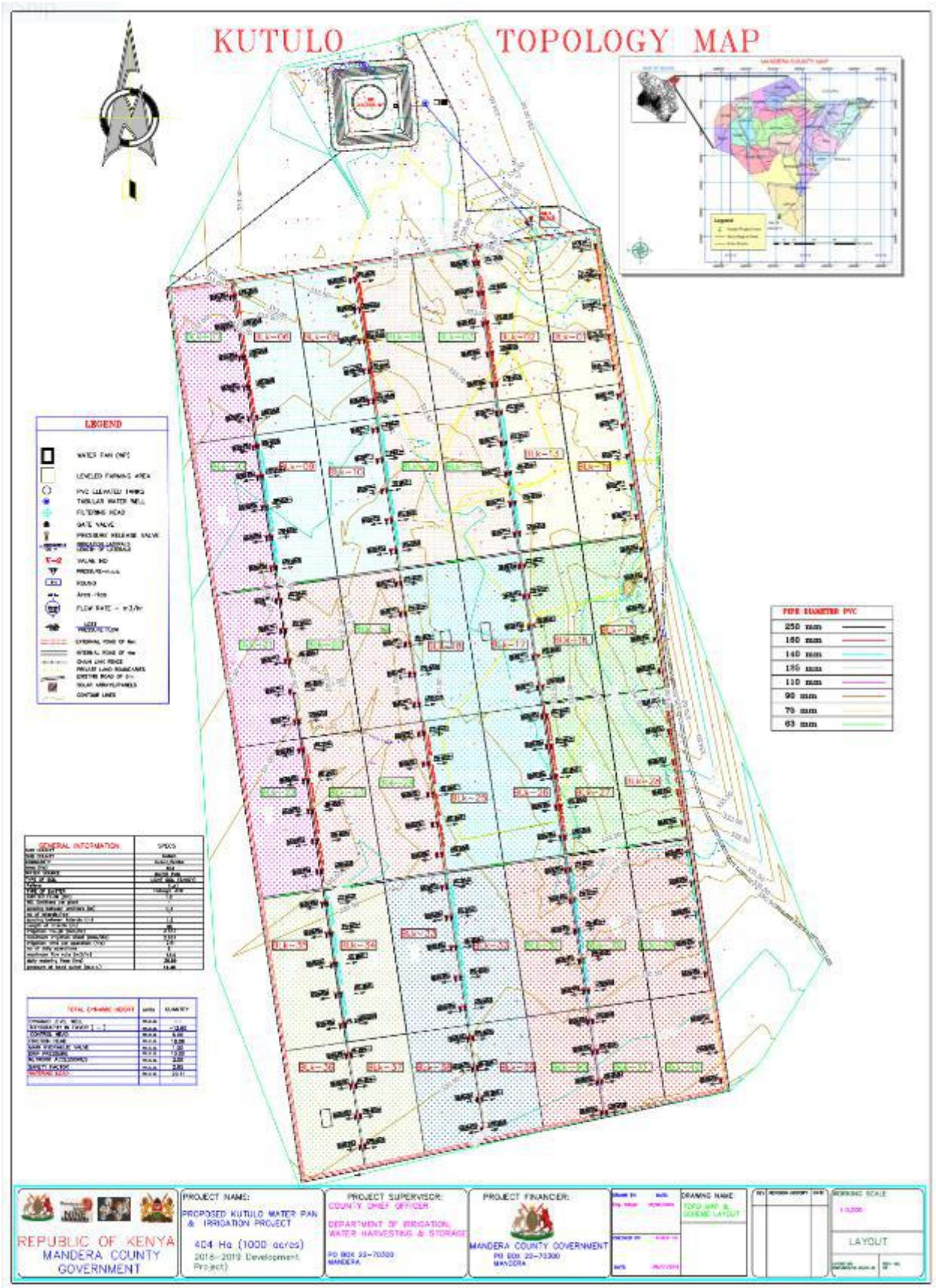


Figure 2: Proposed Scheme layout

3.4 Project implementation process

4.1.1 3.4.1 Community Mobilization & Project sustainability

The project activity involves;

- Creating community awareness/ sensitization bout the proposed irrigation project
- Site identification/ verification/ confirmation

The community was involved in the earlier stages of project inception and will participate in the remaining stages of implementation, monitoring and evaluation. The project is planned to involve the community during the implementation stage. Capacity building on best practices will also be conducted. This is the beneficiary approach that transfers knowledge to the benefitting community. At the same time linkage will be created between relevant government departments/ ministries. In addition, operation management and maintenance committee will manage the project on behalf of the community.

4.1.2 3.4.3 Environmental and Social Impact Assessment (ESIA)

It is a requirement that ESIA be conducted and ESIA license issued by NEMA before commencing irrigation project works

4.1.3 3.4.4 Soil Sampling and Testing

Soil samples will be taken using randomized block design to obtain representative soil characteristics of the area. The soils will be tested for physical, chemical and biological characteristics with emphasis on soil fertility and nutrient deficiency.

3.4.5 Bush Clearing

This will be done using machinery. It involves machine mobilization, actual bush clearing and machine demobilization. Shrubs, light trees, and stumps will be removed to pave way for initial land preparation.

3.5 Project Construction Process

This involves the water conveyance and distribution system from the water source to the farms as well as safe disposal of excess water that may flood or otherwise diverted back to the water source. These works are technical and require technical personnel to execute. The project component will be contracted. This will be done partly by machinery and partly by manual labor. During construction, the major environmental concern is occupational, health and safety of workers.

The Project implementation process commenced with step -by-step engineering design of the proposed earth pan. Preliminary planning and needs assessment was done prior to design. This involved assessing the capacity of the existing earth pan against the needs of the surrounding population of human settlement and the animals depending on it for provision of water. Also the suitability of the site was also considered to ensure that the site would be economically viable, with suitable foundation material, and ensuring the availability of water pan building materials. The design was based on the most technically viable option for the site.

3.5.1 Criteria for Design

The basic principle of design is to produce a safe and stable functional structure through all phases of construction and operation. To accomplish this, the following criteria were met:

- The embankment will be safe against overtopping during extreme flooding by providing sufficient spillway and outlet works capacity.
- The slopes of the embankment will be stable under all conditions of reservoir operation, including rapid drawdown of the reservoir.
- The embankment was designed so as not to impose excessive stresses on the foundation material.
- Seepage through the embankment, foundation, and abutments has been controlled so that no internal erosion takes place and there is no sloughing of the slopes.
- The upstream slope of the embankment has been protected against wave action. The downstream slope and crest has been protected against wind and rain erosion.

3.5.2 Surveying

The survey and design is part of the preliminary activities that gives the details of the irrigation system parameters such as water source, conveyance; canals, basins/ furrows, main and field water distribution controls and other components incidental thereto and connected therewith.

3.5.3 Earthworks

Ideally, the entire earth fill will be drawn from within the reservoir area and, if required, from any cut spillway areas. Thus, most of the earthworks will be done within the water pan site area.

3.5.4 Foundations

The essential requirements of the foundation for an earth-fill water pan are to provide stable support for the embankment under saturation and loading, and to provide resistance to seepage and excessive loss of water. The foundation may consist of rock, course-grained material (sand and gravel), fine-grained material (silt and clay), or a combination of all three.

The soils on the proposed water pan site have been investigated and found to be plastic, Clay soils. This type of soil will provide the required shearing strength to prevent a bearing failure while under saturated conditions. However, to allow the free flow of water and the dissipation of pressure, drainage pipes and a downstream drainage blanket will be used.

3.5.5 Embankment Construction

Once the cutoff has been brought up to ground level, the embankment can be constructed. The embankment will proceed with careful and continuous monitoring of the soil types being used to check that the right soil is placed in the appropriate section. The core is continued up through the centre of the wall as the other sections are placed. The removal of the soil from the borrow areas can be assisted by ripping or irrigating the area involved (avoid over-watering which could lead to traction problems). The latter is especially desirable for core and upstream sections where the soil, if used wet, may be more readily compacted.

The embankment of the earth pan will be 22m wide at the base and 4m wide at the crest with both upstream and downstream slope of 0.02% and a height of 4.0m. This will be accomplished by

depositing soil in layers of 300mm and ensuring proper compaction throughout the embankment construction. The upstream face will be composed of a pervious material to allow drainage and dissipation of water pressures during rapid drawdown of the reservoir.

The crest of the water pan will have a zone of impervious material extending from the crest of the water pan to the foundation material to provide a barrier to the flow of water or seepage through the embankment. The upstream face of the embankment will be protected against destructive wave action. The most common type of surface protection is broken rock or riprap, either machine or hand placed. The crest and downstream face of the embankment should be protected against wind and rain erosion. This surface protection will consist of rocks, stone or grass.

3.5.6 Compaction

In order for the soil to act as predicted, it must be fully compacted. Compaction is the process of removing the voids from the soil and making it as dense as possible. The key to good compaction is small lifts, good energy, and the right amount of water. Placing the soil in layers (or lifts) that are too big is a problem that plagues even professionals in developing countries. Even heavy equipment can't make up for layers that are too thick. For hand compaction methods and even medium sized farm equipment, the lifts should be limited to 75 – 100 mm. This is before the compaction is started. When it's done it will be even smaller.

The most important variables affecting construction of earth fill embankments are the distribution of soils, method of placement, water content, and compaction.

The soil material will be placed in horizontal layers not more than 15 cm thick after being compacted. The soil will be required to be homogeneous and free from lenses, pockets, organic material, or other imperfections. Prior to placement, the material will be required to have the optimum moisture content required for the purpose of compaction.

Good compaction of a soil reduces permeability and increases shear strength and the stability of the water pan. Compaction equipment will include sheep-foot rollers, pneumatic rollers, and hand tampers.

3.5.7 Inlet and Spillway Construction

The spillway is a critical part of water pan construction. The spillway entrance must be kept free of debris. The spillway channel should be protected against erosion with the use of riprap. An under-designed spillway will result in the water pan overtopping or serious spillway erosion during peak runoff. These situations can cause major water losses, potential flooding and water panage downstream, in addition to the costs to repair the water pan.

The spillway been designed with a wide base and a gentle slope, which will reduce water velocity and spillway soil erosion. The spillway base and sides will also be seeded to grass. To prevent spillway erosion, riprap (a collection of loose stones) alone will be required. The spillway will be located away from the water pan fill, not through or directly adjacent to the fill. This placement will reduce the risk of the water pan washing out.

3.5.8 Outlet Works

The outlet works serve to regulate or release the water impounded by the water pan. A control gate should be placed on the upstream end of the sluice pipe, and be easily accessible if an emergency arises.

3.6 Irrigation process

Kutulo Irrigation scheme shall adopt a drip system, Sprinkler and a furrow system of irrigation. The project design incorporates various activities that may pose relatively significant environmental impacts which require mitigation measures to be put in place. These activities include;

- Connection of irrigation pipes with water pan
- Infiltration and draw off system
- Water storage elevated tanks
- Sump well and solar powered pumps
- Drip and sprinkler systems
- On-farm structures
- Fencing
- Floods protection works
- Access roads
- Operational phase farming and related works

3.6.1 Initial Land Preparation

Initial land preparation includes farm operations such as ploughing, harrowing, contouring, ridging, and basin preparation. This will be done by machinery (tractors, ridgers, among others).

3.6.2 Acquisition of farm Inputs and Implements

These include farm hand tools, machinery and implements. Others include seeds and fertilizer.

3.6.3 Farm Operation

The farm operation at this stage include planting, weed control, application of fertilizer, pesticide and disease control, harvesting, post-harvest management, agro-processing and value addition.

3.6.4 Capacity Building

The community will be trained on good husbandry and sustainability particularly on best practices on selected crop production, pasture and soil water conservation among others.

3.6.5 Water Utilization and Management

The water will be used for irrigation of crops and livestock use. Once the project has been commissioned, then maintenance schedule will be established. Maintenance includes repair and maintenance of water pan, conveyance/ canals, basins/furrows, drains among other water distribution and controls. It also includes immediate environment greening, soil and water conservation.

3.6.6 Project Commissioning and Handing over to the Community

Upon completion, the proposed irrigation project will be commissioned by the county government and handed over to the community. The irrigation scheme will be managed by operation, management, and maintenance committee on behalf of the benefitting community and particularly the farmers.

Community contribution in-kind such as land for irrigation system and other infrastructure, provision of locally available materials, unskilled labor, security and management of the project among others is an indicator of community project acceptance.

3.6.7 Tidying up, cosmetic work and other minor works

Though important, these activities prove unnecessarily costly if heavy plant is to be used. Such finishing work will include the following:

- Tree planting
- Digging seepage drains
- Fencing
- Fertilizing and irrigating grassed areas
- Concreting high erosion risk areas

3.7 Project operation process

This stage shall involve use of the irrigation scheme by the beneficiary community. The activities at this stage will include movement of both livestock and human beings to the water pan for water. Also wildlife will benefit from the water. Other activities would include desilting, planting of grass and replacement of worn out parts of the water pan.

3.8 Project Supervision, Monitoring and Evaluation

It shall be the responsibility of the county government and particularly MoALF to conduct periodic supervision and monitoring and evaluation (M&E) including frequent backstopping to assess the operations and management of the irrigation scheme. Quarterly review on progress towards achievement of set targets and outcomes shall also be conducted. The project is planned to relay feedback to the target beneficiaries on progress and changes as they occur.

3.9 Project decommissioning process

Monitoring will be used in water pan risk evaluations. Irrigation scheme decommissioning will be opted after a review of possible water pan remediation options show that it's the most efficient in terms of cost and risk elimination.

To meet requirements of Environmental Management and Coordination Act 1999, the environmental assessment will consider the potential impacts of the project to: Water quality; vegetation; Wildlife and wildlife habitat; Heritage values; Social and economic values.
Additional factors that will be considered on the likelihood of the project causing significant adverse environmental effects are:

- Cumulative environmental effects;
- Current land use and resources;

- Effect of environment on project;
- Accidents and malfunctions

The water shall be used by the community for domestic and livestock purposes. Being in a pastoral environment, shortages of basic needs, such as water often lead to conflict within the local communities.

A hydro-geological survey report has already been conducted. The Project area is situated within a large area underlain by sedimentary rock formations that are characterized by Merti beds that comprise consolidated to semi-consolidated sands, silts and clay with some gravel.

Environmental concerns have now been integrated in the planning, implementation and operation processes of the proposed project; to examine the impacts of the proposed project operations and activities to the general environment. In addition, it is now mandatory for projects of such nature to carry out Environmental and Social Impact Assessment (ESIA), to enhance Sustainable Environmental Management as well as providing Environmental Management Scheme; during implementation and operation phases.

The Environmental approval of the project is sought on the ground that no major predictable environmental harm is likely to ensue from the operation of the project and if any, stringent mitigation measures to counter them have been proposed for implementation.

3.10 Cross Cutting Issues

The project has been planned to address environmental issues through catchments protection, tree planting and general environmental conservation as well as community education/ sensitization/ capacity building. There will be deliberate inclusion of women and youth to address gender and youth issues. The youth will be engaged to avoid them from indulging in alcohol, drug abuse, cattle rustling and forms of crime such as terrorism.

4 BASELINE INFORMATION

4.1 Physical geography

Mandera County is one of the 47 counties in Kenya, located in the north eastern part of the country and borders Ethiopia to the North, Somalia to the East and Wajir County to the South. It is 1,100km from Nairobi. The county has a population of 867,457 (2019 census) and covers an area of25, 991.5km². The County is subdivided into seven sub counties: Mandera West, Mandera South, Banisa, Mandera North, Mandera East, Lafey and Kutulo and 30 wards. The County is characterized by low lying rocky hills located on the plains that rise gradually from 400 meters above sea level in the south at Elwak to 970 metres above sea level on the border with Ethiopia. The rest of topography is low lying, characterized by dense vegetation with thorny shrubs of savannah type. This is especially found along foots of isolated hills, and the area are covered by bushes, shrubs, boulders and invasive *Prosopis juliflora* 'mathenge' coverage. The flat plains make drainage very poor, causing floods during heavy rain downpours. There are no lakes, swamps or dams but earth pans are a common in the county.

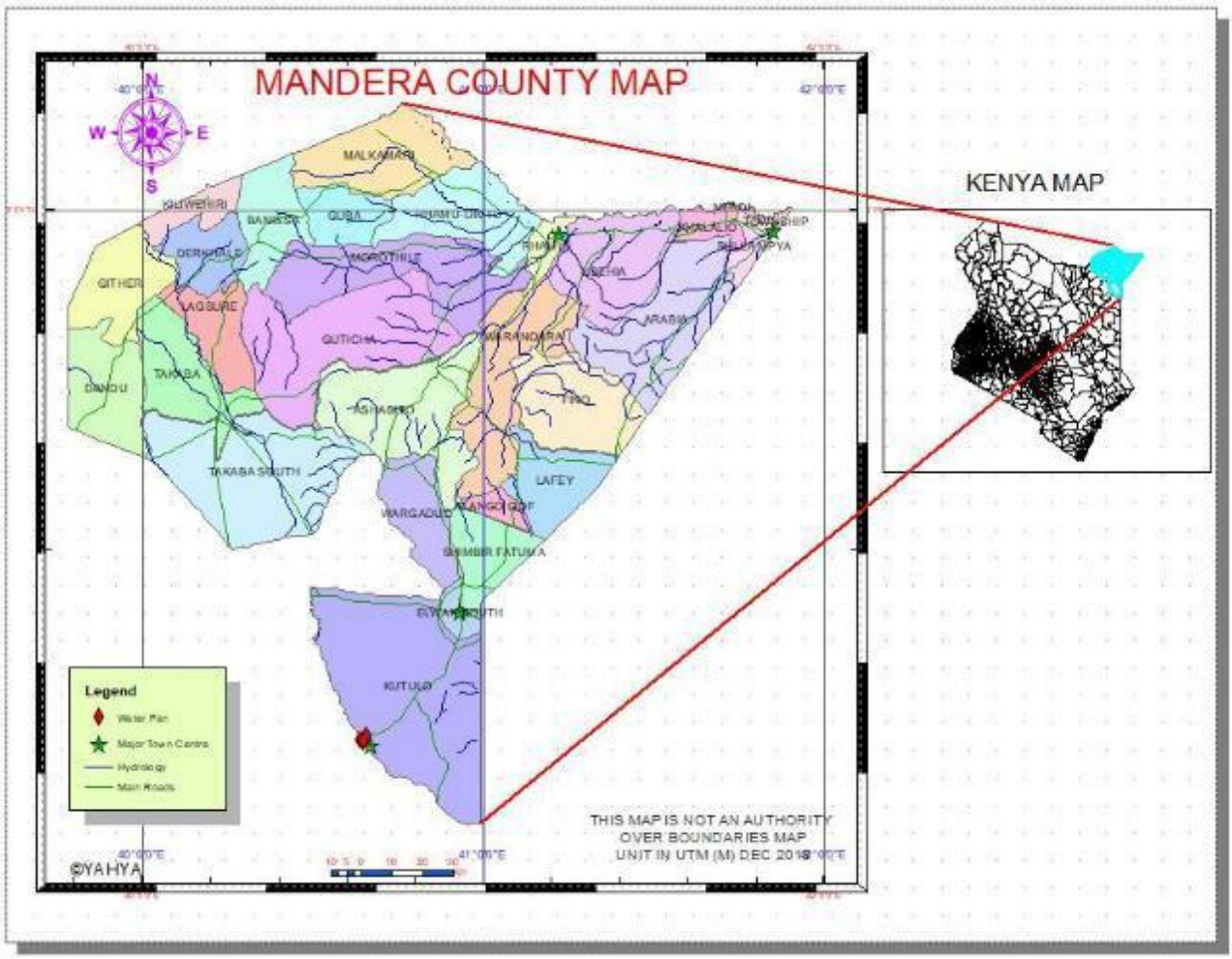


Figure 3: Map of Mandera County

4.2 Soil characteristic

The soil type and its characteristics are critical for the identification of suitable site for the construction of the earth pan. The suitable soil should have high water retention capacity in order to ensure retention of sufficient water ones it rains and water collects in the constructed earth pan. This is a prerequisite for the construction of an earth pan. Before the commencement of the construction works of the earth pan, a geological survey was conducted by water engineers from the department who provided the survey report.

The report is predictive based on data and information obtained elsewhere within the environs of the earth pan site with special attention to information from previously constructed earth pans close to the site. The survey indicated that project site soil has high water retention capacity, hence suitable for the earth pan construction.

4.3 Land and Land Use

Land is the most important resource in livestock rearing and production. Mandera County has an area of 25,991.5 km^2. Most of the land is rangeland supporting livestock production. In the context of agricultural production land suitability for crop production is limited to availability of water hence the concentration of crop production activities along river Daua and other places with laggas where water settles. Generally, the soils in most parts of the county are fertile since they have not been exploited. There are a few areas with soil salinity and solidity where arable crop production cannot be practiced. Under irrigation 4000ha is exploited but the potential area is 15,000-20,000ha whereas under rain-fed agriculture the exploited area is very low considering that reliability of rainfall is below 30%. There is need to focus on increasing area under irrigation by developing irrigation infrastructure and exploiting groundwater sources. There is also need for sustainable land use practices and environmental conservation in the county.

The range of crops that can be grown in the county includes tomato, sorghum, maize, cereals, pulses, horticultural crops, and oil crops and fruit trees. The main challenge in the county is land degradation resulting in some areas rendered unsuitable for crop production. The available land for agriculture has not been fully exploited due to resource constraints.

There are two ecological zones in the County. Mandera East, Mandera North, Mandera West, Mandera South, and Banisa Constituencies are classified under LM (IV-VI) zone while Lafey Constituency is classified as LM (V-VI) zone. The main economic activity practiced in the project area is livestock keeping and small scale farming.

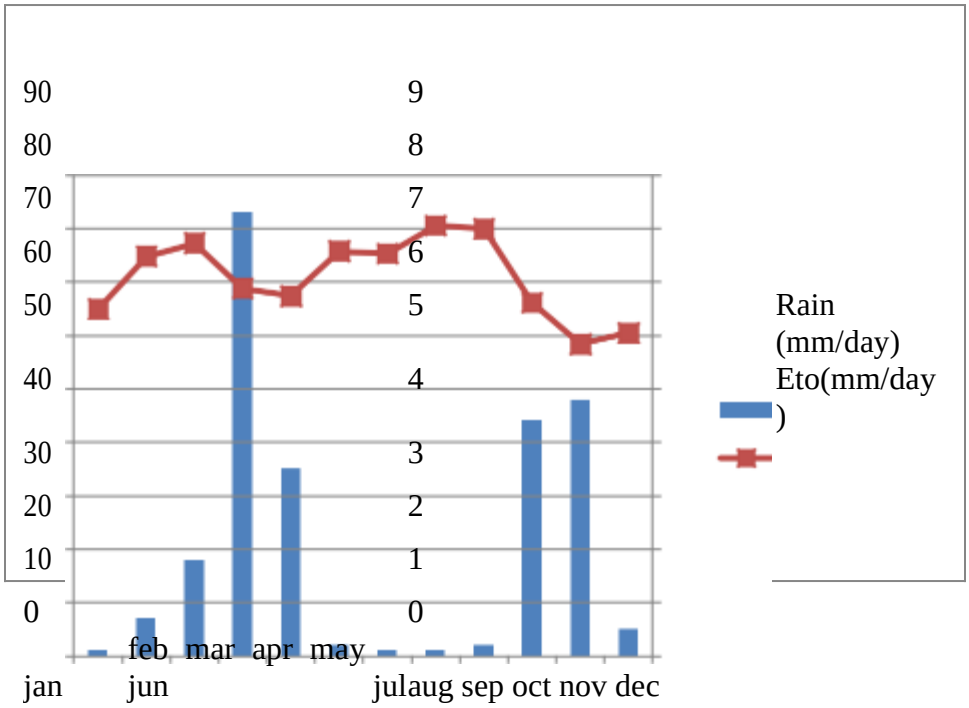
4.4 Climate

Temperatures are relatively very high with a minimum of 24^{o}C in July and a maximum of 42 ^{o}C in February. Variation in altitude brings differences in temperatures across the county where places near Banissa constituency experiences low temperatures due to neighbouring highlands in Ethiopia. Rainfall is scanty and unpredictable averaging 255mm. The long rains fall in the months of April and May while the short rains fall in October and November. Most parts of the county experiences long hours (approximately 11 hours) of sunshine in a day. This causes high evaporation rates thus causing withering to most of the vegetation before maturity. The continuous sunshine in the county has a potential for harvesting and utilization of solar energy.

4.4.1 Rainfall

The rainfall pattern and distribution is erratic and unreliable both with time and space. There are two rainfall seasons. The long rains usually occur between April and May and the short rains between October and November with annual mean average of 228 mm. The driest periods is January, June, July, August and September. Drought are usual, often resulting to significant loss of livestock to the inhabitants of villages (Bulla)

Figure 11: Lodwar rainfall data and average ETo



Source: Farmers handbook by T Wood-head (1968)

4.4.2 Temperature

The Temperature annual average has maximum temperature of 35.8°c and minimum temperature of 24.3°c throughout the year. Therefore temperature in this region is hot. At average of 28.3°c

4.4.3 Climate Change and its Effects in the County

Prolonged droughts and flooding leading to severe famine, disease outbreaks, loss of livestock, and human and wildlife conflicts over resources are some of the effects experienced in the county due to climate change.

4.4.4 Climate Change Mitigation Measures and Adaptation Strategies

Agro-pastoralism, de-stocking and re-stocking, water trucking, tree planting, rain water harvesting, provision of relief food are some of the mitigation measures and adoption strategies undertaken to mitigate against climate change in the county.

4.4.5 Wind

The winds in the project area also indicate seasonal variation in January and February the winds are predominantly north easterly in the morning. While they are easterly in the afternoon from march to april. The wind patterns changes as from May. From May to September the winds are predominantly southerly and south westerly. From October to November they are variable but generally easterly and north easterly. Strong winds are experienced in the year during the month of June, July and August.

4.5 Infrastructure

4.5.1 Road, Rail Network, Ports and Airports, Airstrips and Jetties

The County has a total of 1,884.5km of road network. There is no bitumen surface. The gravel surface covers an approximate length of 494.5 km while earth surface covers an approximate length of 1390 km. The county has neither rail network nor sea/lake ports. The county is served by four (4) functional airstrips in Rhamu, Elwak, Mandera and Takaba. There are other 4 non serviceable airstrips in Malkamari, Arabia, Banissa and Lafey.

4.5.2 Posts and Telecommunications: Post Offices, Mobile Telephony, landline

The county is served by four post offices located in Elwak, Rhamu, Takaba and Mandera Town. Elwak, Takaba, Banisa, Rhamu, Mandera town and a few heavily settled areas like Ashabito, Wargadud, Guba, Malkamari, Dandu, Eldanaba, Shirmbir Fatuma, Kutulo, Lafey are under mobile networks. There is need for more boosters to increase area under coverage.

There are 13 cyber cafes in the county but with the expansion in rural electrification, these numbers are bound to increase. Internet is accessed through mobile phone and computers using modems. There are seven courier service providers and the land lines telephones covers Mandera Town and Elwak Market centre.

4.5.3 Financial Institutions: Banks, SACCOs, Micro Finance Institutions

There are three banks in the county, two in Mandera town (KCB and Equity) and one in Elwak town (Equity). There are five registered SACCOs in the county with a total registration of 100 persons. Only four are active. However, there are no Micro Finance Institutions.

4.5.4 Markets and Urban Centres

There are six markets/urban centres in the county namely Rhamu, Elwak, Takaba, Banissa, Mandera and Lafey.

4.6 Education Institutions

There are 175 public primary schools, 32 public secondary schools and ten private secondary schools and three operational youth polytechnics and one mid level College that offers Diploma and Certificate courses in the county. Mandera County has no single Public University. It‘s a challenge to the leadership of Mandera County to see to it that there is one. Mandera County Government is planning to establish a world class International University [Mandera University of Science and Technology-MUST] to cater for the education needs of our population and economic positioning ourselves to cater for higher education needs for our neighbours. The county has no

public college but has two private colleges Border Point Teachers College and Maarifa college. The county is in need of P1 to be sponsored as locals not pursuing Teaching Profession. Mandera county has a total of five Youth Polytechnics namely Mandera East YP, Takaba YP, Elwak, Banisa, and Fino. The county is keen on youth empowerment. We propose setting up a fully fledged Technical Training Institute for youth empowerment in each of the six constituencies by the year 2017.

4.7 Energy Access (main sources of energy, electricity coverage)

The main source of energy is firewood, which is used by 95.6% of the house holds for cooking (KIHBS 2005/2006). Mandera East, Mandera North, Mandera South and Mandera West constituency headquarters have electricity supply. New electricity coverage is being extended to Lafey and Banissa constituencies. There is potential to develop a green and sustainable energy supply within the county by exploiting solar, wind, biofuel and coal petroleum.

4.8 Crop, Livestock and Fish Production

The main food crops grown are maize, sorghum and cowpeas. Horticultural crops, i.e. vegetables (sukuma wiki, cow peas, onions, spinach, tomatoes) and fruits grown are onions, watermelons, capsicums, mangoes, bananas, kales and tomatoes. Simsim is also grown as an oil crop.

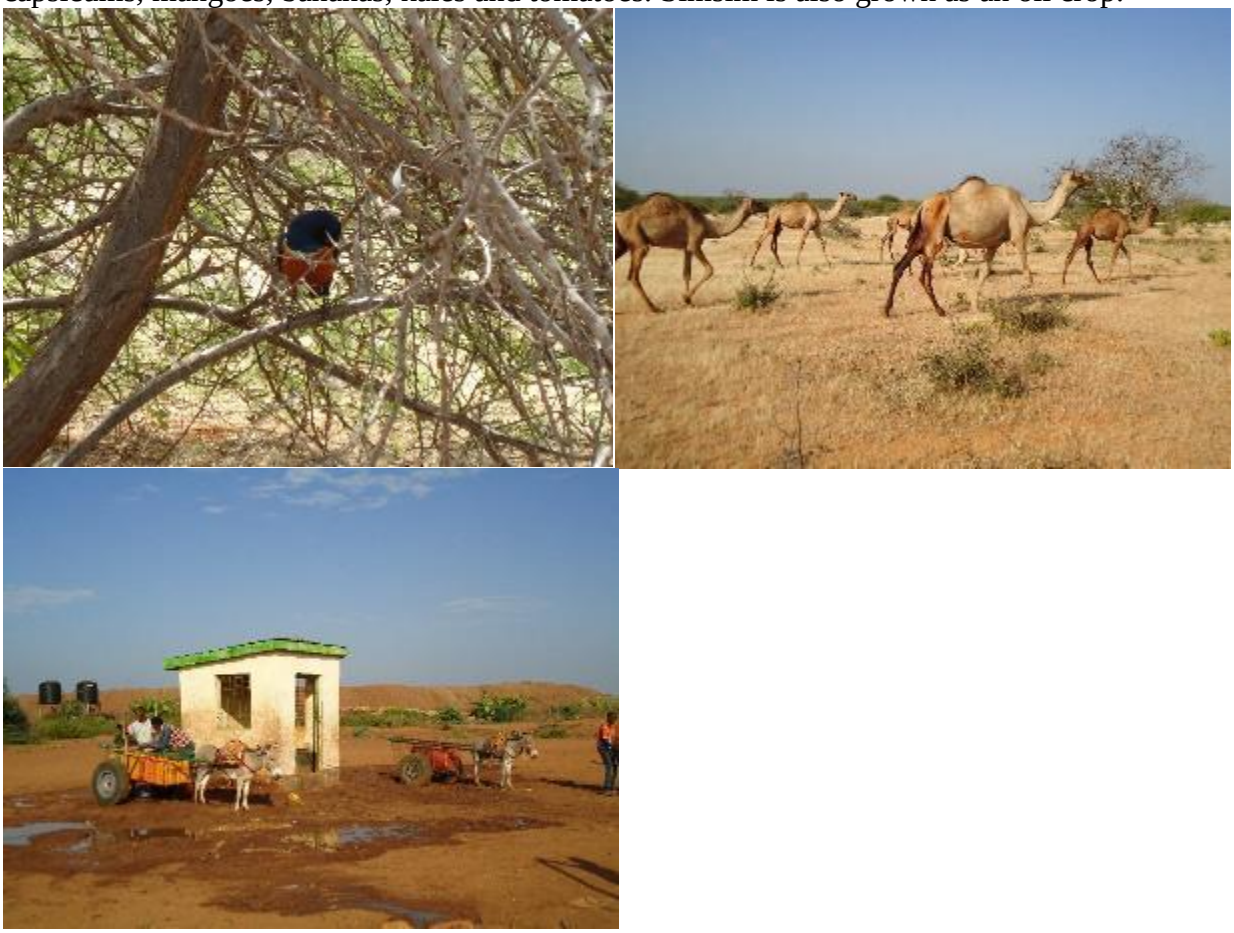


Figure 4: Birds and animals within project area.

The acreage under food crops and cash crops is approximately 716.58 hectares. The main cash crops are horticultural and oil crops (Sim sim, Sun flower and groundnuts). Kiliwehiri in Banisa; Rhamu and Guticha in Mandera North have pontential for growing oil crops under irrigation. The average farm size ranges between 2.5 – 15 hectares and these are dominantly found along river Daua. The

common types of livestock reared are goats (galla breeds), cattle (boran breeds), camels Somali breeds), sheep (Somali black head breeds), donkeys (Somali breed) and chicken (indigenous breed).

There are no known ranches in the county though there is the potential that needs to be exploited by initiating ranches/ranching: group ranches, individual ranches etc through proper paddocking, rotational grazing system.

4.9 Forestry and Agro Forestry

The main forest type is dry land forest which covers the whole county with Mandera North, Mandera West and Banissa constituencies having the largest share of the forest cover. Firewood, building materials, charcoal, Gum and resins, aloe vera and honey are some of the main forest products. The county has no gazetted forests. Promotion of tree planting is mostly done at household level. Bee keeping is practised as an income generating activity in the county**.** Farmers have been trained on how to conserve environment to control soil erosion through introduction of Leucaena on water fallow and protection of indigenous trees.

4.10 Population

The county population during the Kenya Population and Housing Census of 2019 stood at 867,457, constituting 434,976 males and 432,444 females. Its population density is 33 people per square km.

4.11 Vegetation

Nearly the proposed project areas is devoid of trees and two thirds support only scattered trees while reliable sources of grass with high productivity are small and widely scattered. The presence of plant biomass is related to altitude except for riverine areas.

The seasonal rivers' riparian in the area are dominated by Acacia spp and Doum palm (*Hyphene compressa*) and more recently invaded by *Prosopis juliflora* on some sites. *Prosopis juliflora* is an introduced tree species that is rapidly gaining the status of an invasive weed in a large swathe of the project area. The lack of ground cover is caused by prolonged droughts and leads to excessive moisture deficits in the soils. The drought effect on vegetation is compounded by overstocking of livestock in the area that asserts great pressure on pasture leading to bare land and subsequent soil erosion.

Figure 5: Vegetation at project site

4.12 Water Supply Schemes

The county has only one water supplying organization called LOWASCO. This organization is mandated to supply water within Lodwar town. The rest of the areas get water from the boreholes, and shallow wells dug which respective Water Users Associations manage.

The main water sources in the county are rivers; hand dug shallow wells, water pans, boreholes and rock catchment. There also exists several springs. The distance to and from the nearest water points are varied depending on the areas but on average is between 5-10 kilometres. In urban centres and some market centres, different Water Users Associations have managed to pipe water closer to settlements thus reducing the distance to the nearest water points. However, in far flung areas like Kibish, Lorengippi, Lomelo and Mogila, distances covered is much higher ranging from 10-20 kilometres.

4.13 Sanitation

According to the Basic Report – KIHBS 2005/06, the main types of toilet facilities in the county are pit latrines (38.9%), uncovered pit latrines (34.8%), VIP latrines (19%), and covered pit latrines (4.1%). The other 42% have no access to toilet facilities.

In terms of waste disposal methods, 82.2% of households burn their wastes, 12.2% use garbage pits,

3.9% use public garbage heap, 0.8% dispose by using private firms, 0.5% by local authorities while 0.4% by neighbourhood community groups.

4.14 Health Access and Nutrition

There are six Level IV facilities in the county, nine level III facilities, 24 Level II facilities, six Nursing homes and 60 Private clinics. The doctor/population ratio is 1:114,000 while the nurse/population ratio is 1:25,000.The five most common diseases in order of prevalence are Disease of Upper Respiratory Tract Infection (URTI), Malaria, Pneumonia, Urinary Tract Infection (UTI) and skin disease.

In terms of height-for-age, 31.8 per cent of children (6-59 months) are chronically undernourished, i.e. short for their age or stunted while 18.6 per cent are severely wasted. In terms of weight-for-height, 32.8 per cent of children (6-59 months) have low weight for their height, or wasted (acute malnutrition) while 14.8 per cent are severely wasted.

In terms of weight-for-age, 41.2 per cent of children (6-59 months) in the county are underweight while 11.0 per cent are severely underweight (KIHBS 2005/06).

Immunization coverage in Mandera County is 30percent. This can be attributed to inadequate cold chains for storing the vaccines at the existing health facilities. Long distances to and from the facilities, also contribute to the low immunization coverage. Other reasons why there is low immunization coverage include inadequate staffing, inability for health staff to reach members of the community, culture among others. This has led to rise in prevalence of immunizable diseases like measles and polio.

The total fertility in the county has greatly decreased from 7.0 children in 2003 to 5.9 children per woman as per the 2008-09 Kenya Demographic Household Survey (KDHS) which is higher than the country‘s 4.6. Only four per cent of married women use modern methods of family planning that is going to have a minimal impact on overall population growth rates in the county. Injectables are the most popular type of family planning method used. 2% of married women use injectables while 1% uses implants, which is the second most popular meth

5. RELEVANT LEGAL AND REGULATORY FRAMEWORK

There are several policies, laws and regulations that exist that govern issues of environmental concern in Kenya. Some of those relevant to water and sanitation issues include The Constitution of Kenya 2010, the Environmental Management Co-ordination Act, the Water Act 2016 and the Public Health Act, among others.

However, the most significant act that specifically addresses the issues of environmental impacts of development projects, including those on housing development, roads, water and sanitation, is the Environmental Management and Coordination Act (EMCA), 2015.

In addition to the local policies and legislations, several World Bank Policies of relevance to the project have also been considered.

The following is an outline of the policy, legislative and regulatory framework for which the Proponent shall observe and implement in an effort to comply with Environmental Sustainability.

5.1 Policy Framework

5.1.1 Environment Policy, 2014

The aim of the Environment Policy (Sessional Paper No.10 of 2014) is to ensure that environmental concerns are part of the national planning and management processes; and that guidelines are provided for environmentally sound development. The policy has seven broad goals under which guiding principles are mainstreamed to achieve conservation and management of the natural resources (forest ecosystems, arid and semi-arid lands ecosystems etc. that have wildlife resources, water resources, grazing lands, minerals, soils therein). Some of the principles outlined in the policy include right to a clean and healthy environment, ecosystem approach, total economic value, sustainable resource use, equity, public participation, precautionary principle, polluter pays principle, international cooperation, community empowerment, benefit sharing and good governance.

The policy promotes use of EIA as an innovative environmental management tool. It also calls for the Government of Kenya (GoK) to ensure that all significant development projects are subjected to EIA and regular environmental audits.

This ESIA Report (and its ESMP that will be subjected to regular audits) was prepared to promote sustainable development as envisaged in the policy.

5.1.2 The National Biodiversity Strategy, 2007

The overall objective of the National Biodiversity Strategy and Action Plan (NBSAP) is to address the national and international undertakings elaborated in Article 6 of the Convention on Biological Diversity (CBD). It is a national framework of action to ensure that the present rate of biodiversity loss is reversed and the present levels of biological resources are maintained at sustainable levels for posterity. The general objectives of the strategy are to conserve Kenya's biodiversity to sustainably use its components; to fairly and equitably share the benefits arising from the utilization of biological resources among the stakeholders; and to enhance technical and scientific cooperation nationally and internationally, including the exchange of information in support of biological conservation. The project falls in an area with no protected habitats. However, there are some wildlife outside the

protected areas and should the project encounter endangered flora and fauna then their conservation is of primary importance.

5.1.3 National Gender and Development Policy, 2011

The National Gender and Development Policy provide a framework for advancement of gender equity and an approach that would lead to greater efficiency in resource allocation and utilization to ensure empowerment of women.

The National Policy on Gender and Development is consistent with the Government's efforts of spurring economic growth and thereby reducing poverty and unemployment, by considering the needs and aspirations of all Kenyan men, women, boys and girls across economic, social and cultural lines. The policy is also consistent with the Government's commitment to implementing the National Plan of Action based on the Beijing Platform for Action (PFA).

The overall objective of the Gender and Development Policy is to facilitate the mainstreaming of the needs and concerns of men and women in all areas in the development process in the country. This law will be of relevance to the contractor in ensuring that all genders are given an equal opportunity during recruitment during the construction phase and operation phase of the project. The contractor will also provide adequate facilities for all genders within the project site.

5.1.4 National Land Policy, 2009

The policy is presented to provide goals and direction for the current and future management of land in Kenya. It outlines the measures and guidelines which the government shall implement to achieve optimal utilization and management of land, and from which laws governing land administration and management shall be drawn. The Policy and its implementation is guided by the philosophy that land is not just a commodity that can be traded in the market but has multiple values which should be protected by both policy and law. Clause 51(d) of the policy states that government to establish development control standards, processes and procedures that are efficient, transparent and accountable taking into account International Conventions and national policies relating to the sustainable use of land and the preservation of environmental values. The policy in Section 3.4.3.4 promotes Environmental Management and Audit as land management tools and encourages public participation in the process.
This ESIA has espoused the policy recommendations key among them compliance with EMCA as the harmonized framework for sustainable use of land.

5.1.5 The Sustainable Development Goals

The 2030 Agenda comprises 17 new Sustainable Development Goals (SDGs), or Global Goals, which will guide policy and funding for the next 15 years, beginning with a historic pledge to end poverty.
The concept of the SDGs was born at the United Nations Conference on Sustainable Development, Rio+20, in 2012. The objective was to produce a set of universally applicable goals that balances the three dimensions of sustainable development: environmental, social, and economic. The MDGs drove progress in several important areas:

- Income poverty
- Access to improved sources of water
- Primary school enrollment

- Child mortality

With the job unfinished for millions of people—we need to go the last mile on ending hunger, achieving full gender equality, improving health services and getting every child into school. Now we must shift the world onto a sustainable path. The Global Goals aim to do just that, with 2030 as the target date.

This new development agenda applies to all countries, promotes peaceful and inclusive societies, creates better jobs and tackles the environmental challenges of our time—particularly climate change. Nationally, the GOK has taken bold steps to domesticate the SDGs as illustrated by:

i) Investment in the Poverty Reduction Strategy Paper (PRSP) process through which participatory mapping of poverty incidence at both District and National Level was undertaken,
ii) Implementation of the Economic Recovery Strategy for Wealth and Employment Creation, and
iii) Implementation of projects that directly confront specific aspects of the SDGs. By anchoring the Economic Pillar of Vision 2030 which seeks to generate resources needed to address SDGs, implementation of this development project, which involves construction of an earth pan and other accompanying facilities, is attuned to the national and indeed global agenda for economic and social development. *The proposed earth pan contributes to Sustainable Development Goals through improved access to clean, affordable sources of water to the general community*.
iv)

5.2 Legal Framework

5.2.1 The Constitution of Kenya 2010

Article 42 states that every person has the right to a clean and healthy environment. The constitution provides guidance on steps that may be taken in case any of any infringement on these rights. In addition, the constitution provides for the establishment systems for carrying out environmental impact assessment, environmental audit and monitoring of the environment.

In addition to the protection of the environment, the constitution states that the land in Kenya belongs to the people of Kenya collectively as a nation. The constitution classifies the land in Kenya into different categories. These categories will dictate whether compensation will be required for the acquisition of a way leave. The categories include: public (including oceans, land between high and low water marks, all roads and thoroughfares).

5.2.2 The Environmental Management and Coordination (Amended) Act Of 2015

This Act is an amendment of the Environmental Management and Co-ordination Act of 1999. The amended Act covers virtually all diverse environmental issues which require a holistic and coordinated approach towards its protection and preservation for the present generation without compromising the interests of the future generation to enjoy the same. Consequently, the amended act provides for the legal regime to regulate, manage, protect and conserve biological diversity resources and access to genetic resources, wetlands, forests, marine and freshwater resources and the ozone layer to name a few.

The Environmental Management and Coordination (Amended) Act, 2015 harmonizes the various requirements of the other existing laws and regulations by stipulating that where the provisions of any

existing law conflicts with itself, then the provisions of the Environmental Management and Coordination (Amended) Act, 2015 shall prevail. This way, the act is able to minimize any conflicts in enforcement of the various environmental laws and regulations as applied to the relevant sectors. The Environmental Management and Coordination (Amended) Act, 2015 represents the culmination of a series of initiatives and activities coordinated by Government and stakeholders. It accentuates the right of every person in Kenya to live in a clean and healthy environment and obliges each and every one to safeguard and enhance the environment. It is the master plan for the environment in Kenya and contains a National Environment Policy, Framework Environmental Legislation and Environmental Strategy.
The Act gives power to the National Environment Management Authority (NEMA) which is a semi-autonomous government agency mandated to exercise general supervision and coordination over all matters relating to the environment and to be the principal instrument of the Government of Kenya in the implementation of all policies relating to the environment. NEMA is the body in charge of ensuring developments adhere to the policies and frameworks set out by the Authority.

EMCA empowers stakeholders to participate in sustainable management of the natural resources. It calls for Environmental Impact assessment (EIA) (under Section 58) to guide the implementation of environmentally sound decisions. Projects likely to cause environmental impacts are listed in three categories. It is under this provision that the current study is being undertaken; The Act consists of sector plans for the medium and long term intended to lead to sustainable development in the country. EMCA puts special emphasis on environmental management, pollutions and nuisances, and the necessity to safeguard the well-being of the populations.

The second schedule of EMCA stipulates that an EIA is required for:

- Water transport, presumably water distribution systems,
- Drilling for the purposes of using groundwater for water supplies,
- Use of water for agricultural purposes for irrigation,

It should therefore be clear that the granting of a license by NEMA for the project is a prerequisite for proper legal project implementation.
The amended act highlights the need for an ESIA which is presented in this report.
The Act has several regulations that aid in its implementation; the relevant regulations are highlighted in the sections below.

5.2.2.1 Environmental (Impact Assessment and Audit) Regulations, 2003 and Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2016

These Regulations stipulate the importance of conducting an ESIA as well as the procedure necessary. The Regulations highlight the various reports and their contents to be submitted to NEMA for licensing. The regulations highlight the ESIA process which includes:

- Submission of a ESIA project report to NEMA for review or licensing
- In some cases the Authority will request for a full study report for some projects for which the applicant will be required to prepare a Terms of Reference and submit a study report.

The project and study reports will be conducted before the implementation of the proposed development, the reports will be subject to approval by NEMA, which will provide a license after its review.

The regulations also calls for Environmental auditing and monitoring that will be carried out during the construction or operation of the enterprise, the regulations provide the format of the audit report which will be provided to NEMA.

According to the regulations, an ESIA study should incorporate but not limited to the following: -

- The proposed location of the project
- The objective of the project
- The technology, procedures and process to be used in the implementation of the project
- The materials to be used in the construction and implementation of the project
- The products and by-products and waste generated by the project
- The environmental effects of the project including the socio-cultural impacts, effects and direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
- A concise description of national environmental legislative and regulatory framework, baseline information and any other information related to the project
- A description of the potentially affected environment
- Alternative technologies and processes available and reasons for preferring the chosen technology and processes
- An analysis of alternatives including project sites, design and technologies and reasons for preferring the proposed site, design and technologies
- An Environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, time frame and responsibility to implement the measures.
- The provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the cause of carrying out activities
- The measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies
- An identification of gaps in the knowledge and uncertainties which were encountered in compiling the information
- An economic and social analysis of the project
- An indication of whether the environment of any other state is likely to be affected and the available alternative and mitigating measures

5.2.2.2 EMCA (Noise and Excessive Vibration Pollution Control) Regulations, 2009

Enacted as Legal Notice No. 61, these Regulations determine the level of noise that will be permissible, in particular during the construction phase; the following factors will be considered:

- ✓ Time of the day;
- ✓ Proximity to residential area;
- ✓ Whether the noise is recurrent, intermittent or constant;
- ✓ The level and intensity of the noise;
- ✓ Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and,
- ✓ Whether the noise is subject to be controlled without unreasonable effort or expense to the person making the noise.

The Contractor will have to meet the requirements of these regulations particularly during the construction process, where some of the construction activities are bound to make some level of noise. These regulations are summarized in the table below:

Table 1: Permissible Noise Level for a Construction Site

	Facility	**Local Maximum Noise Level Permitted in Decibels**	
		Day	**Night**
1	Health facilities, educational institutions, homes for disabled etc.	60	35
2	Residential areas	60	35
3	Areas other than 1 and 2 above	75	65

In addition, the IFC regulations for permissible noise levels are summarized in the table below:

Table 2: IFC regulations for permissible noise levels

	Facility	**Local Maximum Noise Level Permitted in Decibels**	
		Day	**Night**
1	Residential; institutional; educational	55	45
2	Industrial; commercial	70	70

Comparatively both regulations are relatively similar; as such the local regulations will be used.

5.2.2.3 The Environmental Management and Coordination (waste management) Regulation, 2006

The Waste Management Regulations are meant to streamline the handling, transportation and disposal of various types of waste. The aim of the Waste Management Regulations is to protect human health and the environment. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source.

These regulations will be of great importance particularly during the construction phases of the project. During the Construction, the Contractor will have to meet the requirements of the regulations, by providing solid waste sorting and transportation using a licensed transporter who will dispose of the solid waste to the designated receptacle.

These Regulations shall apply to all categories of waste as is provided. They describe "Biodegradable substance "as a substance that can be degraded by micro-organisms.

5.2.2.4 Water Quality Regulations (2006)

Enacted as Legal Notice No. 120, the water Quality Regulations apply to water used for domestic, industrial, agricultural, and recreational purposes; water used for fisheries and wildlife purposes, and water used for any other purposes. Different standards apply to different modes of usage. These regulations provide for the protection of lakes, rivers, streams, springs, wells and other water sources. These regulations provide the standards for domestic water usage, which will be important for this project as the water will be used domestically by the people. Of particular importance is the suspended solids concentration requirement which is a maximum of 30 mg/L. The IFC standards provide a maximum suspended solid quantity of 50mg/l, this is higher than the local standards, and as such the local standards will take precedence.

5.2.2.5 Environmental Management and Coordination (Air Quality) Regulations, 2014

This regulation is referred to as "The Environmental Management and Coordination (Air Quality) Regulations, 2014". The objective is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. It provides for the establishment of emission standards for various sources, including as mobile sources (e.g. motor vehicles) and stationary sources (e.g. industries) as outlined in the Environmental Management and Coordination Act, 2015. The Regulations prohibits the Proponent from:

- Acting in a way that directly or indirectly cause or may cause air pollution to exceed levels set out in the second Schedule to the Regulations
- Allowing particulates emissions into the atmosphere from any source not listed in the six schedules of the Regulations
- Causing ambient air quality in controlled areas (listed in Schedule Thirteen) to exceed those stipulated under second Schedule.
- Allowing (during construction and demolition) emission of particulate matter above the limits stipulated in second Schedule
- Causing or allowing stockpiling or storage of material in a manner likely to cause air pollution
- Causing or allowing emissions of oxides of nitrogen in excess of those stipulated in the eleventh Schedule of the Regulation
- The Proponent shall observe policy and regulatory requirements and implement the mitigation measures proposed in this document in an effort to comply with the provisions of these Regulations on abatement of air pollution.

5.2.3 Water Act No 43 of 2016

Part II, section 18, of the Water Act, 2016 provides for national monitoring and information systems on water resources. Following on this, sub-section 3 allows the Water Resources Management Authority to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a facility operator and the information thereof furnished to the authority.

Section 73 of the Act allows a person with license (licensee) to supply water to make regulations for purposes of protecting against degradation of water sources. Section 75 and sub-section 1 allows the licensee to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction.

5.2.4 Employment Act, 2007

The Act declares and defines the fundamental rights of employees, to provide basic conditions of employment of employees, to regulate employment of children, and to provide for matters connected with the foregoing. The act provides the basic minimum conditions for employment to include hours of work, water (for use at the place of work), food (employee properly fed) and medical attention.

At construction stage, the project contractor will hire both full-time and casual staff and the prevailing basic minimum conditions of employment will have to be observed.

5.2.5 Land Act (No.6 of 2012)

This Act is intended to create harmony among the land laws to allow for a sustainable administration and management of land and related resources such as environmentally sensitive areas, heritage sites

within public land. As part of environmental management of land resources in areas earmarked for development, the Act requires an Environmental Impact Assessment as per EMCA Act.
The proposed project will be implemented on a community land where the community voluntarily agreed to issue the land and signed the community resolution form (CRF), which authorizes the implementation of the project by the Proponent.

5.2.6 The Public Health Act (CAP. 242)

Part IX Section 8 & 9 of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Any noxious matter or waste water flowing or discharged into a water course is deemed as a nuisance. Part Xll Section 136 states that all collections of water, sewage, rubbish, refuse and other fluids which permits or facilitates the breeding or multiplication of pests shall be deemed nuisances The Act addresses matters of sanitation, hygiene and general environmental health and safety. This Act will govern the Contractor's activities on site including ensuring the health and safety of employees including providing personal protective equipment (PPE) and health services when it comes to venereal diseases. In addition, this law justifies the need for the fencing of the proposed water pan to avoid direct entry of humans and animals into the water pan for water.

Part II of the Act allows for the temporary acquisition of land for utilization in promotion of the public good for periods not exceeding 5 years. At the expiry of the period, the Commissioner of Land shall vacate the land and undertake to restore the land to the conditions it was before. Any damages or reduction of value shall be compensated to the land owners

5.2.7 Occupational Health and Safety Act 2007

This legislation provides for protection of workers during construction and operation phases of the project. The Act provide for the safety, health and welfare of workers and all persons lawfully present at workplaces This act will provide some of the mitigation measures for any negative impacts in particular those concerning the workers within the site. It is tailored at implementation of the EHS plan in compliance with the relevant sections of this Act. Some of the relevant, applicable sections of the legislation are as stipulated below:

Part VI – Health – General Provisions:
Cleanliness
Section 47. (1) Every workplace shall be kept in a clean state, and free from effluvia arising from any drain, sanitary convenience or nuisance, and, without prejudice to the generality of subsection (1)—
(a) Accumulations of dirt and refuse shall be removed daily by a suitable method from the floors and benches of workrooms, and from the staircases and passages.

Sanitary conveniences
52. (1) Sufficient and suitable sanitary conveniences for the persons employed in the workplace shall be provided, maintained and kept clean, and effective provision shall be made for lighting the conveniences. It is thus recommended that all Sections of the Act related to this project, such as observing safety guidelines, provision of protective clothing, clean water, and insurance cover are observed so as to protect all from work related injuries or other health hazards.

5.2.8 Forest Act 2005.

Specifically, the **Forest Act** mandates the Kenya Forest Service to conserve and manage all forests. It also sets out the roles and responsibilities of communities in managing forests. The act is important because the project may reduce forest land and impact on the access of forest goods. Measures have to be taken to reduce negative impacts on forests.

5.2.9 Agriculture Act (cap 318)

The Agriculture Act (cap 318) is the principal land use statute covering inter alia soil conservation agricultural land use and conservation issues such as the preservation of soil fertility. The Act prohibits any land use practices that may intensify soil erosion. The act prohibit cutting down or destroying vegetation on any land of which the slope is 35 per cent. The rules stipulate strict regulations on the cultivation of any land whose slope is between 12 percent and 35 per cent when the soil is not properly protected from erosion. The Act also provides for protection of watercourses setting aside a riparian zone of a minimum 2 meters equivalent to the width of river to a maximum of 30 meters. The act is important because the proposed project impacts on land use and the agricultural sector once the project is put up.

5.2.10 County Government Act 2012

The County Government Act of 2012, which has been adapted to the Constitution's State and County structure in relation to devolution, declares the County Integrated Plan to be central to the County's administration and prohibits any public spending outside of the plan. The Act clarifies that the County Integrated Plan to be broken down into the economic plan, physical plan, social environmental plan and spatial plan. Also, the Act states that the County Plan commands,

- County integrated development plan
- County Sectoral plans
- County spatial plan
- Cities and urban areas plans as stipulated by Urban Areas and Cities Act

The act also stipulates that the County Government will be responsible for functions stipulated in article 186 and assigned in the Fourth Schedule of the Constitution which includes control of air pollution, noise pollution, other public nuisances and outdoor advertising. The County Government will oversee all development activities within the County; as such will be a major stakeholder for the proposed project. The Proponent will ensure the project will be compliant with County Government Act 2012 by controlling all forms of pollution. Additionally, an Environmental and Social Management/monitoring plan have been provided in this report with measures for mitigating potential environmental pollution anticipated from the development of the project.

5.2.11 Wildlife Conservation and Management Act, 2013

This Act through rules and regulations seeks to promote the protection, sustainable conservation and management of wildlife resources within the Country and related matters. The Act recognizes and vests a range of responsibilities to different agencies associated with management of biodiversity. The Act takes cognizance that the conservation, protection and management of the wildlife environment shall be in conformity with the provisions of the Environmental Management and Coordination Act. In addition, the Act in its schedules have listed legally protected areas and various species of wildlife under differing categories of conservation significance (i.e. vulnerable, endangered etc.) and whose

handling requires authority from the Kenya Wildlife Service (KWS). The Proponent shall ensure that human – wildlife conflicts are not induced by the project, instead reduced.

5.2.12 The HIV and AIDS Prevention and Control Act

This is an Act of Parliament to provide measures for the prevention, management and control of HIV and AIDS, to provide for the protection and promotion of public health and for the appropriate treatment, counseling, support and care of persons infected or at risk of HIV and AIDS infection, and for connected purposes. This Act will ensure that the Contractor makes provision for VCT services for employees and locals, as well as promotes public awareness. This will go a long way in ensuring reduced risk of new infection, stigmatization of those already infected as well as management during the construction period.

5.2.13 The Sexual Offences Act, 2006

This Act protects people and employees from any unwanted sexual attention or advances by staff members. This act ensures the safety of women, children and men from any sexual offences which include: rape, defilement, indecent acts. This law will govern the code of conduct of the Contractor's staff and provide repercussions of any wrong doing.

5.2.14 The Children Act, 2001

This Act protects the welfare of children within the Country. The Act identifies Children as a person below the age of 18 years old and protects them from exploitation. Of importance to this project, is section 10, which protects the child from:

- Economic exploitation.
- Any work that interferes with his/ her education, or is harmful to the child's health or physical, mental, spiritual, moral or social development.

5.2.15 Food, Drugs and Chemical Substances Act (CAP 254)

This Act (which has been invoked for the consumption of genetically modified food), requires that food, drugs, cosmetics, devices and chemical substances should not be sold if they are unwholesome, poisonous, or adulterated. It further prohibits deceptive labeling. The statute also gives powers to authorized officers to inspect and examine any premises for evidence of contravention of the provisions of the law. There is thus no explicit policy and legal framework for the development and introduction of modern biotechnology in Kenya. *The vendors who will supply food to the workers at the camp must comply with this Act,*

5.2.16 Work Injury and Benefits Act, 2007

This Act provides for compensation to employees for work related injuries and disease contracted in the course of their employment and for connected purposes. Key sections of the Act include the obligations of employers; right to compensation; reporting of accidents; compensation; occupational diseases; medical aid etc. In case of any accidents or incidents during the project cycle, this Act will guide the course of action to be taken.

5.2.17 Antiquities and Monuments Act, 1983 (Cap 215)

This Act aims to preserve Kenya's national heritage. Kenya is rich in its antiquities, monuments and cultural and natural sites which are spread all over the country. The National Museums is the custodian of the country's cultural heritage. Through the National Museums many of these sites are protected by law by having them gazette under the Act. The proposed site has no sites of cultural heritage.

5.3 Compliance to World Bank Environmental and Social Standards (ESS)

ESS are World Bank tools designed to first identify and then try to avoid, mitigate and minimize adverse environmental and social impacts that may arise in the implementation of development projects. They have a proactive dimension to try to increase chances that the development projects deliver better outcomes for people and environment. They address and redress a large array of issues. Currently the ESS are 10 number with supportive guidelines notes, templates and checklists. They will be the guiding tools in the execution of the project. The ESS are herein briefly described followed by a matrix on implementation guidelines of the standards (Environmental & Social Commitment plan).

ESS1 Assessment and Management of Environmental and Social Risks and Impacts sets out the Borrower's responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project supported by the Bank through Investment Project Financing (IPF), in order to achieve environmental and social outcomes consistent with the Environmental and Social Standards (ESSs). *The project management team continued implementing the relevant national project licensing conditions, acquiring relevant licenses and permits as part of compliance to this standard. Relevant compliances are described in section 3 a, b and c of this report.*

The project has established and maintained an organizational structure with qualified staff and resources to support management of E&S risks. Key positions include the Contractor's Environment & Safety Officer, Contractor's Sociologist and Community Liaison Officer, The Supervising Consultant's Environmentalist and the Supervising Consultant's Sociologist.

The project continues to update, adopt, and implement, the Environmental and Social Impact Assessment that was prepared for the Project. There's working updated Contractor's Environmental & Social Management plan.

The Project team prepares and submits to the Bank regular monitoring reports on the environmental, social, health and safety (ESHS) performance of the Project, including but not limited to the implementation of the Environmental and Social Commitment Plan (ESCP) key deliverables, status of preparation and implementation of E&S documents required under the ESCP, stakeholder engagement activities, functioning of the grievance mechanism(s).

The project team promptly notify the Bank of any incident or accident related to the Project which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers including work related injuries, natural calamities, community grievances and any other major incident within the project scope. Such reports provide sufficient detail regarding the incident or accident, indicating immediate measures taken or that are planned to be taken to address it, and any information provided by any contractor and supervising entity, as appropriate. Subsequently, as per the Bank's request, prepare a report on the incident or accident and propose any measures to prevent its recurrence.

ESS3 Resource Efficiency and Pollution Prevention and Management recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels. This ESS sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life-cycle. *Pollution prevention activities have been outlined in chapter 2 of the report, in addition to compliance of relevant domestic legislations.*

ESS4: Community Health and Safety addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their particular circumstances, may be vulnerable. *This is carried out through community engagements. There were community meetings held to discuss restoration of borrow pits as well as road safety campaigns.*

ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement - involuntary resettlement should be avoided. Where involuntary resettlement is unavoidable, it will be minimized and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving displaced persons) will be carefully planned and implemented. *The Sociologist engaged the client on compensation of the affected people. They will only give way for project activities once fully compensated.*

ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development and it recognizes the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they support. ESS6 also addresses sustainable management of primary production and harvesting of living natural resources, and recognizes the need to consider the livelihood of project-affected parties, including Indigenous Peoples, whose access to, or use of, biodiversity or living natural resources may be affected by a project. *All borrow pits are leased from the community through mutual agreements. Once exhausted, they are restored and handed back to the community. Sacred places once identified are preserved.*

ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities ensures that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities. ESS7 is also meant to avoid adverse impacts of projects on Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities, or when avoidance is not possible, to minimize, mitigate and/or compensate for such impacts. *There is working grievance redress committee that handles any violation or interference to human rights. Reports are handled by the project sociologist.*

ESS8: Cultural Heritage recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present and future. ESS8 sets out measures designed to protect cultural heritage throughout the project life-cycle. *Cultural heritage is preserved through a "Do no Harm" approach in the project implementation. Exploitation of children and women is completely discouraged. The project sociologist handles all issues related to cultural heritage, e.g. graves management.*

ESS10: Stakeholder Engagement and Information Disclosure recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation. *There is continued engagement of the community, local government agencies and other stakeholders in the project. Such engagements include public participation in sub-project siting and execution, shared responsibilities in handling grievances and seeking licenses to carry out project activities.*

6. SOCIAL ECONOMIC STUDY, PUBLIC PARTICIPATION & CONSULTATIONS

This chapter outlines the key issues raised by the public on the proposed project. The findings indicate that all the community members support the project as long as they are involved and fully sensitized on the same.

6.1 Social- Economic Study Report

6.1.1 Introduction to Data Analyses

The Social-economic Impact Assessment (ESIA) was conducted using household survey, observations and key informant interviews. Quantitative data was tabulated and analyzed by Microsoft Excel® software. The target population 5% community members from where the project is likely to affect them directly either positively or negatively.

6.1.2 Basic Household Setup and family structure

Of the people interviewed, 6% were women and 94% men. The Majority of the households were headed by the father followed by mothers at 95 % and 5% respectively.

The age structure of the sample is shown in figure 6. Therefore, the largest population falls in the 19-35years which is the population of young people often referred to as the youth, followed closely with ages 5-18, the school going children. The elderly population is very low depicting that the project neighborhood population is within the young generation.

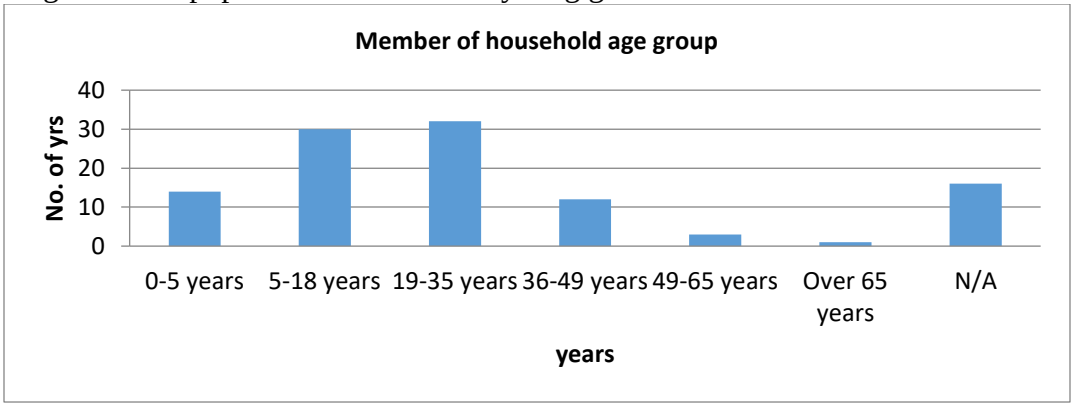


Figure 6: Household age groups

Majority (70%) of the population have not gone to formal education, 20% basic primary education while 8% and 2% have attained Secondary and tertiary education respectively. This can be attributed to hardship conditions, pastoral type of life and reluctance of the population to take their children to school.

Most households (60%) practice animal husbandry, 20% crop farming, 12% general business, 2% formal employment and 6% unspecified livelihood sources. The general business includes 50% general shops/kiosks, 30% motorbike riding, 10% jua kali artisan merchandise management and 10% unspecified. This kind of income sources lead to the largest number (70%) of people generating income within Ksh., 0-5000 per month, followed by 18% between 5000-10000, 5% above 15000 while 7% did not specify.

6.1.3 Waste Management Practices

The most common mode of domestic human faecal waste disposal is by the use of latrines at 88% and 12% septic tanks. However, given options, the population would prefer septic tanks. There were no sewage treatment plants in the entire region. Household waste is mainly dumped at open places (52%) while some are burnt (36%), buried/composited (4%) and some collected by the Municipal council (8%).

Several challenges were noted from the interviews with the outcome as 74%, waterborne diseases, 14% water contamination, 4% general discomfort due to waste management practices, 8% unspecified. Majority reported to have disposed off general household solid wastes by 60% burning and 40% composting. Majority of the population are satisfied with the waste management practices in the area despite burning being one of the worst practice due to pollution. This demonstrates that not much awareness creation has been done on best waste management practices.

6.1.4 Safety, health, water and sanitation

The most prevalent disease is Malaria, followed by malnutrition. Once sick, the population reported to have been seeking medical treatment from health centres owned by the government of Kenya. Others use other means including herbs. Most of the health facilities are within 1-3 km.

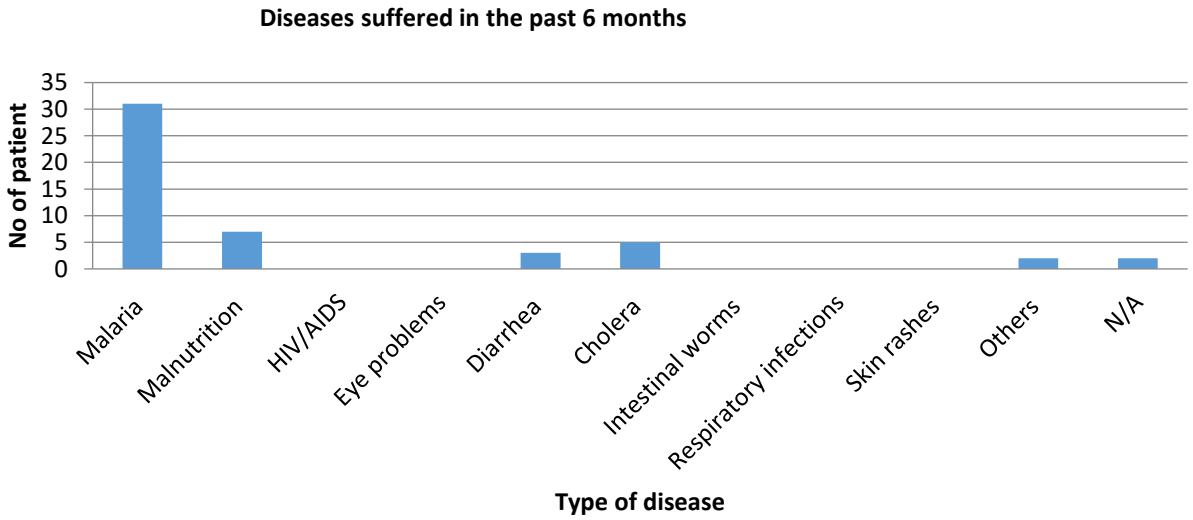


Figure 7: Prevalent diseases

The source of water for the population was found to be dams, followed by shallow wells. The dams provide humble breeding ground for mosquitos as well as being vulnerable to contamination. However, 82% of the population perceived the water to be safe. Majority of the water points are within 2km and followed those by those above 2km. Almost all water points are owned by the community for public use while some are owned by religious organizations. 94% of the population pay for water at the rate of Ksh 5 and above per 20l jerrican; with 54% paying at ksh 5, 40% at ksh 10 and 6% above ksh 10 per 20l jerrican.

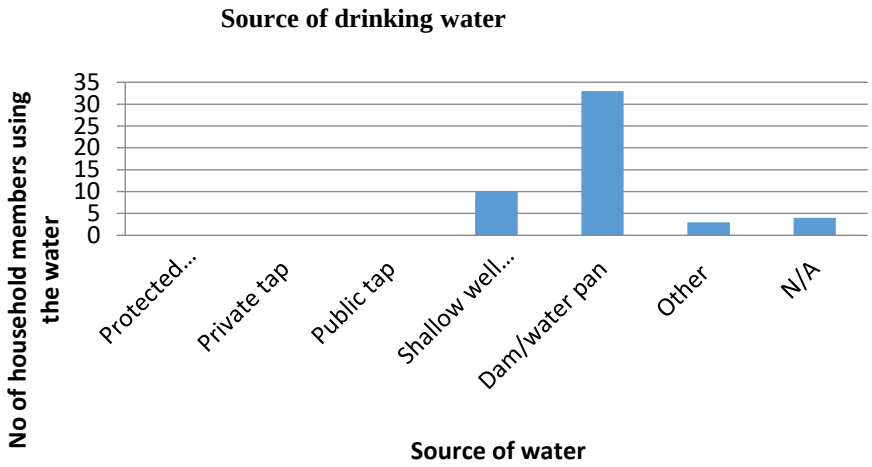


Figure 8: Sources of drinking water.

On security, 84% reported that the site is secure while 16% reported that it was insecure. Manin insecurity was due to armed robbery and theft (72%). The main causes of robbery and theft being poverty (54%) and illiteracy (40%). Moreover, insecurity issues include rape at 4% and others unspecified.

6.1.5 Knowledge and attitude on HIV/AIDS

86% of the population are aware of the causes of HIV/AIDS and ways to prevent it. 94% have been affected by the disease in one way or another. The awareness campaigns are majory use of radio and television (64%), religious leaders (24%), health workers (6%), NGOs/CBOs (4%) and other media (2%). 94% believe HIV/AIDS is preventable. Despite the awareness, 86% do not know where to find Voluntary Counselling and Testing (VCT) services.

6.1.6 Environmental issues

Water shortages was cited as the most prevalent environmental issue followed by Overgrazing, invasive species of plants and flooding during rain season respectively. Tree planting and education has been main environmental conservation measures being undertaken in the county under the initiatives of women groups, youth groups and the community organizations. Environmental conservation is mainly tree planting (75%), public education (9%), construction of terraces/gabions (8%) and clearing mosquito breeding sites (8%). These interventions are carried out by the County Government of Mandera (60%), youth groups (13%), women groups (10%), NGOs (10%), CBOs (4%) and others (3%). 96% Participants in the assessment further agreed that the project will promote environmental conservation through pollution control (76%) and employment provision (24%). They further proposed to promote tree planting as part of environmental conservation means.

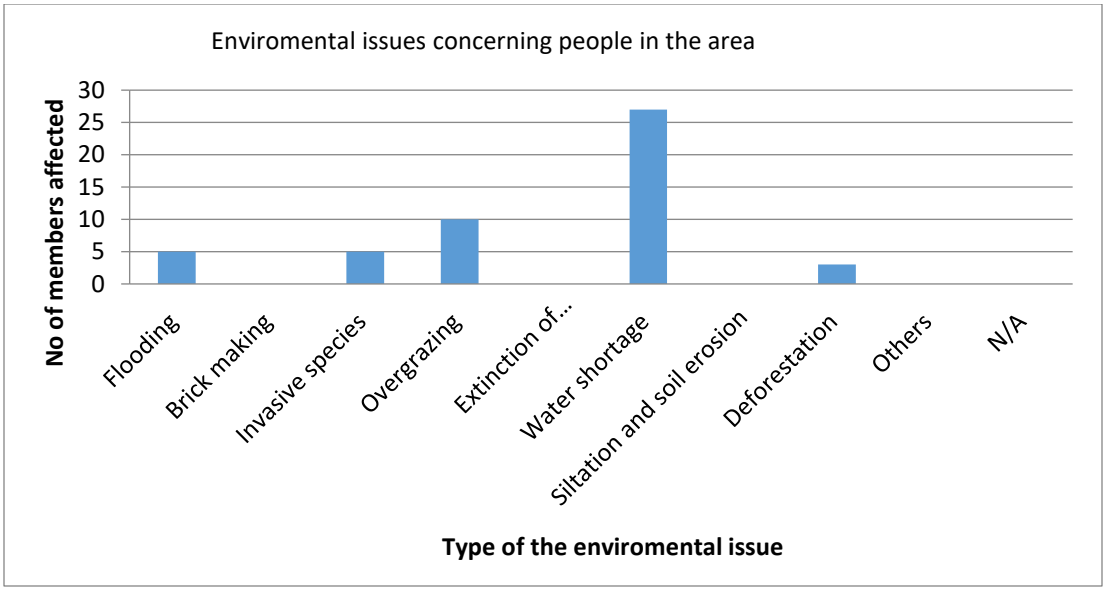


Figure 9: Environmental issues

6.1.7 Verdict on the project implementation

All the people surveyed confirmed their support for the project implementation. They further confirmed that they had heard of the project since 2017 through Chief's barazas, political meetings/campaigns and stakeholder engagement meetings. They were aware of its impacts, of which they said can be beneficial to them at long run.

6.2 Public Consultations & participation

6.2.1 Objectives of Public Consultation

The need for public consultations as required by EMCA (CAP387) was to:

- Disseminate and correctly inform the stakeholders about the project, its key components, location and expected impacts.
- Awareness creation on the need for EIA
- Gather comments, concerns and suggestions of the interested and affected parties.
- Ensure that the concerns of the stakeholders were known to the decision-makers early enough
- Incorporate the information collected into the EIA study

The purpose for such a process was to identify the positive and negative impacts and subsequently promote and mitigate them respectively. It also helped in identifying any other miscellaneous issues which may bring conflicts in case project implementation proceeded as planned.

6.2.2 Approach to Public Consultations

Legal Notice of 101 of EMCA 1999 and amended in 2015 (The Environmental Regulations, 2003) requires that all environmental assessment process in Kenya to incorporate Public Consultation. The aim is to ensure that all stakeholder interests are identified and incorporated in project development, implementation and operation. Of necessity, stakeholder consultations should take place alongside project design and implementation to ensure that the project puts in place measures to cater for stakeholder concerns in all project phases.

6.2.3 Legal and Policy Provisions for Stakeholder Consultations

EMCA 1999 amended in (2015) through the Legal Notice No. 101: the Environmental (Impact, Audit and Strategic Assessment) Regulations, 2003 The principle Act of Parliament is the Environmental Management and Coordination Act (EMCA) 1999 amended in 2015 and the subsequent Regulation, the Environmental Impact Assessment and Audit Regulations 2003 amended in 2009.

The regulation requires that during the process of conducting Scoping, Environmental Impact Assessment the Proponent shall in consultation with the Authority here in referred to National Environment Management Authority (NEMA); seek the views of persons who may be affected by the Project. In seeking the views of the public, after the approval of the scoping report, of the proposed project by the Authority, the Proponent shall publicize the project and its anticipated effects and benefits by;

- Posting posters in strategic public places in the vicinity of the site of the proposed project informing the affected parties and communities of the proposed project;
- Publishing a notice on the proposed project for two successive weeks in a newspaper that has a nation-wide circulation;
- Making an announcement of the notice in both official and local languages in a radio with a nation-wide coverage for at least once a week for two consecutive weeks.
- Hold at least three public meetings with the affected parties and communities to explain the project and its effects, and to receive their oral or written comments; ensure that appropriate notices are sent out at least one week prior to the meetings and that the venue and times of the meetings are convenient for the affected communities and the other concerned parties; and
- Ensure, in consultation with the Authority that a suitably qualified coordinator is appointed to receive and record both oral and written comments and any translations thereof received during all public meetings for onward transmission to the Authority.

6.2.4 Identification of Stakeholders

Various stakeholders were incorporated into the consultation processes. A stakeholder identification and involvement based on various needs, interest and potential influence to the project was used. The stakeholders used were;

- Primary stakeholders i.e. the direct project beneficiaries of the development project or those that are directly affected, aka PAPs.
- Secondary stakeholders i.e. those indirectly affected by the project but influence development. These are involved in the project implementation. They include the responsible agency; Irrigation Department, government line ministries and departments and the local administration.

Figure 10: stakeholders identification

6.2.5 Introductory Meetings

These were conducted on the 25th and 26th July 2012, with the various relevant government line ministries at the scoping stage where issues of concern were discussed. The meetings intended to: -

- Familiarize with the project area;
- Obtain deeper information regarding the project areas; Introductions to the various authorities;
- Obtain the general perception regarding the project.

6.2.6 Participatory Meetings and Public Sensitization Meetings (Barazas)

These were held from the 24th -29th August 2018 at Kutulo scheme. The various interested groups were involved in a participatory process to ensure that all the stakeholders including target beneficiaries and persons affected by the project are involved through sharing of information, pointing out issues of concern and suggesting solution on how various areas of conflict can be addressed. The purpose of the various stakeholders' participation is to ensure that all important environmental, social and economic issues relating to the project are clearly understood by all stakeholders to enable them to make informed decisions on the project including endorsement and provision of information and recommendations toward enhancement of positive impact and mitigation of negative impacts. This will go a long way in enhancing ownership and sustainability of the project. The participation was achieved through the following activities: Community sensitization meetings; local leaders' meetings; FGD and collection of household socio-economic baseline data using questionnaires.

The community sensitization meetings targeted the general affected communities in the area. Various aspects of the project were passed on to the public including the scope, infrastructure, expected benefits and environmental aspects and the public views were also sought. The community members were given opportunities to air their views and bring out the issues that were of concern to them through the FGDs. The meetings addressed among others issues: -

- The project overview
- Socio-economic aspects including anticipated project benefits; Community participation in the project;
- Natural resources including water, land and wildlife likely to be affected Environmental and social issues likely to be affected
- Proposed mitigation measures for identified effects and Probable inputs from the community members.

Figure 11: Public participation meetings

(The list of attendance to the meetings held and attendance lists are attached in the appendix).

6.2.7 Issues Arising from the Consultative Meetings

The forums provided opportunities to get firsthand information on issues of concern by the community including local environmental management approaches and some of the traditional conflict resolution mechanisms. The issues that emerged from the community sensitization meetings are both positive and negative as listed below.

- The potential for chemical pollutants getting into the aquatic resources as the agricultural activities intensifies
- Interruption of livestock movement and of people to access rivers in the excavation and construction phase this would be addressed through the construction of crossings to facilitate human and livestock access to water during and after canal excavation. The bridges should be put up in such a way that every livestock corridor has a crossing.
- Increased dust during the excavation and site clearance; the contractor should ensure there is fast completion of the project so as to ensure a reduction in exposure period for people and livestock,
- Noise emission from the machineries in use at the construction phase
- Increase of mosquito prevalence and therefore increased incidence of malaria and other water-borne diseases due to increased breeding sites, this would be addressed through Educating the community on preventive and control measures such as spraying and use of treated nets and boiling of drinking water and avoiding stagnant water. It would be important to improve the existing health facilities in the project areas and also to ensure the availability of medicines closer to the population or in worst case scenario establish more health facilities
- Inadequate water for target users at the downstream, the project maintenance should ensure minimal siltation to have a regular water flow to all the locations.
- Increased wildlife- human conflict due to increased irrigation leading to more greenery at the farms than the parks.
- There was also concern over the reduction of the water in the various water sources as a result of abstraction to serve the irrigation project

6.2.8 Key Stakeholders Consultative Meetings

There were consultations with the relevant line ministries and government departments in the project area. These meant to brief and pass the relevant information to the stakeholders and their input sort. This was conducted on 12th Nov 2018. The minutes of meeting annexed below:

1.	Jahora M. Abdi	- CECM Agriculture, Livestock & Fisheries
2.	Maryam Dubow Dahir	- CCO – Irrigation Department
3.	Khaliff I. Barrow	- CDI – Irrigation Department
4.	Ahmed Ali Madey	- Head of Delivery unit
5.	Ahmed Mohamed Abdi	- CCO – Gender
6.	Nicholas Omondi	- DCDI – Irrigation Department
7.	Sammy Kenei	- A.E – Irrigation Department
8.	Romlus Ochola	- A.E – Irrigation Department
9.	Barre Shabure	- CCO - Lands
10.	Samson Mulandi	- A.E – Irrigation Department
11.	Williab Habwe	- Assistant Director Communication

12. Jeremy Wachirah	- Chief Photographer
13. Hussein M. Alio	- CDC – NDMA
14. Adan Abdille	- CCO – Water
15. Abdullahi Maalim	- CCO – Energy
16. Farhiya Alinoor	- CCO – Youth
17. Rahma Abdullahi	- CCO – Public Health
18. Zhuleikha Osman	- CCO – Housing
19. Shamsi Mohammed	- CCO – Livestock
20. M. A. Omar	- CECM - Water
21. Abukar A. Sheikh	- CCO – Agriculture
22. Yussuf A. Abdille	- D. Director Agriculture
23. Lawrence K. Monoo	- SLPO – Livestock Department
24. Ahmed A. Adan	- Director – Water
25. Abdi A. Abdille	- D. Director Water
26. Maurice O. Amimo	- Physical Planner
27. Mohammed Omar	-Efficiency Monitoring Unit
28. Yahya Chenge	- A.E – Irrigation Department
29. Dr. Shamsa M. Haji	- CECM Gender
30. Sulekha Harun	- CECM Roads

6.2.9 Focused Group Discussions (FGDs)

There were FGDs and site visits with key informants to facilitate an in-depth analysis of key environmental and social issues. The persons and institutions consulted through this process included:

a) The Local Administration at district, Location and Sub-location levels;
b) Various Government Departments including Ministry of Agriculture; WRMA; Livestock
c) Development; KWS; Gender and Social Development; M.oW&I;
d) NGOs and CBOs with projects and programs in the project areas;
e) Local opinion leaders Elders and various women groups;
f) Local political leaders at ward level
g) Youth leaders

6.2.10 Survey of the Project Area

There was an organized tour of the project area with the farmers' committee leaders, local leaders; the areas chief and assistant to survey the proposed site and the rising main including identification of intake site. The purpose of the tour was to ensure that leaders and by extension the larger community clearly understood the project boundaries and to have a firsthand experience of the actual picture on the ground. The areas that are of socio-cultural significance such as private land were identified.

6.3 Project Acceptance

Majority of the community interviewed accept the proposed project within the community at 100%, with a larger percentage of the community (at 99%) being aware of the proposed project. The Proponents site various advantages for their support to the project, key among them

- **Food Security**

Due to the availability of water, the rate of agricultural production is meant to increase thereby availing more food to the residents.

- **Job Creation**
  There is meant to be increased employment opportunities to the local communities in the project activities and when the project is complete. This has the ripple effect of increasing the income potential to the residents and the resultant uplifting of the welfare of the local residents

- **Improved Crop Varieties**
  There is projected to be an increased variety of crops grown thereby increasing the yields to the local farmers.

- **Constant Water Supply**
  The community anticipates that there is going to be a regular supply of water even during the dry season thereby ensuring a constant supply of food and water. This goes a long way in ensuring effects of famine are tackled adequately.

In contrast those against the project site, cited;

- **Land repossession and acquisition**
  Members of the community are afraid that their land is going to be taken to pave way for the expansion of the project and that they are likely to be relocated.

- **Loss of grazing land**
  Some of the pastoral members of the community are afraid that there is going to be loss of pastures for their animals.

- **Introduction of labour intensive crops:**
  I**s** one of the concerns that may require much of the time to prepare and process.

- **iv Increased Human- Wildlife conflict:**
  Is feared due to increase of greenery inside the fenced farm attracting wildlife to their farms in search of food especially monkeys

7. PROJECT ALTERNATIVES

The EIA study should seek to consider possible alternatives of the inputs and outputs that are to be used throughout the project cycle. These inputs include alternative sites, activities, products, materials, technology and waste management procedures among others. The project report seeks to give a detailed description of the project area, technology, resources and other inputs that are to be put in place so as to promote the best working models that could be adopted to prevent injurious activities to the supporting resources. This study has therefore sought to identify and assess alternatives to the proposed developments so as to have the best working models that may not have adverse effects or those that have the least minimal effects. The best alternative is to be selected based on minimal negative impacts and through a cost benefit analysis. The "No Project" alternative model helps the Proponent and various decision making levels to approximate the impacts of project implementation against the non-implementation thereby making the right decision regarding project implementation. The following alternatives are probable in the project area.

7.1 Project site Alternatives

7.1.1 Current proposed project alternative

There is fast land in Mandera available for water pan construction and irrigation. This project can be considered to be more or less site specific. From the initial feasibility study report for the intake of the proposed canals, the intake sites are appropriate as they are located at a point near the land to be irrigated. Some of the factors that influenced the choice of the locations include the agro-climatic conditions of the area, the soils, water availability and the drainage system in the areas. These can be seen to be the most appropriate site locations for the activities because of close proximity to the sources of water to be used for these activities and for the convenience of the water sustainability and regeneration. The current site was selected based on the following:

- The area is dry with available perennial river Daua. This is the main consideration for the provision of irrigation water.
- It has a wide catchment area
- There is less farmland in the catchment, hence less silting is expected
- It is centrally located within the target project beneficiary
- The soils within are plastic and highly suitable for use as an embankment material
- The hard pan soil structure will reduce infiltration and seepage
- It is in a relatively gentle sloping terrain, hence less gravity water loading and thus, low risk of bursting

In view of these reasons, the site is ideal for the project.

7.1.2 No Project Alternative

This model helps the Proponent measure impacts from the project baseline information and helps in the assessment of impacts in regard to the project's activities. This alternative implies the project does not proceed thereby enhancing the status quo. The status of the environmental resources neither improves nor worsens since the state of the resources is not interfered with at all. However, project implementation could improve food security, increase household incomes and help to provide employment as well as upgrading the regional economy. The 'No Alternative' has various negative and possibly long term impacts to the region which include:

i. The local populations will continue to suffer from food scarcity due to lack of adequate harvests pushed by insufficient water for agricultural use and poor technology.

ii. There is projected to be reduced productivity and poverty.

Land remains in its state, water resource unutilized and community remain practicing rainfed irrigation system. Consequently:

- Loss in productivity of the land
- Increased economic activities that are detrimental to the environment such as charcoal burning
- Reduced capital gains from the land
- Increased demand for agricultural inputs such as fertilizer and pesticides so as to promote outputs.
- Increase poverty level
- Community faces food insecurity

The effects of adopting this model largely shows there will be huge losses to the local residents and the nation at large since the areas especially around Mandera provide the local markets and other nearby towns with much needed fruits and vegetables. The economic level of the project area is low and need to be improved so as to promote the fiscal outputs of the area. The 'No Project Alternative' is the least preferred option since the costs far much outweigh the benefits to be accrued.

7.1.3 The Comparison of Alternatives

Under the proposed development alternative, the project would enhance expansion of irrigation infrastructure and would provide employment both directly and indirectly to the Kenyan population in all phases. Once implemented, this project will not only ensure food sufficiency in the project area but to the whole country and also earn Kenya forex revenue from the export of surplus harvest. The design has been chosen after a careful cost benefit analysis (CBA) and in regard with the available budget and targeted irrigation area. It has also been made practical and aesthetically pleasing hence will improve the general outlook in the area. Under the No Action alternative, there would be no development at all, no impacts on the environment and serious losses to the project Proponent being the farmers, Irrigation Department and the government of Kenya and income, food sufficiency and employment losses to the general population including loss of forex income to the government. Alternative location is currently not viable as the project is site specific and this piece of land is ideal for this kind of investment due to spring water availability and land fertility. Provided that the Environmental Impact mitigation measures are implemented and sound construction measures adopted, negative effects on water, soil, air, and water systems will be avoided.

7.2 Water Abstraction Technology Alternatives

7.2.1 Water Acquisition Technology Alternatives

There are number of water acquisition technologies available. They include: rainwater harvesting, groundwater abstraction and stream water abstraction.

7.2.2 Rain Water Harvesting

There is a number of rainwater harvesting alternatives. These include: rooftop harvesting, runoff harvesting and floodwater harvesting. These are relatively cheap water acquisition technologies, very reliable and easy to use. The only limitation to these technologies is the availability of rainfall. Most part of the year is hot and dry. Thus, there's hardly any source of water to harvest. Hence, the rainwater harvesting alternative is not recommended.

7.2.3 River/Stream water Abstraction

The abstraction of river water requires a relatively reliable stream flow volume, good technology and financing. The project area being a dry area, most of the streams are seasonal and unreliable, but Daua river provides reliable water for irrigation. Hence, this technology is recommended.

7.2.4 Ground water Abstraction

This is one of the most reliable technologies especially in dry areas. The technology requires water abstraction through borehole drilling and digging of wells. However, the technology requires frequent replenishment of the abstracted water through infiltration of rainwater. This is not the case at the project site since the main source of replenishment is rainfall which is scarce and unreliable. Moreover, there are already many wells dug within the project region. Therefore, the technology is not recommended.

7.2.5 Water pan construction

Water pan construction involves putting an impervious wall across a river channel or scooping soil and building an embankment where water is inbounded on upstream. In either case, where concrete is the main material the water pan is called concrete water pan. Where soil usage is the main material it is called an earth water pan. Concrete water pan is relatively expensive than non-concrete water/earth pan. Hence, due to the limited finance, an earth water pan may too be recommended.

7.3 Alternative Irrigation Methods

There are several irrigation methods that can be used in the project area. There is an apparent need to choose the most appropriate method that will promote the effectiveness in the water conservation measures. There was a consideration of various methods that would be used in the areas so as to ensure water conservation measures are promoted. Some of the methods include: -

7.3.1 Sprinkler Irrigation

This kind of method is largely sustainable though prohibitive in terms of capital investments and especially when the project is large and diverse. The method saves water and fertilizer over surface irrigation. The pipes, tubing, and sprinkler forms sprinkler irrigation system. The main advantages are that Water application efficiency is high thereby heavily reducing water losses and that soil erosion is minimal.

7.3.2 Surface Irrigation

In this method, water flows to the land by gravity, the irrigation water must be available at higher grounds/ levels than the recommended fields. Water is diverted from the main source by the head works and supplied to the field through a network of conveyance and distribution canals or pipes. Water can be supplied directly to the fields using canals, sprinklers or indirectly from a storage reservoir. Storing water in a reservoir or dam allows for more area to be covered but it is more expensive due to the high construction cost of the reservoir. This method is rather convenient to the project area since the water is pumped from intakes to higher gravity to the areas water is needed.

7.3.3 Flood Irrigation

This is a form of gravity irrigation from a river without the need for an intake structure to divert the water. Seasonal rains raise the streams and rivers courses and the flow waters can be used by the farmers to irrigate their fields. Channels can be constructed to maintain the water in the fields for as long as possible, and as the flood recede the residual moisture, is used by the crop. Once the floods and residual moisture have been exhausted the farmer can make use of the shallow water table and construct shallow wells to lift the water by bucket for watering/irrigating the crops. However, the method could be prohibitive since it requires a significant amount of water to sustain thereby making it rather impracticable in these areas especially bearing in mind these areas are ASALs.

7.3.4 Drip Irrigation

This kind of method is largely sustainable though prohibitive in terms of capital investments and especially when the project is large and diverse. The method saves water and fertilizer by allowing water to drip slowly to the roots of plants, either onto the soil surface or directly onto the root zone, through a network of valves, pipes, tubing, and emitters. It is done through narrow tubes that deliver water directly to the base of the plant thereby avoiding all potential water losses. This method is very sustainable and water conserving though the capital investment and the distance becoming rather prohibitive. The main advantages are that Water application efficiency is high thereby heavily reducing water losses and that soil erosion is

minimized. However, the disadvantages that may hinder its implementation include;

It is highly expensive; the initial cost can be more than overhead systems,

Harsh weather conditions e.g. the sun can affect the tubes used for drip irrigation, shortening their usable life.

If the water is not properly filtered and the equipment not properly maintained, it can result to clogging.

Drip irrigation might be unsatisfactory if herbicides or top dressed fertilizers need sprinkler irrigation for activation thereby making them less effective.

From the above analysis, it is apparent that the drip irrigation is the most effective method when it comes to saving water. However, with the initial project costs that are estimated, it may become largely

7. DETAILED PROJECT IMPACTS AND MITIGATION

7.1 Noise and Vibration

7.1.1 Baseline Background

Introduction of new sources of noise to a previously dormant environment is an issue in areas where ambient noise levels have been low. This will be a short term impact that will end with the construction phase. There will be constant noise during construction especially from machinery and workforce. Intermittent noise may arise from maintenance activities and vehicles during the operation phase. It will also increase human settlement and commerce which will result in increased noise levels in the project area and areas hitherto relatively quiet.

7.1.2 Environmental Value requiring to be safeguarded

The sensitive receptors identified in close proximity to the Project include: -

- Wildlife habitats
- Pastures
- Residential areas
- Commercial centres including schools and hospitals

The key environmental values for the acoustic environment are outlined within *The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009* as follows:

PART II - GENERAL PROHIBITIONS

3. General Prohibitions.

(1) Except as otherwise provided in these Regulations, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

(3) Any person who contravenes the provisions of this Regulation commits an offence.

4. Excessive vibrations.

(1) Except as otherwise provided in these Regulations, no person shall-

(a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or

(b) Cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source;

(2) Any person who contravenes the provisions of this Regulation commits an offence.

5. Permissible noise levels.

No person shall make, continue or cause to be made or continued any noise in excess of the noise levels set in the First Schedule to these Regulations, unless such noise is reasonably necessary to the preservation of life, health, safety or property

Table 3: Maximum Permissible Noise Levels

Zone		Sound Level Limits dB (A)		Noise Rating Levels (NR)	
		(Leq, 14h)		(Leq, 14h)	
		Day	Night	Day	Night
A	Silent zone	40	35	30	25

B	Places of worship	40	35	30	25
C	Residential;indoor outdoor	45 50	35 35	35 40	25 25
D	Mixed residential	55	35	50	25
E	Commercial	60	35	55	25

Time Frame
Day: 6.01 a.m. – 8.00 p.m. (Leq, 14h)
Night 8.01 p.m. – 6.00 a.m. (Leq, 10h)

In the second schedule
Table 4: Maximum permissible noise levels for construction sites (measurement taken within the facility)

facility		*Maximum Noise Level Permitted (Leq)in dB (A)*	
		Day	*Night*
(i)	*Health facilities, educational institutions, homes for disabled*	*60*	*35*
(ii)	*Residential*	*60*	*35*
(iii)	*Areas other than those described in (i) and (ii) above*	*75*	*65*

Time Frame
Day: 6.01 a.m. – 6.00 p.m. (Leq, 12h)
Night 6.01 p.m. – 6.00 a.m. (Leq, 12h)

PART III- PROVISIONS RELATING TO NOISE FROM CERTAIN SOURCES

13. Construction at night.

(1) Except for the purposes specified in sub-Regulation (2) hereunder, no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations.

15. Environmental Impact Assessment.

Any person intending to carry out construction, demolition, mining or quarrying work shall, during the Environmental Impact Assessment studies-

(A) Identify natural resources, land uses or activities which may be affected by noise or excessive vibrations from the construction, demolition, mining or quarrying;

(b) Determine the measures which are needed in the plans and specifications to minimize or eliminate adverse construction, demolition, mining or quarrying noise or vibration impacts; and

(c) Incorporate the needed abatement measures in the plans and specifications.

These Regulations determine that no person or activity shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. In determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered:

- Time of the day;
- Proximity to residential area;
- Whether the noise is recurrent, intermittent or constant;
- The level and intensity of the noise;

- Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and,
- Whether the noise is subject to be controlled without unreasonable effort or expense to the person making the noise.

This regulation also relates noise to its vibration effects and seeks to ensure no harmful vibrations are caused by controlling the level of noise. Any person(s) intending to undertake activities in which noise suspected to be injurious or endangers the comfort, repose, health or safety of others and the environment must make an application to NEMA and acquire a license subject to payment of requisite fees and meeting the license conditions. Failure to comply with these regulations attracts a fine of KES 350,000 or 18 months jail term or both.

7.1.3 Potential Impacts on the Environmental Value

Impacts on this environmental quality will be short term lasting over the construction period. Likely sources will be:

7.1.3.1 Construction equipment

Potential noise and vibration impacts during construction will arise from construction equipment and activities, mainly occurring at the embankment, treatment works, pipeline alignment, quarries and borrow sites. These will be short term, most likely occurring during daytime. Noise impacts may also occur along roads and tracks used to bring materials and equipment to the Project. This type of noise will be short term and intermittent.

7.1.3.2 Workers' camps

There may be some noise associated with temporary and permanent construction camps but this is unlikely to cause any significant disturbance.

7.1.3.3 Operation Phase impacts

During operations, there will not be much noise except from maintenance activities. Wave action in the lake produces pleasant sounds especially at night. Such kind of noise is not normally taken to be a nuisance.

7.1.4 Environmental Protection Objectives

The mitigation measures proposed in the EMP in regard to environmental health and safety seek to ensure that personnel are protected from excessive noise and vibrations emanating from project activities through training on the importance of self-protection, provision of PPE and through regulated construction scheduling.

7.4 Performance Criteria

The noise criteria are as set out in the First and Second Schedule of the regulations.

Vibration performance criteria will be identified as vibration related impacts are likely during earthworks and at quarry sites. To ascertain noise levels expected during operations documented findings will be used. There are no established standard criteria relating noise and animal behavior. In past sound studies, sudden, novel sounds have a larger effect on behavior. Effects decline as animals become accustomed to sounds.

7.1.5 Control Strategies

7.1.5.1 Noise barriers

Noise mitigation may be achieved through a variety of measures that modify the noise source, noise path, or receiver characteristics. To be effective, noise barriers must be continuous, denoting some form of enclosure. However, for large construction sites noise barriers will not be economically practical and are not cost effective. Other noise mitigation measures aimed at reducing noise levels should be explored such as;

- Install portable barriers to shield compressors and other small stationary equipment where necessary;
- Use of quiet equipment (i.e. equipment designed with noise control elements);
- Limit pick-up trucks and other small equipment to a 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 personnel protective equipment; and
- Construct mainly during the day.

7.1.5.2 Attention sensitive receptors

Studies have shown that at least half the people living within 50m of either side of a site boundary are seriously concerned by construction nuisance in one form or another. Beyond 100m, less than 20% are concerned.

Noise exposure of the sensitive receptors should be assessed and the noise mitigation measures applied accordingly where possible.

Other remedial actions against construction noise may include:-

- ✓ Notify landholders of construction works in advance of commencement of works. Provide information on likely timing and duration of works and contact details of responsible persons in the event of questions or complaints;
- ✓ Notify landholders of any proposed blasting activities; and
- ✓ Notify landholders of any proposed night time construction works.
- ✓ The Selected Contractor to prepare for approval by RVWSB a Health Management Plan (HMP) detailing means to protect construction workers and third parties from excessive noise and vibrations that would adversely impact their health during the construction.

Other regulatory requirements as set out in the regulations:

Part IV- Provisions Relating To Licensing Procedures for Certain Activities

16. License.

(1). Where a sound source is planned, installed or intended to be installed or modified by any person in such a manner that such source shall create or is likely to emit noise or excessive vibrations, or otherwise fail to comply with the provisions of these Regulations, such person shall apply for a license to the Authority.

Generally, the residential and other neighborhoods who (would like to) derive value such as trade and employment opportunities and even rise in property value accruing to the micro-economic environment that the Project presents due to their close proximity, have to contend with the construction and operation noise. Simply said, the Project and associated noise should be looked at and seen as a “necessary evil”, a kind of symbiotic relationship between the natural and built environment.

7.1.6 Monitoring

Monitoring is a continuous undertaking to be done during construction and operation phases. Actions to be taken will include;

- Monitor if noise levels at sensitive receptors during day and night comply to those stipulated in the First & Second Schedules;
- Respond to any complaints arising in relation to noise.
- Conducting regular site audits to ensure that noise control measures are properly implemented.

7.2 AIR QUALITY

7.2.1 Baseline Background

Baseline carbon dioxide emissions are those stemming from the burning of fossil fuels from vehicles. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas. The landscape along the Project's Corridor of Influence (CoI) is rural with the majority of the existing sources of emissions derived from:

- Products of fuel combustion from vehicles and equipment; smoke from agricultural waste and pastureland burning;
- Wind erosion;
- Quarrying activities; and
- Vehicle movements on earth roads.

There may be sensitive receptors within 100m of the proposed project especially in the urban centers. In addition, farm workers and pastoralists may come within 50m of the project during construction.

7.2.2 Environmental Value requiring to be safeguarded

7.4.1 The Draft Air Quality Regulations, 2008

The relevant environmental values to be enhanced or protected are espoused in The Air Quality Regulations, 2008. These guidelines spell out qualities of the environment that are conducive to prevention, control and abatement of air pollution to ensure clean and healthy ambient air. It provides for the establishment of emission standards for various sources such as mobile sources (e.g. motor vehicles) and stationary sources (e.g. industries) as outlined in the Environmental Management and Coordination Act, 1999. It also covers any other air pollution source as may be determined by the Minister in consultation with the Authority. Emission limits for various areas and facilities have been set. The regulations provide the procedure for designating controlled areas, and the objectives of air quality management plans for these areas.

The objective of these Regulations is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The general prohibitions state that no person shall cause the emission of air pollutants listed under First Schedule (Priority air pollutants) to exceed the ambient air quality levels as required stipulated under the provisions of the Seventh Schedule (Emission limits for controlled and non-controlled facilities) and Second Schedule (Ambient air quality tolerance limits).

7.4.2 The Kyoto Protocol

Environmental values have not been set in relation to greenhouse gas emissions. Kenya is signatory to the Kyoto Protocol.

7.2.3 Potential Impacts on the Environmental Value

The project is likely to introduce air pollutants at its fixed facilities. Particulate matter, particularly in the repairable range of concern is dust.

7.2.3.1 Dust or Particulate Matter (PM)

The most common pollutant involved in fugitive emissions is dust or Particulate Matter (PM). This is released during certain operations, such as transport and open storage of solid materials, and from exposed soil surfaces, including unpaved roads.

Construction impacts relate largely to dust emissions from:

- Construction machinery
- Vehicle movements over unsealed surfaces; though these emissions from construction vehicles and equipment are not likely to contribute significantly to degradation of environmental values in relation to air quality.
- Exposure of soils to wind erosion.
- Wind erosion of open active areas.
- Material handling and temporary stockpiles;
- Spoil transportation; and
- Small concrete batching plant activity

7.2.3.2 Air emissions

Potential sources of air emissions from the construction and operation phase of the project include exhaust emissions from diesel powered equipment that contributes to health effects (especially cardiovascular) and global warming.

7.2.4 Environmental Protection Objectives

The mitigation measures proposed in the EMP especially during construction in regard to environmental health and safety seek to ensure that personnel are protected from excessive dust emanating from project activities through training on the importance of self-protection, provision of PPE and through introduction of measures that intercept transmission of dust and other air pollutants likely to be generated to sensitive receptors when it cannot be entirely avoided.

Environmental protection objectives include the following:

- To avoid impacts on human health and amenity arising from particulate emissions;
- To minimize dust emissions beyond 100 m of construction activities; and
- To minimize Greenhouse Gas Emissions.

7.2.5 Control Strategies

Controlling dust emissions and air quality that are likely to take place during construction phase of the proposed Project is useful in minimizing nuisance conditions. It is recommended that a standard set of feasible dust control and air quality measures be implemented for all construction activities. The Proponent is committed to implementing measures that shall reduce air quality impacts associated with construction. All personnel working on the Project will be trained prior to starting construction on methods for minimizing air quality impacts during construction. This means that construction

workers will be trained regarding the minimization of emissions during construction. Specific training will be focused on minimizing dust and exhaust gas emissions from heavy construction vehicles.

7.2.5.1 Dust or Particulate Matter (PM)

A large part of the project area, especially near the project receives rainfall for the better part of the year i.e. 9 months, this will assist in keeping dust levels manageable during construction.
In the rest of the areas dust emissions will be controlled by the following measures:

- Wetting all active construction areas as and when necessary to lay dust;
- Appropriately cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard;
- Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites; and
- Sweep when necessary (with physical sweepers) all paved access roads, parking areas and staging areas at construction sites.

7.2.5.2 Air emissions

The expectation is that emissions from these sources may well be within air quality criteria both in terms of in-air concentrations and dust deposition as well as the fact that residents of the project neighborhoods are most likely already exposed to diesel emissions at levels several times higher than that from the equipment.
The following practical measures shall be implemented during construction to minimize the exhaust emissions:

- The engine size of the construction equipment shall be the minimum practical size;
- The number of construction equipment operating simultaneously shall be minimised through efficient management practices;
- Construction equipment shall be maintained in tune per the manufacturers specifications;
- Vehicle idling time shall be minimized; and
- Equipment shall be properly tuned and maintained

Ideally, the both contractor and operator could explore the place of use of other forms of energy e.g., use of biodiesel in diesel engines like generators if feasible.
Overall, Climate, air quality and physical features are not predicted to be impacted upon significantly, other than in the short term and this can be mitigated against.

7.2.6 Monitoring

Emissions and air quality monitoring programs provide information that can be used to assess the effectiveness of emissions management strategies. The air quality monitoring program will consider the following elements:-

- Monitoring parameters: - The monitoring parameters selected should reflect the pollutants of concern associated with project processes.
- Baseline calculations: Before the project commences, baseline air quality monitoring at and in the vicinity of the alignment and key component sites should be undertaken to assess background levels of key pollutants, in order to differentiate between existing ambient conditions and project-related impacts.
- Monitoring type and frequency: - Data on emissions and ambient air quality generated through the monitoring program should be representative of the emissions discharged by the project over time.

- Monitoring locations: - Ambient air quality monitoring may consist of off-site or fence line monitoring either by the project sponsor, the competent government agency, or by collaboration between both.
- Sampling and analysis methods: - Monitoring programs should apply national or international methods for sample collection and analysis, such as those published by the International Organization for Standardization.

7.3 Water Resources Management and Quality

7.3.1 Baseline Background

Temperatures in Mandera are relatively very high with a minimum of 24^0C in July and a maximum of 42^0C in February. Rainfall is scanty and unpredictable averaging 255mm. The long rains fall in the months of April and May while the short rains fall in October and November. Most parts of the county experiences long hours (approximately 11 hours) of sunshine in a day. This causes high evaporation rates thus causing withering to most of the vegetation before maturity.

7.3.2 Environmental Value requiring to be safeguarded

The IWRM approach guided the preparation of this report. There was recognition of the water management principles, viz.

- Principle 1. Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
- Principle 2. Water development and management should be based on a participatory approach, involving users, planners and policymakers at all levels.
- Principle 3. Women play a central part in the provision, management and safeguarding of water.
- Principle 4. Water has an economic value in all its competing uses and should be recognized as an economic good as well as a social good.

The Water Act 2012 is the national legislation guiding IWRM in Kenya.

7.4.3 Water catchment management policies

The policy on water catchment management has been shaped over time by two Sessional Papers as listed below:

- Sessional paper No. 1 of 1968; and
- Kenya Forest Development Policy Sessional paper No. 9 of May 2005.

Sessional Paper No. 9 encourages the involvement of the private sector, communities and other stakeholders' participation in forest management in order to conserve water catchments areas and reduce poverty.

7.4.4 Environmental Management and Coordination (Water Quality) Regulations, 2006

These apply to water used for domestic, industrial, agricultural, and recreational purposes; water used for fisheries and wildlife purposes, and water used for any other purposes. Different standards apply to different modes of usage. These regulations provide for the protection of lakes, rivers, streams, springs, wells and other water sources.

Regulation 8 of these regulations provides for compliance with water quality standards. It states that "all operators and suppliers of treated water, containerized water and all water vendors shall comply with the relevant quality standards in force as may be prescribed by the relevant lead agencies".

Regulation 9 of these regulations provides for water quality monitoring. It states that the "Authority in consultation with the relevant lead agency, shall maintain water quality monitoring for sources of domestic water at least twice every calendar year and such monitoring records shall be in the prescribed form as set out in the second schedule to these regulations". Table below shows the quality standards for sources of domestic water.

Table 5: Quality standards for sources of domestic water.

Parameter	Guide Value (Maximum allowable)
pH	6.5 – 8.5
Suspended solids	30 (mg/l)
Nitrate – NO3	10 (mg/l)
Ammonia – NH3	0.5 (mg/l)
Nitrite – NO2	3 (mg/l)
Total dissolved solids	1200 (mg/l)
Ecoli	Nil/100ml
Fluoride	1.5 (mg/l)
Phenols	Nil (mg/l)
Arsenic	0.01 (mg/l)
Cadmium	0.01 (mg/l)
Lead	0.05 (mg/l)
Selenium	0.01 (mg/l)
Copper	0.05 (mg/l)
Zinc	1.5 (mg/l)
Alkyl benzyl sulphonates	0.5 (mg/l)
Permanganate Value (PV)	1.0 (mg/l)

Everyone is required to refrain from any actions, which directly or indirectly cause water pollution, whether or not the water resource was polluted before the enactment of the Environmental Management and Coordination Act (*EMCA*) gazetted in 1999. It is an offence to contravene the provisions of these regulations with a fine not exceeding five hundred thousand shillings.

According to these regulations, "Every person shall refrain from any action which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of the Act".

7.3.3 Potential Impacts on the Environmental Value

7.3.3.1 Water quality

There will be deterioration in water quality in downstream reaches of the stream. During construction, waste in form of rubble and other forms may cause pollution to water quality that can affect downstream users.

The reservoir's water quality in the long run will be threatened by land use activities like farming, water extraction, and any industrial activities in the upstream area.

New developments will provide substantial additional sources of polluted runoff or otherwise substantially degrade water quality in the project area. Construction water use may introduce excess pressure on scarce water resources especially in the drier season.
Potential sources of water pollution include site runoff and drainage from construction activities in the camps, effluent from general construction activities and sewage effluent from the construction workforce.

7.3.3.2 Disruption of riverine fisheries

The project could lead to disruption of riverine fisheries downstream due to changes in water flow, blockage of fish migration and changes in water quality and limnological conditions.

7.3.3.3 Pollutants from water abstraction

Discharges containing grease or oil from the pumping systems may render the potable water useless, interfere with aquatic ecosystems, and present extra problems of removal in water treatment processes.

7.3.3.4 Increased Run-off

The new developments will substantially alter the existing drainage pattern of the site or area. The paving of the parking and roads in the water treatment plant will increase the rate or amount of surface runoff in a manner which would result in flooding on- and offsite given that the area has not been developed to handle more than the natural runoff. This could result in soil erosion.

7.3.3.5 Wastewater flows

Wastewater flow will increase after the increase of potable water supply. New wastewater treatment plants may be required to provide for full wastewater treatment capacity including wastewater to be generated from the project.

7.3.3.6 Sedimentation in the reservoir

Indeed, the major long term effect on water supply is a positive one in that the development project benefits the population, reduces levels of leakage, improves efficiency of supply, increases coverage, enables and sustains development and thus improves the economy to the benefit of the people.

7.3.4 Environmental Protection Objectives

The mitigation measures proposed in the ESMP in regard to surface and ground water seek to ensure that water quality standards as stipulated in *EMCA, Water Quality Regulations (2006)* are protected through:-

- Avoiding degradation of water quality due to construction or operation of the Project; i.e. Discharges of process wastewater, sanitary wastewater, wastewater from any operations or storm water to surface water should not result in contaminant concentrations in excess of local ambient water quality criteria or, in the absence of local criteria, other sources of ambient water quality.
- Avoiding impacts on other water users arising from construction or operation of the Project; and
- Minimizing alteration to catchment hydrology, including localized drainage patterns.

7.3.5 Control Strategies

7.3.5.1 Catchment Conservation

The Proponent will be paying water abstraction fees to the Water Resources Management Authority (WARMA). A certain percent of this fee will go to the Catchment Area Advisory Committee (CAAC) to help in catchment conservation. This will in turn help improve water quality and quantities flowing into the reservoir.

7.3.5.2 Pollutants control

The impact of the oils can only be felt if the levels exceed some maximum contaminant levels anticipated in the regulations. These levels have been set at Nil in the WQR meaning the oils and greases should not be in the detectable range. The oiled and greased moving parts of the pumping systems should be contained in a chamber such that oils and greases do not leak into the blades that are in contact with water. In this way, water passing through the turbines will have no oils and greases hence proceeds to the treatment works for conventional treatment.

7.3.5.3 Runoff control

If polluted, it can be treated in septic tanks before release. Proper channels will be constructed to handle excess runoff to prevent soil erosion.

7.3.5.4 Sedimentation control

- Hydraulic removal of sediment (flushing, sluicing, release of density currents)
- Increase frequency of releases when sediment load of inflowing water increases.
- Ensure catchment protection and watershed management Control land use in watershed, prescribed distances of fields in relation to the project

7.3.6 Monitoring

For the purposes of managing project impacts, the water quality objectives include protection of dissolved oxygen levels in the waters, the turbidity and pH levels among other parameters. These parameters will be monitored on a regular basis. Compliance with the regulations providing for integrated water resources management will be monitored through the respective agencies.

7.4 Waste Management

7.4.1 Baseline Background

Waste management refers to:

- Solid Waste Management
- Hazardous wastes and
- Liquid wastes

Waste generation under the baseline conditions emanates from: -

- Typical domestic waste - generated from adjacent residences and farms
- Vegetation- dead and dried up vegetation

Since the communities are rural and lack basic amenities with no good water supply, there is a general absence of standard toilets (with flush system). The people use pit latrines and/or bush to discharge their excreta. They bury their dead ones on their parcels of land.

7.4.2 Environmental Value requiring to be safeguarded

The *Waste Management Regulations, 2006* aim to protect human health and the environment by streamlining the handling, transportation and disposal of various types of waste. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source. The regulations have classified various types of waste and recommended appropriate disposal methods for each waste type.

The regulation requires licensing of transporters of wastes and operators of disposal site (sections 7 and 10 respectively). In section 14 (1) every trade or industrial undertaking is obliged to install anti-pollution equipment for the treatment of waste emanating from such trade or industrial undertaking. The Developer shall ensure that the garbage collector contracted has a valid license from the National Environment Management Authority (NEMA).

The *Public Health Act (Cap. 242),* in Part IX Section 8 & 9 states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Any noxious matter or waste water flowing or discharged into a water course is deemed as a nuisance. Part Xll Section 136 states that all collections of water, sewage, rubbish, refuse and other fluids which permits or facilitates the breeding or multiplication of pests shall be deemed nuisances The Act addresses matters of sanitation, hygiene and general environmental health and safety. These provisions should be adhered to especially during the construction stage of the project. Appropriate mitigation measures should be instituted to comply with these requirements.

7.4.3 Potential Impacts on the Environmental Value

Waste generation for the construction and operation phases of the Project may arise from:

7.4.3.1 Vegetation clearing and transportation,

There will be some cutting down trees especially in the zone of inundation and pipeline through the forest.

7.4.3.2 Typical construction wastes

Huge effort is required to remove all the garbage, including packaging, surplus construction materials such as timber, concrete, gravel, metals and plastics, broken equipment, dilapidated buildings and miscellaneous debris that heap near the workers' camps. If all these are left behind without being cleaned up, the environment would be projectaged.

7.4.3.3 Surplus spoil from earthworks and drainage construction,

Whereas most spoil from excavations may be of reusable quality, disposal of the rest will pose a major problem

7.4.3.4 Typical domestic waste

New problems arise as it's difficult to remove refuse that inevitably collects wherever modern man sets up shop, even temporary shop. It will be generated from occupation of workers' camps, staff houses and offices.

Litter and fly-tipping is a serious problem that besides looking bad, also affects safety on the project and therefore ought to be prevented. Litter can attract rats which can chew on cables, leading to signal failures, delays and even accidents. It can clog water intake points leading to spillages and losses.
The Contractor(s) will probably remove their own equipment, but it's unlikely for them to take responsibility for the informal settlements that will emerge along the pipeline, selling meals and other services to construction workers and also truck drivers.

7.4.3.5 Wastewater

The operations phase may generate sanitary wastewater primarily from staff and visitors.

7.4.4 Environmental Protection Objectives

The *Waste Management Regulations, 2006* states the life, health and wellbeing of people as a chief environmental value in relation to waste management. This value is relevant to the Project as its alignment covers settled areas, areas of ecological value and areas of productive agricultural land. The Project is likely to introduce hazardous waste generation, industrial wastewater and storm water at its fixed facilities.

7.5 Performance criteria

The following performance criteria are proposed for waste management: All waste materials are handled and stored in a safe and appropriate manner; there is no environmental impact on, and disturbance to, the surrounding environment from waste; the construction equipment is maintained in a clean and tidy manner; and no waste is to be disposed of in the marine or terrestrial environment or incinerated.

7.4.5 Control Strategies

7.4.5.1 Sustainable use of resources

Environmental sustainability concerning the use of resources relates to two main issues – to reduce the consumption of resources and to adopt recyclable materials where possible. Water systems comprise significant amount of structures and mechanical fittings. Design of these systems should take into consideration the optimization of the size of the structures to reduce the volume of concrete and other construction materials used and the volume of soil to be disposed. As far as recycling is concerned, the Proponent/contractor should apply the concept of 'sustainable procurement' which involves a life-cycle thinking of an asset. The costs of products should take into account the full costs of their production, their use and their scrappage. This life-cycle thinking relates to the consideration of supply chain impacts and the social and environmental responsibility of contractors when selecting materials for construction and operation. For instance, it would be desirable if certain components of a system could be recycled or reused at the time of asset replacement. Extensive application of such strategy could result in significant reduction of waste emanating from the installation.

7.4.5.2 Handling of cleared vegetation and transportation,

Minimize vegetation clearing where possible. Ensure vegetation materials are mulched and used onsite for rehabilitation and vegetation works. Ensure larger vegetation materials such as hollow logs and hollow bearing trees are stockpiled for use in rehabilitation activities or placed in adjoining bush land.

7.4.5.3 Construction waste management

- Ensure detailed design and specifications are undertaken so as to minimize the generation of waste during construction and the durability of materials is considered
- Locate material and stockpiling areas within the construction corridor until its ultimate destination is determined. Appropriately manage stockpile areas and storage areas
- Dispose non-recyclable construction materials at a licensed waste facility and avoid fly-tipping. Ensure used furniture and equipment from decommissioning is sold off/reused or donated to charity where possible. Otherwise dispose of at an appropriately licensed landfill. Recycle steel off cuts or scrap or send it to scrap metal recycler
- Recycle any ballast that cannot be reused as ballast and remove excess ballast and clean fill off site for reuse, as possible

7.4.5.4 Spoil from earthworks

Where safe and feasible, reuse spoil onsite as backfill or as non-load bearing fill. Transport any surplus spoil that cannot be reused off-site to an approved landfill site or to borrow pits

7.4.5.5 Sludge and related waste disposal

Store all chemicals, used oils, oily rags, solvents, lubricants and fuel in covered and banded areas.

7.4.5.6 Domestic waste disposal

- After the construction of the Project is over, all little informal settlements have no reason to stay, and local authorities have to take responsibility for this.
- Ensure garbage is removed by an appropriate licensed contractor
- Set up designated waste transfer areas
- Store recyclable waste separately from residual/non-recyclable waste
- Provide recycling bins around workers' camps, site offices and amenities

7.4.5.7 Wastewater disposal

There will be septic tanks for disposal of wastewater from project staff housing. Besides it will introduce a culture of proper sanitary practices especially in the project area.

7.4.5.8 Reservoirs safety

Clean up any litter on the water pan and land facilities and quickly act to remove litter which could affect operational safety.

7.4.6 Monitoring

The following monitoring procedures are proposed for the construction and operation phases of the Project:

- Inspect waste storage areas on a weekly basis to make sure that wastes are being stored properly
- Maintain a waste register for all hazardous wastes and operation wastes. Review register monthly to identify any dramatic changes in waste generation patterns and possible opportunities for waste minimization.

7.5 Terrestrial Ecology

7.5.1 Baseline Background

Terrestrial ecological values include:

- Bird species
- Plant species,
- Amphibians
- Reptiles
- Mammals

There are two ecological zones in the county: Arid and semi-arid. Ninety-five per cent of the county is semi-arid with dense vegetation mainly thorny shrubs and bushes along foots of isolated hills and *mathenge* trees along gullies.

Mandera has an area of *25,991.5 km².* Most of the land is rangeland supporting livestock production. Availability of water is the critical factor for agricultural production hence the concentration of crop production along ***River Daua*** and other places with *laggas* where water collects.

In the context of agricultural production land suitability for crop production is limited to availability of water hence the concentration of crop production activities along river Daua and other places with laggas where water settles. Generally, the soils in most parts of the county are fertile since they have not been exploited. There are a few areas with soil salinity and sodicity where arable crop production cannot be practiced

7.5.2 Environmental Value requiring to be safeguarded

Projects can disrupt local ecosystems in irreparable ways. Some national policies and regulations in place include;

7.5.1 Conservation of Biological Diversity Regulations, 2006

Part II of this regulation states that a person may not engage in any activity that may have an adverse impact in the environment without conducting an Environmental Impact Assessment. The Environmental Management and Co-Ordination (Conservation of Biological Diversity and Resources, Access To Genetic Resources And Benefit Sharing) Regulations, 2006, Part II Conservation of Biological Diversity stipulates as follows:-

4. Environmental Impact Assessment Licence.

(1) A person shall not engage in any activity that may-

(a) Have an adverse impact on any ecosystem;

(b) Lead to the introduction of any exotic species;

(c) Lead to unsustainable use of natural resources, without an Environmental Impact Assessment License issued by the Authority under the Act.

7.5.2 The Wildlife Act

The Wildlife Bill, 2011 Part VIII, on Protection of Endangered and Threatened Ecosystems and Species, on Endangered and threatened ecosystems spells out the need and the means to safeguarding endangered species as follows: -

- 53-Protection of endangered and threatened ecosystems
- 54-Listing of endangered and threatened species
- 55-Restricted activities involving listed species
- 56-Recovery plans
- 57-Control of invasive species

7.5.3 The Forest Act, 2005

Section 40 (1) states that:
"Where the Board is satisfied that utilization of a forest can be done through the granting of concessions, the Service may, by license, grant the same subject to an Environmental Impact Assessment License in accordance with the Environmental Management and Co-ordination Act, 1999."

7.5.3 Potential Impacts on the Environmental Value

7.5.3.1 Removal or relocation of trees and vegetation

Potential environmental impacts associated with clearing include: removal of trees, shrubs and wildlife habitat, changes to soil water, temperature and fertility in adjacent areas, erosion and fire hazards due to slash stockpiling. Construction will result in removal or relocation of trees and vegetation along the project site. These impacts are temporary. The topsoil will be preserved and original vegetation will be recovered or replanted after construction. No significant adverse impacts will be imposed on the local terrestrial environment.

7.5.3.2 Habitat Fragmentation

The construction and maintenance of pipeline wayleave may result in alteration and disruption to habitats. Habitat alteration may include fragmentation of habitat; loss of nesting sites and other wildlife habitat through bush clearing; disruption of watercourses; creation of barriers to wildlife movement; and visual and auditory disturbance due to the presence of machinery, construction workers, and associated equipment.

7.5.3.3 Introduction/loss of Species

Generally, animals are less affected by construction activities than plants.
Establishment of non-native invasive plant species e.g. *Prosopis Juliflora* (*Mathenge*).
Introduction of invasive animal species in the ecosystems e.g. the black eagle, the Nile Perch, clearing activities will affect animals such as rabbits, *dik dik* and birds.

7.5.5.4 Soil erosion

Activities such as bush clearing, removal of top soil, excavation and mass haulage will expose the land to elements of erosion such as wind and water and thus will trigger the process of land degradation.

7.5.5.5 Hazards to Life

Introduced fire hazards – the wayleave within the habitat is vulnerable to forest fires during construction especially from fuel spills.

7.5.6 Environmental Protection Objectives

The main objective is to ensure minimal impact upon terrestrial flora and fauna from the construction and operation of the Project. Protection of these endangered and threatened flora and fauna species is crucial to securing livelihoods and to consequently reducing poverty levels—which is currently high in order to attain social equity at the scale anticipated by the social pillar of Vision 2030.

7.5.7 Control Strategies

7.5.3.1 Habitat conservation

Avoid fragmentation or destruction of critical terrestrial and aquatic habitats by siting pipelines, yards, support facilities, and maintenance roads to avoid such locations or by utilizing existing transport corridors whenever possible. Where fragmentation of critical habitats cannot be avoided, maximize the availability of animal crossings.

7.5.3.2 Invasive/Loss of species

- Employ an ecologist or a qualified fauna spotter to accompany clearing of woody vegetation during set out;
- Develop a flora and fauna species relocation plan particularly for threatened species;
- Restrict the extent of clearing to the minimal amount necessary particularly in locations containing endangered plant and animal species;
- Map and clearly mark on the ground the locations of populations of species of conservation significance;
-

7.5.3.3 Erosion Control

The various methods used in erosion control are collectively called upstream engineering. They consist of soil conservation measures such as reforestation, check-project construction, planting of burned-over areas, contour plowing, and regulation of crop and grazing practices. Also included are measures for proper treatment of high embankments and cuts and stabilization of stream banks by planting or by revetment construction.

One phase of reforestation that may be applied near a reservoir is planting of vegetation screens. Such screens, planted on the flats adjacent to the normal stream channel at the head of a reservoir, reduce the velocity of silt-laden storm inflows that inundate these areas. This stilling action causes extensive deposition to occur before the silt reaches the main cavity of the reservoir. Use of vegetation screens, debris barriers, or desilting basins above a reservoir should be planned with future development in mind. For instance, if the project is raised at a later date, the accumulated silt in this area would detract from the added storage that might otherwise have been obtained.

7.5.3.4 Afforestation and reforestation

Promote tree planting using KFS, CBOs and campaigns. Ways to achieve this include
Clearly identify the extent of areas to be cleared and those that must not be cleared or project based on construction plans and in the field;

7.5.3.5 Climatic modifications

The introduction of a large body of water into a relatively enclosed upland is likely to substantially increase humidity and may have an advantageous effect on forest growth and agriculture. It has not been possible in this preliminary assessment to substantiate or quantify this impact.

7.5.3.6 Vegetation protection

- Erect temporary fencing around the construction zones in accordance with an approved site management plan;
- Right-of-way boundaries and sensitive areas shall be clearly marked with flagging tape prior to clearing.
- Right-of-way clearing will be limited to the area required for construction, operation and maintenance of temporary diversion routes and permanent alignment.

7.5.3.7 Hazards to life

If any pits/trenches are to remain open after daily site works have completed, ensure they are securely covered by an impenetrable barrier,

7.5.3.8 Forest Fires

Monitor wayleave vegetation according to fire risk; remove blow down and other high-hazard fuel accumulations; time thinning, slashing, and other maintenance activities to avoid seasons when the risk of forest fires is high;

7.5.4 Monitoring

Implement regular monitoring of:

- Pest species and weeds;
- Fauna strike and mortality during construction and operation and

For areas of the site that are to be rehabilitated, a photographic record will be prepared by the contractor prior to construction commencing.

This will be used as a baseline against which to measure the success of rehabilitation; conduct monthly audits of the proposed management plans for the construction period and recommend adaptive management for weed invasions in habitats adjacent to the project corridor; and on completion of the construction works, monthly visual inspections of the rehabilitated areas will be carried out for a period of 12 months.

7.6 Aquatic Ecology

7.5.1 Baseline Background

The main water resources in the county are river (River Daua), ponds, streams, earth pans, boreholes with pump, protected dug wells and unprotected dug wells. The quality of the water from these resources is poor and residents are advised to treat it before use. There is one main water supply scheme namely Mandera Water and Sewerage Company that serves Mandera town and its environs. The average distance to the nearest water point is 25Kms. The distance reduces in rural areas during rainy seasons and vice versa. Presence of piped water in the constituency headquarters shortens the distance considerably.

7.5.2 Potential Impacts on the Environmental Value

7.6.1.1 Habitat alteration and fragmentation

- Disruption of riverine fisheries downstream due to changes in water flow, blockage of fish migration and changes in water quality and limnological conditions.

7.6.1.2 New species

Opportunistic growth of aquatic macrophytes in the littoral and sub-littoral zone of the reservoir. Increase in abundance and diversity of introduced species

7.6.1.3 Eutrophication

Current Land-use patterns and future changes and development activities in the watershed can accelerate the discharge of sediment and nutrients to impoundments, speeding up the eutrophication process and creating nuisance conditions because of excessive aquatic weed and algae growth.

The reservoir is planned to sit on a farming dependent region. Even the catchment area is heavily agricultural and with the farmers using fertilizers. Eutrophication of reservoir water also reduces the oxygen content of the water downstream.

7.6.1.4 Disease-insect vectors

Creation of favorable habitats for the growth and proliferation of disease vectors

7.6.1.5 Water quality

Alterations in the flow of water and changes in water quality during the construction of the project.

7.5.3 Environmental Protection Objectives

The main objective is to ensure minimal impact upon aquatic flora and fauna from the construction and operation of the Project.

7.5.4 Control Strategies

7.6.1.6 Monitor the presence of disease vectors

- Contribute to strengthening of local health facilities through public enlightenment
- Contribute public health programmes to eradicate / protect against malaria, Schistosomiasis &, etc.

7.6.1.7 Monitor and remove foreign species

- Monitor for any unusual floral species
- Remove such species when seen.

7.6.1.8 Control Water quality deterioration

- Adequately divert the river away from construction areas
- Ensure good practices
- If the quality of the water has deteriorated or if their presence is suspected, relevant and competent authorities shall determine the concentrations of pesticides, heavy metals, cyanides, nitrates, and phosphates. If the water shows a tendency toward eutrophication, relevant authorities shall check for ammonia and total nitrogen.
- Ensure in-stream flows are maintained via a flow diversion system

7.7 Land Management

7.7.1 Baseline Background

Land is the most important resource in agricultural production. Mandera County has an area of 25,991.5 km2 .Most of the land is rangeland supporting livestock production. In the context of agricultural production land suitability for crop production is limited to availability of water hence the concentration of crop production activities along river Daua and other places with laggas where water settles. Generally the soils in most parts of the county are fertile since they have not been exploited. There are a few areas with soil salinity and sodicity where arable crop production cannot be practised. Under irrigation 4000ha is exploited but the potential area is 15,000-20,000ha whereas under rainfed agriculture the exploited area is very low considering that reliability of rainfall is below 30%. There is need to focus on increasing area under irrigation by developing irrigation infrastructure and exploiting groundwater sources. There is also need for sustainable land use practices and environmental conservation in the county.

7.7.2 Environmental Value requiring to be safeguarded

7.6.2 Land Use in Economic Production

The chosen site still minimizes the loss of agricultural land. Although the land lost constitutes a relatively small part of the total area, it nevertheless provides livelihoods for about 3000 local inhabitants. Given the scale of the loss and the value of the resource, this adverse impact is considered significant.

This loss can be directly mitigated given the availability of cultivable land in the area surrounding the reservoir that will be put under irrigation. The present inhabitants can be resettled in the same area and provided with land of comparable size and quality.

In terms of overall agricultural productivity, it is anticipated that there will be some gains in terms of increased cropping on the downstream of the project assisted by the augmented flows in the dry season. This will affect subsistence farming. Environmental Value requiring to be safeguarded.

7.6.3 Constitution of Kenya,

The Constitution of Kenya, The provisions of Chapter IV protects citizens from deprivation of property. No property of any description shall be compulsorily taken possession of, and no interest in or right over property of any description shall be compulsorily acquired, except where it is necessary for public interest.

7.6.4 Land Registration Act, 2012

The **Land Registration Act, 2012** is an Act of Parliament to revise, consolidate and rationalize the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes. This Act repeals; The Indian Transfer of Property Act 1882, The Government Lands Act, (Cap 280), The Registration of Titles Act, (Cap 281), The Land Titles Act, (Cap 282) and The Registered Land Act (Cap 300).

7.6.5 Land Act, 2012

The **Land Act, 2012** is Act of Parliament to give effect to Article 68 of the constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land based resources, and for connected purposes. This Act repeals; The Wayleaves Act, Cap 292 and The Land Acquisition Act, Cap 295.

The *Land Act, 2012* and the *Land Registration Act, 2012* make major changes to the substantive and procedural law respectively relating to land in Kenya. The two statutes have a major impact on contracts relating to land, charges, transfers and leases. There are changes to the law on creation of charges over land and the realization of such charges.

Section 3(1) of the *Land Act, 2012* provides that the Act shall apply to all land declared as:

- Public land under Article 62 of the Constitution;
- Private land under Article 64 of the Constitution; and
- Community land under Article 63 of the Constitution and any other written law relating to community land.

Section 4 sets out values and principles of land management and administration which are binding on and are to be adhered to by all state organs, state officers, public officers and all persons whenever any of them enacts, applies or interprets any provisions of the LA or makes or implements public policy decisions. These values and principles are:

- Equitable access to land;
- Security of land rights;
- Sustainable and productive management of land resources;
- Transparent and cost effective administration of land;
- Conservation and protection of ecologically sensitive areas;
- Elimination of gender discrimination in law, customs and practices related to land and property in land;
- Encouragement of communities to settle land disputes through recognized local community initiatives;
- Participation, accountability and democratic decision making within communities, the public and the Government;
- Technical and financial sustainability;
- affording equal opportunities to members of all ethnic groups;
- non-discrimination and protection of the marginalized;
- democracy, inclusiveness and participation of the people; and
- alternative dispute resolution mechanisms in land dispute handling and management.

In section 5, the Land Act 2012 recognizes the following forms of land tenure:

- freehold;
- leasehold;
- such forms of partial interest as may be defined in the Act or other law, including but not limited to easements; and
- Customary land rights, where consistent with the Constitution.

Section 7 provides that title to land may be acquired through:

- Allocation (―allocation is vaguely defined in section 2 as ―the legal process of granting rights to land);
- Land adjudication process;
- Compulsory acquisition;
- Prescription;
- Settlement programs;
- Transmissions;
- Transfers;
- long term leases exceeding twenty one years created out of private land; or
- Any other manner prescribed in an Act of Parliament.

Thus where land is to be acquired, full compensation shall be paid promptly to all persons affected along the following parameters:

- Area of land acquired;
- Property value after valuation by the Land Commission
- Amount of the compensation payable;
- Market value of the property;
- Projectages sustained from the severance of the land parcel from the land;
- Projectages to other property in the process of acquiring the said land parcel;
- Consequences of changing residence or place of business by the land owners; and
- Projectages from diminution of profits of the land acquired.

7.6.6 The Roads Act, 2007

The Kenya National Highways Authority (KeNHA), a parastatals currently in category PC 3A was set up under the Roads Act, 2007 and charged with the mandate to manage, develop, rehabilitate and maintain national roads and is an equal opportunity employer. The project will have to liaise with the KeNHA where pipeline has to cross or utilize road reserve on the B1and A104 roads – procure the specified licenses.

7.6.7 Physical Planning Act (CAP 286),

Under the Physical Planning Act (CAP 286), physical development activities are supposed to be carried out according to the physical plans. Accordingly, the processes of physical planning involve two stages; the plan making stage and the development control stage. The former involves drawing up the actual plan to indicate the various activities and zones whereas the later involves the process of determining applications by developers to carry out specific development activities. The planning of human settlements along the pipeline route requires enforcement of pipeline reserve standards, especially the width among others. These issues should be taken into account in the design of the project.

7.6.8 The Forest Act, 2005

Section 40 (1) states that:

"Where the Board is satisfied that utilization of a forest can be done through the granting of concessions, the Service may, by licence, grant the same subject to an Environmental Impact Assessment Licence in accordance with the Environmental Management and Co-ordination Act, 1999."

Further, it states in Section 40 (2) that:

"the grantee of a concession shall –

(a) Comply with the guidelines or management plans prescribed by the Service;
(b) Protect the concession area from destruction and encroachment by other persons;
(c) Ensure that the forest areas under his management are maintained for the conservation of biodiversity, cultural or recreational use;
(d) Maintain the physical boundaries of the concession;
(e) Take precautions to prevent the occurrence and spread of forest fires in connection with any or all operations within or outside the concession area; ensure that all structures and facilities constructed or operated by and in connection with any activities are maintained according to the conditions of the license; "
Section 40 (4) of the Act states that:
"The Board may withdraw a concession granted under this section where a grantee breaches any of the conditions prescribed under subsection (2')"

7.7.3 Potential Impacts on the Environmental Value

7.6.8.1 Scenic views and vistas

The creation of the project will create scenic views that areas of such terrain hardly ever command. This will add to the aesthetics of the area.

7.6.8.2 Parks and reserves

The project can also be used for multiple purposes including recreation since there is a forest nearby. Activities like water sports can be introduced to the benefit of the community.

7.6.8.3 Loss of control / income of land

A significant impact is the land-take with the potential to disorganize tracts land some containing dense human settlements all along the pipeline route and in the project area. The project may require land-take of land under private tenure, public or community tenure, trust land or land under the jurisdiction of local authorities
This will trigger massive demand for compensation all along the SGR route.
Also, this will trigger associated social impacts

7.6.8.4 Earthwork Impacts

Loss of vegetation in land clearing for the camps, roads, borrow areas and associated facilities will alter the topography and introduce not-so-pleasant views.

7.6.8.5 Gender disparity in the adverse effects of land-take

There will be need to watch out for marginalized groups in society who are in custody of family sources of livelihood such as widows and orphans.

7.7.4 Environmental Protection Objectives

- Minimize impacts on land based resources including good agricultural soils, agricultural productivity and pastureland and wildlife reserves
- Avoid environmental harm and reduced soil productivity arising from release of sediments, salinization of soil, disturbance of contaminated soils and contamination of soils
- Minimize topographic and drainage changes minimize disruption to infrastructure
- Avoid accidental projectage to existing infrastructure and services
- Protect soil resources such that rehabilitation is successful.

7.7.5 Control Strategies

7.6.8.6 Resettlement Action Planning

This process will lead to identification of the Persons Affected by the Project (PAPs) throughout the project site. It will identify what each PAP is entitled to be it compensation for loss of land or loss of livelihood. Land acquisition will need to be done before the contractor goes to site. It will involve;

- Formulating a detailed Resettlement Action Plan (RAP) process.
- Identify and list all the Project Affected People (PAP) by type of losses and extent of project stages in an Entitlement Matrix.
- Consult Affected Persons (AP's) on, and offer choices among technically and economically feasible resettlement alternatives.
- Compensate those affected according to the official market rates.
- Provide allowances and other assistance to make a smooth transition after displacement.
- Implement an institutional structure or a mechanism for monitoring and evaluating the compensation/resettlement process.

7.6.8.7 Restoration of land

Depending on the planned future use for the site and the size of the excavation, pits and quarries to be backfilled with clean mineral soil or granular material, levelled or sloped and if necessary re-vegetated. They can also be used as pan for watering the animals. Reclamation plans shall be forwarded to NEMA or the Engineer.

7.6.8.8 Construction camps

- The first choice for selecting a site for the construction camp shall be previously cleared sites or natural openings. This will minimize unnecessary clearing.
- Upon decommissioning construction camps and project management offices should be decommissioned such that they will be beneficial to the community

7.6.8.9 Gender considerations

- Gender equity in compensation both at work and in resettlement.
- Ensure payment is to affected women especially the vulnerable ones such as widows or orphans because relatives like oppressing them.

7.6.8.10 Resource Renewal reforestation

Undertake rehabilitation planting where possible to replace vegetation that provided screening to adjacent sensitive visual receptors; and in conjunction with the forests agency replant indigenous species cut down. Retain erosion and sediment control devices until rehabilitation success (80% cover) has been achieved.

7.6.8.11 Soil Contamination management

- If contaminated land is identified further investigate and develop a remediation plan;
- Develop appropriate management and disposal methods for contaminated soils and other materials;
- Dispose of contaminated soils to authorized facilities on-site or off-site in accordance with disposal permits;

- Design fuel, oil and chemical storage areas in accordance with Kenyan Standards;

7.6.8.12 Erosion and control and terracing

- If dispersive soils are necessary to be incorporated as construction material, undertake appropriate treatment of the soil first;
- Undertake appropriate measures required to stabilize the soil moisture content of shrink and swell soils;
- Manage works during the wet season and erosive rainfall events bearing in mind that mud slips can occur and can be hazardous.
- Appropriately manage works and avoid increasing the risk of erosion;
- Manage soils that are at risk of becoming waterlogged;
- Manage acidic and alkaline soils;
- Rehabilitate disturbed areas once construction is completed;
- Develop and implement erosion and sediment control management plan;

7.7.6 Monitoring

- Have an institutional set-up or outsource monitoring of the implementation of the RAP.
- Check that design requirements have been met
- Monitor rehabilitation success through weekly inspections in the first four weeks after seeding, and then monthly until 80% cover has been achieved; Inspect fuel storage areas weekly and clean up and repair any ineffective storage areas.

7.8 Services Delivery Impacts

7.8.1 Baseline Background

Service delivery infrastructure exists along the proposed project. Such infrastructural facilities include roads and storm water drainages may be affected by the Project.

7.8.2 Environmental Value requiring to be safeguarded

The mandate of the following bodies to deliver respective services in their areas of jurisdiction must not be compromised during the planning and implementation of the Project.

7.6.9 The Roads Act, 2007

The Kenya National Highways Authority (KeNHA), a parastatal currently in category PC 3A was set up under the Roads Act, 2007 and charged with the mandate to manage, develop, rehabilitate and maintain national roads and is an equal opportunity employer. The project will have to liaise with the KeNHA where pipeline has to cross or utilize road reserve on the B1and A104 roads – procure the specified licenses.

7.6.10 Improved sanitation

There will be better sanitation of the towns, good hygiene and improved standards of living for residents

7.6.11 Pressure on land and services

Environmental degradation from increased pressure on land as people move and build in the serviced areas.

7.8.3 Environmental Protection Objectives

It is important to safeguard and maintain in operating condition existing services. The respective bodies/lead agencies holding these services have a legal mandate to deliver respective services to citizens. This mandate must be safeguarded during the Project execution.

7.8.4 Control Strategies

Some temporary disruption is inevitable. However, efforts will be made to minimize its occurrence, for example by development phasing, routing of construction traffic and phasing of the local road network

7.6.11.1 Inform all service consumers

Inform all service consumers, in sufficient lead time, of intended interruptions, of how long the interruptions are likely to be and for what reason

7.6.11.2 Considerate construction scheduling

For services to be closed /interrupted for the duration of the project construction, the schedule of the construction work will be designed to keep the service interruptions at a minimum.

7.6.11.3 Institute the process of resumption of service

Restore or institute the process of resumption of service upon completion of disruption

7.6.11.4 Proper planning

Allowing developments in the serviced areas to match what is planned for will ensure residents enjoy quality services from all utility providers.

7.8.5 Monitoring

Service agreements entered into with the respective bodies should set up performance criteria and follow it up.

7.9 Cultural Heritage

7.9.1 Baseline Background

Kenya‘s most important natural heritage is her people – they are skilled, educated, experienced, productive and diverse. Their diversity, traditions, customs and practices create a totality of the distinct people that are Kenyans. They are multi- cultural, multi – national and multi – ethnic with many languages, religions and lifestyles. They work together compete and interact in many ways. Kenya is the only country in Africa with the three major linguistic groups – Bantu, Nilotes and Cushites. The dominant indigenous communities along the rural Project are the Kenyan Solmali people. They have a cultural way of life established over many years. In urban centers encountered along the Project, there is a higher degree of cultural mix.

7.9.2 Environmental Value requiring to be safeguarded

7.6.12 National Museums and Heritage Act 2006

The *National Museums and Heritage Act 2006* gives provision for an area of land of cultural significance to be set-aside or acquired under compulsory provision and declared a protected area under Sections 34 and 35 of the Act. This provides for the gazzettement of national monuments. Monuments gazzetted under this Act fall under the management of the National Museums of Kenya. Several of these monuments include forests of cultural and biodiversity significance.

The Act consolidates the law relating to national museums and heritage; to provide for the establishment control, management and development of national museums and the identification, protection, conservation and transmission of the cultural and natural heritage of Kenya. It was set up in order to repeal the Antiquities and Monuments Act and the National Museums Act; and for connected purposes

Among other definitions, under this Act, "cultural heritage" means— works of humanity or the combined works of nature and humanity, and areas including archaeological sites which are of outstanding value from the historical, aesthetic, ethnological or anthropological point of view;
It is therefore appropriate for the Proponent to check whether the proposed project falls within sacred sites, ruins, caves or areas of national significance before construction.

7.6.13 Constitution of Kenya

The *Constitution of Kenya,* Chapter Two on the Republic, Section 11 on Culture
11. (1) This Constitution recognizes culture as the foundation of the nation and as the cumulative civilization of the Kenyan people and nation.
(2) The State shall—
(a) promote all forms of national and cultural expression through literature, the arts, traditional celebrations, science, communication, information, mass media, publications, libraries and other cultural heritage;
(b) Recognize the role of science and indigenous technologies in the development of the nation; and
(c) Promote the intellectual property rights of the people of Kenya.
(3) Parliament shall enact legislation to—
(a) Ensure that communities receive compensation or royalties for the use of their cultures and cultural heritage; and
(b) Recognize and protect the ownership of indigenous seeds and plant varieties, their genetic and diverse characteristics and their use by the communities of Kenya.

7.6.14 Culture Heritage policy

To this end, the *Culture Heritage policy* has led to the *Draft Culture Bill* which seeks to address art and cultural history. The *Draft Bill* makes two broad distinctions in Traditional Knowledge (TK) and Expressions of folklore (EF). Although the draft offers definitions for each of these as follows:-

"Traditional knowledge" shall refer to any knowledge originating from a local or traditional community that is the result of intellectual activity and insight in a traditional context, including know-how, skills, innovations, practices and learning, where the knowledge is embodied in the traditional lifestyle of a community, or contained in the codified knowledge systems passed on from

one generation to another. The term shall not be limited to a specific technical field, and may include agricultural, environmental or medical knowledge, and knowledge associated with genetic resources. "Expressions of folklore" are any forms, whether tangible or intangible, in which traditional culture and knowledge are expressed, appear or are manifested, and comprise the following forms of expressions or combinations thereof:

- Verbal expressions, such as but not limited to stories, epics, legends, poetry, riddles and other narratives; words, signs, names, and symbols;
- Musical expressions, such as but not limited to songs and instrumental music;
- Expressions by movement, such as but not limited to dances, plays, rituals and other performances; whether or not reduced to a material form;
- Tangible expressions, such as productions of art, in particular, drawings, designs, paintings (including body-painting), carvings, sculptures, pottery, terracotta, mosaic, woodwork, metal ware, jewelry, basketry, needlework, textiles, glassware, carpets, costumes; handicrafts; musical instruments; and architectural forms;

7.9.3 Potential Impacts on the Environmental Value

7.6.14.1 Cultural conflicts

A project of the magnitude of the proposed project is likely to attract large numbers of people to the project area. These people could be workers directly employed in the project or they could be providing services to the workers, the contractors or selling food to the workers. These people are of course from different cultural backgrounds. Due to the presence of migrant workers from different cultural backgrounds, conflicts with the local cultures could arise. The lifestyles of the migrants may not be compatible with those of the hosts and these could cause frictions. These are conflicts resulting from insensitivities of project construction personnel to the local culture, traditions and lifestyles.

7.6.14.2 Social Problems

Due to the influx of migrant workers and the resulting changes in sexual behaviors, there is a chance of escalation of STI's including the deadly HIV/AIDS. There could also be cases of unwanted pregnancies as the migrant workers interact and get into relationships with the local communities.

7.6.14.3 Cultural Assets

There are no cultural heritage sites in the area, and the only long term environmental effect on utilities will be that of disposal of construction wastes and operational wastes of the treatment process to the a landfill site.

7.9.4 Environmental Protection Objectives

To ensure protection, conservation and transmission of the cultural and natural heritage of Kenya's people

7.6.15 Control Strategies

Some actions to this end, which largely will be instituted during and beyond planning phase include: -

7.6.15.1 Cultural conflicts

- To recognize, respect and protect cultural and natural heritage and social bonding during Design Phase, Construction Phase and Operation Phase of the Project.
- Ensure community participation in decisions regarding heritage conservation, and realize that the cultural and spiritual importance of heritage sites and properties may be very location-specific.
- Educate workers on the cultural sensitivities in the host communities.
- Culture clash -Identify with the host communities during festivals

7.6.15.2 Social Problems

- Educate workers on the cultural sensitivities in the host communities.
- Educate workers on responsible sexual practices.

7.6.15.3 Cultural assets

- The client to spare no efforts in showing important social responsibility in relation to the preservation of cultural assets of affected communities. This can be achieved in part by stakeholder participation of community representatives in order to capture value and incorporate this to the Project, especially during operation phase. This will help the communities to not only protect economically valuable physical assets, but also preserve its practices, history, and environment, and a sense of continuity and identity.
- If identified, provide storage facilities for movable heritage properties so that they are not looted, sold, or removed from the community.
- Ensure that temporary camps for worker accommodation of project management offices for the Project are not located so where they create risks to heritage sites or properties.

7.10 Environment, Health and Safety

7.10.1 Baseline Background

Project safety cannot be overemphasized; the area surrounding the project is definitely less hazardous now. Construction of the project will bring with it benefits and risks. It places the population living nearby especially downstream at great risk.

Water transmission pipelines are normally buried underground to shield them from adverse environmental effects. This cover helps deter vandals and water thieves who prick to burst the pipes for water. But over time the soil cover on a pipe may be eroded and hence expose the pipe. Pipes age with time having served their useful life thus require replacement. The water transmission pipelines will need permanent markers to indicate the alignment for easy maintenance, to secure wayleave from encroachment and for public safety. Pipe bursts can cause severe damage to nearby property especially when the water flowing is at high pressures.

7.10.2 Environmental Value requiring to be safeguarded

7.6.16 Occupational Safety and Health Act, 2007

This is an Act of Parliament that provides for the safety, health and welfare of workers and all persons lawfully present at work places to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. Section 3 (1) states “that the Act shall apply to all workplaces where any person is at work, whether temporarily or permanently”.

Under this Act, the duties of the Occupier are provided thus in Section 6:

- Every occupier shall ensure the safety, health and welfare at work of all persons working in his workplace.
- Without prejudice to the generality of an occupier's duty under subsection (1), the duty of the occupier includes:
- the provision and maintenance of plant and systems and procedures of work that are safe and without risks to health;
- arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances;
- the provision of such information, instruction, training and supervision as is necessary to ensure the safety and health at work of every person employed
- the maintenance of any workplace under the occupier's control, in a condition that is safe and without risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks to health;
- the provision and maintenance of a working environment for every person employed that is, safe, without risks to health, and adequate as regards facilities and arrangements for the employees welfare at work;
- informing all persons employed of
- any risks from new technologies; and
- imminent danger; and
- Ensuring that every person employed participates in the application and review of safety and health measures.
- Every occupier shall carry out appropriate risk assessments in relation to the safety and health of persons employed and, on the basis of these results, adopt preventive and protective measures to ensure that under all conditions of their intended use, all chemicals, machinery, equipment, tools and process under the control of the occupier are safe and without risk to health and comply with the requirements of safety and health provisions in this Act.
- Every occupier shall send a copy of a report of risk assessment carried out under this section to the area occupational safety and health officer;
- Every occupier shall take immediate steps to stop any operation or activity where there is an imminent and serious danger to safety and health and to evacuate all persons employed as appropriate.
- It is the duty of every occupier to register his workplace unless such workplace is exempted from registration under this Act.
- An occupier who fails to comply with a duty imposed on him under this section commits an offence and shall on conviction be liable to a fine not exceeding five hundred thousand shillings or to imprisonment for a term not exceeding six months or to both

7.6.17 Health

Part VI of the Occupational Safety and Health Act, 2007, addresses provisions concerning health. These provisions are:

- Cleanliness;
- Overcrowding;
- Ventilation;
- Lighting;
- Drainage of floors; and

- Sanitary conveniences.

These provisions are to be enforced by the Department of Occupational Health and Safety of the Ministry of Labour.

7.6.18 Machinery Safety

Part VII of the Occupational Safety and Health Act, 2007 elaborately deals with machinery safety requirements, mainly from the point of view of avoiding accidents and injuries at work.

7.6.19 Safety –General Provisions

Part VIII of the Occupational Safety and Health Act, 2007 describes safety general provisions.
Section 74 (1) provides for storage. It states that "all goods, articles and substances stored in a workplace shall be stored or stacked –

- In such a manner as will ensure their stability and prevent any fall or collapse of the stack;
- In such manner as not to interfere with the adequate distribution of the natural or artificial light, the natural ventilation systems, the proper operation of machines or other equipment, the unobstructed use of passageways, gangways or traffic lanes, and the efficient functioning of sprinkler systems, the unobstructed access to other fire extinguishing equipment within the workplace; and
- On firm foundations not liable to overload any floor.

Section 76 (2) states that "Every employer shall take necessary steps to ensure that workstations, equipment and work tasks are adapted to fit the employee and the employee's ability including protection against mental strain".
According to Section 76 (3) "Every manufacturer, importer and supplier or an agent of a manufacturer, importer and supplier of the machinery and equipment referred to in paragraph (1) shall ensure that the equipment complies with the safety and health standards prescribed under this Act and shall provide adequate and appropriate information including hazard warning signs".
Section 76 (4) further states that " An employer shall not require or permit any of his employees to engage in the manual handling or transportation of a load which by reason of its weight is likely to cause the employee to suffer bodily injury".
Other provisions covered under this Safety – general provisions include:

- Section 77: Safe means of access and safe place of employment;
- Section 78: Fire Prevention;
- Section 79: Precautions in places where dangerous fumes are likely to be present;
- Section 81: Safety provisions in case of fire; and
- Section 82: Evacuation procedures.

Part IX of the Occupational Safety and Health Act, 2007 also provides for Chemical Safety,
Part X provides for Welfare – General Provisions,
Part XI Health, Safety and Welfare Special Provisions and
Part XII special applications.

7.6.20 Public Health Act

The **Public Health Act** (Cap. 242) Part IX Section 8 & 9 states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Any noxious matter or waste water flowing or discharged into a water course is deemed as a nuisance. Part Xll Section 136 states that all collections of water, sewage, rubbish, refuse and other fluids which permits or facilitates the breeding or multiplication of pests shall be deemed nuisances. The Act addresses matters of sanitation, hygiene and general environmental health and safety.

7.10.3 Potential Impacts on the Environmental Value

The process of quarrying rock, extracting other building materials, and constructing the project. This should be minimized by good construction management thus making the adverse impact minor.

7.6.20.1 Risk of drowning

- Risk of accidental drowning
- Injuries during project construction and/or due to vehicular traffic

7.6.20.2 Risks of diseases

- These diseases range from vector-borne diseases and STI.
- Changes in sexual behaviour leading to the spread and/or escalation of sexually transmitted diseases (including HIV/AIDS) and unwanted pregnancies.

7.6.20.3 Risk of project failure

There have been many project failures world over. Even in this project there is risk of project failure and is definitely catastrophic. This requires a risk assessment of downstream impacts of the potential for project failure to be developed in the full EIA study.

7.10.4 Environmental Protection Objectives

Failure to comply with the OSHA, 2007 attracts penalties of up to KES 300,000 or 3 months' jail term or both or penalties of KES 1,000,000 or 12 months jail term or both for cases where death occurs and is in consequence of the employer. The Environmental Value represented by this Act is that it seeks to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces.

7.10.5 Control Strategies

The client will provide training for operation personnel and will adopt other safety measures; however, there still remains the possibility of some risks to health and safety of operation personnel due to inappropriate handling, or accidental release of chlorine or other chemicals at water treatment plants.

7.6.20.4 Fire Prevention Measures

- The project site especially water treatment plant must have in place appropriate and adequate firefighting equipment of recommended standards and in key strategic points.
- A fire alarm system should be installed in the plant.
- A fire evacuation plan must be posted in various points of the project site including procedures to take when a fire is reported. All workers must be trained on fire management and fire drills undertaken regularly.
- A fire assembly point must be identified and labeled accordingly.

7.6.20.5 Project failure safeguards

It needs to be recognized that the situation downstream of the project may change over time and place the project into a higher hazard category during the life of the project. For example, downstream changes may include the development of new infrastructure, such as housing development where the Population at Risk (PAR) and the severity of damage and loss becomes greater than when the project was first built.

Hence this may make the project deficient in its safety requirements, such as the size of the spillway and a higher safety risk. A suitably qualified and experienced project engineer should be consulted if it is apparent that this may occur.

When estimating the PAR the following issues should be taken into account:

- Groupings of dwellings.
- Camping areas and occupancy times.
- Allowance for itinerants (fisherman, bushwalkers, birdwatchers, and picnickers).
- Occupation of schools, factories, retirement homes, hospitals, institutions, commercial and retail areas

7.6.20.6 Occupational hazards

Injury

- Keep unauthorized persons away from dangerous zones
- Put warning signs (written in English and local languages) at strategic sites
- Ensure regular monitoring of embankment and spillway

Drowning

- Regular patrols
- Fencing
- Train and employ Life guards,
- Provide Life saver equipment

7.6.20.7 Diseases

Malaria and other diseases

- Enlighten personnel and community about Malaria and use of mosquito nets.
- Partner with NGOs in campaign for proper sanitation and hygiene
- Help strengthen healthcare system

AIDS

- Enlighten personnel and community about STDs (HIV/AIDS) and use of condoms.
- Partner with NGOs in campaign to stop the spread of HIV/AIDS.
- Help strengthen healthcare system

7.6.20.8 Overall project safety

Implementation of Project safety plans that will cover

- operation of equipment at the project
- reservoir inflow and flood forecasting
- authorizing spillway flood releases
- recording reservoir data
- routine inspection
- maintenance
- modification
- correct method of opening and closing gates
- Project safety and surveillance.

7.10.6 Monitoring

Ensure proper adherence by the operator to the O&M manual.

7.11 Project

7.11.7 Baseline Background

Projects have been constructed in order to prevent floods, to supply drinking and domestic water, to generate energy and for irrigation purposes since the old-times.
Projects have a great deal of positive and negative effects on the environment besides their benefits like controlling stream regimes, consequently preventing floods, obtaining domestic and irrigation water from the stored water and generating energy.
Projects hold possibilities of considerable harm for living beings in addition to their advantages such as meeting basic requirements of the society and increasing living standards.
The project is located in the fringes of the Bureti forest zone. It is a rich agricultural land.

7.11.8 Environmental Value requiring to be safeguarded

7.6.21 Occupational Safety and Health Act, 2007

This is an Act of Parliament that provides for the safety, health and welfare of workers and all persons lawfully present at work places to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. Section 3 (1) states “that the Act shall apply to all workplaces where any person is at work, whether temporarily or permanently”.
The project area will henceforth become a workplace as defined by the Act and whether it is under construction or operation, all provisions of the said Act will apply.

7.6.22 United Nations Framework Convention on Climate Change (UNFCCC)

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The Convention enjoys near universal membership, with 191 countries having ratified.
Under the Convention, governments:

- gather and share information on greenhouse gas emissions, national policies and best practices;
- launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; and
- co-operate in preparing for adaptation to the impacts of climate change.

The Convention entered into force on 21 March 1994.
The landmark UNFCCC was opened for signature at the 1992 United Nations Conference on Environment and Development (UNCED) Conference in Rio de Janeiro (known by its popular title, the Earth Summit). On June 12, 1992, 154 nations signed the UNFCCC that upon ratification committed signatories' governments to a voluntary "non-binding aim" to reduce atmospheric concentrations of greenhouse gases with the goal of "preventing dangerous anthropogenic interference with Earth's climate system." These actions were aimed primarily at industrialized countries, with the intention of stabilizing their emissions of greenhouse gases at 1990 levels by the year 2000; and other responsibilities would be incumbent upon all UNFCCC parties. The parties

agreed in general that they would recognize "common but differentiated responsibilities," with greater responsibility for reducing greenhouse gas emissions in the near term on the part of developed/industrialized countries, which were listed and identified in Annex I of the UNFCCC and thereafter referred to as "Annex I" countries.
Kenya signed the UNFCCC on 12th July 1992, ratified it on 30th August 1994 and started enforcing it on 28th November 1994.
It is recommended to study if the project has any significant contribution to climate change bearing in mind Kenya's commitment to the above convention.
Other legal provisions that will apply and have been introduced before include *the Wildlife bill 2012, Land Act 2012, National Land Commission Act 2012* among others.

7.6.23 Potential Impacts on the Environmental Value

7.6.23.1 Land take
Possible relocation of human populations and associated impacts of economic disturbance, human trauma, and social disruption

7.6.23.2 Habitat fragmentation
Fragmentation of river ecosystems due to creation of barrier

7.6.23.3 Staff-wildlife conflicts
Elephants are fond of trespassing into farms near the forest. They will continue doing so given that the staff quarters are near the forest cut-line.

7.6.23.4 Breeding grounds for disease vectors
The reservoir may become breeding grounds for disease vectors- especially mosquitoes (which are vectors for malaria) and snails (which are vectors for Schistosomiasis) can take advantage of this slow flowing water.

7.6.23.5 Toxification
The initial filling of the reservoir will inundate the existing plant material, leading to decomposition of the plants and trees. The rotting organic matter settles to the non-oxygenated bottom of the reservoir, releases carbon into the atmosphere and eventually produces and releases dissolved methane.

7.6.23.6 Loss of rich sediment
Loss of flood recession cropping practiced downstream of project - the land is cultivated taking advantage of the residual soil moisture as flooding recedes. The reservoir may affect the agriculture seriously.

7.6.23.7 Soil erosion
- Reservoir induced downstream erosion

7.6.24 Environmental Protection Objectives
To ensure total sum of impacts of the project make the world a better place to live in.

7.6.25 Control Strategies

7.6.25.1 Project safety

- Anchorage of embankment wall properly to the existing side embankments

7.6.25.2 Soil conservation

- Installation of gabion protection at the abutments and up- and downstream of the channel to combat erosion
- Construction of silt traps upstream of the project

7.6.25.3 Water management

- Project intake structure to allow staged abstraction of water from the project

7.6.25.4 Staff-wildlife conflicts

- Installation of elephant electric fence and gate around the project and water treatment plant site

7.6.26 Monitoring/Performance Criteria

The development of O&M manual with clearly spelt out standard operating procedures will ensure consistent maintenance practices by the operator despite staff turnover or even subcontracted operations. Monitoring will apply to both administrative and technical practices in project operations.

7.7 Access Road

7.7.1 Environmental Value requiring to be safeguarded

7.7.2 The Kenya Roads Act Of 2007

The Act stipulates the legal and institutional aspects of the road sub-sector policy. The Act provides for the establishment of three independent Road Authorities, namely: (i) Kenya National Highways Authority (KeNHA), responsible for the administration, control, development and maintenance of all class A, B and C roads in Kenya, (ii) Kenya Rural Roads Authority (KeRRA), responsible for rural and small town roads including class D, E roads and Special Purpose Roads and (iii) Kenya Urban Roads Authority (KURA) responsible for all City and Municipal Roads. The Authorities fall under the Ministry of Roads, which will retain the role of policy formulation, and general oversight of public roads including regulatory aspects such as technical standards.

Section 22 of the Act details the procedure for acquisition of any land required by an authority for the purposes of its functions under this Act.

The access road in question is not classified but could easily fall under Special Purpose roads. It is however the duty of the Proponent rather than the KeRRA to provide alternative access to the residents.

7.7.3 The Land Act, 2012 No.6 0f 2012

Subject to and in accordance with section 143 (1) and section 146, the Commission may, create a right of way which shall be known as public right of way.

144.(1) Unless the Commission is proposing on its own motion to create a wayleave, an application, for the creation of a wayleave , shall be made by any State department, or the county government, or

public authority or corporate body, to the Commission.

(2) An application shall be made in the prescribed form and shall be accompanied by any prescribed information or other information that the Commission may, in writing require the applicant to supply and the Commission shall not begin the process of creating a wayleave until all prescribed or required information has been submitted to it.
Under section 110 (1) of Land Acts 2012 No.6 of 2012 land may be acquired compulsorily under this Part if the Commission certifies, in writing, that the land is required for public purposes or in the public interest as related to and necessary for fulfillment of the stated public purpose.
Part 2 of this section states that if, after land has been compulsorily acquired the public purpose or interest justifying the compulsory acquisition fails or ceases, the Commission may offer the original owners or their successors in title pre-emptive rights to re-acquire the land, upon restitution to the acquiring authority the full amount paid as compensation.
Section 111 (1) states that if land is acquired compulsorily under this Act, just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. The commission shall make rules to regulate the assessment of just compensation.
Likewise where land is acquired compulsorily, full compensation shall be paid promptly to all persons affected in accordance to section 113 (1). (2) Subject to Article 40 (2) of the Constitution and section 122 and 128 of this Act, an award—
(a) Shall be final and conclusive evidence of—

- The size of the land to be acquired;
- The value, in the opinion of the Commission, of the land;
- The amount of the compensation payable, whether the persons interested in the land have or have not appeared at the inquiry; and

Under Section 148 and subject to the provisions of this section, compensation shall be payable to any person for the use of land, of which the person is in lawful or actual occupation, as a communal right of way and, with respect to a wayleave, in addition to any compensation for the use of land for any projectage suffered in respect of trees crops and buildings as shall, in cases of private land, be based on the value of the land as determined by a qualified valuer.
Sub-section 2 states that Compensation relating to a wayleave or communal right of way shall not be paid to a public body unless there is a demonstrable interference of the use of the land by that public body.

The duty to pay compensation payable under this section shall lie with the State Department, county government, public authority or corporate body that applied for the public right of way and that duty shall be complied with promptly. This provision will guide land acquisition where necessary.

7.7.4 Guidelines for Prevention and Control of Soil Erosion in Road Works

The guidelines provide brief introductions on the planning, costing and construction of soil and water conservation structures commonly used in rural road infrastructure delivery. The guidelines present illustrations real life examples and work methodologies that assist engineers and contractors to develop effective construction and supervision techniques, on the prevention and control of soil erosion in road works.
The guidelines provide basic information on techniques for the identification and assessment of challenges and planning of mitigation measures related to erosion control works. The guidelines also provide tips on, among others:

- the design and construction of waterways and soil erosion control measures in the road drainage systems

- soil erosion control measures needed in the upper and lower catchment areas to reduce soil erosion and mitigate against anticipated projectages from the road drainage discharge
- some solutions for soil erosion control on road sections with specific conditions not catered for in standard designs,
- The use of Vetiver grass to stabilize and heal erosion projectages, and
- Costing of works related to prevention and control of soil erosion

The Guidelines have been developed primarily to benefit Engineers and Technicians, Contractors and their Supervisors, Consultants and other potential users involved in road works who are often not aware of the extent of projectages caused by uncontrolled runoff from the road servitude. Established Contractors, Professional Engineers, District Agricultural Officers, Environmentalists, Programme Managers and Planners may also use these guidelines as a reference for some of their planning, design and supervision works.

These guidelines are intended to introduce basic soil and water conservation principles and techniques, related to road works. They are by no means exhaustive.
Mitigation measures proposed in this report for mitigation of soil erosion impacts have borrowed from these guidelines.

7.7.5 Environmental Guidelines for Roads and Bridges, 2010

The Environmental guidelines for roads and bridges provide detailed analysis of environmental issues arising from road works along with mitigation measures that have been used successfully in national and international contexts. The guidelines identify the direct and indirect effects from road works on the biophysical environment – land, water, air, vegetation, etc as well as the socio-economic and cultural environments for instance, public health, welfare and safety and valued traditions from the present and past.
The guidelines underscore the importance of public consultations and participation in all aspects of road transportation development, thereby ensuring accountability, fairness and sustainability.
However, the guidelines do not address environmental impacts from road transport, including:

- Vehicle emissions that degrade air quality, e.g. carbon dioxide, ozone, nitrous oxides etc;
- Road safety issues that arise from unsafe road designs, failure to correct black spots, etc;
- Vehicle inspections that require repairs to ensure road-worthiness for all transport modes;
- Passenger safety viz. use of seat belts; and
- Vehicle overloading.

Environmental guidelines for roads and bridges, 2010 cover the following guidelines for activities that can affect the water quality:

- Contractor Camp Guidelines;
- Site Preparation Guidelines;
- Earthworks Guidelines;
- Drainage Guidelines;
- Borrow Pit Guidelines;
- Rock Quarries Guidelines;
- Sand Sources Guidelines;

7.7.6 Potential Impacts on the Environmental Value

7.7.6.1 Better roads

Although the loss of optional uses for the land is considered to be a negative impact, the construction of the road is a positive and necessary intervention and any such loss of alternative use is the trade-off for a good road.

7.7.6.2 Accessibility

There will be an increased pressure on land and natural resources once the road is constructed. This will be caused by the desire to produce more especially mangoes and oranges due to easy access to the market.

7.7.6.3 Land take

The loss of optional uses for the land is considered to be a negative impact, the construction of the road is a positive and necessary intervention and any such loss of alternative use is the trade-off for a good road. There will thus be direct land take as a result of upgrading the access roads to the site to murram or better standards.

7.7.6.4 Dust

Dust will be emitted during excavation and related earthworks during construction of all Contract components and especially digging of trenches for laying the proposed Pipeline. Air-borne particulate matter pollution is also likely to occur during the route clearance and excavation of the proposed Pipeline and for other facilities. This is likely to affect site workers and those residing nearby, in extreme situations leading to respiratory problems

7.7.6.5 Gender Parity Impacts

Women roles in road construction are mainly confined to supply of unskilled labour and vending of foodstuffs to the construction workers. There is need to promote gender equality in all aspects of economic development and more so in road construction.

7.7.6.6 Construction waste

Project construction will involve earthworks and excavation. This will result in the generation of some spoil materials. Also wastes from pipe offcuts, wires and electronic waste.

7.7.6.7 Traffic accidents

It is envisaged that with the improvement of the road, the traffic volumes and speeds will increase, and composition will change. This will cause increased frequency and severity of accidents.

7.7.7 Environmental Protection Objectives

To provide safe accessibility by construction of roads to project components in an environmentally sustainable way.

7.7.8 Control Strategies

7.7.8.1 Resettlement Action Planning

This is a process involving land acquisition to be done before the contractor goes to site. Actions include;

- Formulate a detailed Resettlement Action Plan (RAP).
- Identify and list all the Project Affected People (PAP) by type of losses and extent of projectages in an Entitlement Matrix.
- Consult Affected Persons (AP's) on, and offer choices among technically and economically feasible resettlement alternatives.
- Compensate those affected according to the official market rates.
- Provide allowances and other assistance to make a smooth transition after displacement.

- Implement an institutional structure or a mechanism for monitoring and evaluating the compensation/resettlement process.

7.7.8.2 Land restoration

Restoration of land after road up grading will be done.

Depending on the planned future use for the site and the size of the excavation, pits and quarries to be backfilled with clean mineral soil or granular material, levelled or sloped and if necessary re-vegetated. They can also be used as pan for watering the animal. Reclamation plans shall be forwarded to NEMA or the Engineer.

The first choice for selecting a site for the construction camp shall be previously cleared sites or natural openings. This will minimize unnecessary clearing.

Upon decommissioning construction camps and project management offices should be decommissioned such that they will be beneficial to the communit

7.7.8.3 Dust mitigation

It is recommended that a standard set of feasible dust control and air quality measures be implemented for all construction activities. The Proponent is committed to implementing measures that shall reduce air quality impacts associated with construction. All personnel working on the Project will be trained prior to starting construction on methods for minimizing air quality impacts during construction. This means that construction workers will be trained regarding the minimization of emissions during construction. Specific training will be focused on minimizing dust and exhaust gas emissions from heavy construction vehicles.

7.7.8.4 Construction waste management

The contractor to submit to the engineer a camp and site office plan defining all facilities to be created. These include human waste disposal facilities and solid waste management facilities.

The contractor to ensure that all waste materials at the point of construction are transported to a place of safe disposal.

7.7.8.5 Road safety

Parking bays to be provided.

To reduce accidents, appropriate road signs and road markings to be put in locations where standards are compromised to warn drivers of safety hazards especially while approaching bends, junctions, bridges, schools and shopping centres.

Clearing of vegetation on the road reserve to improve sight distance and visibility.

Discouraging parking on the road by having shoulders throughout the length of the road

7.7.8.6 Gender empowerment

Give equal employment opportunities for both men and women and encourage women to apply in skills they can be good at.

Expose and involve women in road construction and maintenance activities in an effort to transfer required skills to them.

Involve women groups in environmental management of the road operation such as planting trees and glass and in clearing bush along the road.

Enhance gender sensitivity and reduce gender discrimination in construction activities.

7.8 Stakeholder Management

Good practice in ESIA requires active consultation with relevant regulatory bodies, experts, affected communities and other interested and affected parties. The aim is to inform them about the developing plans and give them an opportunity to express their views on the Project and its impacts, so that these can be taken into account in developing the Project proposals and in assessing and mitigating impacts. Consultation is also invaluable in identifying useful information on the baseline situation and on vulnerable resources and receptors in the study area

The Government of Kenya policy on community consultation and participation is to involve communities in policy formulation and implementation at the local level. More specifically, the Community Action Planning Programmes' objective is to put in place a durable system of intra-community co-operation through collective action, which creates communal discussion forums for the implementation of development activities.

The Kenya government has enshrined the need for human societies' involvement in project development in the Constitution. This has also been set out in the EMCA, 1999 and Environmental (Impact Assessment and Audit) Regulations, 2003. Community consultation and participation ensures that communities and stakeholders are part and parcel of the proposed developments and in so doing assures the sustainable use of resources. It has also demonstrated successfully that projects that go through this process will acquire high level of acceptance and accrue benefits to a wider section of the society.

7.8.1 Likely Stakeholders

In the estimate of the Consultant, stakeholders who could be included (but not limited to) in the Construction and Operation of the Project are;

- The Proponent
- Lead Agencies e.g. KFS, KWS, Kenya Prisons Service
- Respective county officials
- PAPS including businesses in the project area
- Ministry of Water and Irrigation
- Project Consultant
- NEMA
- Project Contractor
- Consumers
- Interest Groups e.g. environmental lobby groups
- Service providers in the region, for example, health, education, training, emergency services

7.9 Approach

In carrying out the public consultations for the proposed Project, so far the strategy used has been to visit the would-be affected land owner at his/her residence to inform and discuss the proposed Project. Going forward there will be need for public meetings (barazas) so as to make the larger community buy into the project. This can be done during the detailed ESIA exercise and beyond.

Further consultations will most likely need to adequately address the following pertinent issues:

- Wayleave realignment;
- Compensation;

- Water allocations;
- Project construction logistics;
- Services disruption; and
- Major installations crossing.

These consultations should be done:

- Prior to commencement of construction;
- During construction phase; and
- During operation phases.

7.9.1 Benefits

7.9.1.1 Benefits to the Proponent

The following public consultation benefits are associated with a Proponent:

- The Proponent will benefit from the local knowledge;
- Costs may be saved as key issues are identified by the public and studies are focused on key issues as opposed to a broad range of issues;
- Measure to reduce impacts and enhance benefits will be identified with stakeholders;
- Relations with the communities in the vicinity of the development will be improved;
- Delays in decision making may be reduced because of good public participation early in the project planning process;
- The public are unlikely to raise objections to the project; and
- The Proponent's image and reputation will be enhanced.

7.9.1.2 Benefits to Civil Society and Public

The following public consultation benefits are associated with the Civil Society and Public:

- Capacity is built through people playing an active role during the process. The skills learnt can be used in other community projects;
- Civil Society and the public rights are exercised and projected by participating; and
- Inputs will influence the form and nature of the development and is likely to lead to better development that takes societies needs into account.

7.9.1.3 Benefits to Decision Makers

The following public consultation benefits are associated with the decision makers:

- Public participation will improve decisions since there is access to a broader range of perspectives and opinion on the proposed development;
- The development is likely to be more sustainable as it takes people's needs and views into account; and
- Governance and the legitimacy of the government will be improved e.g. NEMA will have easy time deciding whether to grant a license.

7.10 Costs of Mitigation

The impact of an environmental effect is more often not directly measurable in terms of money as are the costs of a piece of hardware. This is a setback when one wants to take the environmental aspects into consideration in the societal cost benefit optimisation of a large project design such as the Project Project Water Supply Project. The consultant has however developed methods to monetarise the

impacts of all kinds of environmental effects and have come up with tools to express these impacts in terms of money by following funprojectental principles of economics.
The Table below lists the three categories of techniques and the commonly practised techniques together with a description of their characteristics.

7.10.1 Market Value Approaches

These techniques derive value from comparisons of costs and revenues. The price or cost of the environmental resource is used and these are easily observable in market data for prices. Parameters checked for variation will include;

- Change in productivity - change in availability, quality or quantity of an output
- Change in income – change in availability, quality or quantity of an output
- Replacement cost – for individuals, groups or society replace an entire asset, part of an asset, or quality of an asset,
- Preventative expenditure – if/how much individuals, groups or society spend money to defend their environment
- Relocation cost –for individuals, groups or society relocate an activity or assets

7.10.2 Surrogate market approaches

These techniques derive value from comparisons of costs and revenues in related markets. This will look for prices or costs of surrogate goods or services. Elements of consideration are;

- Value of close substitute- is in effect taken as value of affected interests
- Wages to labour- change in wages depicts value of change in environment
- Market prices of good with an environmental characteristic- change of its price indicates change in characteristics as well.

7.10.3 Simulated market approaches

These techniques derive value from hypothetical questions because there are no observable market data on prices or costs. It answers questions simulating a market situation. Techniques involved include;

- trade-off game between alternatives each with a different level of environmental effect,
- contingent valuation -purchasing of an environmental good/service or asset.(willingness to pay)
- contingent ranking – comparison of environmental effects with other effects
- Priority evaluator – choice of quantities to purchase in market setting

7.10.4 Cost Generation

The EIA mitigation costs were generated as an estimate of the sum of the costs of all the mitigation actions proposed in every chapter. The total cost was as summarized in Table 23-1.

Table 6: Environmental Mitigation costs

No.	Environmental Impact	Mitigation Cost (Ksh.)
1	Noise & Vibration	500,000
2	Air Quality	800,000
3	Water Resources management	500,000
4	Waste Management	1,000,000
5	Terrestrial Ecology	500,000
6	Aquatic Ecology	200,000

7	Land Management	2,000,000
8	Service Delivery Impacts	500,000
9	Cultural Heritage	500,000
10	Environmental Health & Safety	1,000,000
11	Access road	2,000,000
Total		9,500,000

8. ENVIRONMENTAL MONITORING & MANAGEMENT PLANS

Environmental monitoring is a key aspect of environmental management as it ensures a continuous or periodic follow-up on the identifiable environmental parameters in quantity and or in quality. In line with this therefore, the environmental parameters to be monitored have been tabulated alongside the responsible agencies with appropriate time frames and estimated costs.

Table 7: The Environmental and Social Management & Monitoring Plan: Construction phase					
Project Activities/Environmental Effect	**Potential Impact Description**	**Mitigation/ Enhancement Measures**	**Mitigation Cost (Ksh)**	**Responsibility**	**Monitoring Indicators**
Air pollution caused by material and equipment transport, earthworks, material extraction, material crushing/screening/piling,	Dust, exhaust air and other chemical gas emission	• Prohibit idling of vehicles at site during excavation • Spraying water on dusty materials/workplace • Regular maintenance of construction plant and equipment • Enclosing the site where possible • Wetting all active construction areas as and when necessary to lay dust; • Appropriately cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard; • Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites; and • Sweep when necessary (with physical sweepers) all paved access roads, parking areas and staging areas at construction sites. • The engine size of the construction equipment shall be the minimum practical size; • The number of construction equipment operating simultaneously shall be minimised through efficient management practices; • Construction equipment shall be maintained in tune per the manufacturers specifications; • Vehicle idling time shall be minimized; and • Equipment shall be properly tuned and maintained	800,000	Contractor	• Monitoring parameters: - The monitoring parameters selected should reflect the pollutants of concern associated with project processes. • Baseline calculations: Before the project commences, baseline air quality monitoring should be done. • Monitoring type and frequency: - Data on emissions and ambient air quality generated • Monitoring locations: - Ambient air quality monitoring may consist of off-site or fence line monitoring either by the project sponsor • Sampling and analysis methods: - Monitoring programs should apply national or international methods for sample collection and analysis, for Standardization
Land, water and soil degradation/Contamination	Oil and chemical spill	• Proper storage, handling and disposal of oil and wastes from machinery • Discourage servicing of machinery and vehicles on site except on containment area	700,000	Contractor	• Is there any complaint? • Containment of oil tanks and fueling sites. • Compliance with the regulations providing for integrated water resources management will be monitored through the respective agencies.

Site Clearance & Excavation	Soil Erosion, Felling of trees and shrubs,	• Remediate contaminated soil • Landscaping • Ensure management of excavation activities • Control activities especially during rainy conditions • Provide soil erosion control and conservation structures where necessary • Proper disposal of excavated loose soil	100,000	Contractor	• Soil erosion rates (tons/ha/year) • Observable surface changes • Number of trees cut due to construction • Is fuel wood used for fire? • Is the vegetation clearance limited within construction site only?
Fire Risks due to un-controlled disposal of spent cigarettes remains, use of fire for domestic cooking and spillage of diesel/petrol.	Possible fires	• To enhance health and safety preparedness among workers • Ensure equipment is in good working condition • Put up emergency response contracts • Put up Emergency Response Procedures notification instructions • Put up simple instructions on how to handle fires, products spills LPG incidents, armed robbery and product contaminations • A fire evacuation plan must be posted in various points of the project site including procedures to take when a fire is reported. All workers must be trained on fire management and fire drills undertaken regularly. • A fire assembly point must be identified and labeled accordingly.	200,000	Contractor	• Equipment/machine maintenance schedules. • Environmental, Health and safety program. • Training records
Worker camping and site office operations	Injuries, HIV/AIDS, Diseases, Killing of wild animals for food,	• Ensure proper waste collection and disposal • Provide first aid kit at site • Sensitize residents/workers on environmental management • Eliminate breeding of mosquitoes • Workers should be trained on occupational health and safety and first Aid administration • Train staff on petroleum product handling • Sensitize workers on HIV and AIDS	200,000	Contractor	• Waste management program • List of first aid kits and contents • Training records • HIV/AIDS program • Is any wild animal or its remains sighted at construction camps? • Is any poaching by workers reported? • Accident/injury records

Machine and equipment operations	Noise and vibrations from machinery and vehicles	• Construction activities to be restricted to daytime • Workers in the vicinity involved in high level noise to wear respective safety and protective gear i.e. earplugs. • Low noise selection of machinery • Enclose the site • Use low noise equipment • Install portable barriers to shield compressors and other small stationary equipment where necessary; • Use of quiet equipment (i.e. equipment designed with noise control elements); • Limit pick-up trucks and other small equipment to a 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 personnel protective equipment;	500,000	Contractor	• Can two people communicate at a distance of 5m without shouting? • Are machines/vehicles/equipment having silencers/acoustic enclosures? • Are there complaints from neighbours? • Is noise above the legislated noise level? • Monitor if noise levels at sensitive receptors during day and night comply to those stipulated in the First & Second Schedules; • Respond to any complaints arising in relation to noise. • Conducting regular site audits to ensure that noise control measures are properly implemented.
Visual intrusion	Generation of dust and smoke that hinders sighting.	• Use of commercial bill boards to keep construction activities out of sight from the immediate neighborhood • Expedition of construction as far as is technically viable so as to minimize adverse visual impact • Landscaping and gardening to restore biodiversity and aesthetic property of the project	100,000	Contractor	• Billboard guides • Controlled excavations, strict use of design • Landscaping activities
Occupational Health & Safety	Disease infectious	• Encourage residents to maintain high standards of personal cleanliness; Keep the premises and its environment (surroundings) clean always.	300,000	Proponent	• Camping Site inspection report • Records of any disease outbreaks
Construction Staff welfare and services	Use of energy may lead to tree felling for charcoal and firewood	• All energy usage should be accounted for • Facility should embrace the use of energy savings bulbs and implements • Facility should embrace the use of solar power • Installation of solar water heating panels for bathroom and kitchen heating needs • Controlled use of charcoal and firewood	100, 000	Proponent	• Camping Site inspection reports.

Construction waste generation	Waste generation & handling	• Ensure detailed design and specifications are undertaken so as to minimize the generation of waste during construction and the durability of materials is considered • Locate material and stockpiling areas within the construction corridor until its ultimate destination is determined. Appropriately manage stockpile areas and storage areas • Dispose non-recyclable construction materials at a licensed waste facility and avoid fly-tipping. Ensure used furniture and equipment from decommissioning is sold off/reused or donated to charity where possible. Otherwise dispose of at an appropriately licensed landfill. Recycle steel off cuts or scrap or send it to scrap metal recycler • Recycle any ballast that cannot be reused as ballast and remove excess ballast and clean fill off site for reuse, as possible	500,000	Proponent	• Inspect waste storage areas on a weekly basis to make sure that wastes are being stored properly • Maintain a waste register for all hazardous wastes and operation wastes. • Review register monthly to identify any dramatic changes in waste generation patterns and possible opportunities for waste minimization.
Terrestrial and aquatic ecology	Wildlife and domestic animals management	• Erect temporary fencing around the construction zones in accordance with an approved site management plan; • Right-of-way boundaries and sensitive areas shall be clearly marked with flagging tape prior to clearing. • Right-of-way clearing will be limited to the area required for construction, operation and maintenance of temporary diversion routes and permanent alignment.	700,000	Proponent	• Fauna strike and mortality during construction and operation and • For areas of the site that are to be rehabilitated, a photographic record will be prepared by the contractor prior to construction commencing. • Adequately divert the river away from construction areas • Ensure good construction practices • If the quality of the water has deteriorated or if their presence is suspected, relevant and competent authorities shall determine the concentrations of pesticides, heavy metals, cyanides, nitrates, and phosphates. If the water shows a tendency toward eutrophication, relevant authorities shall check for ammonia and total nitrogen. • Ensure in-stream flows are maintained via a flow diversion system

Resettlement action planning	Land related issues	• Formulating a detailed Resettlement Action Plan (RAP) process. • Identify and list all the Project Affected People (PAP) by type of losses and extent of project stages in an Entitlement Matrix. • Consult Affected Persons (AP's) on, and offer choices among technically and economically feasible resettlement alternatives. • Compensate those affected according to the official market rates. • Provide allowances and other assistance to make a smooth transition after displacement. • Implement an institutional structure or a mechanism for monitoring and evaluating the compensation/resettlement process. •	1,000,000	Proponent	• Have an institutional set-up or outsource monitoring of the implementation of the RAP. • Check that design requirements have been met
Cultural heritage management	Culture issues	• To recognize, respect and protect cultural and natural heritage and social bonding during Design Phase, Construction Phase and Operation Phase of the Project. • Ensure community participation in decisions regarding heritage conservation, and realize that the cultural and spiritual importance of heritage sites and properties may be very location-specific. • Educate workers on the cultural sensitivities in the host communities. • Culture clash -Identify with the host communities during festivals •	500,000	Proponent	• Preservation of cultural assets of affected communities. This can be achieved in part by stakeholder participation of community representatives in order to capture value and incorporate this to the Project, especially during operation phase. This will help the communities to not only protect economically valuable physical assets, but also preserve its practices, history, and environment, and a sense of continuity and identity. • If cultural artefacts are identified, provide storage facilities for movable heritage properties so that they are not looted, sold, or removed from the community. • Ensure that temporary camps for worker accommodation of project management offices for the Project are not located so where they create risks to heritage sites or properties.

Farming practices	Soil management and conservation	• If contaminated land is identified further investigate and develop a remediation plan; • Develop appropriate management and disposal methods for contaminated soils and other materials; • Dispose of contaminated soils to authorized facilities on-site or off-site in accordance with disposal permits; • Design fuel, oil and chemical storage areas in accordance with Kenyan Standards; • If dispersive soils are necessary to be incorporated as construction material, undertake appropriate treatment of the soil first; • Undertake appropriate measures required to stabilize the soil moisture content of shrink and swell soils; • Manage works during the wet season and erosive rainfall events bearing in mind that mud slips can occur and can be hazardous. • Appropriately manage works and avoid increasing the risk of erosion; • Manage soils that are at risk of becoming waterlogged; • Manage acidic and alkaline soils; • Rehabilitate disturbed areas once construction is completed; • Develop and implement erosion and sediment control management plan;	700,000	Proponent	• Have an institutional set-up or outsource monitoring of the implementation of the RAP. • Check that design requirements have been met • Monitor rehabilitation success through weekly inspections in the first four weeks after seeding, and then monthly until 80% cover has been achieved; Inspect fuel storage areas weekly and clean up and repair any ineffective storage areas.

Movement of vehicles, people and machines.	Public disturbance	• Construction activities should be done only during the day • Place sign posts at strategic point to notify public of the development, • Put speed caution labels to avoid accidents • Where possible encourage the use of environmentally friendly fuels such as lead-free fuels • Provide adequate parking facilities within the premises • Prohibit parking of construction vehicles along access road • Firm to deploy adequate security personnel to guide traffic, parking and movement within the compound • Install heavy truck turning signs at safe distance along pipeline road (during the construction period for transporting construction materials)	Project budget Contingencies allocation	Contractor	• Time of construction • Billboards • Speed caution labels • Type of fuel used • Parking space • Presence and capacity of diversion routes • Traffic guide interventions

Table 8: The Environmental and Social Management & Monitoring Plan: Operation phase					
Project Activities/Environmental Effect	**Potential Impact Description**	**Mitigation/ Enhancement Measures**	**Mitigation Cost (Ksh)**	**Responsibility**	**Monitoring Indicators**
Land, water and soil degradation/Contamination	Oil and chemical spill	• Proper storage, handling and disposal of oil and wastes from irrigation machinery • Discourage servicing of machinery and vehicles on site except on containment area	700,000	Contractor	• Is there any complaint? • Containment of oil tanks and fueling sites. • Compliance with the regulations providing for integrated water resources management will be monitored through the respective agencies.
Irrigation farm management camp and site office operations	Injuries, Bleeding of mosquitoes, HIV/AIDS, Diseases, Killing of wild animals for food,	• Ensure proper waste collection and disposal • Provide first aid kit at site • Sensitize residents/workers on environmental management • Eliminate breeding of mosquitoes • Workers should be trained on occupational health and safety and first Aid administration • Train staff on petroleum product handling • Sensitize workers on HIV and AIDS	200,000	Contractor	• Waste management program • List of first aid kits and contents • Training records • HIV/AIDS program • Is any wild animal or its remains sighted at construction camps? • Is any poaching by workers reported? • Accident/injury records
Farm machinery and equipment operations	Noise and vibrations from machinery and vehicles	• Workers in the vicinity involved in high level noise to wear respective safety and protective gear i.e. earplugs. • Low noise selection of machinery • Use low noise equipment	500,000	Contractor	• Monitor if noise levels at sensitive receptors during day and night comply to those stipulated in the First & Second Schedules; • Respond to any complaints arising in relation to noise. • Conducting regular site audits to ensure that noise control measures are properly implemented.
Occupational Health & Safety	Disease infectious	• Encourage residents to maintain high standards of personal cleanliness; Keep the premises and its environment (surroundings) clean always.	300,000	Proponent	• Camping Site inspection report • Records of any disease outbreaks
Farm and domestic waste generation	Waste generation & handling	• Locate material and stockpiling areas until its ultimate destination is determined. • Appropriately manage stockpile areas and storage areas • Dispose non-recyclable at a licensed waste facility and avoid fly-tipping. • Recycle any recyclable that cannot be reused and remove excess ballast and clean fill off site for reuse, as possible	500,000	Proponent	• Inspect waste storage areas on a weekly basis to make sure that wastes are being stored properly • Maintain a waste register for all hazardous wastes and operation wastes. • Review register monthly to identify any dramatic changes in waste generation patterns and possible opportunities for waste minimization.

Terrestrial and aquatic ecology	Wildlife and domestic animals management	• Erect temporary fencing around the farm zones in accordance with an approved site management plan	700,000	Proponent	• Manage Pest species and weeds; • Fauna strike and mortality during operation. • Ensure good farming practices • If the quality of the water has deteriorated or if their presence is suspected, relevant and competent authorities shall determine the concentrations of pesticides, heavy metals, cyanides, nitrates, and phosphates. If the water shows a tendency toward eutrophication, relevant authorities shall check for ammonia and total nitrogen. • Ensure in-stream flows are maintained via a flow diversion system
Resettlement action planning	Land related issues	• Compensate those affected according to the official market rates. • Provide allowances and other assistance to make a smooth transition after displacement. • Implement an institutional structure or a mechanism for monitoring and evaluating the compensation/resettlement process. •	1,000,000	Proponent	• Have an institutional set-up or outsource monitoring of the implementation of the RAP. • Check that design requirements have been met
Cultural heritage management	Culture issues	• To recognize, respect and protect cultural and natural heritage and social bonding during Operation Phase of the Project. • Ensure community participation in decisions regarding heritage conservation, and realize that the cultural and spiritual importance of heritage sites and properties may be very location-specific. • Culture clash -Identify with the host communities during festivals	500,000	Proponent	• preservation of cultural assets of affected communities. This can be achieved in part by stakeholder participation of community representatives in order to capture value and incorporate this to the Project, especially during operation phase

Farming practices	Soil management and conservation	• If contaminated land is identified further investigate and develop a remediation plan; • Develop appropriate management and disposal methods for contaminated soils and other materials; • Dispose of contaminated soils to authorized facilities on-site or off-site in accordance with disposal permits; • Design fuel, oil and chemical storage areas in accordance with Kenyan Standards; • If dispersive soils are necessary to be incorporated as construction material, undertake appropriate treatment of the soil first; • Undertake appropriate measures required to stabilize the soil moisture content of shrink and swell soils; • Appropriately manage works and avoid increasing the risk of erosion; • Manage soils that are at risk of becoming waterlogged; • Manage acidic and alkaline soils; • Rehabilitate disturbed areas once construction is completed; • Develop and implement erosion and sediment control management plan;	700,000	Proponent	• Have an institutional set-up or outsource monitoring of the implementation of the RAP. • Check that design requirements have been met • Monitor rehabilitation success through weekly inspections in the first four weeks after seeding, and then monthly until 80% cover has been achieved; Inspect fuel storage areas weekly and clean up and repair any ineffective storage areas.

Movement of vehicles, people and machines.	Public disturbance	• Construction activities should be done only during the day • Place sign posts at strategic point to notify public of the development, • Put speed caution labels to avoid accidents • Where possible encourage the use of environmentally friendly fuels such as lead-free fuels • Provide adequate parking facilities within the premises • Prohibit parking of construction vehicles along access road • Firm to deploy adequate security personnel to guide traffic, parking and movement within the compound • Install heavy truck turning signs at safe distance along pipeline road (during the construction period for transporting construction materials)	Project budget Contingencies allocation	Contractor	• Time of construction • Billboards • Speed caution labels • Type of fuel used • Parking space • Presence and capacity of diversion routes • Traffic guide interventions •

Table 9: The Environmental and Social Management & Monitoring Plan: Decommissioning phase						
Project Activities	**Potential Impact Description**	**Mitigation/ Enhancement Measures**	**Cost of Mitigation /Enhancement**	**Responsibility**	**Frequency**	**Verifiable Monitoring Indicators**
Demolishing the borehole	Dust, solid waste	• Workers to use Personal Protective Devices such as noise masks, breathing masks • Provide dust shields on building under construction • Water sprinkling of driveways to reduce dust emission during construction	20,000	Project Proponent	During demolishing work	• Observable use of PPE • Records of scrap material disposal site licenses and records
	Possible injuries	• Use of first aid kit	10,000	Project Proponent	During demolishing work	Site inspection report
		• Availability of standby ambulance	20,000	Project Proponent	During demolishing work	Contract with the ambulance ownership.
Land Leveling	Dust	• Workers to use Personal Protective Devices such as noise masks, breathing masks	20,000	Project Proponent	During demolishing work	Observation records
Re-vegetation	Soil Erosion	• Take appropriate soil conservation measures	50,000	Project Proponent	After demolishing work	Inspection report
Safety Risks	Possible injuries from demolition activities.	• Training on safe working procedures • Ensure provision of PPEs at all stages of project cycle	500,000	Contractor	During demolishing work	Inspection report Inspection report
Cultural heritage management	Culture issues	• To recognize, respect and protect cultural and natural heritage and social bonding during Operation Phase of the Project.	500,000	Proponent	• During demolishing work	• Preservation of cultural assets of affected communities.
Terrestrial and aquatic ecology	Wildlife and domestic animals management	• Erect temporary fencing around the farm zones in accordance with an approved site management plan	700,000	Proponent	• During demolishing work	• Manage Pest species and weeds from transfer • Fauna strike and mortality during operation.

Visual intrusion		• All solid waste from the demolition site should be cleared on completion and disposed suitably bin to the approved dumpsites. The projects should be blended in a way to merge with the existing environment	Project demolition costs	Contractor	During demolishing work	Inspection report

Table 10: Cross – Cutting issues management (Construction, Operation and Decommissioning)

Occupational Health and Safety				
Objective(s)	To reduce chances of accidents			
Management Strategy	Mitigate or minimise accidents and hazards through health and safety measures.			
		Responsibility (Role)	**Timing**	**Cost**
Control(s)	• Full implementation of Occupational Health and Safety Strategy (Attached) • On-job training of employees • Provision of appropriate PPE'S to employees.	Safety and Health officer	Throughout project period	2,000,000
Performance Indicator(s)	• Number of safety incidents • Number of training sessions organized for workers • Number of PPE's provided to workers			
Monitoring	• A three month risk assessment will be carried out to various contractors' activities and improvements proposed. • A three month OHS report shall be prepared for the supervising consultant as monitoring tool on the strategy implementation • Annually an OHS report will be prepared and submitted to the DOSHS for review			
Reporting	Occupational Health and Safety reports will be prepared every three months and annually.	Safety and Health Officer	Throughout project	
Corrective Action(s)	• Investigate cause of an accident at the workplace and keep record of accidents that occur at the workplace. • Review cause of an accident and develop response, such as variation of OHS plans and strategy or risk awareness to all employees.	Project Manager, Environmentalist and Safety and Health Officer	Throughout project	

	● Implement controls as stated in the OHS strategy.			

Public Health/Community Health				
Objective(s)	● To reduce transmission of diseases ● To create awareness of the HIV/AIDS.			
Management Strategy	Mitigate transmission of STI's, HIV/AIDS and other communicable diseases through awareness and encourage use of preventive and precautionary measures.			
		Responsibility (Role)	**Timing**	**Cost**
Control(s)	● Engage an HIV/AIDS sub contractor to conduct awareness trainings ● Provision of condom dispensers at the camps	Sociologist	As specified in the contract	In contract document
Performance Indicator(s)	● Number of awareness campaigns done ● Number of condoms distributed			
Monitoring	Behaviour change shall be monitored by sub contractor			
Reporting	Monthly and quarterly reports	Sociologist	Throughout project	
Corrective Action(s)	● Investigate cause of inappropriate activities ● Implement controls like ensuring condom dispensers are re-field regularly.	Sociologist	Throughout project	

Child Protection	
Objectives	To prevent and respond to violence, neglect, sexual and other exploitation and abuse against children.
Management Strategy	● Build Partnership and collaborations with the Department of Children's Services and other key actors ● Provide safe environment for all children ● Strengthen the protective role of communities. ● Conduct sensitization of workers on child protection issues

	● Work with the office of the chief to monitor child protection issues ● Keep children away from the camp and work areas			
		Responsibility (Role)	**Timing**	**Cost**
Control(s)	● Workers sensitization on child protection issues ● Workers signing code of conduct ● Constructing entertainment facilities at the camps to reduce interaction with children outside the camps ● Verification of age through national identification cards/passports for workers ● Build capacity of village volunteer child monitors to enhance awareness on child protection in their respective catchment areas ● Setting up of hotline for reporting incidences of child abuse and the number posted at strategic places within the project area ● Encourage village volunteer child monitors to work closely with the office of chief and department of children on issues of child protection ● Involve grievance redress mechanism committees, NGO's and department of children to support child protection processes. ● Engage HIV/AIDS sub-contractor to sensitize children on dangers of early sexual debut, child marriage and HIV/AIDS and other STIs.	Sociologist	Daily	3,000,000
Performance Indicator(s)	● Number of child protection sensitization sessions conducted ● Number of workers who have signed the workers code of conduct ● Number of cases of child abuse reported and dealt with ● Number of child monitors appointed and actively involved in child protection issues ● Number of entertainment facilities constructed at the camp and in use ● Number of sensitization sessions conducted by HIV/AIDS subcontractor ● Number of children sensitized ● Number of calls received on the hotline			
Monitoring	● Routine checks on incidences of child abuse from the chiefs/monitoring centers.			
Reporting	● Bi-weekly reports from village volunteer child monitors, ● Monthly reports ● Quarterly reports			
Corrective Action(s)	The project shall have zero tolerance for breaches of its child protection policies. Failure to comply with the code of conduct will result in the following:			

	• Administrative and legal action taken to safeguard the rights of the child. • Court of law • Termination of employment			

Labour Influx Management				
Objective(s)	To identify ways of dealing with increase in population in the project area by persons in search of employment and business opportunities and the resulting stress they will suddenly put on existing social amenities and resources.			
Management Strategy	Involving Locational committees in recruitment process to allocate employment opportunities to locals and outsiders with relevant skills.			
		Responsibility (Role)	**Timing**	**Cost**
Control(s)	• Effective communication and dissemination of employment opportunities available at the camp • Engagement of Locational committees in recruitment of workers to ensure that people from their locations apply for the available opportunities • Accommodation of non-local workers in camps • Offering wages within the law but which is less competitive	Sociologist	Daily	No cost
Performance Indicator(s)	• Number of opportunities available and filled by non locals • Number of non locals seeking employment opportunities but have not been absorbed • Number of non locals who have established businesses and other engagements as a result of the project			
Monitoring	Routines checks on written applications and the people who come to Contractor's camp gate to look for employment			
Reporting	Monthly and quarterly			
Corrective Action(s)	• Post "No employment vacancies" notices at the gate • Advertise vacancies and allow enough time between advert and interview			

Stakeholder Engagement	
Objective(s)	To provide stakeholders with an opportunity to interact, share concerns, opinions and feelings freely and collectively contribute to the project decisions and outcomes.
Management Strategy	To map out stakeholders and analyze their expectations and capabilities for mutual collaboration and support

		Responsibility (Role)	**Timing**	**Cost**
Control(s)	● Ensure inclusivity by mapping villages within 5Km radius from the center of the road to ensure participation and involvement by all ● Establish a link between the identified stakeholders and the Locational committees to enhance participation and active involvement in project activities ● Facilitation of stakeholders and respective committees to undertake project activities ● Capacity building of stakeholders to improve their performance in project activities ● Ensure that notices for meetings are posted in appropriate places in good time ● Minutes of meetings are prepared and circulated in advance	Sociologist	Quarterly	5,000,000
Performance Indicator(s)	● Number of meetings held and minutes circulated with stakeholders and key decisions made ● Number of women, men and youth engaged in different project activities ● Number of notices posted for meetings ● Number of capacity building sessions held with stakeholders.			
Monitoring	Regular check on performance of different groups of stakeholders			
Reporting	Monthly and quarterly reports			
Corrective Action(s)	Increasing capacity building and facilitation for different project activities such as violence against children, gender based violence			

Grievance Redress Mechanism				
Objective(s)	To provide local solutions to grievances and stimulate social development.			
Management Strategy	Dealing with grievances from the root cause of the problem to a level it can be resolved			
		Responsibility (Role)	**Timing**	**Cost**

Control(s)	• Involving the Resident Engineer and Project manager in the grievance redress mechanism processes. • Building capacity of GRM committees to receive and handle grievances • Facilitate the GRM committees to handle a wide range of grievances in their respective areas • Expose GRM committees to paralegal training to improve capacity to arbitrate grievances • Strengthen the capacity of GRM committees to handle such tools as stakeholder register, feedback form, grievance form, commitment register and grievance log form	Sociologist	Daily	4,000,000
Performance Indicator(s)	• Number of grievances received and resolved • Number of meetings held by different grievance redress committees • Number capacity building sessions for the GRM committees			
Monitoring	Periodic checks on the grievance tools put to project use.			
Reporting	Monthly and quarterly reports			
Corrective Action(s)	Further capacity building of GRM committees.			

Climate Change and Mitigation Measures				
Objective(s)	To ensure that the activities of the project does not cause adverse climate change			
Management Strategy	Mitigation or minimization of possible adverse impact on climate change			
		Responsibility (Role)	**Timing**	
Control(s)	• Drilling of boreholes to supplement the existing water sources which is a scarce resource in this region • Sprinkling water along the dusty prone areas to avoid dust from covering the existing vegetation • Growing trees and flowers in the campsite. Also plans are underway of planting trees at the areas affected by the project at the end of the project	Project Manager	Throughout the project area	1,000,000

	• Bush clearing is only restricted to the road reserve and the borrow pit areas. Some trees are spared at the borrow pit • Use of firewood and charcoal is highly discouraged • Burning of dry solid waste is not allowed • Waste is properly managed at all project sites • Portable clean and safe water is provided at the offices and water taps are installed at the strategic areas at the campsite and the crusher site. The workers will be provided with the washing bays at their residential areas. • There is a water resource management plan to ensure sustainable management of the scarce resource • Vehicles and machinery are regularly serviced and maintained at the workshop. This reduces at the emission into the atmosphere which may cause ozone layer depletion.			
Performance Indicator(s)	• Number of boreholes drilled • Number of trees planted • Number of times a vehicle/equipment serviced • Frequency of water sprinkling along the diversions			
Monitoring	• Daily assessment of trees planted • Annual assessment of the air quality			
Reporting	• Monthly and quarterly reports • Annual water quality reports			
Corrective Action(s)	• Investigate cause of too much air emission • Mitigation of the dust and other particulate matters			

Table 11: Environmental and Social Commitment Plan

Environmental and Social Commitment Plan
(world Bank ESS requirements)

Material measures and actions		**Timeframe**	**Responsible entity / Authority**
Monitoring and reporting			
A	**Regular reporting** Prepare and submit to the [Bank/Association] regular monitoring reports on the environmental, social, health and safety (ESHS) performance of the project, including but not limited to the implementation of the ESCP, status of preparation and implementation of E&S documents required under the ESCP, stakeholder engagement activities, functioning of the grievance mechanism(s).	Monthly and quarterly throughout project implementation	Proponent
B	**Incidents and accidents** Promptly notify the [Bank/Association] of any incident or accident related to the project which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers including work related injuries, natural calamities, community grievances and any other major incident within the project scope. Provide sufficient detail regarding the incident or accident, indicating immediate measures taken or that are planned to be taken to address it, and any information provided by any contractor and supervising entity, as appropriate. Subsequently, as per the [Bank/Association]'s request, prepare a report on the incident or accident and propose any measures to prevent its recurrence.	Notify the Bank within 48 hours after learning of the incident or accident. Timing on the submission of subsequent report would be specified by the Bank, e.g. A report would be provided within a timeframe acceptable to the Bank/Association, as requested.	Proponent
C	**Contractors monthly reports** Subject to the Bank's request, contractors may be required to provide monthly monitoring reports to the project implementing unit. If needed, teams can include an action indicating that such monthly reports would be submitted to the Bank by the borrower upon request.	As need arises	Proponent

ESS 1: Assessment and management of environmental and social risks and impacts			
1.1	**Organizational structure** Establish and maintain an organizational structure with qualified staff and resources to support management of E&S risks. Key positions shall be the contractor's environment & safety officer, contractor's sociologist and community liaison officer, the supervising consultant's environmentalist and the supervising consultant's sociologist.	an organizational structure will be established within 30 days after project effectiveness.	Proponent
1.2	**Environmental and social assessment** Update, adopt, and implement, the environmental and social impact assessment that has been prepared for the project, in a manner acceptable to the Bank/Association.	The draft EIA summary project report is already prepared for review.	Proponent
1.3	**Management tools and instruments** The proponent shall screen any proposed subproject in accordance with the environmental and social management framework (ESMF) prepared for the project, and, thereafter, draft, adopt, and implement the subproject environmental and social management plan (ESMP), as required, in a manner acceptable to the Bank/Association.	Subproject ESMP shall be prepared before implementation of any subproject.	Proponent
1.4	**Management of contractors** Incorporate the relevant aspects of the ESCP, including the relevant E&S documents and/or plans, and the labor management procedures, into the ESHS specifications of the procurement documents with contractors. Thereafter ensure that the contractors comply with the ESHS specifications of their respective contracts.	Prior to the preparation of procurement documents. Supervise contractors throughout project implementation].	Proponent
ESS 2: labor and working conditions			
2.1	**Labor management procedures** Update, adopt, and implement the labor management procedures (LMP) that shall be developed for the project.	Throughout project implementation	Proponent
2.2	**Grievance mechanism for project workers** Establish, maintain, and operate a grievance mechanism for project workers, as described in the LMP and consistent with ESS2.	Grievance mechanism shall me maintained	Proponent
2.3	**Occupational health and safety (OHS) measures** Prepare, adopt, and implement occupational, health and safety (OHS) measures specified in the ESMP, Kenya's Occupational Safety And Health Act 2007 and related legislations	To be developed & applied during implementation	Proponent
ESS 3: Resource efficiency and pollution prevention and management [the relevance of ESS3 is established during the ESA process. ESS3 may require the adoption of specific measures to cover energy, water and raw materials use, management of air pollution, hazardous and nonhazardous wastes, chemicals and hazardous materials and pesticides. Depending on the project, these measures may be set out in an E&S document (e.g. ESMP) already mentioned in the section under ESS1 above or as a stand-alone document or a separate action. Indicate whether ESS3-related measures are covered under an existing document or as stand-alone actions. See examples below].			
3.1	**E-waste management plan:** prepare, adopt, and implement an e-waste management plan.	To be developed & applied during implementation	Proponent

3.2	**Resource efficiency and pollution prevention and management:** resource efficiency and pollution prevention and management measures will be covered under the ESMP to be prepared.	To be developed & applied during implementation	Proponent
ESS 4: Community health and safety [the relevance of ESS4 is established during the ESA process. As with ESS3, ESS4 may require the adoption of specific measures that may be set out in an E&S document (e.g. ESMP) already mentioned in the section under ESS1 above or as a stand-alone document or a separate action. Indicate whether ESS4-related measures are covered under an existing document or as stand-alone actions. See examples below].			
4.1	**Traffic and road safety**: adopt and implement measures and actions to assess and manage traffic and road safety risks as required in the ESMPs to be developed under action 1.2 above.	To be developed & applied during implementation	Proponent
4.2	**Community health and safety:** prepare, adopt, and implement measures and action to assess and manage specific risks and impacts to the community arising from project activities including behavior of project workers, risks of labor influx, response to emergency situations and include these measures in the ESMPs to be prepared in accordance with the ESMF, in a manner acceptable to the Bank.	To be developed & applied during implementation	Proponent
4.3	**GBV and SEA risks**: prepare, adopt, and implement a stand-alone gender-based violence action plan (GBV action plan), to assess and manage the risks of gender-based violence (GBV) and sexual exploitation and abuse (SEA).	To be developed & applied during implementation	Proponent
4.4	**GBV and SEA risks during project implementation**: the proponent to provide funds and/or insurance in the project for prompt implementation of the GBV and sea risks	To be developed & applied during implementation	Proponent
4.4	**Security personnel**: prepare, adopt, and implement a stand-alone security personnel management plan consistent with the requirements of ESS4, in a manner acceptable to the Bank	To be developed & applied during implementation	Proponent

ESS 5: land acquisition, restrictions on land use and involuntary resettlement [the relevance of ESS5 is established during the ESA process. If during project preparation, it is determined that resettlement documents need to be prepared, this should be reflected in the ESCP. See examples below]			
5.1	**Resettlement plans:** prepare, adopt, and implement resettlement plans (RAPs) in accordance with ESS 5 and consistent with the requirements of the resettlement policy framework (RPF) that has been prepared for the project, and thereafter adopt and implement the respective RAPs before carrying out the associated activities, in a manner acceptable to the [Bank/Association].	Raps shall be prepared and submitted for the Bank's approval and, once approved, implemented.	Proponent
5.2	**Grievance mechanism** The grievance mechanism (GM) to address resettlement related complaints should be described in the RPF, RAPs and SEP. However, if there is a distinctive feature as to how ESS5 related grievances will be handled, this can be specified as an action in the ESCP.	To be developed & applied during implementation	Proponent
ESS 6: Biodiversity conservation and sustainable management of living natural resources [the relevance of ESS6 is established during the ESA process. As with other ESSs, ESS6 may require the adoption of specific measures that may be set out in an E&S document (e.g. ESMP) already mentioned in the section under ESS1 above or as a stand-alone document or a separate action. Indicate whether ESS6-related measures are covered under an existing document or as stand-alone actions. See examples below].			

6.1	**Biodiversity risks and impacts**: prepare, adopt, and implement a stand-alone biodiversity management plan, in accordance with the guidelines of the ESIA prepared for the project, and in a manner acceptable to the Bank.	To be developed & applied during implementation	Proponent
ESS 7: Indigenous peoples/sub-Saharan African historically underserved traditional local communities [see examples of possible actions below, if determined that ESS7 is relevant].			
7.1	**Indigenous peoples plan**: prepare, adopt, and implement indigenous peoples plans (IPPS) consistent with the requirements of the indigenous peoples planning framework (IPPF) that has been prepared for the project and ESS7, in a manner acceptable to the Bank.	To be developed & applied during implementation	Proponent
7.2	**Grievance mechanism:** prepare, adopt, and implement the arrangements for the grievance mechanism for indigenous people, as required under the IPPF and further describe such arrangements in the respective IPPS (if the grievance mechanism is distinctive from the one established under ESS10).	To be developed & applied during implementation	Proponent
ESS 8: Cultural heritage [the relevance of ESS6 is established during the ESA process. As with other ESSs, ESS6 may require the adoption of specific measures that may be set out in an E&S document (e.g. ESMP) already mentioned in the section under ESS1 above or as a stand-alone document or a separate action. Indicate whether ESS8-related measures are covered under an existing document or as stand-alone actions. See examples below].			
8.1	**Chance finds**: prepare, adopt, and implement the chance finds procedure described in the ESMP developed for the project.	To be developed & applied during implementation	Proponent

ESS 9: Financial intermediaries [this standard is only relevant for projects involving financial intermediaries (FIS). See below a couple of examples of actions that should be considered when FIS are involved.]			
9.1	**ESMS**: prepare, adopt, and maintain an environmental and social management system ESMS.	To be developed & applied during implementation	Proponent
9.2	**Fi Organizational capacity:** establish and maintain an organizational capacity and competency for implementing the ESMS with clearly defined roles and responsibilities [where relevant, identify specific positions/resources for E&S management that are a part of the organizational structure].	To be developed & applied during implementation.	Proponent
9.3	**Senior management representative:** designate a senior management representative to have overall accountability for environmental and social performance of fi subprojects.	To be developed & applied during implementation	Proponent
ESS 10: Stakeholder engagement and information disclosure			
10.1	Stakeholder engagement plan preparation and implementation [a draft SEP should have been prepared and disclosed before appraisal. The ESCP should indicate whether the plan was already prepared or needs to be updated and require its implementation. See example below]. Prepare, update, adopt, and implement stakeholder engagement plan (SEP).	To be developed & applied during implementation	Proponent
10.2	Project grievance mechanism: prepare, adopt, maintain and operate a grievance mechanism, as described in the SEP.	To be developed & applied during implementation	Proponent

Capacity support (training)			
Cs1	Training may be required for [e.g. PIU staff, stakeholders, communities, project workers] on: • Stakeholder mapping and engagement • Specific aspects of environmental and social assessment • Emergency preparedness and response • Community health and safety.]	to be developed & applied during implementation	Proponent
Cs2	Trainings for project workers on occupational health and safety including on emergency prevention and preparedness and response arrangements to emergency situations.	To be developed & applied during implementation	Proponent

9. CONCLUSIONS AND RECOMMENDATIONS

This report has highlighted the relevant legislation for the project and documented evidence based baseline data on the project. The measures proposed herein in the report need to be implemented to enhance the good utilization of our environment sustainably. It is hereafter reinforced that Project specifications, guidelines, licenses and permits must be in the possession of the contractor and the contracting department prior to commencement of construction. Through regular safety meetings, all water pan construction employees and contractors working on the project will have to be made aware of these documents and their contents. To enhance the proposals in this report, all employees and contractors should comply with all Kenyan Regulatory requirements relating to the construction, operation and decommissioning of the water pan project and facilities. Environmental management and monitoring programs will have to be conducted in full cooperation with local authorities.

Before excavation starts, runoff control measures shall be designed to redirect surface runoff away from access routes and water pan reservoir. Organic material, topsoil, and subsoil shall be stripped and piled separately adjacent to pits and excavations for future site rehabilitation. To encourage re-vegetation, the organic layer will be separated from other overburden soils and replaced on pit slopes and bottoms after borrow material has been removed from sites designated for decommissioning. Site clearing shall be minimized but will permit the safe and efficient movement of personnel, material and equipment, while allowing for excavation of materials. The contractor will have to reduce soil erosion and instill dust control measures on site. Washing and maintenance of vehicles and equipment in the excavated area shall not be permitted.

Signs will have to be erected to warn unauthorized personnel of safety hazards. Whenever possible, excavation sites for pits and quarries should be selected in areas where a minimum amount of overburden will need to be removed. Appropriate site drainage and erosion control measures shall be implemented for borrow sites which are no longer needed. Before commencement of the work, the Contractor shall provide MOW with their protocol for containment, transport and disposal of wastes. Hazardous materials will have to be stored within dedicated areas at work camps and marshalling yards in full compliance with regulatory requirements.

Thus, on behalf of the study team, I recommend that NEMA should consider issuing a license for the implementation of the project.

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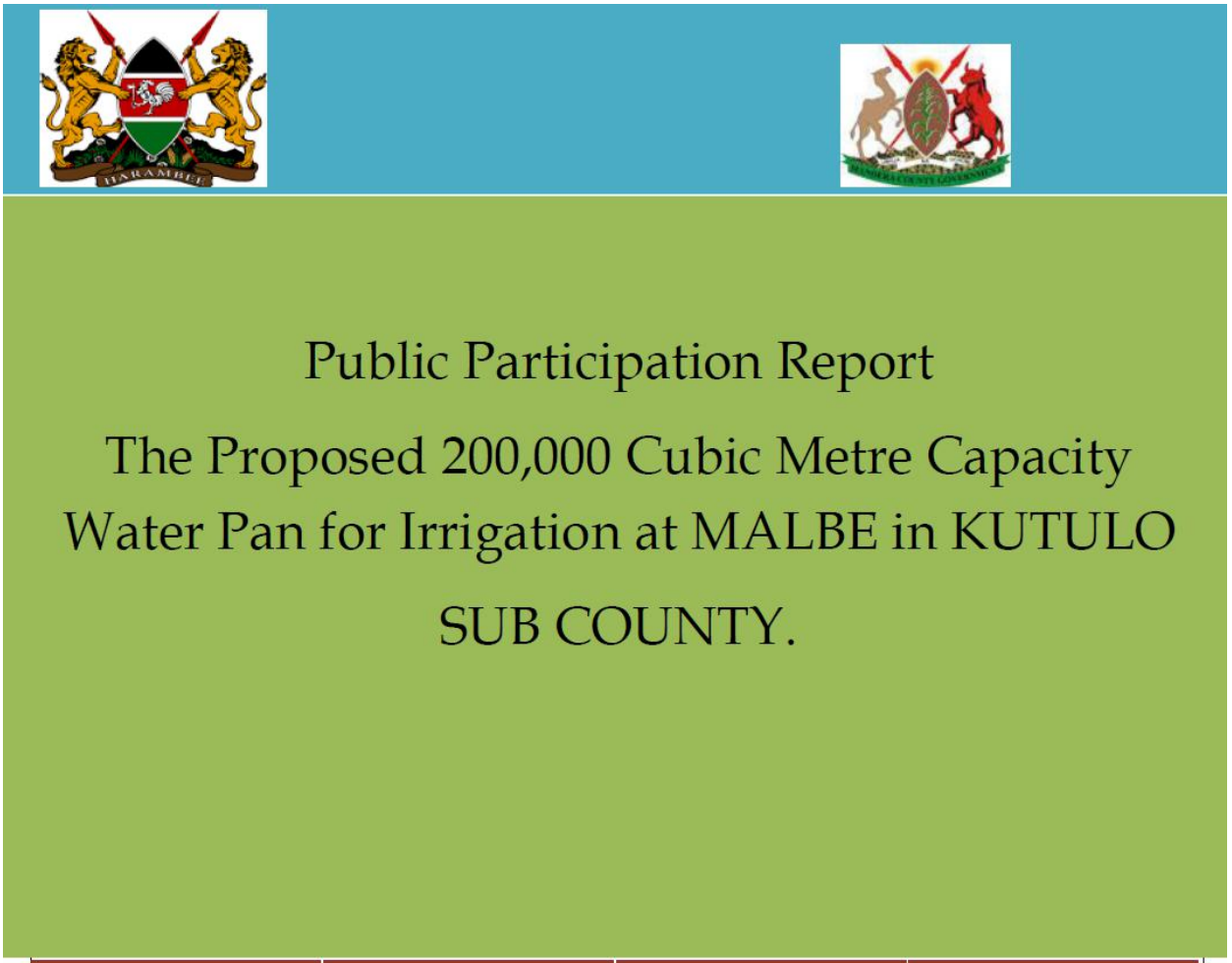
11.APPENDICES

11.1 Appendix 1: Public Participation Report



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1.0 INTRODUCTION

1.1 Background

The County Government of Mandera intends to fund the implementation of the proposed **200,000 M^3** dam complete with irrigation infrastructure at Malbe, Kutulo. This is in line with the MCG initiative to improve food security which also forms part of the Big Four Agenda of the National Government.

The level of poverty in Mandera County is quite high. The initiation of irrigation project is expected to spur economic growth and reduce poverty level in this county.

1.2 Project Location

The geographical location of proposed Malbe water pan is **E** 06 870023 and **N** 0265391, UTM Zone 37 **N**. the project is located in Kutulo sub-location, Kutulo village. The land ownership system among the Garre clan where the project is located is communal.

1.3 What is public Participation?

It is a process in which the views of all interested parties (stakeholders) are integrated into project decision-making. It aims at creating openness and dialogues from the outset of the project. Generally, public participation seeks and facilitates the involvement of those potentially affected by or interested in a decision. This can be in relation to individuals, governments, institutions, companies or any other entities that affect public interests. The principle of public participation holds that those who are affected by a decision have a right to be involved in the decision amking process. Public participation implies that the public's contribution will influence the decision. Public participation is viewed as a tool, intended to inform planning, organising or funding of activities. It may also be used to measure attainable objectives, evaluate impact and identify lessons to future practise. It forms one of the key pillars of the new constitution of Kenya 2010.

1.4 Benefits of public Invlovement

1.5 Sustainable development

This can only be achieved through the involvement of all stakeholders. Therefore, there will be improved sustanability of the project.

1.6 Environmental protection

Environmental issues can be addressed when valued by the public. It is important that a party represents the interests of the environment in the public debate.without such a party, the environment will not be put on the agenda.

1.7 Conflict management

Although conflicts caanot be avoided, they are made explicit in the public participation debate. This makes conflict handling more efficient.

1.8 Project understanding and reduction of opposition of public opposition

The public, being the user of a system, is the only party that can assess and valuate the impacts of (possible) measuers on the functions of the environment.

1.9 Economic benefits

If the public is involved in full decision making process, their concerns may be met early on in the planning process when changes may be easier to make, rather than late in the process when changes may cost both time and money.

2.0 General Objectives of publc Participation

Generrally, the aims of involving the public include:

- The identification of key issues of concern to the public; addressing public perceptions
- The provision of local expertise and knowledge
- The identification of possible project alternatives/options
- Ensuring that affected groups are involved at the very beginning of the project design
- The critical review of documentation

2.1 Specific objectives of Public participation

- ❖ Site visit and site identification

- ❖ Gather community views on the proposed project
- ❖ Provide detailed information about the project to the community

2.2 Main objective of this report

This report is aimed at providing feedback from the community as far as the proceedings, findings, challenges, pauplic participation and recommendations are concerned.

2.3 Public Participation Process and Methodology

2.3.1 Public Notification

The public was made aware of the construction of the proposed water pan project through the Chairman of Council of Elders, Mr Mohammed Ahmed Tache who liased with the village elders to bring on board women, religious leaders, the youth, business community and the public in general.

2.3.2 Courtesy call

The county puplic participation team led by the deputy director of irrigation department Eng Omondi, paid courtesy call to the Deputy Sub-County Commissiner on 2nd of Nov 2018 as was captured in the photo below. The sole objective was to inform him of the purpose of visit and seek his views and support over the same.

Plate 1.0 Members during courtesy call to DSCC in his office.

2.3.3 Site Visit

On the 2nd day of Nov 2018, the Engineering team together with a section of community elders under the watchful eyes of security personnel conducted a site visit to the proposed Malbe site as can be seen in the slide below.

Fig 1.1 The Engineers taking notes on the proposed site. Looking on from 3rd Left is DSCA.

The geographical location of proposed Malbe water pan is **E** 06 870023 and **N** 0265391, UTM Zone 37 **N**. the project is located in Kutulo sub-location, Kutulo village. The site is about 6km North-East of Kutulo centre.

2.3.4 Public Participation

Public Participation was conducted on 3rd of Nov at Kutulo centre. The exercise was led by the DDCI, Mr Omondi, The DSCA Mr Mustaffa and Chairman council of Elders Ahmed Tache, Mr Omondi. The subject of proposed water pan construction was introduced to the members for a debate. Some of the issues of concern that were raised include:

- The beneficiaries
- Suitability of the site
- Security at the site
- Types of crops to be grown
- Design work
- Land size to be irrigated by the water pan.

2.3.5 Tools used to conduct public Participation

2.3.5.1 Photography

The team used digital phone cameras to capture images of the participants during the proceedings.

Slide 2.0 Chairman Council of Elders giving his contribution

Slide 3.0 A section of members keenly following the debate.

2.3.5.2 Direct Observation

During site visit, the team visited some small farms in the neighborhood of Kutulo centre. It was realized that the type of soil in this area had the potential of supporting many high value crops, such as Maize, Onions, Pawpaw, Bananas, etc. some of the crops are shown in the slides below.

2.3.5.3 Crop Performance

A spot check at some of the crops grown in small scale around Kutulo revealed that the soil around this has the potential of supporting a good number of high value crops. Some of them include:

Food crops:

- Maize
- Sorghum
- Cowpeas

Horticultural crops (vegetables)

- Onions
- Capsicum
- Kales
- Tomatoes

Horticultural crops (fruits)

- Water melon
- Mangoes
- Bananas

Oil crops

- Simsim
- Sunflower

Fodder crops: Include maize, Rhodes grass.

Slide 4.0 Onions

Slide 5.0 Dhania (corrianda)

Slide 6.0 Tomatoes

Fig 7.0 Black Night shade (osuga)

Slide 8.0 Bananas

Slide 9.0 Pawpaw

Slide 10.0 Kales

2.3.5.4 Use of Pen and Paper

The team of engineers took the initiative to pass round an attendance sheet where most participants wrote their names. The list comprised the women, community elders, religious leaders, youth and the general public.

2.3.5.5 Interviews

Interviews and stakeholder engagements were carried out in the form of a public meeting where attendance sheets were filled in and minutes of meeting taken. The status of the project as well as its design was disclosed to the stakeholders at this point.

2.4 Resolutions of public Participation

Some the issues that were raised during the participation were resolved as follows.

2.4.1 The beneficiaries

After lengthy debate, members agreed that the host community will reap direct benefits from the project. Others are institutions such as schools.

2.4.2 Suitability of the site

Initially, two sites were floated for evaluation. That is, Dufe and Malbe. The members rejected Dufe since it was characterized by poor soil, compounded with the fact that it was situated about 11km away from Kutulo centre. This distance was seen as a hindrance to farm attaendance.

Members unanimously settled on Malbe area. They said it had good soil, much closer to Kutulo centre where most farmer reside. It is about 6km away from Kutulo centre. Finally, our expert opinion also approved Malbe citing same reasons, adding that laggasure would be much more necessary as water source to the water pan. Further, the technical team realized that the land was virgin since it has taken over 40 years before being put to agricultural use. The team also realized that there were no human settlements in the area and so the issue of human displacement and related effects would not be there.

2.4.3 Security issues

During public participation, members observed that even though it had taken long before major incidences of insecurity were reported, it was wise to put security into consideration since the Al Shabaab are unpredictable and no one knows when they would strike.

2.4.4 Types of crops to be grown

Some members wanted to know which crops will be grown after the construction of the water pan. It was resolved that this will be handled at a later date. That when the time comes, they will be required to rank all the crops of their choice in terms of preference and from there, soil analysis will be conducted to identify which crops can do better in the region.

2.4.5 Design work

A member requested that they be presented with the design layout of the water pan. It was resolved that this will be done later once survey work is done.

Attendance sheet

PUBLIC PARTICIPATION
VENUE: KOTULO
DATE: 03/11/2018

S.NO	NAME	ID NO:	SIGN
1	MOHAMMED IBRAHIM MOHAMMED (FORMER CALR)	0126675	[illegible]
2	ABDIRAHMAN OSMAN ABIO MZEE		Mohe
3	ABDI GARKE MZEE		
4	ABDISALAM ISSACK		
5	Ali Abo Nahed		[illegible]
6	Abdullahi M. Edin	2104971	[illegible]
7	Mohamed Adan Osman	2112027	[illegible]
8	Salal Hassan Ibrah	12426790	[illegible]
9	Mohamed Maalim Hassan	25326415	
10	Adan Maalim Hassan	0174559	
	Siyad Aliow Kumbi	12226759	[illegible]
	Hillow Abdullahi Mayow	12427022	[illegible]
10	Ibrahim Wala Abdy	0196212	[illegible]
11	Abdi Hassan Hassan (sic)	74650073	[illegible]
12	Yakub Maalim Abdulla	2112155	[illegible]
13	ABDIRAHMAN IBRAHIM (chief)	0196521	[illegible]
14	MUSA ADAN ISSACK	5964605	[illegible]
15	ABDULLAHI HUSSEIN MOHAMED	0726499966	
16	Abdulkadir Abdullah	0724731318	Ahmed
17	Ahmed Tache		Tache
18	ADAN HASSAN OMAR	5139575	[illegible]
19	SOMO ALI EDDOW		
	MOHAMED TACHE ISSAK		[illegible]
	Mustafa Shauri Osman	3087 5597	[illegible]
	Mohamed Ahmed Tache	24662518	[illegible]

FORUM PARTICIPATION
VENUE: KOTULO
DATE: 03/11/2018

SNO	NAME:	ID NO:	SIGN:
24	Ali Hassan Kala		
25	Mohamed Isaak Ali		
26	Mohamed Tarke Isaak		
27	Somo Ali Edow		
28	Adan Haji Omar		
29	Abdo Osman Abdo		
30	Abdi Gabole Abdi		
31	Omar Madan Barow		
32	Mohamed Ali Hassan		
33	Madin Mohamed M. Nunow		
34	Mohamed Bare Osman		
35	Abdisalam Abdurahman Ibrahim	Absent	
36	Isaack Omar Isaack		
37	Ibrahim Mohamud Isaak		
38	Mohamed Sheikh Ali		
39	Abdisalam Isaak Abbey		
40	Hussein Mohamed Isaak		
41	Hassan Mohamed Nur Edin		
42	Ibrahim Madin Edin		
43	Abdi Hassan Hassan		
44	Mohamud Ali		
45	Musa Edin Isaak		

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY FOR THE PROPOSED CONSTRUCTION OF KOTULO/MALBE WATER PAN AND IRRIGATION SCHEME PROJECT IN KUTULO SUB COUNTY, MANDERA COUNTY.

HOUSEHOLD QUESTIONNAIRE

Introduction:
The County Government of Mandera is carrying out the construction of the Proposed Kotulo/Malbe Water Pan and Irrigation Scheme Project in Kutulo Sub County, Mandera County. As part of the requirement of the second schedule of the Environmental Management and Coordination Act 1999 (Revised 2012), the County is carrying out Environmental & Social Impact Assessment (ESIA) of the project.

This household survey is part of the tools for collection of pertinent data for the ESIA. The aim of this survey is to form a realistic and up to date picture of the environmental and social economic situation in the project site.

We need your honest and accurate information during this survey. Your inputs will assist in the understanding of the overall social-economic state of the project site and further aid in making decisions that would minimize the project's negative impacts as well as enhancing the possible positive impacts.

The answers you provide will be kept confidential.

[To the Enumerator: Ask the Question and Check Response from the Options given else Write Down Response given If Not within the Options. Do Not Read the provided Options to the respondent]

SECTION 1 PARTICIPANTS DETAILS.

1.1 Name of the Enumerator: ……
1.2 Tel No. of Enumerator……..Signature of the Enumerator: …….
1.3 Name of the Respondent……
1.4 Relationship to household head (self/spouse/son/daughter/relative)……..……
1.5 Telephone number of the respondent……
1.6 Date: …….. Time of Interview: ……..……..
1.4 Respondent's place of residence:
(1)Village…….. (2) Location ……..
(3)Division -…… (4) District ……

SECTION 2 BASIC HOUSEHOLD SETUP

2.1 Who is the household head (father/mother/son/daughter/relative)…….
2.2 How many members do you have in this household?.....
2.3 How many members of your household fall under each of the following age groups?
(1) 0 – 5yrs(2) 5 – 18yrs (3) 19-35yrs (4) 36-49yrs (5) 49-65yrs (6) Over 65yrs
2.4 How many of your household members have attained each of the following education levels?
(1) None (2) Primary (3) Secondary (4) College/university
2.5 What is the occupation /economic activity of the household head?
(1)Crop farming (2) Livestock (3) Formal employment (4) Business (5) Others specify
2.6 If business what kind of business?
(1) Shop (2) motorbike (3) Jua kali (4) Others specify_____
2.7 What is the average combined household income per month?
(1) Less than 5,000 (2) 5,000-10,000 (3) 10,000-15,000 (4) Above 15,000

SECTION 3: WASTE MANAGEMENT

3.1 What is the common mode of domestic waste management in this area?
(1) Septic tanks (2) Latrines (3) Wetlands (4) Sewage treatment plants (5) Others, specify_____
3.2 What challenges do you face in domestic waste management?
(1) Waterborne diseases (2) Airborne diseases (3)Exhaust costs (3) water contamination (4) Discomfort (5)Others, specify_____
3.3 What is your general opinion on waste management practices in this area?
(1) Good (2) Fair (3) Bad
3.4 What other domestic waste management would you recommend?
(1) Septic tanks (2)Latrines (3) Wetlands (4) Sewage treatment plants (5)Others, specify _____

SECTION 4 SAFETY, HEALTH, WATER AND SANITATION

4.1 Which diseases have members of your household suffered from in the past six months?
(1)Malaria (2)Malnutrition (3)Measles (4)HIV/AIDS (5) Eye problems (6)Diarrhea (7) Cholera (8) Intestinal worms (9)Respiratory infections (10)Skin rashes (11)Other, specify
4.2 What do you do when you are sick?
(1)Visit medical clinic/centre (2)Pray (3)take herbs (4) Other, specify_____
4.3 What is the ownership status of health facilities attended by your household members?
(1)Public (2) Private (3) Faith based (4) NGO (5) Traditional
4.4 How far is the health facility visited by your household members in km?
(1) Less than 1km (2) 1 -3km (3) 3 – 5km (4) Above 5km
4.5 What is the main source of drinking water?
(1) Protected spring /river (2) Private tap (3) Public Tap (4) Shallow well with Hand Pump (5) Dam/water pan (6) Others, specify_____
4.6 What is the general quality of the water? (1) Good (2) Fair (3) Poor
4.7 How far is this water source in km? (1) Less than 1 Km (3) 1– 2km (4) Above 2km
4.8 What is the ownership status of the water source?
(1)Public (2) Faith based (3)Private (4) NGO (5) Other (specify)
4.9 Do you pay for water (1) Yes (2)No
4.10 If yes how much per 20litre jerrican in Ksh.
(1) None (2) Kshs. 2. (3) Kshs 5 (4) Kshs 10. (5) Above Kshs 10
4.11 How do you dispose of your household waste?
(1)Compost pit/burying (2) Collection by the council (3) Recycling(4) Burning
(5) Dumping in open areas (6) Others, specify
4.12 Is this place secure to live? (1) Yes (2) No.
4.13 If No, what are the main security issues in this area
(1) Theft (2) Burglary (3) Rape (4) Others, Specify
4.14 What is the main cause of these security problems in this area?
(1) Poverty (2) Corruption (3) Illiteracy (4) Bad culture…. (Others), Specify

SECTION 5 KNOWLEDGE AND ATTITUDE ON HIV/AIDS

5.1 Have you ever heard of HIV/AIDS? (1) Yes (2) No
5.2 If yes, what source did you hear it from?
(1) Radio/TV (2) Billboards (3) Posters (4) Religious leaders (5) Relative/friend (6) Health worker (7) NGO/CBOs (8) Newspaper (9) Other (Specify)
5.2 Has any of your household members been affected by HIV/AIDS? (1)Yes(2)No
5.3 Do you think HIV (AIDS) can be prevented? (1)Yes (2) No (3) Do Not Know
5.4 Do you know where to go for voluntary testing for HIV/AIDS? (1)Yes (2) No
5.5 Do you think the project road will increase or decrease instances of HIV/AIDS? Give reasons for your answer……

SECTION 6 ENVIRONMENTAL ISSUES

6.1 What environmental issues are of concern to the people of this area?
(1) Flooding (2) Brick making(3) Invasive species (4) Overgrazing(5) Extinction of endangered species (6) Water shortage (7) Siltation and soil erosion (8) Deforestation (10) Others, specify

6.2 What are the environmental conservation initiatives in the area?
(1) Tree planting (2)Educating the public (3) Cleaning of mosquito breeding sites (4) Construction of terraces and gabions (5) Others, specify

6.3 Who are carrying out environmental conservation initiatives?
(1) Women groups (2) Youth groups (3) Non-governmental organization (4) Community based organizations (6) others, specify

6.4 Will the completion of the project help conserve the environment? (1) Yes (2) No

6.4 If yes in what ways? (1) Control pollution (2) Provide employment (3) Other, specify

6.4 What do you think should be done to promote safe environment in this area?
(1) Plant Trees (2) Educate the public on environment (3) Provide environmental management incentives like payment for environmental conservation activities (4) Enforce legislation (6) Others, Specify.

SECTION 7 PROPOSED PROJECT VIEWS

7. 1 Have you heard about the proposed project? a) Yes b) No

7.2 How did you hear about the proposed project?

a) Chiefs baraza
b) Workshop
c) Political meeting
d) From fellow residents

7.3 Briefly explain your opinion on the project as regards its impacts and whether to be implemented or not.

Thank the respondent for her/his time to provide your views and opinions on the issues in this questionnaire.