ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED SEAL SUGAR MILLS LIMITED ON PLOT LR. NO CENTRAL ALEGO/OJUANDO B2/110 IN BORO, ALEGO USONGA SUB-COUNTY, SIAYA COUNTY.

(Latitude 0.112885º and longitude 34.244957º)

(NEMA TOR 386)

PROJECT PROPONENT:

SEAL SUGAR MILL LIMITED
P.O.BOX 388-40600
SIAYA
Tel: 0708 807002

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FEBRUARY 2022

Document Authentication

This Environment and Social Impact Assessment (ESIA) Study for the above mentioned project have been prepared by Katrina Management Consultants Limited (NEMA Registered and licensed EIA/EA Firm of Experts) in consultation with the Seal Sugar Mills Limited (Project Proponent).

This ESIA has been done with reasonable skills, care and diligence in accordance with the Environmental Management and Coordination Act 1999 and the Environmental (Impact Assessment and Audit) Regulations 2003.

We the undersigned, certify that the particulars given in this ESIA Study Report are correct, complete, accurate and righteous to the best of our knowledge and will be sufficient to provide adequate and informative Environmental and Social Impact Assessment on the Seal Sugar Mills Limited Development.

PROJECT PROPONENTS

SEAL SUGAR MILL LIMITED
P.O.BOX 388-40600
SIAYA
Tel: 0708 807002

Signature……Date……

EIA/EA FIRM OF EXPERTS

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Signature……Date……

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Abbreviations

Covid-19	Corona Virus Disease
EA	Environmental Audit
EDL	Effluent Discharge License
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
EMS	Environmental Management System
ETP	Effluent Treatment Plant
LTP	Leachate Treatment Plant
Ha	Hectare
KES	Kenya Shillings
KPLC	Kenya Power & Lighting Company Limited
LR No	Land registration number
MDG's	Millennium Development Goals
NEAP	National Environment Action Plan
NEMA	National Environmental Management Authority
OSHA	Occupational Safety and Health Act
pH	Potential of Hydrogen
PPE	Personal Protective Equipment
UNCED	United Nations Conference on Environment and Development
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization
WRA	Water Resources Authority

Non-Technical Summary

Introduction

Seal Sugar Mill Limited is determined to support Kenya in addressing the recurrent sugar production deficit in the country by establishing a new sugar factory in Alego Usonga Sub County of Siaya County. The Sub County is endowed with suitable natural conditions for increased sugar cane production and expansion.

The development will definitely increase farm house hold incomes and promote sugarcane as the main cash crop. Moreover, if the income obtained from sugar cane cultivation can be partially invested in complementary agricultural or horticultural activities, then household food security and sustainable livelihoods could easily be attained.

To comply with the requirements of the Environmental Management and Co-ordination Act (EMCA) of 2015 and the Environmental Impact Assessment and Audit Regulations 2003, the project owner has commissioned Katrina Management Consultants Limited to prepare a comprehensive Environmental and Social Impact Assessment (EIA) Project Report. The environmental study was commissioned in January, 2022. To initiate the public consultation process, standard public consultation forms were issued to the immediate neighbours, clients, staff of the proposed sites, and consultations were made with key lead agencies.

Terms of Reference

The Terms of Reference for this assessment are based on the Environmental Impact Assessment and Audit Regulations dated June 2003. The TOR was submitted to NEMA and given reference number TOR 386 which was reviewed and approved by NEMA on the 21st January 2022, copy of which is attached to this report.

Project location and scope

The proposed Seal Sugar Mill Limited development shall be located along Segere-Ambira Road within Boro Area, on Plot L.R. No. Central Alego/Ojuando B2/110 Central Alego Location, Alego Usonga Sub County in Siaya County. The project shall comprise of the following components:

- Workshops;
- Administrative offices
- Weighbridge house;
- Cane yard;
- Mill House;
- Power house;
- Sugar house;
- Effluent treatment and recycling plant;
- Agricultural offices;
- Staff houses
- Stores;

- Access roads;
- Bagasse silos.
- Fuel station
- Water supply works (from River Wuoroya)
- Electricity connection

The project shall also incorporate major land use change in the area involving sugarcane cultivation in partnership with the local farmers through leases. It is projected that an estimated 18,400 acres of land will be under sugarcane when the project is completed.

Legal and regulatory compliance

Seal Sugar Mill Limited is committed to comply with all applicable legal provisions and regulations which have been reviewed in the report:

- The Constitution of Kenya (2010)
- Environmental Management & Coordination Act, 1999 (Amended 2015) and Subsidiary Regulations
- Environmental Management and Co-ordination (Waste Management) Regulations 2006
- Environmental (Impact Assessment and Audit) Regulations, 2003
- EMCA (Water Quality) Regulations, 2006
- EMCA (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009
- Environmental Management and Coordination (Air Quality) Regulations, 2014
- Land Act 2012
- The Public Health Act (Cap 242)
- The Occupational Safety and Health Act, 2007
- The Water Act, 2016 and The Water Resources Management Rules, 2007
- The County Governments Act 2012
- Employment Act 2007
- Standards Act Chapter 496
- Kenya Sugar Act, 2001 (rev. 2012)
- Agriculture, Fisheries and Food Authority Act 2013
- Food Drugs and chemicals substances Act (Cap 254)
- Sustainable Development Goals (SDGs)

Public Participation

Legal Notice of 101 of June 2003 requires that all environmental and social assessment process in Kenya to incorporate Public Consultation.

Key stakeholder consultation was undertaken in the project area. The team identified stakeholder who are key to implementation of the proposed project as well as those who rely on such services. The stakeholders included County Government officials, National Government officials, and Non-governmental organization among others.

PCMs – The Consultant in collaboration with the national government led by the ACC Alego Usonga, the Central Alego Location Chief carried out public participation on the proposed Seal Sugar Mill Limited project. The meetings were held in two venues namely at the proposed mill site in Segere Centre and at Boro Market. In their consultations, the community sensitization meetings targeted in general all community members within the project area.

Project Impacts:

Construction phase

Project impacts and their mitigation measures have been discussed in the report and they include:

- Procurement of construction materials:
- Employment opportunities
- Enhancement of local economy / More cash in circulation
- Occupational health and safety hazards
- Energy utilization:
- Water Utilization
- Waste production:
- Influx of construction workers into the area:
- Construction traffic:
- Archaeological findings:

Operation phase

- Increased pressure on infrastructure – Stressed up service provision
- Pollution – Environmental Degradation
- Drain blockages – Back flooding
- Vector and rodents breeding grounds – Vulnerability to diseases
- Electricity consumption – pressure on supply
- Offensive smell from factory effluent
- Gaseous emissions into the atmosphere
- Reduction in biodiversity in the area due to altered habitats
- Destruction of wetlands
- Limitation of grazing land for animals
- Seepage of fertilizers into water sources
- Possible use of pesticides for crop pest control
- Reduced distance to cane milling factories for farmers
- Reduction of area of arable land for food crops
- Possible changes in soil quality / soil erosion
- Possibility of human disease outbreaks (e.g. cholera) due to poor effluent and sewage disposal
- Reduction of rampant theft due to better incomes for the youth
- Employment opportunities
- Occupational health and safety hazards

- Provision of briquettes from bagasse as alternative fuel
- Improvement of infrastructure and social amenities through CSR activities
- Water supply and consumption

Decommissioning phase Impacts

- Solid Waste Generation
- Dust
- Noise and Vibration
- Labour work
- Occupational Health and Safety Hazards

Project Alternatives

Project alternatives discussed in the report include:

- Site alternative
- Alternative Technologies
- Alternative Bagasse management
- Alternative Equipment
- "No Project" Alternatives

Impact Matrix

The impact matrix below summarizes the positive and negative impacts by type and mitigation measures.

Environmental Impact	Impact Type								Mitigation	
	Positive		Negative							
	Significant	Not Significant	Significant	Not significant	Short term	Long term	irreversible	Cumulative	No mitigation	Mitigation Required
CONSTRUCTION AND INSTALLATION PHASE IMPACTS										
Employment opportunities	x				x				x	
Procurement opportunities	x				x				x	

More Cash in Circulation	x					x			x	
Occupational health and safety hazards			x		x	x				x
Energy utilization	x				x				x	
Water utilization	x			x	x					x
Waste production			x		x					x
Influx of construction workers	x			x	x					x
Increase in social vices e.g. prostitution, STDs, HIV-AIDS			x		x					x
Construction traffic			x		x					x
Archeological findings				x	x					x
OPERATION PHASE IMPACTS										
Employment opportunities	x					x		x	x	
Increased pressure on infrastructure				x		x		x		x
The bagasse menace				x				x		x
Land and water pollution – oil spills, effluent discharge			x					x		x

Air pollution / Emissions			x			x		x		x
Offensive smell from effluent			x			x				x
Electricity consumption	x					x				x
Noise and Vibration			x			x				x
Reduction in biodiversity				x		x		x		x
Destruction of wetlands				x		x	x	x		x
Vector and rodents breeding grounds			x			x		x		x
Limitation of grazing lands			x			x		x		x
Chemical pollution – fertilizer, pesticides and herbicides			x			x		x		x
Reduction of arable land for food crops				x		x		x		x
Reduced distance to milling factories	x					x		x	x	
Possibility of human disease outbreaks e.g. cholera			x			x				x
Possible changes in soil properties/qua				x		x		x		x

lity										
Reduction of theft by youth	x					x			x	
Employment opportunities	x					x		x	x	
Improved infrastructure and social amenities through CSR	x					x		x		x
Provision of alternative fuel i.e. briquettes	x					x				x
Occupational health and safety hazards	x					x				x
Water supply and consumption	x		x			x				x
Land-use and landscape changes				x		x		x		x
Land degradation through soil erosion, soil compaction				x		x		x		x
Potential conflict with community of land ownership and succession issues, late payment			x		x	x	x	x		x
Increased accidents due to agricultural machinery				x		x		x		x

traffic										
Possibility of increased poverty due to late payment for cane			x			x		x		x
DECOMISSIONING PHASE IMPACTS										
Solid waste generation				x	x					x
Dust			x		x					x
Noise and vibration			x		x					x
Rehabilitation	x				x				x	
Employment		x			x				x	
Occupational Health and Safety hazards			x		x					x

Conclusion

This ESIA Study Report has been prepared to provide sufficient and relevant information on the proposed project to enable NEMA to establish whether activities of the project are likely to have significant adverse environmental impacts. Mitigation measures have been proposed for identified impacts in this report and an Environmental Management Plan (EMP) for the implementation of the proposed measures has been presented. The EMP presented in this report is a tool to be used by the Project Team during the construction, hand-over and operation periods.

1. INTRODUCTION AND SCOPE OF STUDY

1.1 Introduction

In Alego Usonga Sub County of Siaya County, it is evident that only minimal agricultural and horticultural activities have been taking place in the recent past. Indeed, a good number of homes have been deserted by the able-bodied youth who have moved to towns and cities in search of jobs. The potential of the land is, however, clearly good enough for cash crop farming such as sugar cane or other high value horticultural crops. There is a real possibility that well-planned and managed cash crop farming could employ several people and increase household incomes in the area. It is in this context that Seal Sugar Mill Ltd has proposed to put up a sugarcane processing plant to support the production activities in Alego Usonga.

Seal Sugar Mill Limited is determined to support Kenya in addressing the recurrent sugar production deficit in the country by establishing a new sugar factory in Alego Usonga Sub County of Siaya County. The Sub County is endowed with suitable natural conditions for increased sugar cane production and expansion.

Successful sugarcane growing requires an altitude of 110-1500 masl, an average of 1500mm of rainfall and a temperature range of 20°C-30°C. A total of 34,400ha of land in the Sub County falls under the land utilization types UM1, LM1 and LM2 which are suitable for sugarcane production and largely distributed in Alego Usonga Sub County. With an annual rainfall of 1300–2000mm, temperature range of 15°C to 30°C and altitude range between 1140 and 1420 masl, cane production should gain prominence much more than it is currently in order to boost the economy toward the national level and reduce poverty levels.

The development zone will definitely increase farm house hold incomes and promote sugarcane as the main cash crop. Moreover, if the income obtained from sugar cane cultivation can be partially invested in complementary agricultural or horticultural activities, then household food security and sustainable livelihoods could easily be attained.

1.2 Background and Rational of the EIA

To comply with the requirements of the Environmental Management and Co-ordination Act (EMCA) of 2015 and the Environmental Impact Assessment and Audit Regulations 2003, the project proponent has commissioned Katrina Management Consultants Limited to prepare an Environmental and Social Impact Assessment (EIA) Project Report. The environmental study was commissioned in January, 2022. To initiate the public consultation process, standard public consultation forms were issued to the immediate neighbours, clients, staff of the proposed sites, and consultations were made with key lead agencies.

1.3 Scope

As a requirement by the Environmental Management and Coordination (Amendment) Act 2015, of Kenya, a project proponent is required to undertake an Environmental Impact Assessment study before undertaking any project highlighted in Schedule2 of the Act. This study undertakes to fulfil this requirement. This study is necessary at the planning stages of the undertaking to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation, and decommissioning of the facility.

The project scope included literature review; detailed and updated description of the project design and proposed implementation schedule, costs, as well as suitable alternative options; an in-depth analysis of the environmental and social baseline conditions; an outline of policy, legal and institutional framework governing the sector with specific focus on agro-processing; inclusive public participation and meaningful stakeholder engagement; establishment of details of significant environmental and social impacts associated with the construction, operation, decommissioning or after-use plans and post-decommissioning of the project; recommend appropriate mitigation measures for all adverse environmental and social impacts and enhancement of the benefits; and develop an Environmental and Social Management Plan (ESMP) for all the project's phases giving specific actions, responsibilities, cost estimates, timeframes and monitorable indicators.

1.4 Terms of Reference

The Terms of Reference for this assessment are based on the Environmental Impact Assessment and Audit Regulations dated June 2003. The TOR was submitted to NEMA and given reference number TOR 386 which was reviewed and approved by NEMA on the 21st January 2022, copy of which is attached to this report.

1.5 Methodology

After preliminary visits to the proposed site, the following were carried out in the preparation of this document:

i) Observations, discussions with stakeholders and lead agencies
ii) Documentary review of the nature of the proposed project;
iii) Policy and legal frameworks, social and environmental setting of the area;
iv) Checklists were prepared to identify possible environmental and human safety issues, photography, etc;
v) Review of the project designs and implementation plans and comprehensive discussions with the project proponent;
vi) Report writing

2. PROJECT DESCRIPTION

2.1 Project Objectives

The primary objective of this Project is to construct a factory building, install equipment and machinery for sugar cane processing with an initial capacity of 1250 tonnes of cane per day (tcd) that will be expanded to 2500 (tcd) using state-of-the-art technology, that will;

- Reduce waste generation.
- Reduce energy consumption.
- Improve conversion efficiency.
- Produce better quality product
- Increase sustainability.
- Help farming community to improve economy
- Reduce transport cost to nearest factory.

2.2 Proposed Project Components

The proposed Seal Sugar Mill Limited development shall be located along Segere-Ambira Road within Boro Area, on Plot L.R. No. Central Alego/Ojuando B2/110 Central Alego Location, Alego

Usonga Sub County in Siaya County. The project shall comprise of the following components:

- Workshops;
- Administrative offices
- Weighbridge house;
- Cane yard;
- Mill House;
- Power house;
- Sugar house;
- Effluent treatment and recycling plant;
- Molasses tank
- Agricultural offices;
- Staff houses
- Stores;
- Access roads;
- Bagasse silos.
- Fuel station
- Water supply works (from River Wuoroya)
- Electricity connection

The project shall also incorporate major land use change in the area involving sugarcane development in partnership with the local farmers through leases. It is projected that an estimated 18,400 acres of land will be under sugarcane when the project is in full operation.

2.3 Proposed infrastructure and processing activities

The proposed infrastructure and activities in the factory will include the following: -

2.3.1 Cane yard

The yard will consist of weighbridge and overhead gantry. The cane preparation equipment will consist of a cane carrier, a cane kicker to regulate feed cane knives and a fibrizer.

2.3.2 Milling

The extraction line will consist of roller milling tandem using a hydro-pneumatic pressure regulating system. The milling tandem will be driven by four AC electric motors with planetary type speed reducers. Auxiliary equipment will include a mill house crane. The mixed juice will be passed through a rotary juice screen before being pumped to the screened juice tank.

2.3.3 Clarification

The pumping of juice to clarification station will be done through automatic flow control to ensure uniform flow rate. Primary heating of juice will be done prior to liming and sulphitation. Before final heating, both liming and sulphitation will be done to the juice with proper control of pH. Control of liming will be automated. Finally, heated juice will be pumped through flask tank to clarifier for settling out mud and production of clear juice. The mud from the clarifier is de-sweetened in a rotary vacuum filter, with filtrate being returned to the screened juice tank, and mud removed and used as fertilizer on the fields.

2.3.4 Evaporation

The clear juice from the clarifier will be heated and then evaporated to form syrup. The evaporated set will consist of a quintuple effect. Exhaust steam from the turbine and boiler through pressure reducing station will be used as the heating medium for the first effect. Exhaust steam will be used in sequence so that the vapor leaving the first vessel will be used in the next vessel heat and so on; so that boiling will take place at reduced temperatures giving the advantage of minimizing destruction of sucrose, and for general steam company. Syrup, which consists of a concentrated clear juice will then be withdrawn from the last vessel and pumped to concentrated clear sugar juice will then be withdrawn from last vessel and pumped to Sulphitation Vessel to reduce color before pumping it to the Boiling House section of crystallization.

2.3.5 Boiling house (crystallization)

Batch vacuum pans will be used to boil syrup into A-massecuite while automatic continuous pans will be used to boil B- and C- massecuite. From the pans, A- & B-massecuite will flow under gravity to air cooled crystallizers. Vertical continuous crystallizer will be used for C-massecuite.

2.3.6 Crystal separation

A-sugar will be separated from A-molasses by Batch type Centrifugal machines. The centrifugal machines will be fully automated with a 1250kg/charge capacity, complete the accessories and drive. B&C sugars will be separated from B& C molasses with continuous centrifugal machines. The centrifugal will be of vertical type and have a total capacity to cure all the massecuites produced. The molasses produced will be pumped to the molasses storage tank.

2.3.7 Drying and bagging

Hot air will be blown into the sugar drier and the sugar leaving the batch centrifugal to dry it. Drying will occur in multi-tray dryer with a hot air blowing arrangement. Big sugar lumps will be separated in last section of the tray. The sugar will then be cooled, sieved and conveyed to silos before packaging for sale.

2.3.8 Steam generating plant

The high-pressure steam needed will be generated in a 70 t/h (MCR) water tube boiler with heat recovery equipment (an economizer and air pre-heater). The steam at 44Bar and 415^0C will be generated using bagasse with 50% moisture. The flue gasses will be passed through mechanical grit collectors to meet the emission standards.

2.3.9 Spray ponds

Hot water from the condenser will be taken to spraying pond where it will be cooled and re-used.

2.3.10 Effluent treatment plant

During processing, the water effluent from the plant, mainly consisting of bagacillo and floor washings, which are rich in BOD, will be taken to modern effluent treatment plant to reduce level of biological oxygen demand (B.O.D) to less than 30ppm and remove suspended matter.

2.3.11 Maintenance

The milling process will normally run for ten months per year, with monthly shutdowns of approximately 24 hours for servicing, cleaning/maintenance. These activities will include cleaning of heat exchangers, lubrication repairs and general cleaning.

During the two months off crop for replacement /rebuilding of wearing parts like mill rollers and general maintenance on all equipment and machinery will be done.

2.4 Cane Production Process

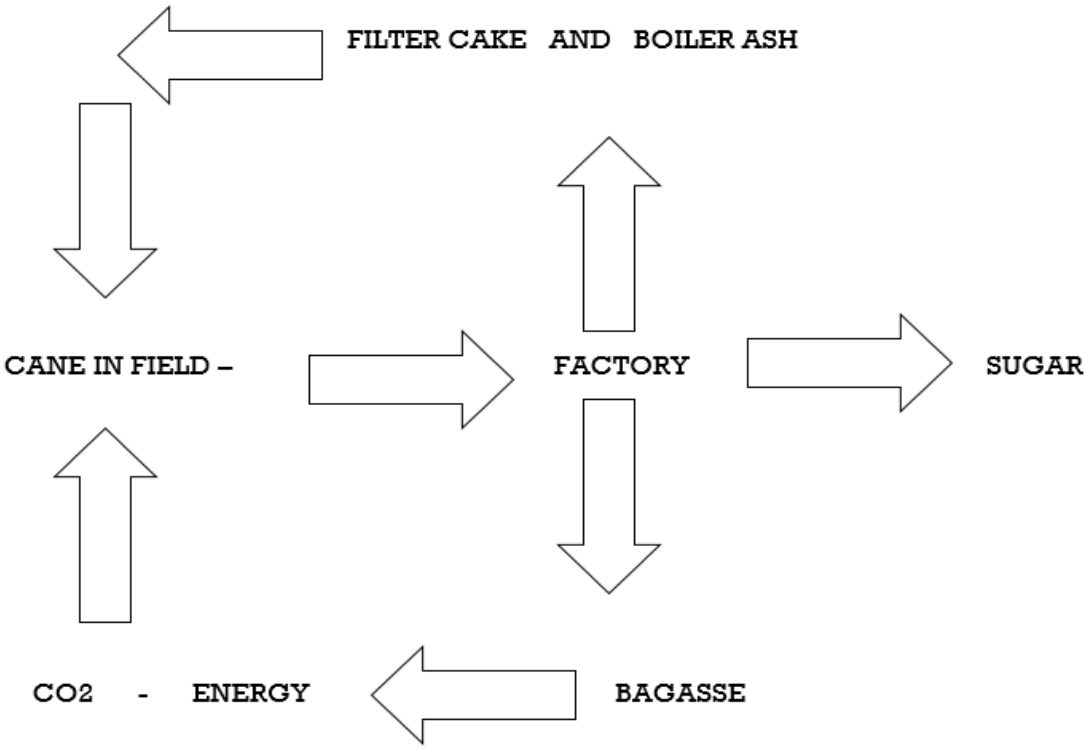


Figure 1: Summary of sugar process

2.5 Project Implementation

The project will be implemented in the four phases: design and construction, equipment installation, operation and decommissioning.

2.5.1 Design Phase

This phase is the concept of the planned development and the designing of a structure which was envisaged to be functional and to take care of every environmental concern such as liquid and solid wastes and security. This has already been completed.

2.5.2 The Equipment Installation Phase

This phase will be based on the building standards, code and all other relevant regulations applicable in Kenya. All the proposed works will follow standard environmental guidelines, health and safety measures.

a) Equipment installation Activities

i) Construction activities

This will have to be undertaken to provide support and shelter for the additional equipment to be installed. The construction of the building walls, foundation, floor

pavement, and drainage system, among other component of the project will involve minimal masonry works and related activities. General masonry and related activities will include concrete mixing, plastering, slab construction, construction of foundation and curing of fresh concrete surfaces. These activities are known to be labour intensive hence may be supplemented by machinery such as concrete mixers.

ii) Roofing and sheet metal works

Roofing activities will include laying of iron sheets, and structural steel to the roof and fastening the roofing materials to the roof.

iii) Electrical Works

Electrical work during both construction and operation will involve installation of electrical gadgets and appliances including electrical cables, lighting apparatus, sockets etc.

2.6 Equipment to be installed

The proponent intents to achieve its objectives by installing the following equipment within the facility:

2.6.1 Shredder

The shredder is designed to achieve very fine preparation of sugar cane by separating the fibres and opening the cell wall efficiently. This allows the subsequent extraction process to maximise the removal of the sucrose bearing juice from the prepared cane. It shall ensure:

- Excellent fibre particle size distribution
- Improved final bagasse moisture
- Higher imbibition efficiencies at each stage
- Improved boiler performance
- Consistently higher bagasse densities
- Lower bagasse pol loss

2.6.2 Cane carrier

Completely made from steel the cane carrier will have adequate column and support hence facilitating to feed the required cane capacity.

2.6.3 Pressure feeders

The new pressure feeders will have built-in overload protection, besides ensuring smooth and safe operation. They will have a compact, low-weight design that fits the available space without costly adjustments.

2.6.4 Boiler

As one kind of environmental protection industrial boiler, biomass fired boiler will be used in sugar factory, which can burn bagasse. With large quantity of sugar cane bagasse expected at the sugar factory, a lot of fuel cost will be saved.

2.6.5 FFE-Falling Film Evaporator

Falling film evaporator concentrates the juice coming from the purification station and sends the concentrated juice (syrup) to the crystallization station. The way an evaporator plant works has a crucial impact on the heat economy of sugar factories and refineries. Perfectly tailored to the overall process, it allows effective action to increase the energy efficiency of upstream or downstream process steps. Falling-film evaporators that will be installed will have a higher juice distributor dome, making them easier to inspect and clean. Whenever necessary, the juice distributor and heating tubes can be cleaned with a high-pressure water jet from the top tube plate, without opening the dome flange.

2.6.6 CVP-Continuous vacuum pan

The new CVP design produces high massecuite exhaustion, consistent crystal size and improves energy efficiency. The Continuous Vacuum Pan designs are suitable for A, B and C massecuites and are configured to optimise upstream and downstream plant capabilities. Importantly, the pan's vapour demand is surge-free and consistent with steady-state boiler operation and evaporator performance for extended periods.

2.6.7 Grader

Grader to be installed will provide vital grading functions that help in maintaining sugar cane quality and are known to improve the efficiency in grading processes. The grader shall be highly durable, corrosion resistance and will require low maintenance, thereby improving services and bringing greater efficiency in production.

2.6.8 Spray pond

The warm water from the condensers needs to be cooled to the lowest practical temperature before being re-used. The cooling process is carried out in spray ponds after which the water is pumped back to the condensers.

2.6.9 Molasses tank

Molasses tanks shall be installed. These will be specially designed to suit the storage of molasses. The tanks will come complete with an inspection lid / manway access, and good ventilation (to reduce condensation and bacterial growth).

2.6.10 Centrifugal machine

The centrifugal machine will provide real and sustained process advantages to the user as they are more efficient and reduce processing costs through lower electrical power consumption and improved recovery of crystals from the massecuite.

2.7 Decommissioning Phase

At the end of the operational life of the plant (factory), all the equipment and waste materials from the construction/equipment installation will be removed from the site. The materials that can be reused will be separated and used for other construction work and others disposed of appropriately. The areas not intended for parking of vehicles will be landscaped and planted with beautiful vegetation to improve the aesthetics of the surrounding.

3. BASELINE INFORMATION

3.1 Location

The proposed site is located within Alego Boro Area on Plot L.R. No. **Central Alego/Ojuando B2/110** Central Alego Location, Alego Usonga Sub County in Siaya County. The proposed site for the sugar mill is currently 10 acres but is projected to occupy 40 acres after further land acquisition by the Proponent. The area is served with good road network including Segere-Ambira Road and other access roads which will ease the transportation from the proposed sugar mill to other parts of the County.

The site is located on coordinates: **Latitude 0.112885º and longitude 34.244957º.**

Figure 2: Google map showing location of the facility
(*Source: google earth*)

3.2 Project's surrounding

The proposed project site is currently an open parcel of land with scattered homesteads in the neighbourhood. The entire land is covered by grass, herbs and a few mature trees that will be cleared to allow for the construction.

The proposed project site borders Segere Dispensary and Segere Shopping Centre.

Plate 1: Photos showing the proposed project site

Plate 2: Segere Dispensary within the Project area

3.3 Siaya County Overview

3.3.1 Position and Size

Siaya County is one of the six counties in Nyanza region. It has a land surface area of approximately 2,530 km² and water surface area of approximately 1,005 km2. It borders Busia County to the North West, Vihiga and Kakamega counties to the North East, Kisumu County to the South East and Homa Bay County across the Winam Gulf to the South. The water surface area forms part of Lake Victoria (the third largest fresh water lake in the world). It approximately lies between latitude 0º 26´ South to 0º 18´ North and longitude 33º58´ and 34º 33´ east.

3.3.2 Physiographic and Natural Conditions

Physical and Topographic Features

Siaya County has three major geomorphological areas namely: Dissected Uplands, Moderate Lowlands and Yala Swamp. These areas have different relief, soils and land use patterns. The altitude of the County rises from 1,140m on the shores of Lake Victoria to 1,400m above sea level on the North.

There are few hills found in the County namely: Mbaga and Akara in Alego Usonga; Odiado in Ugenya; Regea, Rawalo and Nguge in Gem; Usenge, Ramogi hills, Got Abiero, Sirafuongo in Bondo and Rambugu and Naya hills in Rarieda. Rivers Nzoia and Yala traverse the County and enter Lake Victoria through Yala Swamp. The features have a bearing on the overall development potential of the County. High altitude areas of Ugenya and Ugunja sub-counties and parts of Gem sub county experience higher rainfall hence suitable for agriculture and livestock keeping. The low altitude areas of Bondo, Rarieda, parts of Alego Usonga and part of Gem Sub Counties experience less rainfall and thus are suitable for cotton growing and drought resistant crop varieties.

The geology of Siaya County ranges from early Precambrian to Quaternary and can be divided into the following well defined groups based on their relative age and lithology. Precambrian Intrusive, Nyanzian system rocks, Kavirondian system rocks and Pleistocene to Recent formations.

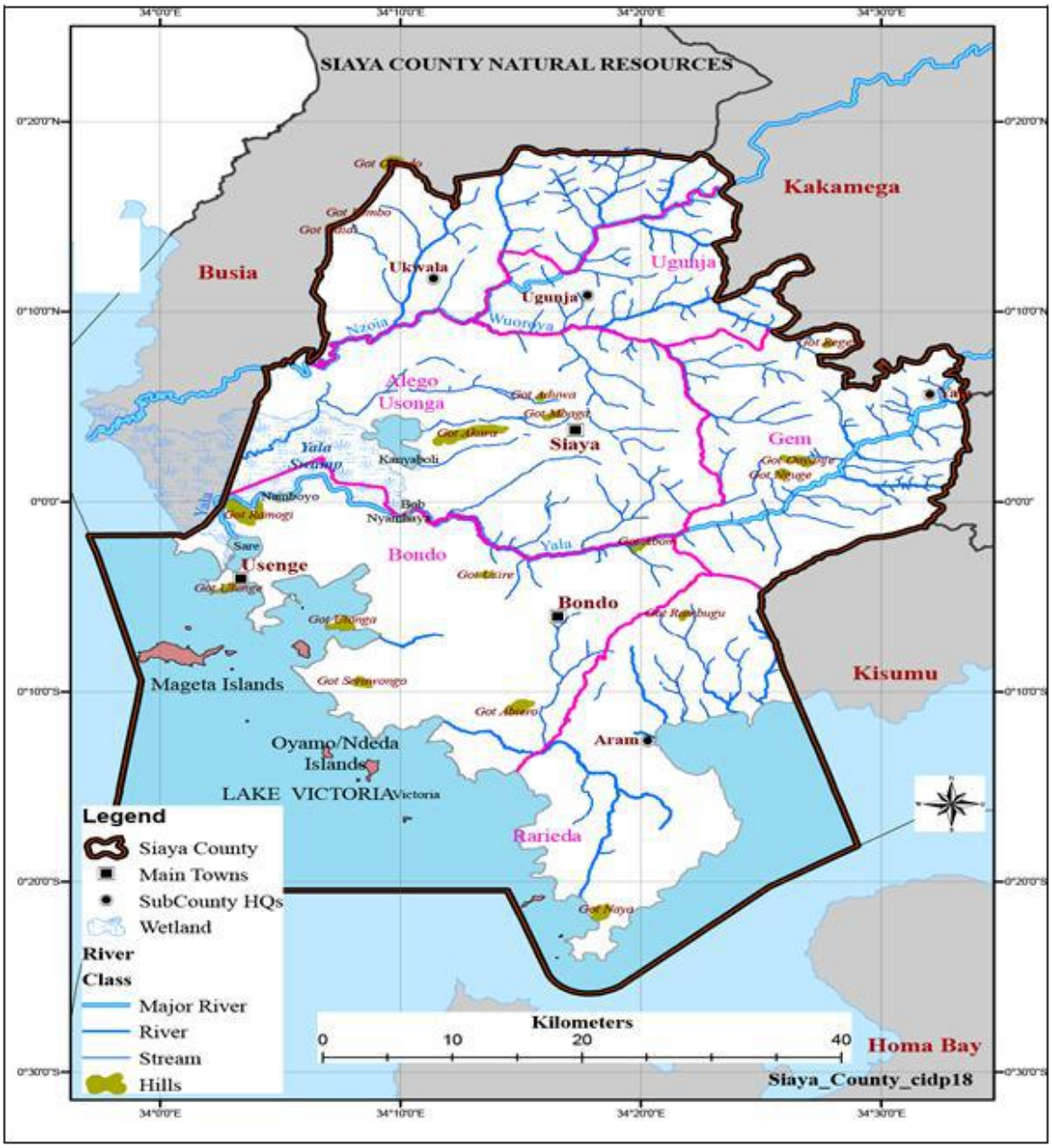


Figure 3: County Natural Resources

(*Source: Siaya CIDP 2018 – 2022)*

Ecological Conditions

The County spreads across agro-ecological zones LM1 to LM 5. According to the Kenya Soil Survey and Integrated Regional Development plan for the Lake Basin Development Authority, the lower part of the County and especially the shores of Lake Victoria can be categorized into semi-humid, semi-dry Lower Midland zones (LM4 and LM5). These zones cover the whole of Uyoma in Rarieda Sub-County and Yimbo in Bondo Sub-County. The lower central parts of the County, covering the whole of Sakwa and Asembo in Bondo and Rarieda Sub-counties respectively and the lower parts of Boro Division are classified as the midland zone LM3. The northern part of the County comprising Gem, Ugunja and Ugenya Sub-counties and the upper parts of Boro

Division [in Alego Usonga Sub-County are classified as the low-midland zones (LM2 and LM3).These are sub-humid and humid zones with reliable precipitation. There are also pockets of upper midland zones (about 30sq.kms) in Yala Division, Gem Sub-County with a high potential for agricultural activity.

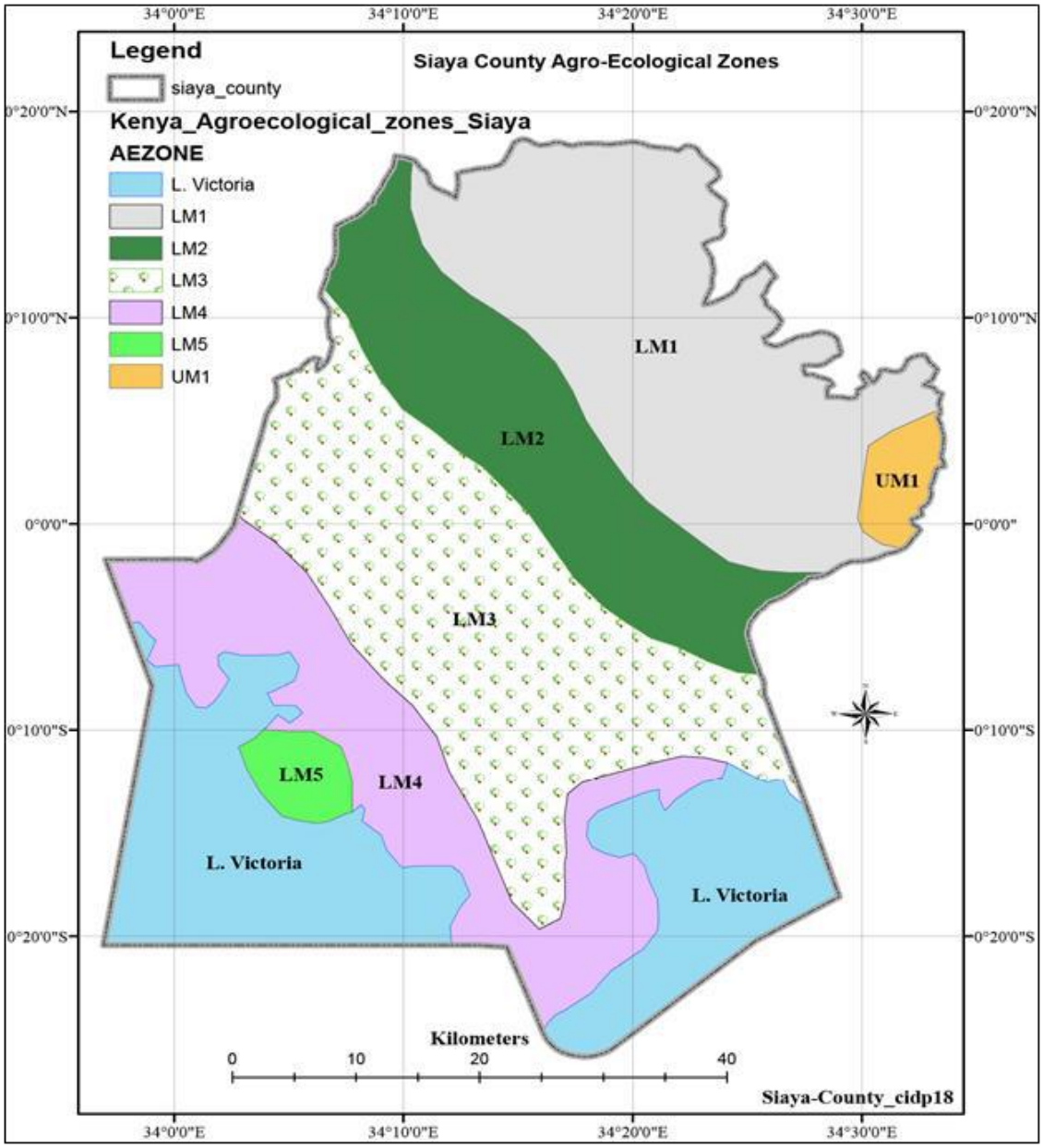


Figure 4: County Agro-Ecological Zones

(*Source: Siaya CIDP 2018 – 2022)*

3.4 Administrative and Political Units

3.4.1 Administrative Sub Division

The county consist of six sub-counties and thirty wards. Alego Usonga, Bondo and Gem sub counties have six wards each; Rarieda, Ugenya and Ugunja Sub Counties have five, four and three wards respectively. Of the six Sub Counties, Alego Usonga where the project will be located is the largest with an approximate area of 605.8 km^2 while Ugunja

is the smallest with an approximate area of 200.9 Km^2. The table below shows details of the administrative units forming Alego Usonga Sub County in Siaya County.

Table 1: Alego Usonga Sub County Administrative Units

Constituency/ Sub County	Wards	Ward Area	Sub Location
Alego-Usonga	Township	42.6	Mulaha, Nyandiwa, Karapul
	Usonga	79.2	Sumba, Nyadorera A,Nyadorera B
	North Alego	53.8	Hono, Nyalgunga, Ulafu, Nyamila, Umala, Olwa
	South East Alego	191.5	Mur Ngiya, Bar Agulu, Bar Ding, Masumbi, Nyangoma, PapOriang, Randago, BarOsimbo, PapOriang, Nyajuok, Murmalanga, BarOlengo
	Central Alego	139.8	Kadenge, Obambo, Ojuando A, Nyandiwa, Kochieng A, Kochieng B,Ojuando B, Koyeyo, Kakumu Kombewa, Komolo

3.4.2 Political Units

The county consist of six constituencies and thirty wards. Alego Usonga, Bondo and Gem constituencies have six wards each; Rarieda, Ugenya and Ugunja constituencies have five, four and three wards respectively.

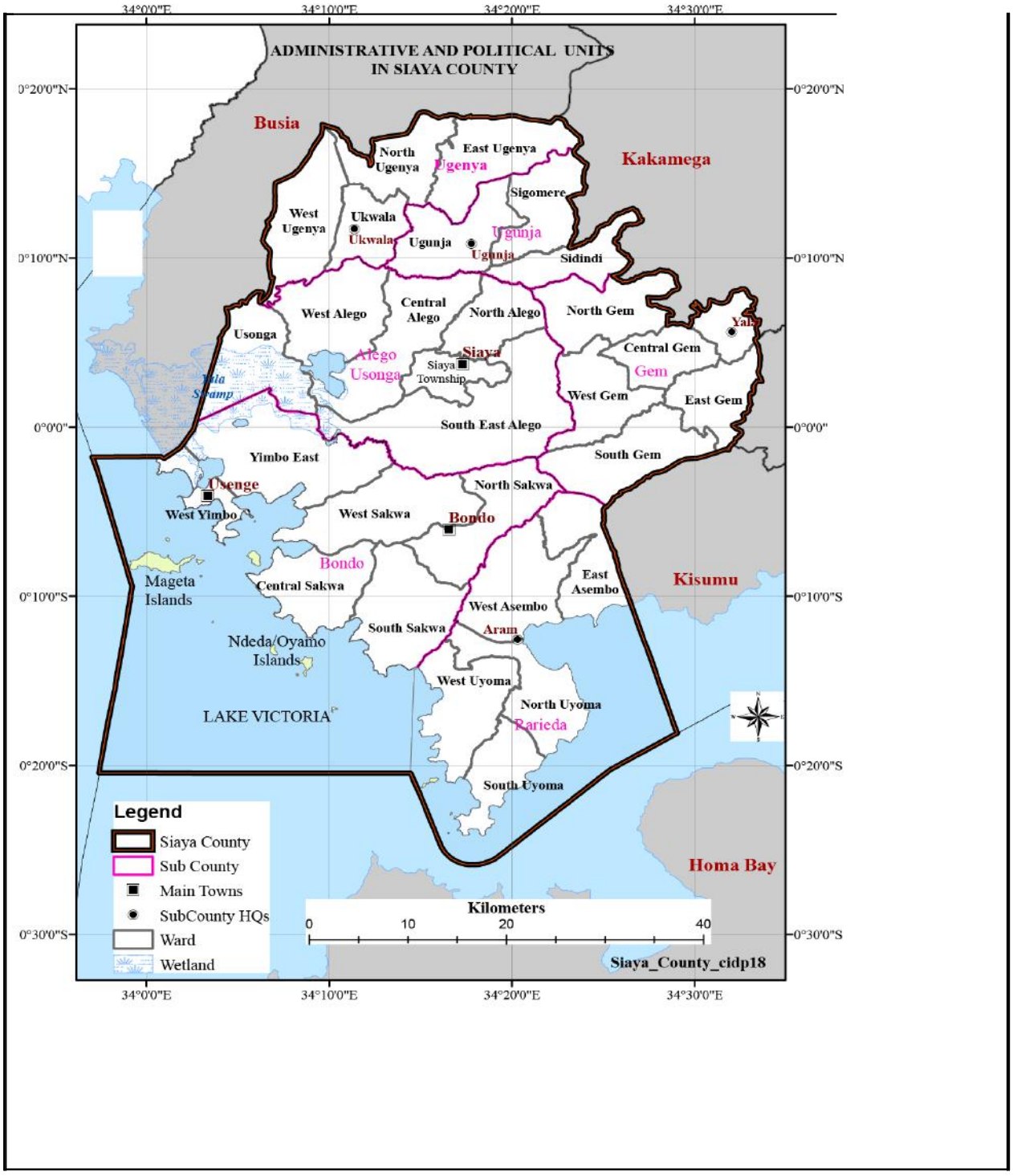


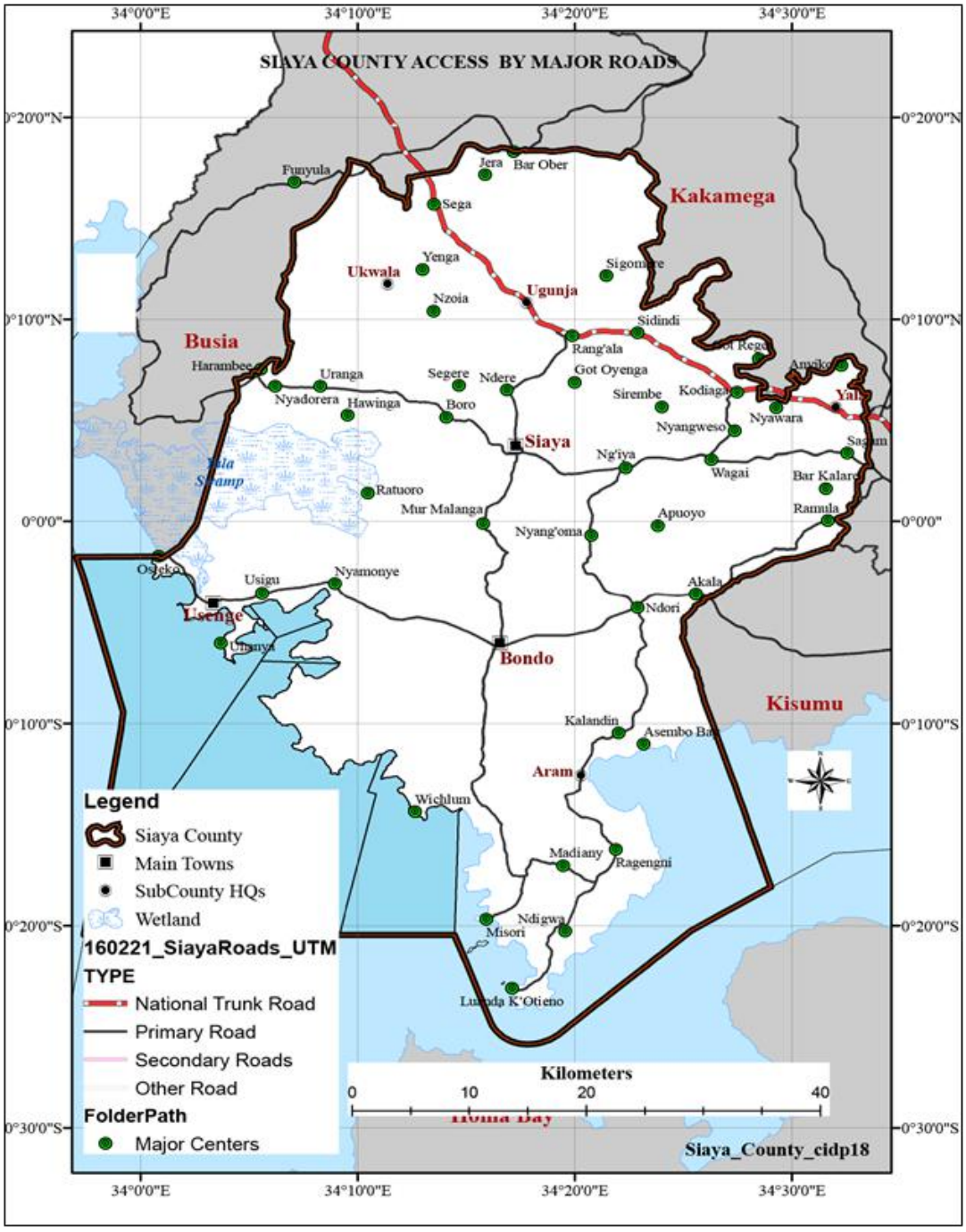
Figure 5: Administrative and Political Units

(*Source: Siaya CIDP 2018 – 2022)*

3.5 Infrastructure Development

3.5.1 Road, Rail Network, Airstrips and Jetties

Roads - As of 2017 the county had 434.2km of bitumen standard roads, 1297.41km gravel,532.78 km of earth and a further 1,170 narrow roads. Major roads traversing the



county are Kisumu-Busia Highway (which is an international trunk road, class B1), Luanda-Siaya (30km), Siaya-Nyadorera (22km), Rangala-Siaya-Bondo (34km), Ngiya-Ndori(17km), Ndori- Luanda-Kotieno (47km), Bondo-Misori (26km) and Kisian-Bondo-Usenge (72km) roads. In addition, there are roads which are being upgraded to bitumen standard; these include Akala-Luanda, Kodiaga-Wagai-Aluor-Onyinyore-Akala, Ugunja-Ukwala-Nyadorera, Butere- Ugunja and Boro-Ndere roads.

Figure 6: Access by major roads

(*Source: Siaya CIDP 2018 – 2022)*

Airstrips - There are three main airstrips in the county namely Gombe, Dominion and Sega. Their conditions are not very good and require attention. There is no airport in the county but Kisumu International Airport is only 75kms to Siaya town centre.

Rail Network – Railway line passes through the county in Gem with a station at Yala. However, the line is not in use.

Harbours and Jetties - There are three jetties in the county namely Luanda K'otieno, Asembo Bay and Usenge. Out of these, Asembo Bay is not functional.

3.5.2 Energy Access

The main sources of lighting in the County include: paraffin 69 per cent, electricity 24 per cent (KPLC County Electricity Access Rates of June 2016), solar 6 per cent and gas lamps 0.2 per cent while the main sources of cooking fuel used in the households include firewood 84.2 per cent, LPG gas 1.1 per cent charcoal 13.2 per cent while 0.8 per cent. 85 per cent of trading centres, 89 percent of health facilities and ninety seven percent of secondary schools across the county are connected to electricity.

The main cooking appliances include traditional three stone fire 71.4 per cent, ordinary jiko 10.8 per cent, improved modern cook stove 14.5 per cent, gas cooker 2 per cent, kerosene stove 0.6 per cent and electric cooker at 0.07 percent. Energy is a critical driver of the economy, standard of living and national security of every country. The level and the intensity of energy use in a country is a key indicator of economic growth and development. The Kenya Vision 2030 identified energy as one of the infrastructure enablers of its social economic pillar.

Approximately 70 per cent of the County lacks electricity supply especially within the growing market centers and recently created administrative political units. This hinders realization of the County's potential in agri-business processing, jua-kali development and efficient service delivery. Frequent power interruptions and outages adversely affect businesses and institution's operations.

Respondents on Sources of Energy for Cooking

When the study turned to the respondents' sources of energy for cooking within the project area, the results obtained were as shown in the figure below. Majority of them use either firewood or charcoal for cooking at 89% and 11% respectively.

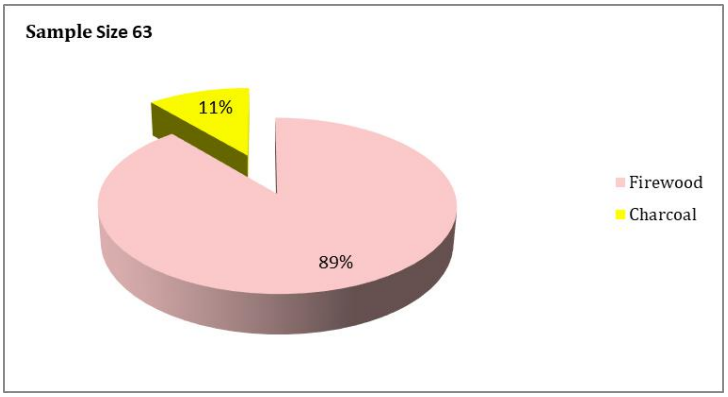


Figure 7: Sources of energy for cooking in the Project Area
Source: ESIA Study Socio-economic Survey, 2022

Respondents on Sources of Energy for Lighting

When the study turned to the respondents' sources of energy for lighting within the project area, the results obtained were as shown in the figure below. It is pleasant to note that a good percentage of the community are now using clean source of energy for lighting - Solar 51%. A small number of the project area respondents use electricity (13%) since the area is significantly rural. However, we still note that a significant number still use kerosene lamp (36%) as shown in the figure below. Use of kerosene lamps is unsafe health-wise and may contribute to respiratory and eye related diseases due to smoke emission.

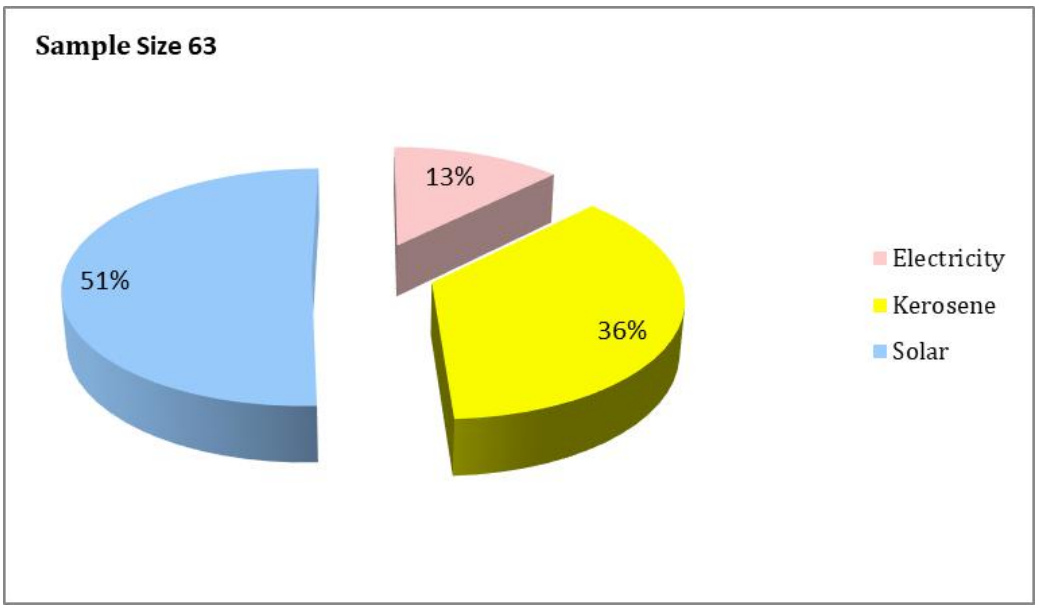


Figure 8: Sources of energy for lighting in the Project Area

Source: ESIA Study Socio-economic Survey, 2022

3.5.3 Housing

The classification on housing is based on the walling, roofing and floor materials used. It is estimated that 70.1 per cent of the households have earth floor, 29.0 per cent have cement floor, 0.40 percent have tiles while 0.4 per cent have wooden floor. 63.8 per cent of households use mud/wood as the main type of walling material while 0.1 per cent of the households use tin as the main type of wall material. The main types of roofing material used in the County include: corrugated iron sheets (65.9 percent), makuti/grass (32.1 per cent) and asbestos sheet (0.9 per cent).

When the study turned to the respondents' types of housing within the project area, the results obtained were as shown in the figure below. It was noted that approximately 86% of the respondents lived in semi-permanent houses consisting of iron sheet roofing and mud walls. 9% of the respondents still lived in grass thatched huts while a paltry 5% lived in permanent houses.

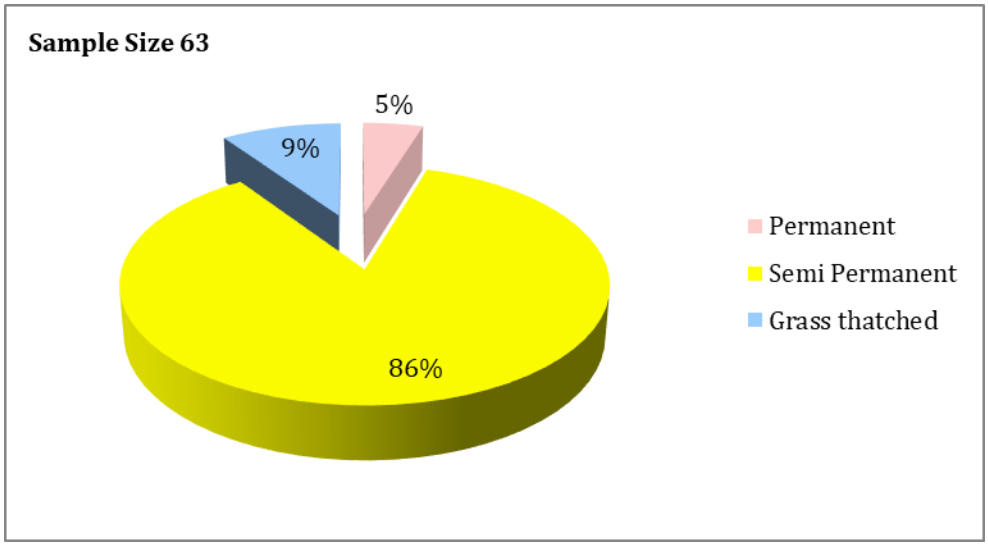


Figure 9: Type of housing in the Project Area

Source: ESIA Study Socio-economic Survey, 2022

3.6 Land and Land Use

3.6.1 Land Ownership Categories

Land in the County is categorised based as per the Constitution of Kenya 2010 as private land, public land and community land.

Private land, which forms most of the land in the county, is the category of land privately owned by individuals. The rights and interests of this category of land have been fully ascertained through the process of land adjudication and therefore relatively easy to acquire for investment purposes. There however still exist sections whose rights and interest have not been determined and the County Government needs to intervene to have the process finalised.

Approximately 2,059 square kilometres of land is arable and a major form of land use is peasant agriculture. Only small portion of Siaya town has been planned for industrial use. There is need to demarcate more land for industrial use in major urban centres in the county.

Most of the lands in the rural areas are under general boundaries prone to a lot of boundary disputes, while in urban centres there are fixed surveys which are free from disputes. The first category requires that this general surveys be geo-referenced to reduce the number of disputes arising from the boundaries.

3.6.2 Mean Holding Size

The average farm size in the County varies from Sub County to Sub County, for instance the average farm size for small scale farmers in Bondo Sub-County is approximately 3.0 Ha while in Alego Usonga Sub-County is 1.02 Ha. The average farm size for large scale farm stands at approximately 7.0 ha.

Due to high cost of processing land transactions and succession charges, there are a lot of informal land subdivisions in the County.

3.6.3 Incidence of Landlessness

Siaya County is majorly inhabited by families that trace their land ownership mostly based on their ancestral lineage. The culture of land ownership is under threat following the emerging trend of leasing or selling land for commercial endeavours. This trend is likely to lead to cases of landlessness in the near future. In Ugunja, Gem and Ugenya there is limited land for agriculture due to the high population densities. Following the 2007/2008 post-election violence, a percentage of the residents of the County were displaced from various parts of the County. Almost all of those displaced traced their way to their ancestral land in which they were welcome. Generally there are no cases of landlessness in the County.

3.7 Employment

3.7.1 Employment and Other Sources of Income

Wages Earners

Wage employment in the county forms approximately 17% of the total employment opportunities scattered across various sectors including agriculture, Non-Governmental Organizations, the government and in the transport industry. Agriculture alone provides approximately 61% of all employment opportunities in the county.

Self Employed

The urban self-employed comprise 14 percent of the total labour force while 8 percent is rural based. Most people in the rural areas are self-employed and engaged in small scale businesses operating kiosks, selling grocery, foodstuffs, small hotels and *bodaboda* services and undertaking small scale farming.

The urban self-employment includes those in businesses like shop keeping, hotels, chemists, hair dressing foodstuff trade, cottage industry among others.

Unemployment Levels

It is estimated that approximately 40% which translates to 172,120 persons in the counties labour force is unemployed. These high levels of unemployment may be explained by low access to affordable credits, lack of collateral and more often overreliance on white collar jobs with total disregard to self-employment.

In this regard, more opportunities need to be created with an aim of addressing the unemployment problem. The County Government has put in place various programmes that will expand opportunities for the youth and women. Nonetheless, there is need for more interventions by all stakeholders to complement government‘s initiatives.

The Study team carried out administration of the socio-economic questionnaires to establish the livelihood activities within the project area. The outcome is presented in the figure below.

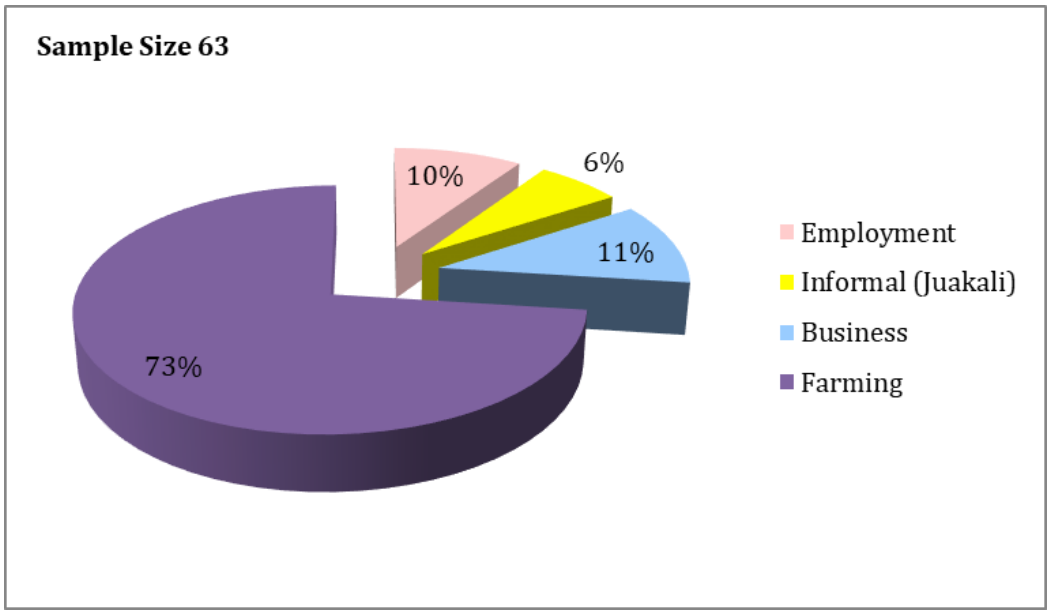


Figure 10: Livelihood in the Project Area

Source: ESIA Study Socio-economic Survey, 2022

Majority of the respondents (73%) are engaged in farming and agriculture while 6% are casual labour including the Jua kali sector. 11% are engaged in commercial and business enterprises while 10% in the formal employment.

3.8 Irrigation Infrastructure and Schemes

3.8.1 Irrigation Potential

Siaya County has an irrigation potential of 7100 hectares in its natural state. Areas suitable for irrigation include land along Lake Victoria and Kanyaboli; Rivers Yala, Nzoia and major streams such as Wuoroya. This acreage is not yet fully utilized despite the potential for expansion using irrigation dams. Over-reliance on rain fed agriculture has been the major reason for food insecurity in the county. This has made the county a net importer for most foodstuffs. With an irrigation potential of 7100 hectares, Siaya County would be food secure if more focus is put on expanding area under irrigation from the current 10 per cent to 20 per cent in the next five years. Besides, there is need to rehabilitate and expand the old schemes(Obenge, Nyangoe, Kasiri, Aram, East Yimbo, Central Sakwa, North Sakwa, North Alego and South East Alego and improve water use efficiency from the current 35 per cent to 50 per cent within the existing irrigation schemes. Farmers undertaking irrigation farming are few with very low adoption level on irrigation farming techniques, this situation calls for enhanced irrigation extension services. Irrigation farming in the county besides ensuring food security for the populace would create employment and stem rural - urban migration.

3.9 Crop, Livestock, Fish Production and Value Addition

3.9.1 Main Crops Produced

Crop production is a major contributor to food self-sufficiency and security in the county. In addition, it contributes to poverty reduction through employment creation and value addition. The main food crops are maize, sorghum, beans, cassava and sweet potatoes. These are produced across all the six sub-counties, albeit with different intensities. Cash crops produced are mainly rice, sugarcane and groundnuts. Over the years cotton production has declined because of marketing problems.

Vegetables produced in the County include; tomatoes, onions, avocado and kales while fruits are mangoes, pawpaw, bananas, oranges and watermelon. Some of the emerging crops in the County include: irrigated rice, palm oil, chilli, passion fruits and grain amaranth.

3.9.2 Acreage under Food and Cash Crops

The area under major food crops had a tremendous increase in 2014 compared to 2013. This was partly attributed to the introduction of Tractor Hire Service (THs) that accelerated the opening of more land for crop production. This was also contributed to by the subsidized seeds and fertilizers, favourable weather conditions and facilitation of agriculture extension staff. However in the subsequent years, there was both a drop in acreage under crop production and productivity. This was majorly caused by inadequate moisture resulting in some of the ploughed land remaining unattended to. In Agro Ecological Zones (AEZ) LM3 and LM5, most crops suffered water stress leading to depressed production. Pest and disease infestation such as out- break of fall armyworm in 2016also exacerbated the situation.

In 2016, 67,009 MT of cereal crops valued at Ksh 1,879,277,000 was produced from 89,273Ha, 23,346MT of legume crops valued at Ksh 1,157,671,600was produced from 45,490 Ha. For roots and tuber crops, the production was 96,505 MT valued at Ksh 1,126,745,980 from7630 Ha while a total of 29,400 MT of fruit crops was harvested valued at Ksh 85,790,300 from 1075 Ha.

Since most of the vegetable production is under irrigation, the effect on weather was not significant. A total of 36,682.3 MT valued at Ksh 1,346,538,750 was produced from 3732 Ha during the same period. (Directorate of Agriculture, 2016).

3.9.3 Average Farm Size

The average farm size for a small scale farmer is 1.1 hactares for a large scale farmer. The farm size is 0.8 ha for Gem and Ugunja; 1 ha for Alego Usonga, Bondo and Rarieda and 2 ha for Ugenya. Due to small farm holdings and the resulting limited benefits of economies of scale, the practice of mechanized agriculture is heavily constrained.

3.9.4 Fishing Activities

Fisheries activities are major sources of income, food, employment and foreign exchange earnings in Kenya. Lake Victoria is the most important source of fish in East Africa and the biggest source of freshwater fish on the African continent. The lake is

also important in conservation terms because of its great biodiversity of predominant fish species.

Fisheries in the County are two folds; capture fisheries from Lakes Victoria and Kanyaboli, and culture fisheries (aquaculture). The Siaya Waters of Lake Victoria directly employs12,140 fishing crews operating 4,007 boats accounting for about 30% of the number of crews and 28% of fishing boats operating on the Kenyan side of the lake (Frame Survey, 2016). The fishing crews and crafts operating in Lakes Victoria and Kanyaboli stands at 834 and 398 respectively. In total, there are 83 fish landing sites on Lake Victoria and 4 on Lake Kanyaboli with the major ones being Usenge, Wichlum, Luanda Kotieno, Osindo and Nambo on Lake Victoria.

3.9.5 Apiculture

In addition to contributing directly to household incomes, bees play an important role in plant pollination. In 2016 the county had 10,600 beehives producing 513 MT of honey and 13 MT of beeswax, all valued at Ksh 183 million. Beekeeping is becoming increasingly popular due to the low investment and variable costs involved. The potential for apiculture is huge and underexploited.

3.10 Tourism and Wildlife

3.10.1 Main Tourist Attractions and Activities

Siaya prides herself of great Luo heroes, scholars, politicians as well as great chief – Odera Akang'o- who is well remembered for his powers being the first chief in Kenya to instil formal education.

Siaya County has diverse tourism attractions, ranging from natural, historical, flora and fauna and cultural attractions. This land potentially harbours different forms of tourism including agro tourism, sport tourism, eco-tourism, cultural tourism and culinary tourism.

Main categories of tourism attraction include and not limited to:

a. Cultural Tourism: Ramogi Hill(Got Ramogi), Jaramogi Oginga Odinga Mausoleum and Museum, Achieng' Oneko Mausoleum, Holy Got Adodi, Justice Ayanga Museums, Huluwino Blacksmiths, Chief OderaAkang'o Office and Cells in Yala and Cultural Activities in Siaya County.
b. Eco Tourism: Lake Kanyaboli, Yala Swamp Wetland, Dominion Farm Birds Sanctuary, Anyiko Wetlands, Uwasi/Muluhwa Rice Scheme, Elmolo Crocodile Park, Lake Namboyo, Lake Bob, Lake Sare and Lake Victoria Fish Cages in Lake Victoria.
c. Nature based Tourism: Ndanu Falls, Mahira Falls, Godha Falls, Mageta Island, Sirigombe Island, Rawalo Hills and Naya Hills
d. Leisure based Tourism: Goye Beach, Madundu Beach and Luanda Kotieno

3.10.2 Main Wildlife

The varieties of wildlife found in the County include hippopotamus (Lake Victoria, Rivers Nzoia and Yala), crocodiles (Yala Swamp, parts of the Lake Victoria), Sitatunga

(Yala Swamp) and monkeys and leopards. The County has several species of fish, but the most popular ones are Nile perch, *Rastrineobola argentea* (Locally known as Omena), *Hatlochromines* (locally known as Fulu or Wiu) and Nile Tilapia. Nile perch has a very high commercial value and is responsible for the economic break through which has been experienced along the shore of Lake Victoria. Others are bushpig (mainly in Yala Swamp), Hyenas (Got Abiero, Utonga), various species of snakes e.g. pythons, cobras and various species of birds.

3.10.3 Museums, Heritage and Cultural sites

The county hosts two gazetted national monuments and other heritage resources:

a. **Jaramogi Oginga Odinga Mausoleum and Museum** which is a gazetted heritage built on top of the grave of Kenya‘s first vice president and father of opposition politics, Jaramogi Oginga Odinga. Housed in the museum is a rich collection of Jaramogi‘s regalia i.e. Brief case, Ceremonial hats and clothes he wore at various stages of his political life as well as various Luo artefacts that have become extinct in most parts of Nyanza.
b. **Ramogi Hills** has always occupied a special place in the history of the Luo. The name Ramogi is not only equated to the hill as a physical feature - it is the name of the forefather of the Luo people. Ramogi is believed to have settled on the hill when he emigrated from Sudan, hence the name Got Ramogi (Ramogi’s Hill).Got Ramogi is a hill of multiple purposes and significance ranging from cultural, religious and for the archaeologist; it is a historical site rich in traditional artefacts which indicates early life of people. Ramogi hills symbolize the heritage of the Luo Community. The hills have sacred sites which are believed to be mediums through which this community draws strength and divine protection from the ancestral spirits. This is why people visit the hill for blessings, strengths, and for divine protection.

3.11 Industry and Trade

3.11.1 Industrial Parks

In Siaya there are no major industrial parks. There is a minor SME park owned by the Kenya Industrial Estates (KIE) that is operational. The proposed project would be a big boost to the economy of the county through job creation and industrial development.

3.11.2 Types and Number of Businesses

There are supermarkets, wholesale and retail outlets, open air market businesses. Major supermarket is found in Ugunja while in other towns, there are mini-supermarkets. These vend items ranging from manufactured goods, agricultural products and services.

3.11.3 Major Industries

The industrial sector comprises of the manufacturing, quarrying, mining and construction activities out of which the manufacturing sector accounts for approximately two-thirds. The sector is mainly agro-based and characterized by relatively low value addition, employment, capacity utilization and export volumes partly due to weak linkages to other sectors.

Siaya County has a relatively small Industrial Sector as stated in various County reports. In August 2016, the department undertook a survey to get the true picture of industries in the County. The results of the survey indicated that there were 27 operating industries, six (6) non-operational and two (2) were under construction.

It is worth noting that majority of these industries are privately owned but plays a vital role in provision of goods and services in addition to being a source of employment to members of the community and residence of Siaya County.

3.12 Environment and Climate Change

3.12.1 Major Degraded Areas

Land degradation and ecosystem destruction continue to be a major concern in the county. This is manifested in the silted water bodies such as water pans and rivers. In addition waste management remains a major challenge in most of our urban centres and is compounded by the increasing populations in such areas. Of late, the high need for road-surfacing material and other construction materials exacerbate land degradation incidences. These exist at localized scales in form of quarry mines, sand mines, eroded lands, bare soils and gravel extraction sites randomly spread across the county. The major county areas affected by land degradation include: Wichlum and Kamariga sand mining beaches in Bondo; Barding gold mining areas, Got Aduwa gravel site, Sumba sand mining site, Uranga murram extraction sites in Alego-Usonga; Eroded gulleys of Homba Stream in Gem; Misori Quarry sites in Rarieda; Bar-Ober and Jera Brick-making sites in Ugenya Sub-County.

3.12.2 Major Contribution to Environmental Degradation

Environmental degradation is the deterioration of environment through consumption of assets such as water, air and soil; destruction of environment and eradication of wildlife. Siaya County has areas experiencing environmental degradation and there is need by the government to put interventions to reduce or counter its effect.

3.12.3 Environmental Hotspots

Environmental hotspots in the County are those areas with significant level of animal and plant life that is threatened with destruction. Some of the notable environmental hotspots include: Kamalunga and Sumba flood plains in Usonga ward of Alego Usonga Sub-County; Masawa flood plains in West Ugenya ward of Ugenya Sub-County; Yala Swamp and other wetlands encroachment within the County; Land Degradation in Wichlum sand harvesting sites in Central Sakwa ward of Bondo Sub-County; Land Degradation in Kamariga sand harvesting sites in West Uyoma ward of Rarieda Sub-County; Barding Gold mining sites in South-East Alego ward in Alego Usonga Sub County; Wuoroya River pollution and associated disease outbreaks; River Nzoia pollution caused by sugar industries upstream; Undesignated dumping sites in town centres within the county and Un gazetted Hills as hotspots for deforestation.

The proposed project is located 3Km from Wuoroya River as the nearest sensitive receptor. The Water Resources Authority shall be contacted for abstraction permit since the proponent intends to use the river as a source of water for the factory.

3.12.4 Solid Waste Management Facilities

The county government has put in place the following solid waste management facilities in urban and market centres: 10 Skips; 850 Garbage Bins; 2 Dumping Sites reserved in Ugunja and Alego Usonga Sub-Counties and 6 Tractors in each Sub County for waste collection.

3.12.5 Invasive Species and Impacts on Health

The County bears the burden of a variety of invasive species. Water Hyacinth, occurring in unpredictable seasons, is a major problem in Lake Victoria affecting about 60% of the beaches. It provides substrate and breeding grounds for snails which carry the bilharzia causing protozoa. Its infestation has also had negative effects by blocking public water supplies with intakes in the lake as well as affecting livelihoods among the fishing community by blocking entrance into the lake. Fish is a vital component of human diet and its deficiency is likely to affect human health.

Dodder parasitic plant is the latest menace to terrestrial vegetation in the county and is spreading at an alarming rate. The parasite twines on the host plant choking and feeding on food crops, trees and shrubs thus reducing agricultural yields and productivity. This subsequently denies humans of the necessary nutritional support weakening their immunity systems and leaving them highly prone to diseases.

Recently, the Fall Army Worm has invaded maize fields with very adverse effects on productivity. This is likely to result in famine and again increasing vulnerability to disease epidemics.

The introduction of the Nile perch in Lake Victoria has led to the reduction in various endemic fish species with some threatened with extinction. Species such as tilapia, ―sire" and―fulu― are drastically reducing in population sizes

3.12.6 Loss of Biodiversity

Loss of biodiversity in Siaya County is characterized by loss of certain fish species, extinction of certain wild animals and indigenous trees.

In Lake Victoria fish species such as ― "sire", "ngege", "fulu", "nyamami", "odhadho", have declined due to a variety of reasons. Key amongst them are climate change, introduced alien species, over-fishing, poor harvesting technologies and changing breeding patterns. Another reason has been the continuous clearing of the papyrus reeds which are breeding grounds of fish leading to migration of fish thus decline in fish populations.

The preference of eucalyptus as source of timber and wood has led to cutting down of indigenous tree species such as "olwa", "ngowo", "chwa", and "ogongo".

The sitatunga, majorly in Yala Swamp, is faced with serious extinction due to poaching and hunting whereas the wild pig (mbidhi) is almost extinct as its habitat (bushes) is being cleared to pave way for agricultural activities. Hippos are another mammal species whose population is dwindling. In areas such as Nyadiang'a, killing of leopards has led to increase in monkey populations. The monkeys then invaded maize farms prompting poisoning that eventually led to their reduction.

Other mammals and reptile species facing extinction are, Monitor Lizards, Mongoose, Hyenas and Warthogs.

3.12.7 Climate Related Disasters

Siaya County experiences a number of climate-related disasters in different magnitudes. Amongst the most serious of them is flooding experienced in Usonga and Mahawa Swamp in West Ugenya.

Drought is also being experienced in the county. The frequency of occurrence has lately increased with the resultant effects of famine and crop failure. Disease epidemics especially cholera as a result of water pollution arising from faecal contamination and malaria due to poor drainages, open excavations and over-grown vegetation within human dwellings.

3.12.8 Deforestation

Population increase has led to a high demand for wood products and pasture land exerting undue pressure on the existing forest vegetation. Additionally the need for space for human settlements necessitates clearing of forests. Human encroachment into the non-gazetted forest areas such as Nyambare, Regea and Mbaga hill tops has also led to deforestation. Unless controlled, the effects of deforestation would affect the county in loss of habitat, change in micro-climate and the general environmental ambience. This would be a setback on the county and national targets. Urgent intervention measures have therefore to be put in place for afforestation programmes to reverse the otherwise impending adverse effects.

3.12.9 Change in Water Level

The water levels in Lake Victoria have been rising over the years, a phenomena associated with climate change. On the other hand the depths in the lake are reducing due to increasing sediment load as a result of deposited silts. However on a local scale Lake Kanyaboli has been experiencing receding water levels due to various factors including high evaporation rates. Water level fluctuations have also been noted in Rivers Yala and Nzoia. These have had grievous consequences in public water intake works including Bondo Water Supply and Hawinga Water Supply intakes in River Yala and Lake Kanyaboli respectively. Water Pans and Dams in the county particularly in Rarieda and Bondo Sub-Counties frequently dry up due to high evaporation rates and reduced depths due to siltation. This in effect results in water scarcity for both animal and human consumption. Groundwater level fluctuations are also a common phenomenon in Siaya County especially during the dry spells of January and February when springs and shallow wells dry up while the pumping levels in boreholes reduce greatly.

3.12.10 Conflict Resulting From Shared Resources

Community trust lands where grazing rights are shared for example in Randago area, has led to physical confrontations amongst the users. More pronounced however, is the use of various natural resources within Yala swamp.

The River feeds Lake Kanyaboli and its diversion therefore leads to low water volumes in the lake. Land-use conflict between the local communities and the government agencies managing the wetlands is also common in Yala swamp. The locals have encroached on the riparian lands against the established regulations. Human-wildlife conflicts also occur. A case in point is the hippos destroying crops on the shores of Lake Kanyaboli and the banks of River Nzoia around Magoya and Yala around Kosoro and Jina areas.

3.13 Water and Sanitation

3.13.1 Water Resources

The county has two (2) major rivers namely; Yala and Nzoia. These rivers form the County‘s drainage systems of major river basins with numerous tributaries and they drain directly into Lake Victoria. The seven major tributaries (small rivers) are Hawiro, Uludhi, Nyamonye, Wuoroya, Sese, Dhene and Seme Awach which are potentially important sources of water for farming and domestic use.

There are several swamps, wetlands, dams and pans. The major lakes in the County are Lake Victoria, Lake Kanyaboli and Lake Sare. Ground waters are found in Nyanzian rock aquifer system. Generally, the County has good potential of ground water. The potential however, diminishes as one approach the lake.

Surface water resources are the rivers, streams, lakes while the underground waters are those drawn through boreholes and shallow wells. There is abundant surface water available in the county but underground water potential is generally scarce in Bondo and Rarieda Sub Counties.

Run-off water can also be collected in small surface dams and earth pans. This alternative is particularly suitable for drier parts of the County in Uyoma, Asembo, Sakwa and parts of Alego Usonga.

3.13.2 Water Supply Schemes

Access to improved water sources in the county is estimated at 66 percent (KDHS 2014) leaving a majority of the population accessing unimproved water sources. The County has one major Water Service Provider, SIBOWASCO and currently runs 10 major Water Supply Schemes including Siaya, Bondo, Asembo-Ndori, South Sakwa, SidindiMalanga, Ugunja, Ukwala, Sega, Mauna and Kogelo Water Supplies.

The County also has over 40 Medium Water Supply Schemes serving over 396,000 people. The schemes range from small community based to large piped water supplies. The facilities are managed by Community Based Water Management Committees, Semi-autonomous water service providers and Institutions. Examples include East Uyoma and West Uyoma Water Schemes in Rarieda Sub-County; South Sakwa, Osieko Nambo,

Penwa in Bondo Sub-County; North Alego, Ulafu, Hono in Alego Usonga Sub-County; Akala, Ahono Sinaga, Sirembe in Gem Sub-County; Sigomere, Uhuyi, Ruwe, Sira, Nyawita, Naya in Ugunja Sub County and Masat, Yesise, Bar Ober in Ugenya Sub-County.

3.13.3 Water Access

The distribution of water sources, surface and underground in the County are naturally widely spaced and make people walk long distances to fetch water. The Government interventions were intended to reduce the long distance coverage to about 500m distance. The intervention measures the Ministry of water has put in place so far in terms of piped schemes, point water sources like boreholes, shallow wells and spring protection has not met the target.

The rural population of the County depends on various types of water sources for their domestic needs. The southern part (Bondo and Rarieda) have less than one water point per 2.5km², while the north and north-eastern parts have a water point density of more than 3 per km². Streams are the most wide spread type of water points, but occur mainly in north-eastern part of the County. Other sources of water in the County include; wells, boreholes, roof catchment, rivers, Lake Victoria, water holes, dams, ground catchments and piped supplies. A large number of water points cannot be used during the dry season because they are seasonal.

When the study turned to the respondents' sources of drinking water within the project area, the results obtained were as shown in the figure below. Majority of them had access to borehole water source (57%), followed by piped water source at 17%. Drawing directly from the river at 13%, hand dug wells at 8%.

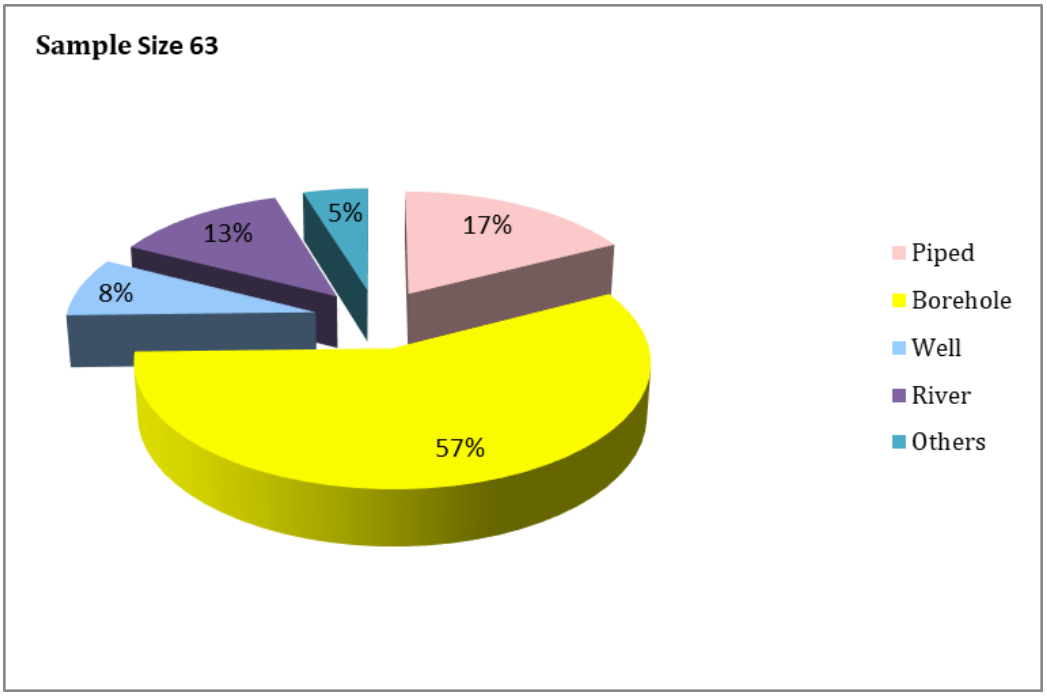


Figure 11: Sources of domestic water in the Project

Source: ESIA Study Socio-economic Survey, 2022

3.13.4 Water Management

This is the management of water resources under set policies and regulation. Lake Victoria South Water Services Board, Water Resources Authority, Water Services Regulatory Board, Water Services Trust Fund, Water Appeals Board, Water Resources Users Associations and the County Government are some of the organs concerned with water resources and services management

3.13.5 Sanitation and sewerage

The County access to pit latrines is at 82.4 percent. The sewerage access is estimated at 5 percent courtesy of the completed Siaya – Bondo Water and Sanitation project.

During the planning period the department will aim at actively promoting, conserving and protecting environment; and improve access to safe water and urban sanitation for sustainable development.

When the study turned to the respondents' access to sanitation facility within the project area, the results obtained showed that all the respondents (100%) use pit latrines.

3.14 Health Access and Nutrition

3.14.1 Health Access

The County currently has a total of 213 health facilities of which 147 are public health facilities. There is one County Referral hospital located in Alego Usonga and nine Sub County hospitals spread across the six sub counties .there are 34 health centres and 102 dispensaries.

The current health care staffing levels in the county is represented by a nurse to population ratio of 1:1997 and a doctor to population ratio of 1:17236 against a national ratios of1:600 and 1:8500 for nurses and doctors. The WHO recommended ratios stand at 1:400 and1:1000 for nurses and doctors respectively. The County has a total of 936 Health workers in public facilities distributed across the county. In Alego Usonga there are 273, Bondo 189, Rarieda 109, Gem 157, Ugunja 81 and Ugenya 79. In addition, the county has employed 47CHAs and engaged 2148 Community Health Volunteers (CHVs) and provides the CHVs with monthly stipend. In addition to health care workers employed by the county Government, the partners on HIV have also deployed 950 staff for intervention in HIV management.

3.14.2 Morbidity

Communicable diseases such as Malaria, HIV/AIDS, diarrheal, respiratory infections and Tuberculosis (TB) continue to dominate causes of ill health in the County. As per the Kenya Malaria indicator survey, prevalence rate in 2010 and 2015 was at 38 per cent and 27 per cent respectively for the Lake endemic region, that notwithstanding it contributes to 38 per cent of morbidity cause. New HIV infections have reduced from 16,147 cases to 8,260 cases annually between 2013 and 2015, although prevalence has remained relatively constant at24.8 per cent (NACC 2015). This is largely attributed to success in the HIV care and treatment programs where individuals are living longer

healthier lives as a result of the lifesaving anti-retroviral drugs (ARVs). TB treatment success rate has equally improved to 82 per cent in 2016 from 77 per cent. Diarrhoea cases in under five seen at the health facilities have reduced from 21 per cent in 2015 to 12 cent in 2017. Similarly, Pneumonia cases seen at the outpatient among under-fives reduced from 6 per cent in 2015 to 4% in 2017

3.15 Education, Skills, Literacy and Infrastructure

The County has 652 primary schools, 237 secondary schools, seven tertiary institutions, 12 special education schools, one public university and 13 special units in regular primary schools. School enrolment is 80,672 pupils at pre-primary level, 248,336 pupils at primary school level, 78468 students at secondary school level, 2,759 at tertiary level, 1,847 in the university and 1,179 in the youth polytechnics. Basic literacy rate stands at 80 per cent.

4. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

Environmental law is principally concerned with ensuring the sustainable utilization of natural resources according to a number of fundamental principles developed over the years. In an ideal setting, the utilization of land and land based resources should adhere to these principles, which are sustainability, intergenerational equity, principle of prevention, the precautionary principle, the polluter pays principle, and public participation.

The EMCA, 1999 was developed based of the principles highlighted in the preceding sections. The basis of the EMCA, 1999 was anchored on the fact that the public should be given effective access to judicial and administrative proceedings and further that it have access to the judicial review of environmental decision making functions effectively.

4.1 Background to environmental management policies and laws

4.1.1 Sustainability

The principle of sustainability requires that natural resources should be utilized in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations. It strives for equity in the allocation of the benefits of development and decries short-term resource exploitation which does not consider the long-term costs of such exploitation.

4.1.2 Principle of intergenerational equity

The principle of sustainability should be examined together with that of intergenerational equity, which focuses on future generations as a rightful beneficiary of environmental protection. Essentially, the principle of intergenerational equity advocates fairness, so that present generations do not leave future generations worse off by the choices they make today regarding development. Its implementation requires the utilization of natural resources in a sustainable manner while avoiding irreversible environmental damage.

4.1.3 Principle of prevention

The principle of prevention states that protection of the environment is best achieved by preventing environmental harm in the first place rather than relying on remedies or compensation for such harm after it has occurred. The reasoning behind this principle is that prevention is less costly than allowing environmental damage to occur and then taking mitigation measures.

4.1.4 Precautionary principle

The precautionary principle recognizes the limitations of science, as it is not always able to accurately predict the likely environmental impacts of resource utilization. It calls for

precaution in the making of environmental decisions where there is scientific uncertainty.

Accordingly, it is closely related to the principle of prevention and can be viewed as the application of the principle of prevention where the scientific understanding of a specific environmental threat is not complete. The precautionary principle thus requires that all reasonable measures must be taken to prevent the possible deleterious environmental consequences of development activities. Further, it demands that scientific uncertainty should not be used as a reason for not taking cost-effective measures to prevent environmental harm.

4.1.5 Polluter pays principle

The polluter pays principle requires that polluters of natural resources should bear the full environmental and social costs of their activities. It seeks to internalise environmental externalities by ensuring that the full environmental and social costs of resource utilization are reflected in the ultimate market price for the products of such utilization. Since environmentally harmful products will tend to cost more, this principle promotes efficient and sustainable resource allocation as consumers are likely to prefer to the cheaper less polluting substitutes of such products.

4.1.6 Principle of public participation

The principle of public participation seeks to ensure environmental democracy and requires that the public, especially local communities should participate in the environment and development decisions that affect their lives. It requires that the public should have appropriate access to information concerning the environment that is held by public authorities and should be given an opportunity to participate in decision-making processes.

4.2 Policy framework

4.2.1 Environmental policy

The Kenya Government's environmental policy aims at integrating environmental aspects into national development plans. The broad objectives of the national environmental policy include:

- Optimal use of natural land and water resources in improving the quality of the human environment;
- Sustainable use of natural resources to meet the needs of the present generation while preserving their ability to meet the needs of future generations;
- Integrate environmental conservation and economic activities into the process of sustainable development;
- Meet national goals and international obligations by conserving bio-diversity, arresting desertification, mitigating effects of disasters, protecting the ozone layer and maintaining an ecological balance on earth.

4.2.2 National Environmental Action Plan Framework, 2009-2013

The National Environment Action Plan Framework is the second national environmental policy after the 1994 National Environment Action Plan (NEAP). The development of NEAP is provided for by EMCA, 1999 which requires preparation of Environmental Action Plan at different levels; district, provincial, and national levels. The framework recognizes the intertwined linkages between economic growth and environment in Kenya. It highlights priority themes and activities for the country towards achieving sustainable environment.

The policy framework among others, proposes integration of environmental concerns into regional and local development plans, promotion of appropriate land uses and enforcement of EMCA, 1999 and its subsidiary and other relevant legislations. The policy framework also advocates for efficient water harvesting, storage and usage. On human settlements and infrastructure, this policy framework recognizes the associated environmental issues. These include waste management, sanitation, diseases, land use changes in conservation areas, demand for water, energy, construction materials, pollution, land degradation, biodiversity loss, land and housing tenure, urban planning and design and electronic wastes. In managing operations of the Seal Sugar Mill Limited, consideration of the highlighted issues is vital towards contribution to the national sustainable development goals.

4.2.3 The Sugar Policy

The Sugar policy as established is in line with the national objectives of national food policy, which are; self-sufficiency, food security, employment creation, income generation, foreign exchange earnings, stemming rural-urban migration, poverty alleviation and overall economic growth. Sugar plays a vital role in providing livelihoods, earning national revenues and incomes, creating employment and foreign exchange savings. It is an industry valued at approximately Kshs. 15 billion, providing over 500,000 direct and indirect jobs and supporting the livelihoods of over 6 million people.

The Sugar sub-sector is a major enterprise in the Western and Nyanza and potential exists in the Eastern and Coastal belts. Further improvement of this vital industry will help alleviate unemployment through backward and forward linkages.

4.2.4 The Occupational safety and Health Policy

This Policy lays emphasis on continual development and implementation of the Occupational Safety and Health systems and programs to reduce incidences of work related accidents and diseases. In addition, it seeks to offer equitable compensation to those who suffer physical injuries and contract occupational diseases. The Policy addresses the current challenges, gaps and future development of safety and health systems and programs in the country. It promotes basic principles of assessing occupational risks or hazards; combating occupational risks or hazards at source; and developing a national preventative safety and health culture that includes information, consultation, research and training. The policy also promotes continuous improvement of occupational safety and health by integrating Kenyan national laws and regulations with Regional Protocols, ILO Conventions, ISO standards and the best practices in the world.

It sets up mechanisms for resource mobilization for occupational safety and health programs and activities and provides guidance to all stakeholders in the development and implementation of occupational safety and health systems and programs. Seal Sugar Limited is committed to put in place occupational safety and health systems and programs to be in tandem with the national policy.

4.2.5 The Kenya Vision 2030 and the "Big Four" Blueprint

The Kenya Vision 2030 is the national long-term development policy that aims to transform Kenya into a newly industrialized, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment.

The Big Four is an economic blueprint that was developed by the government to foster economic development and provide a solution to the various socio-economic problems facing Kenyans. The four items that intended for delivery include Food Security and Nutrition, Universal Health Care, affordable Housing and enhancing the Local Manufacturing industry. Seal Sugar Limited will explicitly play a big role in realization of two of the pillars namely food security and local manufacture as soon as it starts its operations in Siaya County.

4.2.6 Sustainable Development Goals (SDGs)

MDGs are eight internationally-agreed goals for socio-economic development that emphasize the following: elimination of extreme poverty and hunger; universal primary education; gender equality; reduction in child mortality; improvement in maternal health; lower HIV/AIDS and major disease incidence; environmental sustainability; and better partnerships with international development partners. The facility has an opportunity to contribute towards local achievement of some of these goals via employment opportunities creation, corporate support to community initiatives and contribution towards achieving environmental sustainability goal.

4.2.7 National Water Policy

The National Policy of Water which was promulgated in April 1999 as Sessional Paper No. 1 of 1999 calls for decentralization of operational activities from the central government to other sectors, including local authorities, the private sector and increased involvement of communities in order to improve efficiency in service delivery. It also tackles issues pertaining to water supply and sanitation facilities development, institutional framework and financing of the sector. According to the policy, in order to enable sustainable water supply and sanitation services, there is need to apply alternative management options that are participatory through enhanced involvement of others in the provision of these services but particularly the private sector.

The overall objective of the National Water Policy is to lay the foundation for the rational and efficient framework for meeting the water needs for national economic development, poverty alleviation, environmental protection and social well-being of the people through sustainable water resource management.

4.3 Legal framework

4.3.1 NEMA

The National Environment Management Authority (NEMA) is the National body charged with coordinating matters of implementation of policy issues relating to the environment. This body was established under the Environmental Management and Coordination (amendment) Act (EMCA), 2015. Other departments that deal with environmental issues in the Sub County include Water Resources Authority (WRA), Lake Victoria Environmental Management Project (LVEMP II), the Kenya Forestry Service, Kenya Wildlife Services (KWS), National Construction Authority (NCA), Kenya Sugar Board (KSB), County Government of Siaya, among others.

Seal Sugar Mill Limited is committed to comply with all applicable legal provisions and regulations which have been reviewed in the table below.

Table 2: Relevant legal and regulatory requirements

Legislation/Regulation/ Standard	Provisions	Compliance/Non-compliance
The Constitution of Kenya (2010)	• Provides for the protection of the right to private property • Provides for the sound conservation and protection of ecologically sensitive areas • Supports the settlement of land disputes through recognized local community initiatives • Gives powers to the state to regulate use of land	• Theproponent will ensure sound protection of the environment and any other ecological sensitive receptor by installing pollution prevention technologies such as effluent treatment and recycling plant.
Environmental Management & Coordination Act, 1999 (Amended 2015) and Subsidiary Regulations	Ensure environmental protection during project implementation. • Environmental Impact Assessment EIA) • Environmental Audit and Monitoring, Environmental Quality standards and issuance of environmental protection orders • Generation of sector related regulations • Environmental Management and Coordination (Environmental Impact Assessment and Audit) Regulations, 2003 - Waste Management Regulations - 2006 - Water Quality Regulations - 2006 - Wetlands, River Banks, Lake Shores and Sea Shore Management Regulations - 2009 - Air Quality Regulations - 2014	• Seal Sugar Mill Limited shall comply with EMCA and subsidiary regulations including best international practices; • The proponent shall have Environmental Policy in place and employ an environmental officer to oversee all environmental matters during construction and operation of the sugar mill.
Environmental Management and Co-ordination (Waste Management) Regulations 2006	• Provides for standards for handling, transportation and disposal of various types of wastes including hazardous wastes.	• Seal Sugar Mill Limited shall utilize sugar process waste known as bagasse to produce power for its own consumption. • The proponent shall contract a NEMA registered waste disposal agent to dispose appropriately its solid waste including hazardous wastes such as used oil and oil filters from the workshop; • The proponent shall pave and install oil water interceptor in active operation area such as the workshops and parking areas.
Environmental (Impact Assessment and Audit) Regulations, 2003	• No proponent shall implement a project if it is likely to have a negative environmental impact; or for which an environmental impact assessment is required under the Act or these	• The Proponent is carrying out the ESIA for NEMA review and licensing and shall carry successive Environmental Audits at the facility to identify new

Legislation/Regulation/ Standard	**Provisions**	**Compliance/Non-compliance**
	Regulations unless an environmental impact assessment has been concluded and approved in accordance with these regulations. • No licensing authority under any law in force in Kenya shall issue a license for any project for which an environmental impact assessment is required under the Act unless the applicant produces to the licensing authority a license of environmental impact assessment issued by the Authority under these Regulations	potential environmental impacts associated with the future operations of the factory.
EMCA (Water Quality) Regulations, 2006	• Every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution, • No person shall throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution. • No person shall • (a) Discharge, any effluent from sewage treatment works industry or other point sources without a valid effluent discharge license issued in accordance with the provisions of the Act; • (b) abstract ground water or carry out any activity near any lakes, rivers, streams, springs and wells that is likely to have any adverse impact on the quantity and quality of the water, without an environmental impact assessment license issued in accordance with the provisions of the Act;	• The proponent shall install Effluent Treatment and recycling Plant (ETP) for pre-cleaning and recycling of effluent water from the factory. • The facility shall apply for a valid Effluent Discharge License from NEMA for its Effluent Treatment Plant once it is operational.
EMCA (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009	A person shall not engage in any activity that may- • have an adverse impact on any ecosystem; • lead to the introduction of any exotic species; • lead to unsustainable use of natural resources, Without an Environmental Impact Assessment License issued by the Authority under the Act.	• The nearest sensitive receptor is River Wuoroya which is located 3km away and no effluent shall be released back to the river since the recycled water shall be re-used for other uses within the factory.
Environmental Management	• Provides for ambient air quality tolerance limits.	• Seal Sugar Mill Limited shall install appropriate

Legislation/Regulation/ Standard	**Provisions**	**Compliance/Non-compliance**
and Coordination (Air Quality) Regulations, 2014	• Prohibits air pollution in a manner that exceed specified levels. • Provides for installation of air pollution control systems where pollutants emitted exceed specified limits. • Provides for the control of fugitive emissions within property boundary. • Provides for the control of vehicular emissions. • Provides for prevention of dispersion of visible particulate matter or dust from any material being transported. • Provides for acquisition of an emission license.	Electrostatic precipitator (ESP) as an effective emissions control technology; • Seal Sugar Mill Limited shall also sponsor tree planting exercises within and around the premises to counter air pollution as a result of the activities due to their operations.
Land Act 2012	Promote Land Conservation including and need to prepare EMP: • Conservation of ecologically sensitive public land • Conservation of land based natural resources • submit an EMP pursuant to existing law on environment	• The proponent is the registered title holder and shall ensure that he complies with the current environmental laws in order to protect the land from any form of pollution.
The Public Health Act (Cap 242)	• No person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health. • It shall be the duty of every health authority to take all lawful, necessary and reasonably practicable measures for preventing or causing to be prevented or remedied all conditions liable to be injurious or dangerous to health arising from the erection or occupation of unhealthy dwellings or premises	• Housekeeping within the site shall be well maintained in all the operation areas including compliance with the Ministry of Health Covid-19 Protocols by providing hand washing stations and notices to both the employees and visitors to keep social distances and put on face masks at all times within the facility. • Sanitary conveniences shall be provided to the employees during construction and operation of the factory; • The proponent will sensitize the community on the importance of environmental management and carry out HIV/AIDS awareness programs within the community
The Occupational Safety and Health Act, 2007	• Provides that every occupier shall ensure the safety, health and welfare at work of all persons working in his workplace • Provides that the architectural plans of the factory be approved by the Directorate of Occupational Safety and Health Services before construction activities commence. In approving the plans	• The facility has recently carried out occupational health and safety audit, fire safety audit, risk assessment and is in the process of implementing the recommendations. • The proponent shall ensure that firefighting

Legislation/Regulation/ Standard	Provisions	Compliance/Non-compliance
	Directorate of Occupational Safety and Health Services will among other requirements ensure that: - Prescribed dimensions with regards to distance of floor to ceiling of every workroom is upheld - Space defining machine layout for intended use by operators will be within statutory limits - Emergency exits are provided for and are designed to open in accordance to statutory requirements - Sanitary conveniences are provided for with adequacy as to number of intended employees and are designed to have separate approaches - First aid facilities like first aid room(s) are provided for, - There is provision for accommodation for clothes not worn during working hours - There is provision for adequate ventilation - There is provision for storage of fire fighting water storage tank with a capacity of at least 10,000 litres • Provides that before any person occupies or uses any premises as a workplace, he shall apply for the registration of the premises • Provides that workplace shall be of sufficient size for work to be carried out with ease and shall further have the necessary free space and, having regard to the nature of the work, an adequate amount of air for each employee, the minimum permissible being ten cubic meters per person • Provides that an occupier shall ensure that effective and suitable provision is made for securing and maintaining, by the circulation of fresh air in each workroom, the adequate ventilation of the room • Provides that an occupier shall ensure that effective provision is made for securing and maintaining sufficient and suitable lighting, whether natural or artificial, in every part of his	equipment are present and strategically placed within the facility including a standby fire engine; • First Aid kits shall be made available in every department and training on first aid done; • Fire assembly points shall be marked where the visitors and employees can gather for briefing in case of a fire; • There shall be provided clear and demarcated emergency exits within the facility; • An ambulance shall be on standby in the eventuality of an emergency; • Provision of PPEs shall be made mandatory within the facility. • Application for site registration will be done as soon as construction commences and registration of the facility shall follow when the facility starts operations. • Safety and health committee shall be formed when the facility is operational • Safety signs shall be erected and posted as appropriate when the facility is operational.

Legislation/Regulation/ Standard	Provisions	Compliance/Non-compliance
	workplace in which persons are working or passing • Provides that 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; and, where persons of both sexes are or are intended to be employed (except in the case of workplaces where the only persons employed are members of the same family dwelling there), such conveniences shall afford proper separate accommodation for persons of each sex • Provides that every steam boiler, lifting appliance, air receiver, refrigeration plant, steam receiver and all its fittings shall be thoroughly examined by an approved person, so far as the construction of the plant permits at prescribed intervals. • Provides that where work has to be done inside a confined space in which dangerous fumes are liable to be present, a permit to work has to be issued and the confined space shall be provided with adequate means of egress and ingress. • Provides that in every workplace or workroom, there shall be provided and maintained, and conspicuously displayed and free from any obstruction so as to be readily accessible, suitable means for extinguishing fire. • Provides every workplace there shall be provided and maintained safe plants and systems during its operational phase. • Provides for every workplace there shall be ensured absence/elimination of risks. • Provide for every workplace to ensure provision of information to employees to ensure safety and health. • Provides that every factory stops any hazardous activities and is maintained in a safe and healthy state. • Provides that every workplace carries out workplace risk assessment and send a copy of the risk assessment to the Directorate of Occupational Safety and Health Services (DOSHS). • Provides for preparation of a safety & health policy and submission of a copy to the Directorate of Occupational Safety and Health Services	

Legislation/Regulation/ Standard	Provisions	Compliance/Non-compliance
	• Provides for prevention of environmental pollution • Provides for notification of accident occurrence, cases of occupational diseases and dangerous occurrence to DOSHS • Provides that no employee is discriminated against by virtue of:- - Lodging a complaint about an unsafe condition at the workplace - Being an active member of a health safety committee. • Provides for establishment of a health and safety committee whose composition should be in accordance to the Factories (Health and Safety Committees) Rules L.N. 31of 2004. • Provides for carrying out workplace health and safety as well as fire safety audits on an annual basis.	
Safety & Health Committee Rules, 2004 Legal Notice No. 31	The Legal Notice provides for functions and duties of the health and safety committee, the purpose of meetings and recording minutes, and the roles of the office bearers. It further describes the duties of the occupier and those of the Health and Safety Adviser. Among other items, the rules provide that: • The occupier of every workplace shall establish a health and safety committee; • The committee shall consist of safety representatives from the management and the workers; • The factory occupiers shall appoint a competent person from the management staff to be responsible for safety, health and welfare in the factory or workplace; and the person appointed shall be the secretary to the committee. • Every member of the Health and Safety Committee shall undertake a prescribed basic training course in occupational health and safety within a period of six months from the date of appointment or election, and thereafter further training from time to time; • The occupier of every factory shall cause a health and	• Safety and health committee shall be formed and trained when the facility is operational

Legislation/Regulation/ Standard	Provisions	Compliance/Non-compliance
	safety audit of the workplace to be carried out at least once in every period of twelve months by a registered health and safety adviser.	
Fire Risk Reduction Rules, 2007 Legal Notice No. 59	The Rules provides that an employer/occupier having flammable substances must have fire resistant facility. The occupier to store highly flammable substances in fixed storage tanks, closed vessels, cupboards except for vehicles transporting the same. Flammable materials have to be kept in separate labelled stores. In go-downs, the employer has to maintain a distance of at least 80 cm wall gangway between the walls and stack of goods. Every employer is required to maintain good ventilation to allow exit of flammable fumes, maintain good housekeeping, maintain good electrical fittings, provide and maintain fire exits, form and train fire fighting teams, conduct fire drills yearly, designate an assembly point, provide and maintain first aid facilities, post fire safety notices, install fire detectors, provide and maintain fire fighting appliances, conduct an annual fire safety audit and formulate a fire safety policy.	• Fire assembly points shall be marked where the visitors and employees can gather for briefing in case of a fire; • There shall be provided clear and demarcated emergency exits within the facility; • The facility has recently carried out fire safety audit, risk assessment and is in the process of implementing the recommendations.
Hazardous Substances Rules, 2007 Legal Notice No. 60	The rules provide that where hazardous substances are handled, washing facilities be provided, protective clothing be kept separate from personal clothing, separate clean and dirty changing rooms be maintained, proper maintenance and testing of engineering controls be done after every 2 years and a report submitted to DOSHS, protection against radioactive, carcinogenic, mutagenic or teratogenic be provided, Material Safety Data Sheets (MSDS) be availed in respect of chemicals handled, correct disposal of hazardous chemical substances be done, containers of hazardous substances be labelled, workers be trained on hazards associated to	• The facility will carry out occupational hygiene measurements and surveys which inform the process of implementing the recommended measures.

Legislation/Regulation/ Standard	Provisions	Compliance/Non-compliance
	hazardous substances handled and air monitoring and measurements be done after every 12 months by an air quality monitor.	
First Aid Rules, 1977 Legal Notice No. 160	These rules provide for first-aid box content with respect to size of a workplace and under whose charge the first-aid box should be placed.	• First Aid kits shall be made available in every department and training on first aid done; • An ambulance shall be on standby in the eventuality of an emergency;
Eye Protection Rules legal Notice No. 44 of 1978	The rules provide for eye safety in workplaces. Processes where eye protection is required include blasting, cleaning, chipping, metal cutting, arc welding, abrasive wheel use (grinding).	• Provision of PPEs shall be made mandatory within the facility. • Safe procedures and programmes will be provided to the workers
Electric Power(Special) Rules, 1979 Legal Notice No. 340	The rules provide for electrical safety with regards to electrical power installations, use and handling. These rules apply to generation, transformation, conversion, switching, controlling, regulating, distribution and use of electricity.	• Provision of PPEs shall be made mandatory within the facility. • Only qualified personnel will be allowed to handle activities that involve electric power.
Building Operations and Works of Engineering Construction Rules, 1984 Legal Notice No. 40	These rules provide for the safety, health and welfare of workers in construction sites relating to building operations and works of engineering construction undertaken by way of trade or business, or for the purpose of any industrial or commercial undertaking, and any line or siding which is used in connection therewith and for the purposes thereof. The rules apply whether the building operations and works of engineering construction undertaken by or on behalf of the Government or a public body or private developer.	During the construction phase, the contractor will be expected to ensure safety, health and welfare of workers and all persons lawfully present at the construction site.
Medical Examination Rules, 2007 Legal Notice No. 24	The rules apply to workplaces of classified hazards. Every	• During the construction phase there will be noise

Legislation/Regulation/ Standard	Provisions	Compliance/Non-compliance
	employer has to ensure medical examination of workers in the workplaces of classified hazards.	emission, exposure to dusts and fumes (cement, soil, welding fumes etc) and exposure to musculoskeletal hazards. • During the operational phase there will be noise emission, exposure to bagasse, dusts and fumes, exposure to musculoskeletal hazards. • Statutory medical examination on the workers exposed will be mandatory.
Noise Prevention and Control Rules, 2005. Legal Notice No. 25	The rules provide that 'No worker shall be exposed to noise level excess of the continuous equivalent of 90 dB(A) for more than 8 hours within any 24 hours duration'. They further provide for protection from exposure to high noise levels.	• Provision of PPEs shall be made mandatory within the facility. • Medical examinations and surveillance will be implemented at the facility • Noise measurement and survey will be done at the facility
Work Injury Benefits Act, No. 17 of 2007	This law provides for compensation to employees for work-related injuries and diseases contracted in the course employment and for connected purposes.	• The employer will have an insurance cover for the facility to cater for compensation of injuries sustained by employees while at work
The Water Act, 2016 and The Water Resources Management Rules, 2007	• Protection of surface and groundwater resources; • Protection of water catchments; • Empower Water Resources Authority (WRA) to impose management controls on land use falling under riparian land; • Provides that a permit shall be required for any use of water from a water resource, especially where there is abstraction and use of water with the employment of works.	• The mill shall install a water treatment plant that abstract water from River Wuoroya and shall obtain water abstraction permit from WRA. Other source of water include the proposed borehole will have a permit from WRA.
The County Governments Act 2012	• Enforcing protection of trees and other vegetation in urban centers • Approval of development designs before construction can begin • Enforce orderly development in an urban setting	• The sugar mill shall work in liaison with the County Government to ensure compliance with land use requirements within the county and obtain the necessary licenses and permits.
Employment Act 2007	• The act stipulates that no person shall use or assist any other person, in using forced labour. • No employer shall discriminate directly or indirectly, against an	• The sugar mill shall be a source of employment for many workers of both gender and diverse cultural

Legislation/Regulation/ Standard	**Provisions**	**Compliance/Non-compliance**
	employee or prospective employee or harass an employee or prospective employee on the following grounds; race, colour, sex, language, religion, political or other opinion, nationality, ethnic or social origin, disability, pregnancy, mental status or HIV status. • An employer shall pay his employees equal remuneration for work of equal value.	backgrounds.
Standards Act Chapter 496	• Section 9 (2), states that, where a Kenya Standard has been declared under subsection (1), the Cabinet Secretary, on the advice of the Council, shall, by order in the Gazette, prescribe a date after which no person shall manufacture or sell any commodity, method or procedure to which the relevant specification or code of practice relates unless it complies with that specification or code of practice. (3) Where, after the publication of an order under section 9. Section 10 (2), states that, any person intends to manufacture any commodity to which that order refers after the date specified therein he shall notify the Bureau in the prescribed form of his intention and the Bureau, if it is satisfied that he is capable of manufacturing the commodity in accordance with the relevant Kenya Standard, shall issue him with a permit to use the standardization mark referred to in paragraph (a) of subsection (1).	• The proponent shall acquire a permit from KEBS to use the standardization mark as per this act to sell its sugar in the market
Kenya Sugar Act, 2001(rev.2012)	PART III – LICENSING AND REGISTRATION, 14. Requirement of license to operate mill states • that (1) No person shall operate a sugar mill or a jaggery mill unless he is a holder of a current license issued by the Board for that purpose. • The Act is the primary legal framework governing the structure, operations and relationships of stakeholders in the sugar industry and provides for: - Establishment, powers and functions of the Kenya Sugar Board, which is the industry regulator; - Licensing and registration of sugar mills; - Financial provisions – the Sugar Development Levy;	• Seal Sugar Mills Ltd has applied for a license from the Kenya Sugar Board to operate the sugar mill

Legislation/Regulation/ Standard	**Provisions**	**Compliance/Non-compliance**
	- Quality, health and safety; - Offences and penalties; - Sugar industry agreements; - Rights of growers; - Establishment and Constitution of the Sugar Arbitration Tribunal	
Food Drugs And Chemical Substances Act (Cap 254)	• The Food, Drugs and Chemical Substances Act (CAP 254) whose purpose is to make provisions for the prevention of adulteration of food, drugs and chemical substances. 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 labelling. The statute also gives powers to authorized officers to inspect and examine any premises for evidence of contravention of the provisions of the law.	• The sugar mill shall be inspected by the public health officers from Siaya County and issued with a Food Drugs and Chemicals Substances License for its sugar production
Sustainable Development Goals (SDGs)	• Sustainable Development goals which were initiated by world leaders in 2015 as an advancement of the Millennium Development Goals (MDGs) provide concrete, numerical benchmarks for tackling extreme poverty in its many dimensions. The SDGs also provide a framework for the entire international community to work together towards a common end making sure that human development reaches everyone, everywhere. If these goals are achieved, world poverty will reduce by half, tens of millions of lives will be saved, and billions more people will have the opportunity to benefit from the global economy. • Goals 6, 7, 13 and 15 of the SDGs revolve around ensuring Environmental Sustainability. The goals highlight on; ✓ Ensuring availability of sustainable management of water and sanitation for all ; ✓ Ensuring a clean and more sustainable supply of water within related watersheds; ✓ Ensuring access to affordable, reliable, sustainable and	• The proposed project will contribute towards alleviating rural poverty by increasing means of livelihood and enhancing food security. The ESIA study will ensure that the proposed project reflects Environmental Sustainability especially during the time of construction and implementation.

Legislation/Regulation/ Standard	**Provisions**	**Compliance/Non-compliance**
	modern energy for all; ✓ Combating climate change through the reforestation of degraded and degrading landscapes where by reforestation helps in strengthening community resilience to climate change ; ✓ Protecting, restoring and promoting sustainable use of terrestrial ecosystem, sustainably manage forests, and ✓ Combat desertification and halt and reverse land degradation, and halt biodiversity loss.	
The Agriculture, Fisheries and Food Authority Act, 2013	• This act consolidated the activities of several agricultural parastatals in Kenya into one entity. The Kenya Sugar Board operates under this entity as a directorate currently. The proponent has to acquaint himself with the provisions of this act especially in so far as licensing and permits are concerned	• The proposed project is expected to comply with the relevant provisions of this act.

4.4 International Conventions and Treaties

A treaty is a binding agreement under International Law concluded by subjects of International Law, namely states and international organizations. Treaties can be called by many names including; International Agreements, Protocols, Covenants, Conventions, Exchanges of Letters, Exchanges of Notes, etc.

Treaties can be loosely compared to contracts; both are means of willing parties assuming obligations among themselves, and a party that fails to live up to their obligations can be held legally liable for that breach. The central principle of treaty law is expressed in the ‘maximpactasuntservanda', translated as "pacts must be respected."

Kenya has ratified the following international conventions.

4.4.1 United Nations Framework Convention on Climate Change

The landmark United Nations Framework Convention on Climate Change (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 12th 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.

4.4.2 Kyoto Protocol

According to a press release from the United Nations Environment Programme:
"The Kyoto Protocol is an agreement under which industrialized countries will reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990 (but note that, compared to the emissions levels that would be expected by 2010 without the Protocol, this target represents a 29% cut). The goal is to lower overall emissions of six greenhouse gases - carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, HFCs, and PFCs - calculated as an average over the five-year period of 2008-12. National targets range from 8% reductions for the European Union and some others to 7% for the US, 6% for Japan, 0% for Russia, and permitted increases of 8% for Australia and 10% for Iceland."

It is an agreement negotiated as an amendment to the UNFCCC, which was adopted at the Earth Summit in Rio de Janeiro in 1992. All parties to the UNFCCC can sign or ratify the Kyoto Protocol, while non-parties to the UNFCCC cannot. The Kyoto Protocol was adopted at the third session of the Conference of Parties (COP) to the UNFCCC in 1997 in Kyoto, Japan.

5. PUBLIC CONSULTATION AND PARTICIPATION

5.1 Overview

The proposed project facilities will mainly serve the public and the local people. Therefore it is imperative that the beneficiaries are involved in the project feasibility, planning, implementation and operation stages. In view of these, the ESIA team adopted a participatory approach during the study noting that stakeholders' participation in Kenya is entrenched in the constitution, several legal instruments and international instruments to where Kenya is a party.

5.2 Legal Requirement for Public Participation

5.2.1 The Constitution of Kenya

Public participation is entrenched in several articles across the Kenya constitution 2010. Article 6 provided for devolution and access to services. Responsibilities in major decision-making process have been bestowed to the public (in the bill of rights, articles 118, 174, 196 and 201). The constitution further in article 21 section 3 requires safeguarding the rights and interests of marginalized groups for equity in public service provision. This can be effectively achieved through active involvement of such groups in decision making process at all levels. Hence need to involve the local people in the project area in studies, design and implementation of the proposed project facilities.

5.2.2 Environmental Management and Coordination Act, 1999

Section 17 of the Environmental (Impact Assessment and Audit) Regulations of 2003 requires that all ESIA studies incorporate consultation with the public during the entire study process. The aim of public consultation in the project were to ensure that all stakeholders' issues and concerns in the proposed facilities are identified and their opinion considered during project planning, design, implementation, operation and decommissioning phase.

5.2.3 County Government Act 2012

Public participation is integral in Kenya's development process as set out in the decentralized system of governance. The county government Act which sets out the service delivery procedure of county governments, has recognized local people involvement in decision making as key to governance. The Act in part VIII stipulates the principles of citizen participation and in part IX it guarantees the citizens‟ right to public communication as well as access to information. To ensure that there is optimal participation, the Act provides for civic education in part X to build the capacity of local people. Therefore meaningful public consultation is significant during planning, implementing and operation of development projects hence the need for such consultations for the proposed development of Seal Sugar Mill Ltd project in Siaya County.

5.2.4 International Convention (Aarhus Convention 1998)

The Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters entered into force on October 2001. The Convention grants the public rights regarding access to information, public participation and access to justice, in public decision- making processes on matters concerning the local, national and trans-boundary environment. It focuses on interactions between the public and public authorities.

5.3 Objectives of Public Consultations

Public participation is not a one off event but a process throughout the project cycle that requires regular consultations. In regard to the preceding observation, the proposed project involved stakeholders' participation with the following objectives;

- Disseminate and inform the project stakeholders about the proposed project, its key components and activities, location and expected impacts with particular attention to potentially affected persons;
- Create awareness among the public and stakeholders on the need for the ESIA for the proposed project and its due process;
- To obtain information about the needs, concerns, comments, suggestions and priorities of the local people as well as their general reactions to proposed project activities;
- To obtain the cooperation and participation of the key stakeholders, affected persons and local communities in activities that were required to be undertaken for designing, implementing and operating of the proposed project or development of the project facilities;
- Create a sense of ownership, capacity build and ensure transparency in all activities related to the project including but not limited to designing, planning, implementing, environmental management, operation, monitoring and evaluation of the project by all key stakeholders; and
- To establish a clear communication channel, easily accessible and effective grievance procedure between the public, consultant team, the project proponent and the County government of Siaya.

5.4 Stakeholders' Identification/Mapping

The public participation was an inclusive exercise that required proper planning and arrangements.

- The team ensured that the stakeholders identified are multi-sectorial touching on agriculture, lands, water, health, environment, county and national government. These stakeholders were consulted by use of a key stakeholders' meeting. To ensure that no major player is left out, a desk top study/mapping was done to determine relevant stakeholders to the project and the team settled on the technical representatives of the Siaya County Environmental Committee;
- The stakeholders are categorised into two groups of primary stakeholders and secondary stakeholders. Primary stakeholders are the beneficiaries of a development intervention or those directly affected (positively or negatively) by it. They included local populations (individuals and community-based

organizations) in the project area, in particular, poor and marginalized groups who have traditionally been excluded from participating in development efforts. Secondary stakeholders are those who influence development intervention or are indirectly affected by it. They include the proponent, government and county line ministry and departments, implementing agencies, civil society, NGOs and CBO. The consultation programme was developed and implemented taking into account the various areas of influence.

- Prior to the public meetings/barazas the site was visited to identify all the stakeholders and appropriate meeting venues. This also presented a platform to consult with the area leaders and the residents hence developing a good rapport. The ESIA team established contacts to enable proper planning and invitation of the public for the consultative meetings. The means of communication used to invite the public was verbal through the area chiefs/village elders and posters. The team in liaison with the Assistant County Commissioner settled on appropriate venues and dates for public meetings. The ESIA team documented minutes and ensured that list of attendance was well documented.

5.5 Consultation Process

Legal Notice of 101 of June 2003 requires that all environmental and social assessment process in Kenya to incorporate Public Consultation. This a requirement informed by awareness that development and implementation of projects can occasion diverse impacts on stakeholders who should consequently be informed appropriately following which they can make informed decision to the proposed development. It is also important to ensure that all stakeholder interests are identified and incorporated in project development, implementation and operation and, against such background, consultation was undertaken far and wide both within the project area and outside with the following objectives; -

i. To disclose the Study to both primary, secondary and other stakeholders;
ii. To obtain the reaction/comments/concerns of all stakeholders so as to understand their perceived view of the proposed project and assess the extent to which their views need to be taken into account. This is important as it helps to ensure that important social issues are not overlooked and there is ownership from the communities in all the project areas;
iii. Improve project design by incorporating their views, thereby, minimize conflicts and delays in implementation;
iv. Increase long term project sustainability and ownership of the project;
v. Identify local leaders with whom further dialogue can be continued in subsequent stages of the project.

Key stakeholder consultation was undertaken in the project area. The team identified stakeholder who are key to implementation of the proposed project as well as those who rely on such services. The stakeholders included County Government officials, National Government officials, and Non-governmental organization among others.

5.6 Tools used in stakeholder and public consultations

5.6.1 Reconnaissance Visit

The ESIA study process commenced with a reconnaissance visit to the project area. The consultants alongside the proponent's representatives visited the proposed project site for a reconnaissance survey on 9th January 2022. The goal of the visit was to familiarize the team with the project site and assess the status of the construction site and the farms. The proponent explained the origin and justification of the project as well as the planning activities that had so far taken place in relation to the proposed project.

Feasibility

A feasibility study of the project had already be done. The proponent also confirmed that they had already acquired 12 acre piece of land in Segere area in Boro sub-location that was earmarked for the construction of the proposed cane milling factory. Piloting of cane development had also taken place. It showed that the cane varieties to be used could be harvested after 15 months from planting. However, if ratoons are used, they take only 12-13 months to mature. These maturity rates are much faster than the other cane varieties in the other nearby schemes. The trial experiments also showed they could expect to harvest 40-42 tonnes of cane per acre. Further, it was mentioned that the research / experiments had shown that the sugar cane can be produced under rain fed conditions with no need for irrigation water.

The proposed milling plant will have a capacity of 1250 tonnes of cane per day (tcd) This capacity will be enhanced in future to 2500 tcd. It was also confirmed that there would be enough cane supply to support this capacity. The proponent had a full financial feasibility study for the project which showed a positive Net Present Value (NPV) in terms of financial performance..

Licence

The consultant explained that apart from sugar cane production and milling licence from the Kenya Sugar Board, a NEMA licence was a requirement for such a venture. A comprehensive Environmental and Social Impact Assessment is necessary before a decision to issue a NEMA licence can be made. The proponent authorized the consultant to prepare a Terms of Reference (TOR) for the consultancy assignment.

Meeting with NEMA County Director and County Government Officials

The consultant and the proponent also held a joint meeting with the NEMA County Director of Environment at the Siaya Town Office. The purpose of the meeting was to appraise the office on the proposed project and to identify the broad environmental concerns. The Director was also to help mobilize the key stakeholders in the county government for purposes of consultation and information.

The consultant's team also held a meeting with the Deputy County Commissioner in his office in Siaya Town to inform him about the project and seek his support in mobilizing the public during the public consultation forums. It was agreed that that the consultant and proponent would present the project proposal before the County Environmental Committee before holding at least two public consultations at the proposed site.

Both the County Director NEMA and the Deputy County Commissioner cautioned that large scale agricultural development projects in Siaya County have been frustrated in the past by a lot of negative politics from political and opinion leaders. There was need for proper and early stakeholder involvement to avert such frustrations

5.6.2 Socio-economic Survey

- Socio-economic Survey (Household questionnaires) - This was based on structured questionnaires to gather information on socio economic aspects of the communities in the study area. It was administered through face to face interviews at the household level. The survey was conducted on selected (sampled households). The sampling was confined to communities living around identified project sites and the neighbours that will be affected by the project.

5.6.3 Key Stakeholder Meeting

- Key Stakeholders' meeting. –This meeting was held with technical representatives of the County's Environmental Committee to gather information and interrogate the technical and implementation schedule of the project with a view of identifying and tightening the gaps that might be a hindrance to the project.

5.6.4 *Public Consultation Meetings*

- PCMs – The Consultant in collaboration with the national government led by the Assistant County Commissioner (ACC)Alego Usonga, the Central Alego Location Chief carried out public participation on the proposed Seal Sugar Mill Limited project. The meetings were held in two venues namely at the proposed mill site in Segere Centre and at Boro Market. In their consultations, the community sensitization meetings targeted in general all community members within the project area.

During the meetings, Seal Sugar Mill Limited representative and the consultants explained the salient features of the project including geographical scope, infrastructure, expected benefits that were cross-checked with the communities and environmental aspects. The community members were given an opportunity to air their views and bring out the issues that were of concern to them. The meetings addressed the following topics: Overview of the project; cane development; the sugar milling factory, possibility of domestic water supply; socio-economic aspects including anticipated project benefits; community participation in the project; natural resources including water, land and environmental and social issues including likely negative impacts and the proposed mitigation measures.

5.7 Views Expressed

The various stakeholders expressed their views freely and passionately during the sessions mentioned above. The views were largely expressed verbally. However, some questionnaires for the socio-economic survey were also filled by respondents. The

completed questionnaires capturing the respondents views/opinions and suggestions are attached in the annex while the summarised responses are tabulated in the table below.

Table 3: Summary of stakeholder responses and comments

Serial No.	Name/Office	Positive Comments	Negative Comments /Other Comments
Reconnaissance			
1	Mr. Fred Onyango (Proponent's Representative	• Project will reduce post-harvest sugarcane loss • Project will reduce sugarcane transport costs to factory • 1200 jobs likely to be created directly • Initial plant will have a capacity of 1250 tcd to be expanded to 2500 tcd. • Corporate Social Responsibility activities are envisaged • Have worked closely with the existing County Government in formulating the project. • Seal Ltd with provide demonstration farms and extension services to farmers • Feasibility study shows that the project is viable • Several acres of idle land to be put into productive use • Project will reduce rural-urban migration • Land will mostly be leased from farmers • Sugarcane production will be rain fed, no need for irrigation water • Proper waste and effluent management measures will be put in place (cogeneration, briquetting of bagasse, pelleting, electronic smoke precipitators) • AFFA / Kenya Sugar Board license being sought.	• Political interference in similar ventures in the county • Pressure on water resources (Abstraction of water from River Wuoroya for the factory) • Delayed cane cutting affects farmers cash flow adversely

Serial No.	Name/Office	Positive Comments	Negative Comments /Other Comments
		• Sugarcane production has relatively few disease problems	
3	Mr. William Kodeyo (County Director, NEMA)	• EIA for Seal Sugar Mills is a requirement of the law • Matter has to be presented before the County Environmental Committee (CEC) • Sit visit by consultants and ACC is necessary	• There is a lot of politics in Siaya County – ensure proper management of issues • Stakeholder consultation should be taken seriously • Project will generate a lot of waste water which should be handled properly
4	Deputy County Commissioner	• Welcomed the project idea • Noted that the farmlands cover several sub-locations; there was need to hold public consultation meetings in at least two venues • Noted that project would be a game-changer for the economy of Siaya County	• n/a
5	Katrina Management Consultants Ltd	• Scope of the project should be clarified • Alternatives for the project must be interrogated • Feasibility study is necessary/ already done • Project requires full ESIA disclosures • EIA license is not a blank cheque – proponent may need an environmental consultant on site. • At least two public barazas necessary during consultation • Stakeholder mapping should adopt the MIKE (Mandate, Interests, Knowledge and Effects) approach • To write letter to ACC for convening of public consultation meetings	• Biodiversity, land tenure and land-use planning issues must be observed • Clear waste and effluent management necessary • Wetlands within the project site must be protected • Water permits for abstraction from River Wuoroya will be needed • Complementary crops should be encouraged amongst farmers.

Serial No.	Name/Office	Positive Comments	Negative Comments /Other Comments
Key Stakeholders Meeting (County Environmental Committee Meeting)			
6	• Mr. Fred Onyango (Proponent's Representative	• Project will enhance livelihoods by putting more money into circulation in the area. • Initial milling capacity of 1250 tcd to be expanded to 2500 tcd • Had been piloting can production for the past 2-3 years • Milling plant will reduce cane transport costs to factory • At least 1200 jobs will be created directly • Waste and effluent management strategy in place. • Three alternative sites for the plant had been considered in the past. Proponent settled for Segere plot. • Confirmed that their head office is in Kisumu	• Wastes and effluent from the scheme • Sugarcane production might compromise overall food security/ Complementary agricultural or horticultural activities mud be encouraged •
7	CEC Committee Members Comments	• Welcomed the idea of a sugar processing plant in Segere, Boro • Seal Sugar Mills Ltd should cooperate and coordinate closely with Siaya County Government on their CSR agenda	• Sugarcane farming has impoverished many families; it is a poverty cash crop. • Succession issues in land ownership should be adequately addressed and mitigated • There are many collapsed sugarcane processing Companies and jaggeries in Nyanza and Western Kenya. • Community conflicts over leased or sold land are common. • Late harvesting of cane • Does Seal Company Ltd have a physical address • Business rivalry has killed new sugar firms • Is the rainfall adequate and reliable for sugar

Serial No.	Name/Office	Positive Comments	Negative Comments /Other Comments
			cane production • Distance between the location of sugar factories should be observed • Seal Sugar Mills Ltd should consider partnering with research institutions in the future e.g. internships for students, research into sugar beet etc. • Promise of free water might be empty; water cannot be free.
8	Assistant County Commissioner Alego Central	• Project will help alleviate the high poverty levels in the area • Idle land will be put into good use. • Will enhance the value of land in Central Alego	• Sought to confirm whether the land for the milling factory is already acquired • Noted that frustration may emanate from land issues • Factory may be too lose to a school. • Is the land (12.5 acres) not too small for a complete 1250cd factory plus ancillary amenities? • Lower Nzoia Irrigation project has been plagued by land succession issues. • Lawyers should be prepared to handle the land succession issues
9	CEC Meeting – Plenary Session	*County Director – Environment* • Tree cover and agro-forestry should be considered • Green technologies e.g. water harvesting. Natural lighting, solar energy, green buildings should be considered • Riparian/wetlands conservation should be incorporated in the project	• n/a
		County Director – Agriculture	• n/a

Serial No.	Name/Office	Positive Comments	Negative Comments /Other Comments
		• Ascertain acreage should be owned by a farmer before lease agreement • Only one third of land should be under can production • Consider availability of pasture land	
		County Director – National Land Commission • Confirm change of land use from agricultural to industrial before constructing the factory • Liaise with Physical and Land use planning directorate • Change of use should be participatory • Need of well-structured document on alternative enterprises for food security	• n/a
		County Director - Trade and Industry; • Project will enhance the county's revenue collection • Weighbridge be developed in consultation of trade and Industry department	• n/a
		County Director – Governance • Engage community leadership from the beginning • CSR should be in collaboration with Siaya County Government	• n/a

Serial No.	Name/Office	Positive Comments	Negative Comments /Other Comments
		• There should be some agreement between the proponent and county government • Legal technicalities on succession should be proactively addressed • 25-year lease too long. Go for a 5-year lease.	
		County Director – Public Health • Put an elaborate system for sewage management • Liaise with the County Government for solid waste management • establish effluent stabilization ponds and recycle wastewater for re-use in irrigation • Consider a bio digester • consider and MOU with the County Department of Public Health	• n/a
		County Director – Environment • Land ownership disputes a common cause of derailment of such projects • Proof of land ownership (Title Dead, Search Certificate or Affidavit, or Letter of Administration should be presented. • Design plans should be attached to the ESIA report	• n/a

Serial No.	Name/Office	Positive Comments	Negative Comments /Other Comments
		• Land use change need to be authorized by the relevant county government department • Wetlands and riverbank need to be protected according to WRA/NEMA regulations. • Most pollution problems start during the operational phase.	
		County Director – Public Participation • Child labour must be avoided • Civil society opinions should not be ignored	• n/a
			•
Public Forums for Project Affected Persons (Day 1)			
10	Assistant County Commissioner – Mr. Isaac Kimani	• Explained that public participation is today a requirement in any development process in Kenya • Noted that Central Alego had lagged behind for a long time because of underutilization of land for economic activities • Urged the residents to give their views freely to enable the consultants/NEMA make an informed decision	• n/a
11	Mr. Fred Onyango – Proponent's Representative	• Project aims to support farmers by putting up a sugar factory and development of sugarcane crop in Central Alego • Project to use fast maturing sugarcane varieties	• n/a

Serial No.	Name/Office	Positive Comments	Negative Comments /Other Comments
		• Water for the factory will be sourced from River Wuoroya and also boreholes • Cogeneration will be done to supplement grid electricity • CSR activities for local schools, health facilities, rural roads and water supply are envisaged. • 2023 is the targeted year for commissioning of the plant	
12	Katrina Management Consultants Ltd	• Enumerated the possible negative and positive consequences of the project • Sought unbiased views from the locals • Promised to come up with a balanced, comprehensive and independent report about the proposed projects	• n/a
13	Celestine Agola	• n/a	- Sister-in-law to the land seller - Sought to know the boundaries of the project land - Only one son engaged in sale of land; other sons not aware
14	John Omunya	• Project site/ Land belongs to uncle • Good project for the area • Welcomed the free participation in the public forum •	• No agreement so far among family land owners • Area Chief has not appraised some landowners • Project to occupy a much larger area • Prior consultations necessary before public such forum • Disadvantages of the project seem to be too many
15	John OlooAmoth	• Land belongs to him • Land was divided among 4 sons of Mzee Amoth Kokuoma in 1992. • Subdivision was agreed and minutes taken	• n/a

Serial No.	Name/Office	Positive Comments	Negative Comments /Other Comments
		to relevant government offices • Land belongs to him and the last born Agola. All other brothers are dead • Administrator died before initiating the process of succession • Land is private, not public • Land belongs to the children of Amoth Kokuoma.	
16	Kevin Otin	• n/a	• Sugar can plantation belongs to one person, no benefit to locals • Other farmers also require cane seed • At least a prior notice for public forum was necessary
17	Nicholas Oyoo Omollo	• Owner of adjacent land • Avery good project; it has been a long story • Development will provide ready market for MSMEs • Factory would be a good legacy for the County Commissioner and Assistant County Commissioner • Strongly supported the project	• n/a
18	Phillip Okello Odongo	• Land used to be a wasteland/bush land. • Happy about the proposed sugarcane plantations and factory • Caution to avoid too much politics, but focus on development • Land succession or transfer issues should be handled amicably	• n/a
19	Paul Jura Oluoch	• Many of the youth from the area had migrated to other cities or towns in search	• n/a

Serial No.	Name/Office	Positive Comments	Negative Comments /Other Comments
		of jobs or livelihoods • Strongly supported the project • Urged the locals to support the project • Project shows that every problem (like poverty) has a solution	
20	Francis Aloo Angang'o (Former Assistant Chief of the area)	• Has worked in land tribunal for ten years • Strongly supported the project • Already growing sugar cane • Urged the locals not frustrate the project	• n/a
21	Maureen Akinyi Opiyo	• Lamented that the youth have been misused by politicians • Strongly supported the project • Project would be a legacy for the ACC	• n/a
22	Peter Otieno	• Strongly supported the project • Opined that the project requires larger acreage • Urged locals to avoid chest-thumping	• How will neighbors be affected • How will company handle bagasse
23	William Oduor Ariri	• Strongly supported the project • Incorporate gender perspectives in project planning and management • Do not despise small beginnings.	
Public Forums for Project Affected Persons (Day 2)			
24	Area Chief – Mr Felix Juma	• Decried the level of poverty and underdevelopment in the location • Welcomed the project • Invited the ACC to call the meeting to	• n/a

Serial No.	Name/Office	Positive Comments	Negative Comments /Other Comments
		order.	
25.	Assistant County Commissioner – Mr. Isaac Kimani	• Emphasized that there is a requirement for genuine public participation in development projects whether financed by the government or private sector entities. • Explained that the role of the consultants was to collect and collate views of the stakeholders to assist the government through NEMA to make an informed decision	• n/a
26	Mr. Fred Onyango – Proponent's Representative	• Proponent has already initiated research on sugarcane production in the area. • Project will serve at least 12,000 farmers • Project will inject Kshs. 35-37 million into circulation in the area on a weekly basis • Project will enhance county government revenue • Project has potential to employ 1200 people directly • -Project to use FR and N14 varieties of sugar cane which are fast maturing • Complementary agricultural activities to be supported by the proponent • Cane seed will be provided by the company • Effective re-use and management of wastes e.g. making fertilizers from bagasse	• n/a
27	Katrina Management Consultants Limited	• Enumerated the possible negative and positive consequences of the project	• n/a

Serial No.	Name/Office	Positive Comments	Negative Comments /Other Comments
		• Sought unbiased views from the locals Promised to come up with a balanced, comprehensive and independent report about the proposed projects	
28	Micheal Gondi Kut	• Impressed by the project plan and public forum • Noted that Dominion Farms Ltd enhanced the livelihoods of locals but is now stalled due to bad politics and lack of proper consultation in the planning phase • Project offers an opportunity to create jobs	• n/a
29	Paul Owidhi Rusa	• Project is a good idea • Will help to end theft in the area	
30	Chrispine Sire	• Supported the project • Disadvantages of increased insecurity and other social vices could be overcome	• Possible cholera outbreak if untreated effluent and sewage is discharged into the rivers
31	Antony Owino Malowa	• Happy about the project • Has worked at Mumias Sugar Ltd • Both investor and farmers need to benefit • Can contribute (ready to sell) land for staff housing	• Olwenge project failed due to poor management
33	Rosemary Achieng Owino	• Happy about the project • Investor should not disappear after this event	• n/a
34	John Okoth Ogada	• Worked at Sony Sugar previously • N14 is a very good variety • Supported the project	• n/a
35	Okello Odongo	• Supported the project idea • Every profitable venture involves risk. Let	• Waste discharge points need to be ascertained

Serial No.	Name/Office	Positive Comments	Negative Comments /Other Comments
		community not be risk-averse. • Good cane variety is already identified • Every project has challenges • Project will bring economic growth for Boro • Let the locals not overprice their labour but work hard • Encouraged leasing of fallow land for can farming • Dairy farming should be considered as a complementary activity	
36	Fred	• Free-range grazing should be controlled. • Livestock owners should be more responsible	• Effluent treatment plant for waste necessary • Death of cows from treated pastureland near sugarcane farms has been reported
37	Hilton Onyango Owiti	• Appealed for mutual respect among farmers • Strong support for the factory • Frustration of projects has caused poverty in Alego-Usonga	• n/a

6. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This chapter presents an assessment of environmental impacts from the planned project design and activities, and proposes mitigation and management measures to prevent and control these impacts.

The environmental impact assessment and analysis was done using a number of methods and tools. While identifying impacts, a checklist was used. This indicated all possible impacts that would accrue from implementation of this project.

6.1 Legal and regulatory compliance

The national laws and regulations relevant to the development and their relevance to the process project have been discussed.

6.2 Construction and Equipment installation

Key aspects to be considered during construction are:

- Procurement of construction materials;
- Installation of services and interiors of the buildings;
- Use of heavy and light machinery;
- Energy utilisation, major energy consuming activities include:
  - ✓ Lighting;
  - ✓ Excavation;
  - ✓ Transportation;
  - ✓ Hauling and hoisting of materials;
- Mixing raw materials;
- Waste handling trucking and disposal;
- Testing and commissioning of the development.
- Energy sources for these activities include grid electricity and diesel or petrol fuel for machinery/vehicles.
- Water utilisation, including use for the following activities:
  - ✓ Washing of machinery and equipment;
  - ✓ Preparing of mixtures, including water based emulsion paints;
  - ✓ Concrete works, including curing;
  - ✓ General cleaning;
  - ✓ Landscaping;
  - ✓ Controlling dust on site;
  - ✓ Domestic utilisation (sanitary facilities).
- Construction waste will include the following:
  - ✓ Timber from used formwork;
  - ✓ Paints, lubricants and petroleum wastes;
  - ✓ Containers, cement paper bags and other packaging materials;
  - ✓ Metal, glass, plastic containers and other unwanted materials.
- Socio-economic effects;
  - ✓ Labour;
  - ✓ Security;

- ✓ Transport.
- ✓ Archaeological findings and aesthetics.

Table 4: Summary of impacts and mitigation during construction and installation

Activity	Anticipated Impact	Recommended Mitigation Measures
Procurement of construction materials:	• Natural resource depletion if not rationally done through activities such as quarrying, mining, timber logging.	• The tender documents should specify required standards and certification for procurement of all materials and appliances; • All construction materials should be from approved sources; for example, hardstone for building should be obtained from bona fide commercial quarries; • As far as possible, environmentally friendly and sustainable materials should be used. • Materials not to be used for construction of the buildings include: ✓ High alumina cement; ✓ Wood wool slab in permanent formwork to concrete; ✓ Calcium silicate bricks or tiles; ✓ Asbestos in any form; ✓ Asbestos substitutes or any naturally occurring or man-made mineral fibers; ✓ Lead, lead paint or any other materials containing lead which may be inhaled, ingested or absorbed; Vermiculite, unless it is established as being fiber-free; ✓ Any products containing cadmium that are regarded as being injurious substances; ✓ Any other substances regarded as being deleterious building materials which are not in accordance with statutory requirements or with current accepted good building practice at the time of specification or construction. • The Project Manager should ensure that the Contractors are instructed in the use of all • materials that may have negative environmental (including health) effects; • If any material or substance is used that is at any point in the future deemed to be deleterious to health, then it must be replaced with an acceptable alternative.
Building works:	• Health and safety risk from accidents and incidents; Noise, vibrations and dust.	• Adhere to safety regulations outlined in the County Government Adoptive by-laws, Building Code and the Building Operations and Works of Engineering Construction • The Project Manager should ensure strict safety management through close attention to design, work procedures, materials and equipment; • Schedule noisy construction • Develop a site safety action plan detailing safety equipment to be used, emergency procedures, restrictions on site, frequency and personnel responsible for safety inspections and controls; • All workmen should be provided with personal protective equipment (e.g. dust masks, ear muffs, helmets, overalls, industrial boots, harnesses, etc); • There should be regular site reporting on health, safety and environment (HSE) issues by an

Activity	Anticipated Impact	Recommended Mitigation Measures
		appointed HSE representative, daily site inspections should be done to ensure safe work practices are adhered to; • All injuries that occur on site must be reported recorded in the accident registers and corrective actions for their prevention be instigated as appropriate; • Statistical records on accidents and incidents should be collated and analyzed on a monthly basis and forwarded to the Project Manager and / or displayed on the notice boards; • Site personnel should be encouraged to report "near-miss incidents" in order to avoid potential problems and increase safety awareness. • Safety signage should be erected and adhered to at the site
Energy utilization:	• Energy consumption.	• Develop an energy management plan; • Construction machinery and vehicles should be maintained and used in accordance with manufacturer's specifications, to maximize efficiency and lower use of energy, e.g. drivers of construction vehicles should be instructed not to leave them idling for extended periods; • Construction workers should be sensitized on the importance of energy management.
Water Utilization	• Water consumption; Hygiene and sanitation challenges.	• Monitor water consumption and utilization; • Sensitize construction workers on the importance of proper water management; • All wastewater should be drained into approved drainage facilities.
Waste production:	• Littering, soil and surface water pollution potential.	• The tender documents should specify the proper disposal of waste during construction and should also ensure that the Contractor leaves the site in a clean and safe condition on completion of the Works; • The Contractor should be required to restore and landscape all areas to the satisfaction of the Project Manager; • All solid waste generated during construction should be collected, stored, and taken away for disposal; • There should be controlled use of raw materials; • Procedures for handling of special wastes, such as waste fuel oil, should be specified; • Comply with guidelines on solid waste disposal and Waste Management Regulations 2006.

Activity	Anticipated Impact	Recommended Mitigation Measures
Influx of construction workers into the area:	• Proliferation of informal kiosks in the area; • Increase in transport demand.	• Develop a catering program on site for construction staff; • Provide transportation for the workforce to and from the site.
Construction traffic:	• Disruption of local traffic; • Potential for accidents.	• The Contractor should plan itineraries for site traffic.
Archaeological findings:	• Destruction of natural heritage /loss of archaeological findings.	• In the event of an archaeological finding, the Contractor should secure the location 'as is' and immediately call the National Museums of Kenya's Archaeology Section.

6.3 Operation Stage

The key environmental issues during commissioning and operation are as follows:

- Water supply and consumption;
- Energy consumption and management;
- Effluent Management
- Solid waste, bagasse, filter cake and boiler ash management;
- Stack emissions
- Property management;
- Transport & security;
- Health and safety;
- Noise.
- Contamination of soil and water by agrochemicals
- Oil and fuel spillage on soils or highways

6.3.1 Operational Phase Negative Impacts

1. Increased pressure on infrastructure – Stressed up service provision

The additional facility will lead to increased pressure on existing infrastructure such as roads, water abstracted from Wuoroya River, etc. due to the increased number of users. In turn, this may directly translate into increased use of facilities and services.

Recommended Mitigation Measures

a. Relevant authorities such as the Kenya Power and Lighting, WRMA should be informed of the capacity of the facility;
b. The proponent will install water-conserving automatic taps and toilets, as well as energy saving electrical fittings to optimize use of public resources;
c. Water leaks through damaged pipes and faulty taps will be fixed promptly by qualified staff.
d. Occupants of the facility should be sensitized to use water efficiently.

2. Pollution – Environmental Degradation

Possible pollution may impact on alteration of soil structure by contaminations from introduced materials, bagasse, molasses, boiler ash, filter mud, waste water contamination, air pollution as well as noise levels from various sources within the premise.

a. Solid waste generation/by-products (bagasse, filter cake, boiler ash)

Once the proposed project is completed and operational, they are expected to generate a large amount of solid waste on a daily basis whose composition will be dominated by organic waste. These solid waste, if not disposed properly can cause the following impact on environment:

- Ground water contamination by bagasse leachate generated by non-scientific dumping;
- Surface water contamination by the run off from the bagasse dumping site;

- Bad odour, Pests, rodents and windblown litter in and around the collection site;
- Generation of inflammable gases (e.g. Methane).

- Risks of bagasse avalanche

b. Impacts may also result from improper sitting, inadequate design and poor operation of waste disposal facilities.

Recommended Mitigation Measures

a. Clearly designate and construct an appropriate waste collection facility or provide covered refuse skips;
b. Designate filter cake and boiler ash dumping and composting sites;
c. Use only NEMA licensed waste transport vehicles to transport waste materials;
d. Maintain a proper waste tracking document;
e. Utilise bagasse as a source of fuel in the boilers, making of briquettes or mixing with boiler ash and filter mud for use by farmers as fertilizer and other reuse options such as cogeneration for electricity and quarry rehabilitation;
f. Construct bagasse holding shades to ensure remaining bagasse on site does not come in contact with rain to produce leachate; and
g. Ensure adequate fire warning, response and management systems are installed.

c. Wastewater management

There will be effluent release due to the cane crushing. The EMCA Water Quality Regulations of 2006 requires all facilities that discharge any effluent to the environment to obtain an Effluent Discharge license and to continuously monitor the discharge. The fourth schedule of the Water quality regulations gives a guide on the quality parameters which should be monitored for different types of effluents. The parameters which should be monitored for Sugar Industry effluent include the following: Biochemical Oxygen Demand (BOD), Total suspended solids (TSS), pH, Faecal Coliforms /Ecoli, Chemical Oxygen Demand (COD), Colour/Dye/Pigment, Organic Nitrogen as N, Flow, Copper, Zinc and Surfactants.

Recommendations

- Incorporate Effluent Treatment Plant (ETP) within the facility;
- Apply for effluent discharge license from NEMA on time;
- Install a water meter to measure the amount of water waste water released from the factory on daily basis;
- Carry out an analysis of the composition of the effluent through a NEMA registered laboratory;
- Continuously monitor the discharge as per the regulations.

d. Air pollution levels

Vehicular emissions from vehicles, stack emissions and fugitive emissions will be the major air pollution sources from the Project.

Recommended Mitigation Measures

- Regularly monitor stack emission and obtain Emission licence from NEMA;
- Invest in bagasse drying mechanism along the delivery line;
- Exhaust gas recirculation
- Selective non-catalytic/catalytic reduction
- Installation of Electrostatic Precipitators (ESP), wet scrubbers and thermal oxidizers
- Avoid overloading the bagasse for efficient burning
- Formulate the fugitive emissions Control Plan
- Use the correct fuel to air ratio by proper adjustment of air and fuel ratios
- Avoid carbon build-up in the boiler and furnace tubes and maintain the boiler and furnace settings in good condition

3. Increased traffic flow – Unnecessary congestion

An increase in the number of vehicles within the area is anticipated which may lead to congestion and pose a threat to accidental occurrences.

Recommended Mitigation Measures

- In case of heavy traffic, an attendant should be employed to direct vehicles during peak periods.

4. Drain blockages – Back flooding

Poor surface drain management or large amounts of effluents may lead to blockage of drains which in turn could result to flooding and unsanitary conditions within the neighbourhood. Blocked drains produce bad odour and are a threat to general health, hence are environmentally unfriendly.

Recommended Mitigation Measures

- The proponent should ensure that there are adequate means of handling the large quantities of sewage generated at the facility;
- It will also be important to ensure that septic pipes are not blocked or damaged since such occurrences can lead to release of the effluent, resulting in land and water contamination.
- Such blockages or damages will be fixed expeditiously

5. Vector and rodents breeding grounds – Vulnerability to diseases

If the project does not have well designed storm water drains, the rain water may end up stagnating or intruding neighbouring facilities and hence creating conducive breeding areas for mosquitoes and other water based vectors leading to human diseases like malaria. Poor solid waste management practices may also lead to breeding grounds for pests such as rats and other scavenging animals.

Recommended Mitigation Measures

- The design of the construction should ensure that no space for stagnant water will be retained;
- A well maintained trash collection point should be set aside;

- The proponent should put in place efficient storm water and waste management systems that will prevent the accumulation of rain water and uncontrolled waste, as well as an efficient collection system and recycling;
- Proper monitoring of the premise should be effected for maintenance of health and hygiene.

6. Electricity consumption – pressure on supply

The project shall consume large amount of electricity due to activities that will take place once the project is complete. The Sugar Mill will however generate its own electricity for internal use.

Recommended mitigation measures:

- Maximize the contribution of daylight to reduce use of artificial lighting in the buildings;
- Select the most efficient lighting system design and minimum lighting level appropriate for the required application;
- Install energy saving appliances;
- Select the most effective lighting controls for optimal operating efficiency and minimum energy wastage.
- Develop an energy management plan.

7. Water supply and consumption

Water for the project shall be extracted from Wuoroya River located 3Km away in addition to the proposed borehole to be drilled on site after obtaining abstraction permits from WRA.

Recommended mitigation measures:

- Monitor water consumption;
- Install internal water meters;
- Manage consumption rigorously.
- Installing plumbing fittings, appliances and devices to optimise water use efficiency;
- Recycling of wastewater to reduce water consumption.

8. Contamination from Agrochemicals

Agrochemicals such as pesticides, fertilizers and herbicides may be used on the farms and if not properly handled end up in water sources or the soil. There is also a danger that agrochemicals could be consumed by human beings deliberately or inadvertently Contamination of soil or water by agrochemicals can be minimized by;

- Training of farmers on Good Agricultural Practices for sugarcane production
- Storing the chemicals in properly designed stores
- Ensuring that farm workers are well-trained on handling and application of agro-chemicals
- Ensuring that human beings are warned about the danger of agro-chemical poising.

9. Oil and fuel Spillage

Oil and fuel spillage not only contribute to accidents but can also damage the soil or water bodies. People handing machinery like tractors must be trained on safe workshop practices and proper repair and maintenance to avoid such mishaps**.**

10. Safety and Health hazards

During operation the use of machinery pose mechanical hazards such as accidental cuts and bruises. There will be storage of flammable liquids such as fuels and lubricants and bagasse, which at some point will be stored at the workplace for use in vehicles, machines and firing of the boilers respectively. Leakage, spillage or poor handling of such substances may result in fires that may cause considerable losses in terms of injury to persons and damage to property. Persons exposed to bagasse will likely suffer from bagassosis. Noise levels from the occasioned by use of machinery may pose health hazards also. There are many other potential safety and health hazards commonly inherent in sugar factory.

Recommended mitigation measures:

- Regular maintenance and use of machinery safeguards i.e. machine fencing and guarding
- Statutory examination of plant and machinery
- Statutory medical examination and surveillance of workers exposed to classified hazards
- Statutory industrial hygiene surveys
- Statutory safety and health audits
- Use of appropriate Personal Protective Equipment (PPE)
- Safety and Health training for workers
- Provision of first aid facilities and personnel
- Execution of fire safety training and drills

6.4 Decommissioning

Decommissioning is the process of shutting down an operational facility in a manner that leaves the area in a safe and stable condition that is consistent with the surrounding physical and social environment. The Contractor will ensure that:

- The process of closure occurs in an orderly, cost effective and timely manner with the allocation of adequate resources;
- The anticipated cost of decommissioning is adequately provided for in the project costs.

The Contractor will be expected to:

- Carry out consultations with stakeholders;
- Develop the action plan for demolition including the assigning of roles for the demolition crew;
- Isolate power at the main switch and remove cables up to that point;

- Dismantle, remove and dispose of construction camp equipment and structures in an appropriate environmentally friendly manner;
- Request utility service providers to disconnect the power, water and telephones as may be appropriate;
- Reinstate the land to its natural condition by filling excavations and planting suitable saplings.

The Contractor must obtain a Certificate of Satisfactory Decommissioning from the relevant Authorities. In the unlikely event that the facilities is closed down decommissioning would comprise the reduction of all buildings and facilities to a safe condition and the restoration of the land to its original condition. The following will be done:

- Notification of intent to all relevant regulatory agencies;
- Liaise with project Consultants including architects, engineers, and environmentalists to ascertain guidelines, anticipated de-commissioning impacts and mitigation measures.

6.4.1 Decommissioning phase Negative Impacts

During the decommissioning phase, another comprehensive ESIA study based on the intended new use of the site will be conducted. Decommissioning may involve one of the following options: facing out operations and evacuating the premise without carrying out any other plans; change of use of the facility; demolition of the property to restore it to the current or better status.

1. Solid Waste Generation

Demolition of the facilities and related infrastructure will result in large quantities of solid waste. The waste will contain the materials used in construction including concrete, metal, drywall, wood, glass, paints, adhesives, sealants and fasteners. Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment. In addition, even the generally non-toxic chemicals such as chloride, sodium, sulphate and ammonia which may be released as a result of leaching of demolition waste, are known to lead to degradation of groundwater quality.

2. Dust

Large quantities of dust will be generated during demolition works. This will affect demolition staff as well as the neighbouring residents.

3. Noise and Vibration

The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas. This will be as a result of the noise and vibration that will be experienced as a result of demolishing the proposed project.

Table 5: Summary of major impacts and their proposed mitigation measures

Project stage	Potential Impact	Proposed Mitigation
Pre-construction/ equipment installation stage	▪ Introduction of improper seeds to the sugar farmers	▪ Use of short maturing sugar varieties which will enable the farmers to be able to meet their financial needs through short maturity period. The Proponent currently has FR and N14 sugar varieties which takes approximately 15 months to mature.
	▪ Improper land preparation	▪ Seal Sugar Mills through their designated office will sensitize the farmers on the standards of land preparation and methods of soil conservation so as to sustain the productivity of the soil over the long term.
	▪ Use of improper inputs	▪ Seal Sugar Mills through their designated office will sensitize farmers on the need of applying all the inputs they are given so as to get higher yields instead of diverting the farm inputs to other uses.
	▪ Conflicts with other sugar millers	▪ Seal Sugar Mills will carefully identify and contract their sugar farmers in collaboration with the local administration in order to avoid conflicts with other millers in the catchment area.
Construction/equipment installation stage	▪ Noise and vibration pollution	▪ Switching off machines while not in use ▪ Proper servicing of machines
	▪ Material and equipment Transport	▪ Restrict working hours to periods which are not associated to human disturbances especially the recommended working hours 8.00 am – 5.00pm ▪ Provide workers with ear masks. ▪ Regular servicing of working machines ▪ As far as possible, transport of construction materials should be scheduled for off-peak traffic hours. ▪ Appropriate traffic warning signs, informing road users of a construction site entrance ahead and instructing them to reduce speed, should be placed along the main road in the vicinity of the entrance to the site during the construction period. ▪ Flagmen should be employed to control traffic and assist construction vehicles as they enter and exit the project site. ▪ Issue notices/advisories of pending traffic inconveniences and solicit tolerance by local residents before the commencement of construction works. ▪ Assign traffic regulators to places during periods of chronic or potential traffic congestions.

Project stage	Potential Impact	Proposed Mitigation
		▪ Set relatively low speed limit within the site. ▪ Encourage transport vehicle owner to insure their vehicles on regular basis. ▪ Discourage parking near the entrance or exit routes.
	▪ Material and equipment stockpiling & storage	▪ The stockpiling of construction materials should be properly controlled and managed. Fine-grained materials (sand, marl, etc.) should be stockpiled away from any surface drainage channels and features. ▪ Low berms should be placed around the piles of sand and marl and/or tarpaulin used to cover open piles of these materials to prevent them from being washed away during rainfall. ▪ Safe storage areas should be identified and retaining structures put in place prior to the arrival and placement of material and equipment ▪ Materials and equipment to be delivered on site in installments.
	▪ Soil Erosion	▪ Stage site clearance works so as to minimize the area of exposed soil at any given time. ▪ Re-cover exposed soils with grass and other ground cover as soon as possible. ▪ Temporarily bund exposed soil and redirect flows from heavy runoff areas that threaten to erode or result in substantial turbid surface runoff to adjacent drainage waters. ▪ Monitor areas of exposed soil during periods of heavy rainfall throughout the construction phase of the project to ensure that any incidents of erosion are quickly controlled. ▪ Leveling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil, therefore avoid compaction where possible.
	▪ Workers safety and health	▪ Provide workers with reflective garments. ▪ Regular maintenance and safeguarding of working machines. ▪ Train workers on manual handling techniques. ▪ Deploy an expert to lead first aid administration. ▪ Provision of adequate safety equipment and enforce on their usage. ▪ Discourage trespass. ▪ Erect signage on the ongoing activities ▪ Provide workers with personal protective equipment ▪ Provide implement safe systems and programs

Project stage	Potential Impact	Proposed Mitigation
	▪ Construction debris and other rejected construction materials.	▪ Reduce wastes from the point of generation by purchasing high standard and recommended materials. ▪ Instruct workers to avoid damage of working materials. ▪ Contract NEMA registered garbage collector to collect waste on regular basis. ▪ Embrace the 3R's concept (Reduce, Reuse and Recycle).
	▪ Dust generation and aerosol emission	▪ Sprinkle water to harness dust level. ▪ Provide workers with dust masks.
	▪ Landscape and ecosystem change	▪ Once the project is completed any bare land will be re-vegetated with indigenous grass, shrubs and trees ▪ Landscaping will be done to reduce any negative impacts ▪ Only specified areas of construction will have vegetation cleared ▪ protecting the existing individual trees as much as possible
	▪ Water supply	▪ Provide adequate water storage reservoirs on the construction site to meet project needs during periods of high demand externally and refill the tanks during periods of low demand (e.g. late at night). ▪ Engaging water supply tankers in case of total supply failure.
Operation Stage	▪ Cane fires	▪ Seal Sugar Mills will encourage green cane harvesting to avoid the negative ▪ Environmental impacts associated with can harvesting through burning
	▪ Land and succession conflicts	▪ Seal Sugar Mills should have a proactive approach to this issue by considering appropriate lease agreements and using qualified lawyers to advise farmers about their land ownership status. It should also adhere to the Ministry of Agriculture, Land and Fisheries guidelines on sustainable sugarcane farming, including supporting complementary agricultural activities for food security and discouraging monoculture.
	▪ Cane spillage	▪ Seal Sugar Mills in partnership with Kenya Sugar Board, Kenya Roads Board, KENHA, KURA, KERRA and the County Government of Siaya will ensure the improvement of the road infrastructure within the cane growing area in order to reduce the level of cane spillage along the roads ▪ Sensitization of sugarcane loaders so as to allow for proper sugarcane loading avoiding protruding cane which inconvenience other road users ▪ The company should also institute measures of collecting all the spilled cane on the feeder

Project stage	Potential Impact	Proposed Mitigation
		roads
	Late Payment for Cane	▪ Seal Sugar Mills Limited should ensure that their cane purchase agreements with farmers contain provisions for timely payment for can delivered and penalties for late payment.
	▪ Water use	▪ A Sustainable Water Management System Plan should be developed in collaboration with WRA to minimize impact to natural systems by managing water use, avoiding over-abstraction in Wuoroya River or the groundwater aquifers, and minimizing impacts to other water users. ▪ Factory water use should be carefully monitored through the use of flow meters and timely identification and control of nay leakages ▪ The factory will be operated at optimum capacity and with minimum stoppages because raw water consumption per ton of cane crushed increases when crushing lower than the optimum capacity and when hot water production is suspended during halts in operations (cleaning, restocking, and breakdowns).
	▪ Waste water	▪ Wherever possible, containment of water collected from areas with potential contaminants will be ensured. Such waste water should be reused; ▪ Oil interceptors and sediment traps should be installed and maintained to ensure any discharge to the environment carries a low sediment load. ▪ Storm water management canals and dams should be maintained and kept clean in order to ensure that the capacity of such systems is not compromised during the life of the operations ▪ Sensitization of the clients who buy molasses of the environmental effects of the product so as to prevent spillage of the same; ▪ Apply for effluent discharge license from NEMA on time; ▪ Install a water meter to measure the amount of water waste water released from the factory on daily basis; ▪ Carry out an analysis of the composition of the effluent through a NEMA registered laboratory; ▪ Continuously monitor the discharge as per the regulations; ▪ The company to construct drainages throughout the factory to direct storm waters to the

Project stage	Potential Impact	Proposed Mitigation
		river after lab testing and treatment if necessary.
	▪ Solid waste generation/by-products (bagasse, filter cake, boiler ash)	▪ Clearly designate and construct an appropriate waste collection facility or provide covered refuse skips; (Designate Filter cake and boiler ash dumping and composting sites) ▪ Provide NEMA licensed waste transport vehicles; ▪ Maintain a proper waste tracking document; ▪ Bagasse to be used as a source of fuel in the boilers in addition to being used to make alternative cooking briquettes and future plans of cogeneration; ▪ Ensure adequate fire warning, response and management systems are installed. ▪ Ensure prescribed regular medical examination of workers exposed to bagasse
	▪ Air pollution levels	▪ Monitor stack emissions regularly ▪ Have Fugitive Emissions Control Plan ▪ Install appropriate Electrostatic precipitator (ESP) as an effective emissions control technology. ▪ Ensure the emissions are within permissible limits in line with Air Quality Regulations 2014 ▪ Apply for Emission license and undertake quarterly analysis to ensure compliance with the emission standards. ▪ Do regular air quality monitoring (AQM) in the prescribed intervals
	▪ Drain blockages	▪ The proponent should ensure that there is adequate means of handling large quantities of sewage blockages as well as related emergency situations. ▪ Proper monitoring at waste generation points should be established. A site management plan should be put in place.
	▪ Increased pressure on infrastructure	▪ The proponent should maintain close operations with service providers such as the Kenya Power and Lighting Company, WRA etc. ▪ Principles of Cleaner Production should be applied to ensure optimal system performance.
	▪ Fire outbreak	▪ Install and regularly maintain firefighting equipment

Project stage	Potential Impact	Proposed Mitigation
		▪ Clearly labeling fire exit routes. ▪ Constitute a fire fighting team ▪ Staff to be made clearly aware of fire hazards
	▪ Vector breeding grounds	▪ Include an efficient storm water and waste management systems that will prevent the accumulation of rain water ▪ All trenches and drains should be kept clear of all debris
Decommissioning stage	▪ Loss and damage of properties during demolition activities	▪ Removal of properties that are not intended to be destroyed before the actual demolition process. ▪ Proper supervision during demolition activities.
	▪ Loss of employment opportunities	▪ A good phase out programme for employees should be put in place from the onset of the project.
	▪ Accidents to the demolishing team.	▪ Issue the workers with reflective garments. ▪ Supervisors to ensure measures in place for the worker and ensure that no one is at risk by falling objects.
	▪ Loss of environmental aesthetics beauty.	▪ Ensure complete collection and disposal of wastes after demolition ▪ Landscaping the affected areas. ▪ Conduct a decommissioning audit.

7. PROJECT ALTERNATIVES

7.1 Site alternative

Alternatives for siting of the project may be limited to land ownership and appropriateness of the area. The current location provides a most suitable place. The relocation option to a different site is an option available subject to negotiating afresh lease on other lands within the project area. More time shall be needed and delays towards implementation of the project may be realised. Alternatives for siting of the project may be limited to land ownership and appropriateness of the area.

The proposed site is located within AlegoBoro Area on Plot L.R. No. Central Alego/Ojuando B2/110 Central Alego Location, Alego Usonga Sub County in Siaya County. The proposed site for the sugar mill is currently 10 acres but is projected to occupy 40 acres after further land acquisition by the Proponent. The area is served with good road network including Segere-Ambira Road and other access roads which will ease the transportation from the proposed sugar mill to other parts of the County. This alternative will have minimal impact on the physical environment and has considered the necessary measures to almost eliminate the identified issues.

Advantages:

- The property value appreciates.
- Investment made in the property will be productive. Proponent will have potential source of income in long term basis.
- Government earns revenue from fees, taxes, rent, rates and licenses.
- Employment opportunity for the workforce at the facility.
- Optimal economic and spatial land use
- Visual amenities will be improved.

7.2 Alternative Technologies

The design of the ETP has taken into account measures that can be implemented to minimise wastewater production through recycling, treatment and reuse. No discharge of effluent shall be made to the River Wuoroya before satisfactory treatment. Sewage arising from the workforce at the plant will also be discharged into septic tanks. Equipment for the development were preferred with reference to available capital, and function. The design of the facility was undertaken with a view to providing the most suitable, modern and practical facilities for the expected users.

7.3 Alternative Bagasse management

Bagasse is the residual material after extraction of juice from sugarcane. This bagasse through the conveyor is sent to steam generation unit. However, the bagasse generated is so voluminous that managing it requires serious interventions. The proponent shall have a robust bagasse waste management infrastructure that comprises of briquette processing plant side by side with the sugar milling plant to ensure excess bagasse that is not undergone complete combustion during boiler firing is turned into fuel briquette for the

consumption by the local community in order to reduce chances of forming leachate especially during wet weather.

Bagasse Leachate is a low pH liquid which normally forms when rain water percolates through bagasse and washes some of the bagasse organic components.

Seal Sugar Mill Ltd has considered each of several methods in the management of bagasse.

7.3.1 Transfer the bagasse heap to another location

Seal Sugar Mill Ltd explored the possibilities of shifting the bagasse from the factory grounds to another site to reduce the quantities of bagasse at the yard. However this will only worsen the situation since the large quantities of bagasse will form leachate in the near future.

7.3.2 Use of bagasse in co-generation of power and steam

Seal Sugar Mill Ltd will use fresh bagasse to produce about 3 MW of power at its station. However, the power station will only be able to utilise a fraction of the fresh bagasse daily out of the quantities produced from crushing of cane per day.

7.3.3 Reuse of bagasse in making of briquettes

Seal Sugar Mill Ltd has planned to introduce making of briquettes at the sugar mill once the mill commences operation. It will involve drying bagasse from 45% - 50% to the required 8% moisture content in order to make the briquettes.

7.3.4 Reuse of bagasse as soil conditioner

Bagasse could be a suitable soil conditioner if applied in thin layers and with pH adjustment, for example, using lime. Seal Sugar Mill Ltd shall work with farmers on application of the bagasse on land.

7.4 Alternative Equipment

Equipment for the development were preferred with reference to available capital, and function. The design of the facility was undertaken with a view to providing the most suitable, modern and practical facilities for the expected users.

7.5 "No Project" Alternatives

The No Project alternative would be a loss to the expected gap that would be filled by with the increase in sugar production at the sugar factory. The no project expansion alternative in respect to the proposed Project implies that the status quo is maintained. Under the no project expansion alternative, the proponent's proposal would not receive the necessary approval from NEMA. The proposed sugar factory complex Project would not be constructed and the expectations attached to the Project would not be met. The no project construction alternative is the least preferred from the socio-economic perspective.

7.6 Preferred option

For this project, there are limited alternatives for the project site because the proponent already acquired the land and has been carrying out cane development is the area for over two years. Therefore, emphasis is now placed on the technological approaches that the proponent will adopt in constructing and managing the proposed development.

8. ENVIRONMENTAL MANAGEMENT PLAN

8.1 Introduction

The Environmental Management Plan involves the protection, conservation and sustainable use of the various elements of the environment. The EMP for the proposed project provides all the de tails of its activities, impacts, mitigation measures and expected costs during implementation and decommissioning phases of the project. This project bears the potential of a number of negative impacts on the environment. With proper environmental management procedures in place and adhered to then there should be minimal negative impact of concern emanating from it. Key areas that require mitigation measures include wastewater, solid wastes, maintaining good air quality, safety, and storm water management.

The table below indicates measure for Environmental Management Plan

Table 6: Environmental Management Plan (EMP)

Environmental parameter	Impact	Mitigation measure	Responsible party	Costs (KES)
Construction/equipment installation phase				
Extraction of raw material	▪ Land-use and Landscape change ▪ Poor visual quality ▪ Water abstraction	▪ Obtain a change of User (Agricultural to industrial) as required. ▪ Source material from supplies that use environmentally friendly processes in their operation. ▪ Ensure accurate budgeting and estimation of actual construction material requirement to ensure that the least amount of material necessary is ordered. ▪ Ensure that damage or loss of material at construction site is kept minimal through proper storage. ▪ Use at least 5%-10% recycled, refurbished, or salvaged materials to reduce the use of raw material and divert material from land fill. ▪ Hydrological study to inform abstraction of water from Wuoroya River and WRA permit to be obtained prior to abstraction. ▪ The tender documents should specify required standards and certification for procurement of all materials and appliances; ▪ Steel scaffolding should be used in preference to timber and the Contractor should ensure that sufficient quantities of scaffolding are available for hire at the time of construction. ▪ All construction materials should be from approved sources; for example, hard stone for building should be obtained from NEMA licensed sites and bona fide commercial quarries.	▪ Proponent and Contractor ▪ WRA, NEMA	▪ As per BQ and agreement with Contractor
Removal/ clearing of vegetation	▪ Exposing ground to agents of soil erosion ▪ Loss of terrestrial habitat & biodiversity	▪ Proper demarcation and delineation of the project site to be affected by construction work ▪ Specify location for trucks and equipment, and areas of the site which should be kept free from traffic, equipment and storage. ▪ Designate access route within the site ▪ Design and implement an appropriate landscaping program to help	▪ Proponent and contractor ▪ KFS	▪ 100,000 for landscaping

Environmental parameter	Impact	Mitigation measure	Responsible party	Costs (KES)
	▪ Permanent loss of vegetation ▪ Habitat fragmentation ▪ Interruption of ecological corridors and migration paths ▪ Erosion and stream sedimentation ▪ Draining of wetlands	in re- vegetation of part of the project site after construction ▪ Mapping out the conservation zones and ensure Protection of wetlands, rivers, springs and the existing vegetation as much as possible and in line with applicable rules, regulations and standards. ▪ Set a replanting and landscaping programme that focuses on increasing "green area"		
Sewage and effluent	▪ Pollution	▪ Provide adequate sanitary facilities for workers, ▪ Provide solid waste receptacles and storage containers, particularly for the disposal of plastic bags boxes, so as not to block drainage system and to prevent littering of the site.	▪ Proponent and contractor	▪ As per BQ and agreement with Contractor
Movement of vehicle at the site	▪ Compaction of soil ▪ Interference with soil structure leading to low water infiltration	▪ Apply soil erosion control measures such as levelling of the project site to reduce run-off velocity and Increase infiltration of storm water into the soil. ▪ Ensure that construction vehicles are restricted to existing graded roads to avoid soil compaction within the project site, ▪ Ensure that any compacted areas are ripped to reduce run-off. ▪ Storm water drainage lines be well constructed to reduce incidence of pounding and flooding	▪ Proponent and contractor	▪ As per BQ and agreement with Contractor
Utilization of construction materials	Generation of wastes leading to: ▪ Wastage of resources/ materials	▪ Through accurate estimation of quantities of materials required, order materials in the sizes and quantities they will be needed, rather than cutting them to size, or having large quantities of residual materials.	▪ Constructor and his workers	▪ As per BQ and agreement with Contractor

Environmental parameter	Impact	Mitigation measure	Responsible party	Costs (KES)
	▪ Health risk to the worker and environment ▪ Reduced aesthetic value of the site ▪ Blockage of drainage systems ▪ Chocking water bodies	▪ Ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed off. ▪ Ensure that damaged or waste materials including cabinet, doors, plumbing, and lighting fixtures, marble and glasses will be recovered for refurbishing and use in other projects ▪ Reducing the amount of construction waste generated over time ▪ Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements ▪ Purchase of perishable construction materials such as paints should be done incrementally to ensure reduced spoilage of unused materials ▪ Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste ▪ Maintain a proper waste tracking document ▪ Ensure adequate fire warning, response and management systems are installed. ▪ Hazardous wastes, such as waste oils and grease to be collected in secure storage facilities on-site to prevent accidental release that may result in contaminated run-off and leaching. ▪ Storage areas for hazardous material to be cemented to provide an impervious surface and to prevent uncontrolled discharges to groundwater. ▪ Contract a NEMA licensed waste handler to collect waste oil, waste tyres and general office and domestic wastes. ▪ Practice the 6Rs (Reuse, Recover, Refill, Return, Recycle) of waste Management. ▪ Training of workforce on matters health, safety and environment		

Environmental parameter	Impact	Mitigation measure	Responsible party	Costs (KES)
		with regards to waste and its effects.		
Dust emission from movement of transportation vehicles at the site and on the road	▪ Air pollution ▪ Causing breathing problems to the workers and the neighbourhood ▪ Blockage of fauna stomata	▪ Sprinkle water on graded access routes each day to reduce dust generation by construction vehicles ▪ Controlling the speed of vehicles on the site ▪ Watering open soil or storage sites ▪ Selecting transportation routes ▪ Provide worker with dust masks ▪ Spiro metric examination on exposed workers at prescribed interval of time	▪ Constructor and his workers	▪ As per BQ and agreement with Contractor
Utilization of fossil fuel by fuel consuming machineries.	▪ Emission of carbon gas into the atmosphere leading to global warming ▪ Exhaustion of fossil fuel resource ▪ Air pollution ▪ Can Lead to breathing problems	▪ Ensure proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips done per vehicle or the number of vehicles on the road. ▪ Sensitize truck drivers to avoid unnecessary racing of vehicle engines at adding/offloading points and parking areas, and to switch off or keep vehicle engines when not in use ▪ Prompt servicing of vehicles engines ▪ Use of unleaded and low sulphur fuel ▪ Monitor energy use during construction and set target for reduction of energy use.	▪ Contractor and Drivers	▪ As per need
Noise and vibration	▪ Noise generation ▪ Hearing problem	▪ Sensitize construction drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, schools, residential areas and hospitals ▪ Sensitize construction vehicle drivers and machinery operators to switch of vehicle or machinery not being used. ▪ Ensure that all heavy duty equipment are insulated or placed in	▪ Constructor and Workers	▪ 50,000

Environmental parameter	Impact	Mitigation measure	Responsible party	Costs (KES)
		enclosures to minimize ambient noise levels. ▪ Measure to ensure that noise levels does not exceed 75dB(A) ▪ Attenuation of any sound that may affect the inner ear by use of earplugs and earmuffs. ▪ Audio metrical examination of workers at prescribed intervals		
Water consumption	▪ Excessive use / misuse of water ▪ Generation of excess waste water ▪ Water pollution	▪ Prompt reuse and recycling of water as much as possible where necessary ▪ Install a discharge meter at water outlet to monitor and determine total water usage. ▪ Monitor water consumption and utilization; ▪ Sensitize construction workers on the importance of proper water management; ▪ All wastewater should be drained into approved drainage facilities.	▪ Contractor and his workers	▪ 150,000
Approval of building plan	▪ The development being in alignment with the County Integrated Development Plan (CIDP)	▪ Ensure that the Change of Use is effected and plans are approved by the County Government, Physical Planner and the local Occupational Health and Safety Office	▪ The proponent	▪ Gazetted fee
Incident, accidents, and dangerous occurrences	▪ To enable relevant authorities to monitor incidence occurrences and take necessary measure to minimize them.	▪ Ensure that provisions for reporting incidents, accidents and dangerous occurrences during construction using prescribed forms obtainable from the local Occupational Health and Safety Office (OHSO) are in place.	▪ Contractor and his workers	▪ Gazetted fee

Environmental parameter	**Impact**	**Mitigation measure**	**Responsible party**	**Costs (KES)**
Safety, health and environment (SHE)policy	▪ To give guidelines on how one is to protect himself within a given premises against any incident.	▪ Develop, document and display prominently an appropriate SHE policy for construction works	▪ Contractor	▪ 5,000
Personal protective gears	▪ To protect against any infection or injuries while at work.	▪ Suitable overalls, safety footwear, dust masks, gas masks, respirators, gloves, ear protection equipment etc. should be made available and construction personnel must be trained on their use.	▪ Contractor	▪ 100,000
Supply of clean water	▪ Ensure good health as dirty/untreated water leads to water borne diseases.	▪ Ensure that construction workers are provided with an adequate supply of wholesome drinking water which should be maintained at suitable and accessible points.	▪ Contractor	▪ 100,000
Storage of materials	▪ Can cause accident, material wastage and spoilage, and reduced aesthetic value.	▪ Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse	▪ Contractor	▪ 5000
First aid	▪ To ensure that when any injury occur it can be taken care of before main treatment at a hospital or a dispensary.	▪ Well stocked first aid box which is easily available and Accessible should be provided within the premises ▪ Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body.	▪ Contractor	▪ 40,000

Environmental parameter	**Impact**	**Mitigation measure**	**Responsible party**	**Costs (KES)**
Safety and security	▪ Destruction and stealing of materials on site.	▪ Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the construction site. ▪ The Contractor should ensure strict safety management through close attention to design, work procedures, materials and equipment; ▪ Develop a site safety action plan detailing safety equipment to be used, emergency procedures, restrictions on site, frequency and personnel responsible for safety inspections and controls; ▪ All workmen should be provided with personal protective equipment (e.g. nose masks, ear muffs, helmets, overalls, industrial boots, etc.); ▪ There should be regular site reporting on health, safety and environment (HSE) issues by an appointed HSE representative, daily site inspections should be done to ensure safe work practices are adhered to; ▪ All injuries that occur on site must be recorded in the accident registers and corrective actions for their prevention be instigated as appropriate (Section 62 of the Factories and Other Places of Work Act); ▪ Statistical records on accidents and incidents should be collated and analysed on a monthly basis and forwarded to the contractor and / or displayed on the notice boards; ▪ Site personnel should be encouraged to report "near-miss incidents" in order to avoid potential problems and increase safety awareness.	▪ Contractor	▪ 100,000

Environmental parameter	**Impact**	**Mitigation measure**	**Responsible party**	**Costs (KES)**
Fire Hazards	▪ Destruction of property and lives	▪ Provide adequate number of appropriate fire fighting equipment as well as fire exit options. ▪ Ensure inspection and maintenance of fire equipment ▪ A fire escape route and an emergency assembly point should be clearly indicated ▪ Form and train fire fighting team ▪ Conduct regular fire drills	▪ Contractor and proponent	▪ 200,000
Construction traffic:	▪ Disruption of local traffic; ▪ Potential for accidents.	▪ The Contractor should plan itineraries for site traffic. ▪ Issue notices/advisories of pending traffic inconveniences and solicit tolerance by commuters before the commencement of construction works. ▪ Assign traffic regulators to places during periods of chronic or potential traffic congestions. ▪ Prepare & provide appropriate signage & trained flag persons where the movement of heavy machinery and construction equipment may cross the main roads.	▪ Contractor	▪ 50,000
Influx of construction workers into the area:	▪ Proliferation of informal kiosks in the area; Increase in transport demand. ▪ Road side vending	▪ Develop a catering program on site for construction staff; ▪ Provide transportation for the workforce to and from the site; ▪ The contractor should identify, demarcate and fence a specific area within which specific number vendors will be allowed to operate. ▪ The vendors should be instructed to maintain the area in a tidy fashion and litter bins should be provided with arrangements in place to have the contents of these emptied on a regular basis and disposed of appropriately.	▪ Contractor	▪ 100,000
Energy utilization	▪ Energy consumption	▪ Develop an energy management plan; ▪ Construction machinery and vehicles should be maintained and used in accordance with manufacturer's specifications, to maximize efficiency and lower use of energy, e.g. drivers of	▪ Contractor	▪ 20,000

Environmental parameter	Impact	Mitigation measure	Responsible party	Costs (KES)
		construction vehicles should be instructed not to leave them idling for extended periods; ▪ Construction workers should be sensitized on the importance of energy management.		
Ergonomic	▪ Bad posture may lead to body structural disorder.	▪ Provision for repairing and maintaining of hand tools must be in place ▪ Hand tools must be of appropriate size and shape for easy and safe use ▪ Height of equipment, controls or work surfaces should be positioned to reduce bending posture for standing workers	▪ Contractor	▪ 20,000
Operation phase				
Solid waste generation	▪ Generation of general Solid wastes leading to pollution of water bodies, air impairment when decomposing hence odours, and reduction in aesthetic value of the compound.	▪ Provision of dirt bins/skips at strategic points of the compound ▪ Disposal at the designated site, ▪ Awareness creation among workers ▪ Practice reuse and recycling methods as much as possible where applicable. ▪ Display portraits like “Don’t Litter”, “Keep Environment Clean”	▪ Proponent	▪ Waste collection as per rates
	▪ The Bagasse Menace	▪ Installation of a bagasse house as part of the project design. ▪ Use as a source of fuel in the boilers. ▪ Installation of a Co-generation unit ▪ Installation of a pelleting unit. ▪ Installation of a briquetting unit ▪ Practicing of bagasse bailing to enhance transportation. ▪ Reuse together with the filter cake as soil enrichment to increase	▪ Proponent	▪ As per need

Environmental parameter	Impact	Mitigation measure	Responsible party	Costs (KES)
		organic matter in the farm lands. ▪ Consider use of bagasse as a raw material in paper and chip-board manufacturing.		
Hazardous waste generation	▪ Pollution of surface or ground water due to oil spillage	▪ Hazardous wastes, such as waste oils and grease to be collected in secure storage facilities on-site to prevent accidental release that may result in contaminated run-off and leaching. ▪ Storage areas for hazardous material to be cemented to provide an impervious surface and to prevent uncontrolled discharges to groundwater	▪ Proponent	▪ Waste collection as per rates
Air pollution	▪ Unmonitored stack emissions	▪ Monitor stack emissions regularly ▪ Have Fugitive Emissions Control Plan ▪ Install appropriate Electrostatic precipitator (ESP) as an effective emissions control technology. ▪ Ensure the emissions are within permissible limits in line with Air Quality Regulations 2014 ▪ Apply for Emission license and undertake quarterly analysis to ensure compliance with the emission standards.	▪ Proponent	▪ 400,000
Accidents and injuries	▪ Machine safety (improper use and maintenance of machines)	▪ All plant, machinery and equipment should only be used for work which they are designed for and be operated by a competent person. ▪ Insist on regular servicing of electrical fittings and appliances by qualified personnel. ▪ Every machine intended to be driven by mechanical or any other type of power should be provided with safeguards and an efficient starting and stopping appliance, the control of which should be in such a position as to be readily and conveniently operated by the	▪ Proponent	-

Environmental parameter	Impact	Mitigation measure	Responsible party	Costs (KES)
		person operating the machine.		
Occupational health and Safety	▪ Accidents and injuries	▪ The premise must be kept clean, daily removal of accumulated dust from floors, free from effluvia arising from any drain, sanitary convenience or nuisance ▪ The premise must not be overcrowded, there must be in each room 10 metres of space for each employee, not counting space 14 feet from the floor and a 9 feet floor-roof height. ▪ The circulation of fresh air must secure adequate ventilation of workrooms. ▪ There must be sufficient and suitable lighting in every part of the premise in which persons are working or passing. ▪ There should also be sufficient and suitable sanitary conveniences separate for each sex, ▪ Management should ensure provision of suitable protective clothing and appliances including where necessary, suitable gloves, footwear, goggles, gas masks, and head covering, and maintained for the use of workers in any process involving expose to wet or to any injurious or offensive substances ▪ Management should ensure training and supervision of inexperienced workers ▪ An adequate supply of both quantity and quality of wholesome drinking water must be provided. ▪ Maintenance of suitable washing facilities, accommodation for clothing not worn during working hours must be provided. ▪ Provision of well-equipped First Aid kits and /or ready transport facilities to hospital.	▪ Proponent	▪ 100,000

Environmental parameter	**Impact**	**Mitigation measure**	**Responsible party**	**Costs (KES)**
Use of sanitary room (toilets and urinal)	▪ Generation of sewage(liquid waste),Water pollution, Air pollution (odour) ▪ Reduced aesthetic value	▪ Incorporate grease traps ▪ Conduct regular inspections for sewerage pipe blockages or damages and fix appropriately ▪ Ensure regular monitoring of the sewage discharged ▪ Reuse, recycle waste water where necessary ▪ Ensure adequate water supply for flushing and to ensure the waste is carried to the sewerage system without causing blockage. ▪ Ensure flashing toilet after use though Avoid unnecessary flushing ▪ Apply for effluent discharge license	▪ Proponent ▪ NEMA	▪ 150,000
Water Consumption	▪ Overutilization of water	▪ Monitor water consumption ▪ Apply for water abstraction permits from WRA ▪ Install internal water meters. ▪ Installing plumbing fittings, appliances and devices to optimize water use efficiency; ▪ Recycling of wastewater to reduce water consumption.	▪ Proponent/ Contractor ▪ WRA	▪ As per BQ
Waste management	▪ Drain blockages	▪ The proponent should ensure that there is adequate means of handling large quantities of sewage blockages as well as related emergency situations. ▪ Proper monitoring at waste generation points should be established.	▪ Proponent/ Contractor	▪ As per BQ
Use of energy	▪ Overutilization of hydropower ▪ Overloading hydropower grid	▪ Switch off electrical equipment, appliances and lights when not being used ▪ Install energy saving fluorescent tubes at all lighting points within the facility instead of bulbs which consume higher electric energy ▪ Sensitize occupants of the facility to use energy efficiently ▪ Plant trees within the compound and along the fence.	▪ Proponent	▪ -

Environmental parameter	Impact	Mitigation measure	Responsible party	Costs (KES)
Electricity use	▪ Explosions/Fire outbreaks causing injuries and destruction of properties	▪ Regular maintenance of fire extinguishers ▪ Proper electric connections. ▪ Circuit must not be overloaded ▪ Distribution boards switches must be clearly marked to indicate respective circuits ▪ No live exposure connection ▪ Electrical fittings near all potential sources of ignition should be flame proof	▪ Proponent/Contractor	▪ As per BQ and need
Ventilation	▪ Suffocation and lack of clean air may lead to discomfort of the occupants in the facility.	▪ Enough space must be provided within the premises to allow for adequate natural ventilation through circulation of fresh air	▪ Proponent ▪ Contractor	▪ As per BQ
Vector/rodents breeding grounds	▪ Diseases and infections	▪ Ensure that there is no space for unplanned stagnant water retained in the fields. ▪ Recommended measures should be applied when dealing with rodents and food storage. ▪ A monitoring programme should be put in place for controlling relative cases observed.	▪ Proponent	▪ As per need
Lighting	▪ Lack of enough light in the facility may lead to eye straining hence eye problems	▪ There must be adequate provision for artificial and natural lighting in the facility.	▪ Proponent	▪ As per BQ
Decommissioning Phase				

Environmental parameter	**Impact**	**Mitigation measure**	**Responsible party**	**Costs (KES)**
Demolition activity	▪ Lead to accident from falling, and flying objects. ▪ Generation of construction waste ▪ Reduced aesthetic value of that place ▪ Destruction of soil structure ▪ Lead to soil erosion hence water pollution	▪ Develop a decommissioning EIA	▪ Proponent and the contractor	▪ Develop BQ and project budget

9. CONCLUSION AND RECOMMENDATIONS

This Study Report has been prepared to provide sufficient and relevant information on the proposed project to enable NEMA to establish whether activities of the project are likely to have significant adverse environmental impacts. Mitigation measures have been proposed for identified impacts in this report and an Environmental Management Plan (EMP) for the implementation of the proposed measures has been presented. The EMP presented in this report is a tool to be used by the Project Team during the construction, hand-over and operation periods.

To ensure implementation, mitigation measures should be reflected in the Conditions of Contract and Bills of Quantities. It is the responsibility of the Proponent to ensure these measures are incorporated into these two documents.

It is recommended that the available waste management systems must be monitored and upgraded (where necessary) to ensure that they adequately handle the anticipated increase in waste and by- products.

In this respect the project can proceed on condition that the concerns are addressed the proposed mitigation measures are implemented and an EIA license issued with the above conditions taken fully into account amongst any others.

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ANNEXURE

Annex 1: NEMA Approved TOR

Annex2: Proponent's Registration and PIN

Annex 3: Land ownership documents

Annex 4: Expert practicing licenses

Annex 5: Minutes of public participation

Annex 6: Project Designs

Annex 7: Photographic plates