ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED GIRITU SUGAR FACTORY IN GARSEN, TANA RIVER COUNTY

PROPONENT

GIRITU SUGAR LIMITED

P.O BOX 518-80200

MALINDI

CERTIFICATION BY EXPERTS

We hereby certify that this environmental and social impact assessment has been done under our supervision and that the ESIA criteria, methodology and content reporting conform to the requirements of the Environmental Management and Coordination Act, 1999 (Rev. 2015) and legal notice No. 101 of June 2003 (Environmental Impact Assessment and Audit Regulations)

Name: **Mr. Fredrick Owiti –Lead expert (NEMA 1265)**

Signed: _____ Date: _____

Name: **Esther Ayaga –Associate expert (NEMA 8848)**

Signed: _____ Date: _____

Name: **Kabbie Kabuki –Associate expert (NEMA 9067)**

Signed: _____ Date: _____

Contact details:

Prelance Co. Limited (8878)
P.O. Box 87388-80100, MOMBASA
Email: info@prelance.co.ke

CERTIFICATION BY PROPONENT

We, **Giritu Sugar Limited**, hereby confirm that this Environmental and Social Impact Assessment (ESIA) report has been prepared and submitted to NEMA with our authority as the proponent.

On behalf of Giritu Sugar Limited;

Name: _____Position_____

Signature: _____Date_____

Stamp/Company seal:

ACKNOWLEDGEMENT

The successful completion of this environmental and social impact assessment report was made possible by various people. We thank Giritu Sugar Limited management for providing resources and logistical support to undertake the assessment. In this regard, we acknowledge the input of Mr. Luqman Masoud who facilitated site visit and the documentation required for the assessment process.

The team is further indebted to the project site neighboring facilities, Tana River County government officials and other key stakeholders for accepting to participate in the public consultations which would not have been possible without their support. Their opinions and suggestions are included in this environmental and social assessment report.

The staff of Prelance Co. Limited assisted in data and information collection, interpretation and analysis, draft material write-up and the printing of the final report. In this regard, we acknowledge the support of Mr. Fredrick Owiti, Ms Esther Ayaga and Mr. Kabbie Kabuki among others.

EXECUTIVE SUMMARY

Project background

Kenya's estimated 50m population has a "sweet-tooth" and annual per capita sugar consumption of 1.7Kg per month (780,000 tonnes), this consumption is not met by local production. The gap in production provides an opportunity to a new large scale producer with the ability to also export the product.

Giritu Sugar Limited is planning to invest in a mechanized irrigated sugarcane plantation in Tana River County within the reach of Tana River as an initiative that targets competitive sugar production.

The majority of Kenyan sugar production is in the Western region where temperatures are too low for optimum sugar growth although sufficient rainfall is available; however with sustainable irrigation in the Coastal region the increased temperatures would ensure much higher levels of production and therefore lower costs of production.

Project site

The project is located at Giritu ranch in Mwima and Salama Locations in Tana River County. The project will cover an area of 5280 ha of estate sugarcane farming and 1,500 ha of smallholder sugarcane blocks all under sub surface drip irrigation. This location is served by Malindi-Garisa Road.

ESIA Methodology

The baseline information was obtained through several data collection methods including; observation and transects walks in the project area, interview with key informants, administering of questionnaires, public participation and consultations, use of checklists, physical investigation and analysis of parameters and literature review from the client. Photography and documentation of notes were also utilized in the study.

Public meetings were held in all the sub-locations within the project area where various issues revolving around proposed project where discussed. ***Copies of the minutes are attached in the annex.***

Socio-economic baseline characteristics of the project area

The baseline information of the study area was collected using various methods as indicated above. The proposed project is to be undertaken in Mwima and Salama Locations in Tana River County. The communities in this vast area are small scale farmers and small scale business men and women. The land in this area is communally owned with subdivision done among community members and from father to children. The crops mostly grown in this area include watermelon, maize etc. the community in this area depend mostly depend on rain- fed agriculture. The communities also keep goats, chicken and cows.

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Biophysical baseline characteristics of the project area

Tana River County is located in the Northern Coast of Kenya and is one of the Six Coastal Counties in Kenya. It borders Kilifi County in the south, Lamu County to the east and Garissa County to the north. The county lies between latitudes 000'53" and 200'41'' South and longitudes 38025'43" and 40015' East. The county has a total area of 38,862.2 Km2and covers about 35km of the coastal strip. The major physical feature in Tana River County is an undulating plain that is interrupted in a few places by low hills at Bilbil around Madogo and Bura divisions. The land in Tana river generally slopes south eastwards with an altitude that ranges between 20m to 200m above sea level at the top of the Bilbil hills. The River Tana traverses the county from Tharaka County in the North to the Indian Ocean in the South passing through Tana Delta and covering a stretch of approximately 500km.

The most striking topographical feature is the River Tana that traverses the county from the Aberdares in the North to the Indian Ocean in the South covering a stretch of approximately 500km.

Review of legislative frameworks, policies and institutional arrangements

The ESIA examined; legal frameworks, policy frameworks, national regulatory frameworks, international policy frameworks and World Bank Safeguard Policies on the project. On policy frameworks, the consultant examined Kenya's Vision 2030, Sustainable Development Goals, National Environment Action Plan 1994, Land Policy among others. The study also looked at Legal frameworks which included Kenya's constitution 2010, Environmental Management and Coordination Act 2015, the Water Act 2016, the Kenya Roads Board Act cap 408 of 1999, Commission on National Land Act 2012, the County Government Act 2012, draft National Irrigation Bill 2016, Forest Act 2005 etc. On national regulatory frameworks, Waste Management Regulation Act 2006 (legal notice 121) among others was examined. The study also looked at International Policy Frameworks which included Ramseur Convention of 1971, World Commission on Environment and Development among others.. The key institutions whose mandate are important in the implementation and management of this this project include but not limited to; Government of Kenya, TBI/TELSAP, Ministry of Water and Sanitation, Ministry of Agriculture, Water Resource Authority, National Environment Management Authority, World Bank, Ministry of Environment and Forest among others.

Results of Socio-economic survey of the project area

Identification of Impacts and Mitigation Measures

Implementation of Giritu Sugar project has both positive and negative impacts to the social, cultural, economic, physical and biological environment. The positive impacts will be maximized through undertaking enhancing measures while mitigation measures will be undertaken to reduce the effects of negative impacts.

Positive impacts

The positive impacts include; improved sugarcane production, employment opportunities, improved animal husbandry and productivity, increased income among locals, agro-industrial growth, poverty alleviation, increased access to the

market within the project area, availability and access to financial services, increased land value and demand, improved soil fertility, catchment management, wildlife conservation, increased crop yields, increase in crop diversity, increase in cropping intensity, agro forestry, water conservation, growth of local economy and an opportunities for skill acquisition by the local people.

Negative impacts

In spite of the positive impacts, the project will also have negative impacts that will need to be mitigated as outlined in the table 1 below.

Table 1: Negative impacts and their mitigation

No.	Potential Impacts	Mitigation measures	Time frame
.	Loss of Aquatic organisms.	● Ensure no observable aquatic organism is destroyed during construction and irrigation. ● KWS in consultations with proponent and the local people to gazette conservation areas where need be, ● Key stakeholders to enhance public awareness and participation in conservation activities, ● Enforcement of wildlife Act 2013 and EMCA (wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009.	During construction phase and operation phase
2.	Loss of vegetation.	● The proponent and Farmers to Practice Agro-forestry on at least 10% of their farms. ● Introduce vegetation strips to unproductive land to compensate for what will be cleared, ● Identify endangered species of trees to be planted in other places where they will not be affected. ● Consider re-vegetation around the upstream points and along the river. ● Plant more trees in the site reserve areas to increase vegetation ● Encourage local people in catchment areas to plant more vegetation.	During construction and operation

3.	Loss of habitat.	● NEMA in collaboration with WRA to gazette wetlands that may exist within the area ● KWS in consultations with the proponent and the local people to gazette conservation areas where need be, ● Key stakeholders to enhance public awareness and participation in conservation activities, ● Enforcement of wildlife Act and EMCA 1999 (wetlands conservation) Act. ● Planting of similar trees lost in other areas of the project to create more habitat that is vital for the project.	Construction phase
4.	Water pollution.	● The contractor to prepare an integrated waste management plan during construction and operation period of the sugar mill and irrigation scheme, ● Ensure all repairs and maintenance work are done at the contractors" yard to avoid spillages, ● Compact loose material/soils ● Prevention of non-point source of pollution to the water for irrigation. ● Regular water sampling of boreholes and water downstream to detect water pollution that will be handled immediately.	During construction and operation
5.	Excessive Noise and Vibrations.	● Workers using drilling equipment to be provided with specialized anti-vibrating gloves, ● switching off vehicles and machines when not in use, ● Machines and equipment to be fitted with silencer devices where possible, ● The site for construction should be hoarded off ● An improvised rock breaking system should be adopted by use of Ammonium Nitrate ● avoiding unnecessary hooting, ● workers to be provided with personal protection equipment, ● machines to be serviced to reduce generation of noise and	During construction

		vibrations, ● warnings to be issued to the locals in case of any unusual noise, ● the noisy activities should be restricted to daytime ● Ensure that NEMA noise and Vibration standards are observed in all project activities.	
6.	Water borne Diseases.	● public awareness and campaigns on hygiene behaviour change, ● Promotion of household water treatment methods ● provision of safe water for domestic use to the local people ● Provision of alternative water sources to those who use water from wells being affected by the project ● Building of hospitals in the project area and equipping them to treat the illnesses when they occur.	During project construction and operation
7.	Changes in Hydraulics of the river.	● Provision of water harvesting and storage facilities during wet seasons to supplement abstracted water. ● Plant more water loving trees in the project area to increase flows in the river	During construction and operation
8.	Soil erosion.	● Planting of trees in the project catchment areas to minimize soil erosion ● Where there is intense soil erosion, gabions should be built as a measure to reduce soil erosion ● There should be intensive re-vegetation on bare grounds after construction. ● Compaction of loose soils after excavations and reuse of materials for refill. ● The canal design to adopt sub critical flow velocity to avoid erosion.	During construction and operation phase

9.	Waste water and effluents.	● The grey water runoff from the working areas should be contained and properly treated before being disposed. ● Where possible wastewater need to be treated to meet the effluent standards before releasing to the environment. ● Water containing pollutants such as cement, concrete, lime, chemicals and fuels should be discharged into a conservancy tank for removal from the site. ● Potential pollutants should be stored, kept and used in such a manner that any escape can be contained to avoid degrading the water table. ● Any pollution incidents on site should be resolved immediately. ● The construction should have sanitation facilities that will not pollute water	During construction and operation phase
10.	Increase in waste.	● promote the reuse, recycling and reduction of wastes generated ● Provision of adequate litter collection facilities, ● Approval of waste disposal sites by NEMA in accordance with the waste management regulations, ● The chemical and hazardous wastes should not be burnt or dumped in open pits ● Debris should be utilized in filling up of quarries within the project area	During construction and operation phase,
11.	Increased communicable diseases.	● Hospitals should be built in the project area for to treat the locals for all the illnesses. ● Carry out public awareness campaigns against HIV/AIDS, STIs, Tuberculosis and other communicable diseases present in the area, ● Accessible health care services to be provided to the local populace, ● Free VCT centres to be provided in the project area as well as sex education and awareness among the youth.	Construction phase

12.	Downstream Water use conflicts.	● Formation of community irrigation water users associations for water conflicts resolution and management, ● Enforcement and adhering to the water management rules by all key stakeholders, ● Rationing irrigation water supply during dry seasons, ● Harvesting of rain water for use during the dry season ● The need to provide piped water supply for domestic users.	During project Operation.
13.	Occupational Health and Safety (OHS).	▪ Ensure safety of the construction workers by putting first aid area and injury reporting mechanism ▪ The contractor to have his workable health and safety rules to apply always at work places ▪ Securing of sites to prevent any accident at sites ▪ Ensure safety of residents by providing safety signs at strategic places around the access roads. ▪ Ensure compliance to Occupational Safety and Health Act Cap. 514 and its Subsidiary Legislations. ▪ Provide adequate crossings where canals will pass ▪ Provide personal protective equipment to workers. ▪ There should be adequate provision of the requisite sanitation facilities for human waste disposal ▪ The workers should receive the requisite training especially on the operation of the machinery and equipment. ▪ Preparation of a working site safety plan ▪ Provide clean drinking water for the employees. ▪ Develop a site safety action plan detailing safety equipment to be used, emergency procedures, restriction on site, frequency and personnel responsible for safety inspections and controls. ▪ Recording of all injuries that occur on site in the incident register, corrective actions for their prevention are instigated as appropriate. ▪ Provision of prevention tools such as condoms at the health	Construction phase

		center and construction site availed to all ▪ The contractor to register workplace and ensure fire and safety gears are in order and to be regularly maintained during operation	

Monitoring Plan

This report has provided a matrix for the negative impacts and how they will be monitored. The monitoring plan has also provided methods and tools to be used to monitor the impacts if they occur or not during the course of project lifecycle.

Pest Management Plan summary

The pest management plan has identified diseases and pests within the project area for various crops as shown in the table 3 below highlighting the banned substances in Kenya and registered pesticides to be utilized in the project. A full Pest Management Plan has been presented as a stand-alone report as an annex of the report.

Table 3: Identified diseases and pests within project area.

Crop	**Pests**	**Diseases**
Maize	Fall army worm, maize stock borers, larger grain borer, termites and chafer grubs, termites.	Maize lethal necrosis and Maize streak disease
Water melon	Aphids, white Flies, melon fly	Blight, virus disease
Tomato	Red spider mites, Aphids, African ball worm, leaf miner	Bacterial wilt, Early and Late Blight, Dumping off disease, blossom end rot, root knot nematodes
Kales	Aphids, diamond back moth, cut worms.	Stem root, powdery mildew, ring spot, downy mildew, dry rot canker, white rust, black rot
Onions	Onions thrips,onion flies,	Downey mildew, purple blotch, rust
Bananas	Banana weevil, nematodes	Cigar end rot, Bacterial Xanthomonas wilt
sugarcane	Shoot borer, internode borer	Mosaic virus, puccinia melanocephala

Conclusions

The study has made the following conclusions regarding the proposed Giritu Sugar Factory project:

1. From the report, it is evident that the project is environmentally and socially acceptable with all the mitigation

measures taken into consideration.

2. The local community has indicated their desire to have irrigated sugarcane project to be implemented without delay;
3. Tana River County have welcomed the project and they wish for quick implementation to improve people's livelihood;
4. The project is acceptable to a majority of the local residents, most of whom appreciates the value it will have on the social and economic wellbeing of the area.
5. Health concern of the workers during the construction and operation phase need to be effectively addressed with the incorporation of a hospital and qualified doctors within the project area.
6. With implementation of the project following the ESMP provided, negative impacts shall be reduced to the minimum maximizing on positive impacts.
7. The IPMP prepared shall provide guidance to the proponent and farmers on pest management and control maximizing on their produce.
8. Monitoring of parameters prepared should be carried out to determine the impacts of the project to the community.

Recommendation

The study on Giritu Sugar factory project recommends the following;

1. There is need to undertake capacity building for the local communities so as to enable them to competitively exploit opportunities that arise from construction of the project (employment, supplies, etc.) as well as utilization of their resources;
2. There is need to assist community to form Water Users Associations and Irrigation Water Users to manage the irrigation scheme for the out growers;
3. ESMP measures should be effectively implemented during construction and operation phase of the project under the strict supervision of the client and supervising consultant to achieve maximum project acceptability;
4. The factory should conduct annual environmental audits upon commencement of the project.
5. Initiatives on the conservation and protection of the immediate catchment should also be formulated and integrated into the project operations guidelines,
6. Monitoring of the parameters detailed in the monitoring plan should be effected as required;
7. Since all the negative impacts have been addressed, the consultant recommends that NEMA should approve the project for implementation to benefit the communities and the country at large.

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ABBREVIATIONS AND ACRONYMS

AEZ	Agro-Ecological Zone
AIDS	Acquired Immune Deficiency Syndrome
CBOs	Community Based Organizations
CDTF	Community Development Trust Fund
CIDP	County Integrated Development Plan
CIWA	Cooperation in International Waters
CPP	Consultative Public Participation
CS	Cabinet Secretary
CWOE	Cooperation in International Waters
DAO	Decentralized Autonomous Organization
DSP	Site Safety Plan
EA	Environmental Audit
EBITDA	Earning before interest, taxes, depreciation and amortization
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
EMoP	Environmental Monitoring Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
IRR	Internal rate of return
FGD	Focused Group Discussion
GOK	Government of Kenya
Ha.	Hectares
HIV	Human Immunodeficiency Virus
IWUA	Irrigation Water Users Association
KFS	Kenya Forest Services
KPRS	Kenya Poverty Reduction Strategy
KW	Kilo Watts
LEG	Legal Vice Presidency
LEGVP	Vice president General Counsel
NEAP	National Environmental Action Plan

NBI	Nile Basin Initiative
NCPB	National cereals Produce Board
NEMA	National Environment Management Authority
NH3	Ammonia
NGOs	Non-Governmental Organizations
NPV	Net present value
NWCPC	National Water Conservation and Pipeline Corporation
M	Meters
MCM	Million Cubic Meters
Mg/L	Milgram per Litre
PAPS	Persons Affected by Project
PBT	Profit before tax
pH	Potential of Hydrogen
PRSP	Poverty Reduction Strategy Paper
RVP	Regional Vice President
SIA	Social Impact Assessment
STIs	Sexually Transmitted Diseases
TOR	Terms of Reference
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
VCT	Voluntary Counseling and Testing
WRA	Water Resources Authority
WSTF	Water Service Trust Fund
WUA	Water Users Association

1.0. INTRODUCTION

1.1. Background and Concept of Environmental Impact Assessment Study

Sugarcane, on average, accounts for about 80% of global sugar production. Developing countries account for 77% of global sugar consumption. Production in Europe is declining, while potential in Africa largely remains unexploited.

In Kenya, the first sugarcane factory was set up at Miwani near Kisumu in 1922 and later at Ramisi in the Coast Region in 1927. Thereafter, the Government of Kenya expanded the sugar sector by introducing sugar cane growing and milling plants in Muhoroni (1966), Chemelil (1968), Mumias (1973), Nzoia (1978) and Sony and Awendo (1979). Ironically, Kenya is not yet self-sufficient in sugar production and continues to have a deficit of more than 200,000 tonnes each year. The gap in production provides an opportunity to a new large scale producer with the ability to also export the product.

Though majority of Kenyan sugar production is in the Western region, temperatures are too low for optimum sugar growth although sufficient rainfall is available. With sustainable irrigation in the Coastal region the increased temperatures would ensure much higher levels of production and therefore lower costs of production.

Giritu Sugar Factory Limited is planning to invest in a mechanized irrigated sugarcane plantation in Tana River County within the reach of Tana River as an initiative that targets the competitive sugar production and as a requirement by Environmental Management and Coordination Act (EMCA 1999, they are required to carry out an environmental and social impact assessment before commencement of the project.

The environmental impact assessment arises out of the need to attempt to predict future environmental outcomes (implications) of supposedly beneficial project programmes (actions), in order to:

- Minimize (immediate and long term) adverse effects
- Maximize good outcomes (in the project, programme or action)

Adverse impacts can be minimized by not having the project at all or by taking steps to remedy the adverse impacts

The current proposed project falls under schedule 2 of NEMA list of projects that requires an environmental impact study report so that all the anticipated impacts can be screened and examined in detail.

1.2. Project type and scope

The project will be located within Tana River Basin which is the longest River in Kenya with an estimated irrigation potential area of 400,000 Ha. This project is at the lower end of Tana River which has a mapped potential of 200,000 Ha of irrigable Land. Giritu Sugar Factory will initially have a nucleus cropped area of 5280 Ha and 1500 Ha of out grower

plantation.

1.3. Project Location

The project will be located at Giritu ranch in Mwima and Salama Locations in Tana River County.

1.4. Key Project Components

The main features of the proposed project are as follows:

a) Sugarcane Production/plantation

b) Factory

i) Sugar factory with an initial cane crushing capacity of 2500 tcd expandable to 3,500 tcd.

ii) Co-generation capacity up to 8 MW power for use in the Project area and balance to the national grid.

iii) Ethanol production plant

c) Other Project Components

i) Fodder production

ii) Feed lot system for fattening beef cattle

iii) Biogas Production

d) Social Amenities and Benefits

The communities participating in the project will be supplied with the following:

i) Water

ii) Electricity

iii) Roads and bridges

iv) Schools

v) Health facilities.

vi) Tree seedlings

1.5. Purpose of the project study report

The purpose of the study report is to determine risks on the environment that will be brought by the proposed Giritu Sugar Factory on the environment and provide mitigation measures so as to reduce the effects of the impacts on the environment.

1.6. Objectives of the study report

The proposed ESIA Study will aim at identifying both positive and negative environmental and social impacts. The study will pay attention to detail in providing feasible and cost-effective mitigation measures. The mitigation measures proposed will aim at ensuring that the proposed project is environmentally friendly, economically viable, socially acceptable and sustainable. The specific ESIA objectives shall be:-

1. To consider all possible positive and adverse impacts to the delta including flood plains, critical habitats, endemic species, wildlife, aquatic ecosystems and the overall fauna and flora.
2. Determine effects of irrigation on soil/water salinity, logging, leaching, microbes and soil erosion.
3. To determine socio-economic impacts of the project
4. To perform an environmental hazard and risk assessment of the project
5. To design and prepare mitigation measures and action plans to address all the possible environmental impacts as detailed below.

1.7. Details of ESIA Specialists

Name	Role
Esther Ayaga	Team Leader
Fredrick Owiti	EIA Lead Expert
Andrew Makoti	EIA Lead Expert
Kabbie Kabuki	Sociologist
Marcel Otieno	GIS expert
David M. Kioko	Hydrologist
Netfim	Agronomist

CVs are attached in the annexes of this report.

1.8. ESIA Methodology

1.8.1. Consultant Mobilization

To execute the consultancy assignment in accordance with the TOR, the Consultant mobilized the key staff on the project.

1.8.2. Equipment and Other Resources

The Consultant has adequate facilities including office space and equipment, vehicles, tools for undertaking the assignment and some of the tools and equipment include:

- Computers (desktops and laptops) equipped with requisite software for the assignment, including, QGIS, MS Project, SPSS etc.;
- LED projectors and other conference facilities;
- Handheld GPS equipment for mapping out useful spatial information in the project area; and
- High resolution digital cameras and video recording equipment

1.8.3. Scoping process

The project is classified as Category A, because of the scope of the expected impacts from construction and operation of the factory on the natural environment. The Environmental Impact Assessment Regulation as outlined under the Gazette Notice

No. 56 of 13th June 2003 established under the Environmental Management and Coordination Act (EMCA), 1999 was followed for the scoping process of NEMA in defining the TOR for the detailed ESIA.

1.9. Project Justification

The proposed project area is located in one of the most exciting sugar destinations in the COMESA region, which according to studies carried out by Riegos Agricolas Espaniolas (RAESA), has one of the best Sugar Cane Days (SCD) in the World. This study is supported by a varietals replication study conducted in this region by a joint team of Agronomists and Economists from Kenya Sugar Board (KSB), Tana and Athi River Development Authority (TARDA), Kenya Sugar Research Foundation (KESREF) and Coast Development Authority (CDA). These facts make the establishment of a sugar plantation not only justifiable but confirms this project is crucial in offering a solution to the perennial shortage of sugar in Kenya. This development will not only increase revenue to the government through taxes, but will also respond to the four pillars identified in government strategy to create jobs and eradicate poverty.

1.10. Review of Documents

The previous EIA reports of the nearby areas had good baseline data of the project area but the information contained therein is not comprehensive enough as it did not address issues such as: the overall environmental and social impact the project is likely to have on the locals once the project has been implemented. To remedy the situation the consultant carried out a baseline survey and a detailed social impact assessment employing several data collection approaches for purposes of updating the scoping report and generating a detailed ESIA report. The exercise carried out assisted in coming up with a detailed RAP which will facilitate the implementation process of the proposed project.

Another observation from the review of the previous reports was the need to undertake a thorough stakeholder participation considering that the process is mainly participatory. During the reconnaissance visit this was a key area stressed by those consulted. Consultations were done for Persons Affected by the project (PAPs) and other interested parties in the project area. Also a large amount of new socio-economic data focused in the project area was generated in order to propose adequate mitigation measures acceptable to the affected population groups, in order to make the project feasible from the socio economic point of view

1.11. Preparation and Submission of Scoping Report

The Consultant using information at inception phase prepared a reviewed scoping report that informed how ESIA was to be carried out and its timelines. The Scoping report was been submitted to NEMA and was approved.

1.12. Detailed ESIA Study

This assignment involved a series of activities carried out in liaison with the Client, relevant government departments, local authorities, community groups and other organizations in the area with a view to sharing their experiences and information

with respect to environmental resources and social aspects concerning the area. Effective evaluation of the social baseline status achieved through interviews (consultative meetings and discussions) and physical inspection of the entire project area. The baseline conditions provided the starting point for the impacts predictions and benchmark for the mitigation measures. The study involved;

- Review of the proposed project and irrigation details to understanding of the project magnitude and the overall implementation plan by the client.
- Establishment of the current baseline conditions to provide a documented foundation for the impact predictions and a benchmark for the development of mitigation measures
- Update of the legislative and regulatory requirements as a basis for drawing a compliance monitoring protocol for the construction and commissioning phases.
- Environmental and Social Impacts Assessments for the identification of significant impacts to the environment and the nearby communities, including cumulative and induced impacts. Types and levels of impacts as well as criteria for developing suitable mitigation measures and an environmental management plan.
- Environmental management plan on mitigation measures, responsibilities, timeframes, environmental costs and a comprehensive environmental management plan.

1.13. Public participation

Interaction with the stakeholders and communities living around the project area was a continuous process at scoping and findings of detailed draft final ESIA study was also presented to stakeholders for their feedback. Among the interactions include informal contacts from administrations and engaging local youth/community in the study activities. Among the formal forums undertaken were sensitization, training of enumerators and stakeholder feedback sessions involving all levels of stakeholders, social and economic surveys at household levels and public participation forums that were open to all residents. Focused group discussions were also used in gathering more information concerning the project.

1.14. Preparation of draft final ESIA report

All the information obtained above was compiled and the questionnaires used for socio-economic survey were analysed using SPSS to come up with the draft final ESIA report. This report was presented to the stakeholders for their comments before finalization of the ESIA Report.

1.15. Preparation of Final ESIA Report

1.15.1. Quality Assurance Management System

Throughout the execution of these consultancy services, the Consultant employed the best management practices and incorporated quality assurance checks to ensure the assignment was undertaken in the best way possible and to the internationally recognized standards of practice. The assignment was coordinated by the Team Leader, who oversaw and supervised the team of experts on the assignment in the preparation of the project deliverables with quality and timely inputs

from the relevant experts. The quality management system is illustrated in figure.1-1 below. Our key mandate was to ensure that the quality of our services is unsurpassed in accuracy, efficiency, timeliness and cost effectiveness and executed in strict adherence with the requirements of the terms of reference and any other relevant guidelines and regulations with respect to an assignment of this nature.

Figure 1-1: The key stages of the quality management system

1.15.2. Structure of the Report

The report (volume one) is organized into eleven (11) chapters with an executive summary. Chapter One covers introduction while Chapter Two provides the description of the project, its activities and justification. Chapter Three highlights legal and institutional framework related to this project after which chapter four describes the project area including description of Socio-economic environment within the project sites. Chapter Five discusses project alternatives before the Sixth chapter discussing on public consultation and participation process. Chapter Seven describes the environmental/socio-economic impacts and mitigation measures of the project. Chapter Eight describes the Environmental and Social Management Plan for the project and chapter Nine describes the environmental and social monitoring plan. Chapter is Ten describes organization and management for the project activities during construction and operation phases while chapter eleven describes the conclusions and recommendations. References follow the appendices in the document. The second volume of the report brings out annexes on hydrological report and Pest Management Plan.

2.0. BASELINE INFORMATION

2.1. Introduction

This chapter gives the background information on the socio-economic and infrastructural information that has a bearing on the development of the county. It provides description of the county in terms of the location, size, physiographic and natural conditions, demographic profiles as well as the administrative and political units.

2.2. Position and Size

Tana River County is located in the Northern Coast of Kenya and is one of the Six Coastal Counties in Kenya. It borders Kilifi County in the south, Lamu county to the east and Garissa County to the north. The county lies between latitudes 000'53" and 200'41'' South and longitudes 38025'43" and 40015' East. The county has a total area of 38,862.2 Km^2 and covers about 35km of the coastal strip with a population of 262,684 with 131,544 being female and 131,140 male.

Figure 2-1; Tana River county map

Source; Kenya bureau of Statistic 2013

2.3. Physiographic and Natural Conditions

This section provides a brief of the major physiological and topographic features of the county. It covers the ecological and climatic conditions and their influence on the settlement patterns and economic life of the county residents

2.3.1. Physical and Topographic Features

The land in Tana river generally slopes south eastwards with an altitude that ranges between 20m to 200m above sea level at the top of the Bilbil hills. The River Tana traverses the county from Tharaka County in the North to the Indian Ocean in the South passing through Tana Delta and covering a stretch of approximately 500km.

The most striking topographical feature is the River Tana that traverses the county from the Aberdares in the North to the Indian Ocean in the South covering a stretch of approximately 500km.

Besides the River Tana, there are several seasonal rivers in the county popularly known as lagas, which flow in a west-east direction from Kitui and Makueni Counties draining into River Tana and eventually into the Indian Ocean. The river beds support livestock as well as wildlife during the dry season since they have high ability to retain water. River beds are most appropriate sites for shallow wells, sub-surface dams as well as earth

2.3.2. Ecological conditions

The county is divided into four agro- ecological zones namely: CL 3 Coconut – Cassava zone (non ASAL), CL4 Cashew nuts-Cassava zones where the main economic activity is peasantry mixed farming; CL5 Lowland Livestock zone and CL6 Lowland Ranching zones where the locals are involved in pastoral activities. The soils range from sandy, dark clay and sandy loam to alluvial deposits. The soils are deep around the riverine environments but highly susceptible to erosion by water and wind. Soils in the hinterlands are shallow and have undergone seasons of trampling by livestock, thus are easily eroded during rainy seasons.

The vegetation ranges from scrubland to thorny thickets within the riverine area. Shrubs and annual grasses dominate most parts of the region. However, there are enclaves of trees and perennial grasses dominating wetter parts. An invasive tree species called *Prosopis Juliflora*, commonly known in the area as '*Mathenge*' (named after the person who introduced it) has spread rapidly in the area and is threatening to replace most of the indigenous vegetation. It was introduced for fuel-wood production in the Bura Pilot Irrigation Scheme. It grows fast and chokes other vegetation, watering points and the canals, and is colonizing most of the areas that are not cropped, including the riparian environments.

2.3.3. Climatic Conditions

The region has a hot and dry climate within ecological zones ranging from III (in the very high grounds) to VII (in the plains or lowlands). Average annual temperatures are about 300C with the highest being 410C around January-March and the lowest being 20.60C around June-July. Rainfall is low, bimodal, erratic and conventional in nature. The total annual rainfall ranges

between 280 mm and 900 mm with long rains occurring in April and May, short rains in October and November with November being the wettest month. The Inter Tropical Conventional Zone (ITCZ), which influences the wind and non-seasonal air pattern for the river Tana, determines the amount of rainfall along the river line. The dry climate in the hinterland can only support nomadic pastoralism.

2.3.4. Administrative and Political Units

The county is divided into three (3) administrative units namely; Bura, Galole and Tana Delta, 15 wards; 54 locations; and one hundred nine (109) sub-Locations. Table 1-1 shows the area of the county by administrative units.

Constituency	Area(km^2)	No. of wards	No. of Locations	No. of Sub-Locations
Bura	13,191.5	5	16	25
Galole	9,657.3	4	21	45
Tana Delta	16,013.4	6	17	41
Total	**38,862.2**	**15**	**54**	**109**

Source: Tana River County Development Planning Office, 2018

2.3.5. Demographic Features

2.3.5.1. Population Size and Composition

The projected population of Tana River County in 2018 is estimated at 313,374 with 157,282 being female and 156,092 males. This is expected to increase to 344,595 in 2020 and to 366,661 by 2022, reflecting about 17.7 per cent increase. The county has an inter census population growth rate of 2.83 per cent slightly lower than the national average of 2.9 per cent. The ratio of male to female is 99:100 and the pattern is projected to remain the same over the plan period.

Table 1-2 shows population projection by age cohort. The first column shows various age groups. The consecutive column indicates the county population at various years. It also gives the projected population of the county by age cohorts and gender for the year 2012 and projections for 2015 and 2017.

Table 1-2: Population Projection by Age Cohort

Age Group	2017			2018			2020		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-4	30,594	29,595	60,191	31,157	30,129	61,294	32,397	31,353	63,750
5-9	27,054	26,049	53,105	27,944	26,865	54,815	29,688	28,515	58,203
10-14	21,454	20,062	41,517	22,174	20,783	42,961	23,579	22,198	45,777
15-19	15,728	16,193	31,923	16,329	16,805	33,138	17,470	17,991	35,461
20-24	11,852	11,824	23,677	12,212	12,083	24,297	12,929	12,650	25,579
25-29	9,597	11,600	21,195	9,904	11,680	21,578	10,508	11,926	22,434
30-34	7,746	9,968	17,715	8,042	10,405	18,449	8,604	11,224	19,828
35-39	6,985	8,583	15,562	7,213	9,267	16,458	7,660	10,354	18,014
40-44	5,894	6,470	12,364	6,156	6,863	13,019	6,638	7,542	14,180
45-49	5,309	4,788	10,098	5,703	5,170	10,873	6,336	5,776	12,112
50-54	4,038	3,167	7,205	4,245	3,335	7,580	4,614	3,635	8,249
55-59	3,044	2,723	5,767	3,182	2,812	5,993	3,434	2,989	6,423
60-64	2,314	2,188	4,502	2,426	2,284	4,711	2,628	2,464	5,092
65-69	1,701	1,321	3,022	1,804	1,397	3,201	1,981	1,529	3,510
70-74	1,171	989	2,160	1,221	1,034	2,255	1,312	1,118	2,430
75-79	695	722	1,417	719	752	1,471	765	809	1,574

80+	917	1,039	1,956	916	1,043	1,959	919	1,060	1,979
Total	**156,092**	**157,282**	**313,374**	**161,347**	**162,707**	**324,054**	**171,462**	**173,133**	**344,595**

Source: Source: KNBS, Tana River 2018

Tana River County with 62.2 per cent of the population living in absolute poverty, and with the population growth rate of 2.8 per cent, the projected increase in population has a major and direct impact on the basic needs such as food, water, health and education for all ages. The first priority being food security, it implies that efforts should be made to increase food production to cater for the increased population. In the water sector, the expectation is that the available water sources of River Tana will have to be tapped to increase the volume of clean water for consumption. The health sector is expected to enhance its effort to increase the available facilities, personnel and supply of medicine accordingly.

Additionally, there are special age groups that need targeted interventions because of their special characteristics. These include the under one year, the under five years, 3-5 years, primary school going age, secondary school going age, youth population, female reproductive age, labour force and aged population as shown in Table 1-6 below shows the Tana River County population projection for selected age groups

Table 1-3: Population Projections for selected Age Groups

Age Group	2018			2020			2022		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Under 1	6,618	6,235	12,854	6,881	6,488	13,369	7,072	6,668	13,740
Under 5	31,157	30,129	61,294	32,397	31,353	63,750	33,294	32,223	65,516
6-9	21,578	20,723	42,306	22,924	21,996	44,921	23,878	22,905	46,782
10-13	18,160	17,061	35,225	19,310	18,223	37,533	20,665	19,460	40,124
6-13	39,738	37,784	77,530	42,235	40,219	82,454	44,542	42,364	86,907
14	4,014	3,722	7,737	4,269	3,975	8,244	4,568	4,245	8,813
15-17	10,220	9,424	19,631	10,934	10,089	21,007	11,710	10,859	22,554
14-17	14,235	13,146	27,368	15,203	14,064	29,251	16,278	15,103	31,367
Under 15	81,276	77,777	159,070	85,664	82,066	167,730	89,450	85,619	175,069
15-30	38,445	40,568	79,013	40,907	42,567	83,474	43,813	45,476	89,289
15-64	75,411	80,704	156,097	80,821	86,551	167,372	87,365	93,818	181,172
65 +	4,660	4,226	8,887	4,977	4,516	9,493	5,474	4,947	10,421
Women 15-49		72,274			77,463			83,602	

Source: KNBS, Tana River, 2018

Under One Year: The county has an estimtated population of 12,854 infants in 2018 and is projected to increase to 13,369 by 2020 and 13,740 by 2022. This calls for special interventions in order to significantly reduce the high Infant Mortality Rate (IMR) which stands at 91/1000 (2018), higher than the national figure of 39/1000 in 2016

Under Five Years: This population comprises of 20 per cent of the total. The population is estimated at 61,294 in 2018 and is projected to increase to 63,750 in 2020 and 65,516 in 2022. The county will implement projects and programmes which are aimed at enhancing immunization coverage and health care. The county will also work towards expanding, equipping and staffing Early Childhood Development Centres (ECDCs) to cater for this group

Pre-School Education: The County has 322 public ECD centres. Among these, 167 are stand-alone ECDs while 155 are integrated with primary schools. There are 52 private ECDs. The total number of EDC teachers is 298. The teacher - pupil ratio in pre-primary school is 1:82. The total enrolment in public ECDs is 24,666 and 446 in private ECDs. The pre-primary retention rate is 87 per cent with a drop-out rate of 13 per cent while transition rate is 87 per cent. However, this indicates that about 60 per cent of the pre-primary school aged children are at home. There is need for the government to up-scale efforts to ensure all these children access school.

Primary School Age-group (Age Group 6-13): The primary school going age population (6-13 years) in 2018 was estimated at 77,530 and projected to increase to 82,454 and 86,907 in 2020 and 2022, respectively. The increase is expected to put pressure on the existing 165 primary schools in the county. Given this is a national government function, it calls for the construction of more primary schools, improve the facilities in the existing schools and employ more teachers to maintain a reasonable teacher-pupil ratio. The current enrolment stands at 50,348 for public schools and 1,450 for private primary schools, with a total enrolment of 51,798. The teacher-pupil ratio in primary level is 1:55 while dropout rate stands at 40 per cent. The average years of attendance for primary school is 8, retention rate is 60 per cent while transition rate to secondary level is 48 per cent. Efforts need to be put in place to ensure improved retention and transition.

Secondary School Age-group (Age Group 14-17): The population in the age group of 14-17 years (secondary school age) was estimated at 27,368 in 2018 and projected to increase to 29,251 and 31,367, in 2020 and 2022 respectively. This poses a major challenge as the county currently has 32 public and 3 private secondary schools. The number of teacher stands at 224, making teacher - student ratio1:32 with a total enrolment of 7,215. The dropout rate is 15per cent; while the retention rate is 85 percent.

With the introduction of free day secondary education and increase in bursaries from various devolved funds, the existing schools will not be able to cope with the high demand. There is a need for education stakeholders to invest in constructing more secondary schools, improving the existing facilities and employment of teachers. Further, investments are required in Youth Polytechnics to absorb those who will not be able to join secondary schools. Secondary school students are vulnerable to HIV infection and drug abuse. The education department, religious leaders and development partners will strengthen in-school counselling and Behavioural Change Campaigns (BCC).

There are six vocational centres in the county with total enrolment of 375 students with 35 vocational training instructors. The teacher student ratio is 1:11; transition rate is 42 per cent while retention rate is 50 percent.

The county has one medical training college in operation and three technical training colleges currently under construction in the three sub-counties.

Special Needs Education: Enrolment of children with special needs remains low. Currently, there are 2 Special units with an enrolment of 152.

Youth (Age Group 15-30): This age group (15-30 years - youth) represents 25 per cent of the whole county population. The population is estimated to be 79,013 in 2018 and will continue increasing to 83,474 and 89,289 in 2020 and 2022 respectively. This population constitutes 58 per cent of the potential labour force thus effective strategies for creating job opportunities should be developed. This is a very active group that needs to be occupied through income generating and sporting activities; investment in skills development so that they can exploit their potential; and information on career opportunities and business development service. The county is challenged in the construction and equipping tertiary institutions and providing bursaries for needy students entering post-secondary school education institutions.
The county will provide this group with behavioural change information and facilities such as youth friendly VCT centres. The county will also invest in expanding sports infrastructure and recreational facilities to make them fully occupied.

Reproductive Age for Women (Age Group 15-49): Women in Age Group 15-49 (Reproductive Age) constitute about 23 per cent (72,274) of the total projected population in 2018. This population is projected to increase to 77,463 and 83,602 in 2020 and 2022 respectively. With total fertility rate of 6.5 births per woman and low levels of contraceptive adoption rates, currently at 21 per cent, the rapid population growth rate of 2.8 per cent is expected to continue. To cater for the increase in females in the reproductive age, investment in health services and facilities is required in the county. Important programmes on family planning, maternal health care and girl child education will be scaled-up.

Labour Force (Age group 15-64 years): This is the economically active age group whose increase will require a commensurate increase in creation of job opportunities. This population stands at 156,097 in 2018, representing about 49.8 per cent of the county total population. This age group is projected to grow to 167,372 and 181,172 in 2020 and 2022 respectively. Of the total labour force, 51 per cent are female and are projected to dominate the age group. Due to the expected increase in the labour force, the county will need to spur growth of many other sectors including manufacturing, processing and trade so that they become more productive.

Currently, 83 per cent of the labour force is engaged in subsistence agricultural and livestock activities. There is therefore a need to ensure that these economic activities are profitable through the support of modern methods and value addition ventures.

The Dependent Population: The dependent population (under 15 years and above 64 years) stands at 164,984 in 2018 and is projected to increase to 177,223 and 185,490 in 2020 and 2022 respectively. The challenge facing the county is to ensure that this dependent population has adequate food, water and social amenities such as schools and hospitals. The older persons cash transfer and OVC cash transfer programs will be scaled up to take care of the growing needs of the county's old people and vulnerable children respectively.

2.3.5.2. Urban population

The county has two urban areas namely Hola and Madogo having a total projected population of 41,586 in 2018 as indicated in Table 1-7. This population represents 13.8 per cent of the total population and is expected to increase at the same rate by the year 2022. This therefore calls for proper town planning

Table 1-4: Population Projections by Urban Centre

	2009			2018			2020			2022		
Urban Centres	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Hola	8,470	8,867	17,337	11,095	11,615	22,711	11,782	12,334	24,115	12,510	13,096	25,606
Madogo	8,152	7,672	15,824	10,679	10,050	20,729	11,339	10,672	22,011	12,040	11,331	23,372
Garsen	1,484	1,420	2,904	1,944	1,860	3,804	2,064	1,975	4,039	2,192	2,097	4,289
Total	18,106	17,959	36,065	23,718	23,526	47,244	25,185	24,980	50,165	26,742	26,525	53,267

Source: Kenya National Bureau of Statistics, Tana River 2018

2.3.5.3. Population Density and Distribution

In 2018, the estimated population density of Tana River County is eight (8) persons per square kilometre. This is however expected to increase to nine (9) persons per square kilometre by 2022.

Table 1-4: Projected Population Densities by Constituency

Constituency	Area Sqkm	2009	Density	2018	Density	2020	Density	2022	Density
Galole	9657.3	60,866	6	79,732	8	84,663	8	89,898	9
Bura	13191.5	82,545	6	108,131	8	114,817	8	121,917	9
Garsen	16013.4	96,664	6	126,626	8	134,457	8	142,771	9
Total	38862.2	240,075	6	314,490	8	333,937	8	366,661	9

Source: Kenya National Bureau of Statistics, Tana River 2018

Table1- 5: Population Projection by Constituency / Sub County

Constituency	2009			2018			2020			2022		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Bura	41,686	40,859	82,545	54,607	53,524	108,131	57,984	56,834	114,817	61,569	60,348	121,917
Galole	29,467	31,399	60,866	38,601	41,132	79,732	40,988	43,675	84,663	43,522	46,376	89,898
Garsen	48,700	47,964	96,664	63,795	62,831	126,626	67,740	66,716	134,457	71,929	70,842	142,771
Total	**119,853**	**120,222**	**240,075**	**157,003**	**157,487**	**314,490**	**166,712**	**167,225**	**333,937**	**177,021**	**177,566**	**366,661**

Source: Kenya National Bureau of Statistics, Tana River 2018

2.4. Infrastructure and Access

2.4.1. Road, Railway Network, Ports and Airports, Airstrips and Jetties

The total road network in the county is 3,377km with about 55 per cent in motorable condition. The total road network is composed of 1,108km (class A – E) of classified roads and 2,269km (class U) of unclassified roads. Out of this only 449km is bitumen surfaced. The major roads in the county include the Madogo – Hola – Malindi road which is dilapidated and impassable at various points during rains. The Kenya National Highways Authority (KeNHA) has however put in place plans to upgrade the 330km stretch to bitumen standard, and the project is in the design phase and construction is set to begin as soon as funds are available. The county boasts of seven airstrips with major ones located at Hola, Bura and Garsen. The county has a 76Km sea front with Kipini operating as a fish landing site which can be potential sea port for fishing vessels. The LAPSSET project will potentially open up the county with road and rail network.

2.4.2. Post and Telecommunications: Post Office, Mobile Telephony, Landline

The county is served by three mobile phone service providers that cover 55 per cent of the county. These services are however concentrated along the Garissa- Malindi road. There are three post offices in the whole county located at Bura, Hola and Garsen. The landline is in deplorable state and does not function in most areas. There are five courier service providers in the county. Internet connectivity is still low with most people using modems from mobile phone service providers. Investments in DSTV, Zuku and other free to air satellite television has nevertheless made access to local and international broadcasts possible in the county . The Kenya Broadcasting Corporation (KBC) Radio is the only media house which has a signal in the county.

2.5. Financial Institutions: Banks, SACCOs and Micro Finance Institutions

There are two banks (KCB and Equity bank), three bank agencies (KCB, Equity bank and Coop bank), one SACCO, one Micro-Finance Institution (MFI) and 10 village banks in the county. The banks, SACCO and the microfinance institutions are located in Hola and Garsen as these areas have electricity connection with many commercial activities. These institutions will help to boost the county's economy through provision of various financial services and credit facilities.

2.6. Education Institutions: Primary/Secondary Schools, Polytechnics, Colleges, Universities

The County has 315 ECDE centres, 152 primary schools and 13 secondary schools. Some of the structures in the institutions are dilapidated. Although the National Government Constituencies Development Fund (NG-CDF) from the three constituencies in the county has been putting concerted efforts to build classrooms, administration blocks, dining halls, laboratories and even dormitories, there is still a glaring shortage of the aforementioned structures. There are three youth polytechnics in the county that need to be expanded to accommodate the rising numbers in enrolment.

2.7. Energy and Access

Majority of the population (87.5%) use wood fuel for cooking and 78.2 per cent use kerosene for lighting. Only 0.9 per cent of the households are connected with electricity. There is a lot of potential for the exploitation of renewable energy sources such as solar and wind, and expansion of electricity transmission in the county through the main grid.

2.8. Markets and Urban Centres

There are 10 major trading centres in the county with 24 registered wholesale traders and 773 registered retail traders. There are two registered Jua Kali associations in the county with 31 members. These trading centres are the main economic hubs of the county since major business activities are done here.

2.9. Housing

Tana River County has 547 pool institutional/government houses that accommodate civil servants. The houses are however, inadequate and not properly maintained. This is due to insufficient funds, lack of cheap and durable raw materials, among others.

Addressing the housing issue in the county will require the operationalization of the National Housing Policy in the county, identification and disseminating of low cost building materials and appropriate building technology, and creation of enabling environment to encourage investors to venture into housing sub-sector.

Majority of the people (41.1 per cent) of Tana River live in mud/wood walled houses, with about 29.5 per cent living in grass straw houses. Twenty six per cent of the roofing materials used are corrugated iron sheets and 13.9 per cent *makuti*.

2.10. Land and Land Use

The land in the county is largely non-arable covering 29,798.7 km2. The rest is either under forest 3,457 km2, arable land covering 2,547 km2, and 3,059.5 km2 under national reserves.

2.10.1. Mean Holding Size

The mean holding land size in the county is 4 ha, especially in the irrigation schemes of Hola and Bura. In the settlement schemes of Witu I and Witu II, the mean land holding size is 15 acres while Ngao adjudication area, the mean holding size is 5

acres. Though the mean holding land size is 4 ha, there is a variation on land holding with some farmers in Bura and Hola irrigation schemes having between 0.6 ha and 3 ha.

2.11. Crop, Livestock and Fish Production

2.11.1. Main crops produced

The main crops produced in the county are mangoes, cowpeas, bananas and green grams. Farmers in the county mainly rely on rain fed and flood recession farming systems with only a few practicing irrigated farming. Maize production also takes place in the irrigation scheme.

2.11.2. Acreage under food crops and cash crops

The total acreage of farms under food crop production is 7,527 hectares while that under cash crop production is 7,063 hectares

Figure; 2-3: Irrigated watermelon farm
Source; Kenya News Agency

2.11.3. Average farm sizes

The arable area in the county is 2,547 Km2 with the average farm size being 0.71 ha. Farmers normally grow subsistence crops.

2.12. Irrigation Infrastructure and Schemes

2.12.1. Irrigation Potential

Irrigation sector in Agriculture department has a commitment in enhancing agricultural productivity through irrigation development. Although irrigation will include private and public participation and partnership, the mandate to provide policy guidelines rests with the department.

Tana River County is endowed with great Irrigation potential. The county irrigation potential areas range between 180,000ha -

200,000ha, out of which only 2% has been put under irrigation development. On the other hand, about 10% of the exploited potential is under the large scale irrigation schemes (Bura, Hola and Tana Delta).

Out of all area identified and developed for Irrigation, only about 50% is under effective and efficient Irrigation agriculture.

Most of the on-going irrigation practice in Tana River County is group based, under the pump- fed group irrigation category, where by groups of between 10- 200 households have been formed and have invested in irrigation. Most of these groups cannot afford to develop their farms due to high cost associated.

Previous efforts by the county and other development partners, irrigation development has produced inconsistent results due to various socio-economic problems which need to be overcome. The main socio-economic problems and constraints which hinder irrigation development are issues related to; skills, weak farmers organizations, infrastructure, resource use conflicts, drought and floods, gender, and dependency syndrome

2.13. Agricultural extension, training, research and information services

The department of agriculture is mandated to provide agricultural extension activities in the county. Currently there are 27 field extension officers to cover 31,055 farmers spread in 15 wards in 3 sub counties. This gives a staff to farmer ratio of 1:817 which is lower than the ideal 1: 400. There is urgent need to recruit more personnel in this field so as to increase the ratio and also replace those staff who by attrition have left or are leaving the service in the next five years. 65% of the current extension staff are beyond the age of 50 and, therefore, prudent human resource management is required so as to have a smooth succession.

Extension staff requires regular training to keep up with fast changing farming technologies. More resources should be directed toward capacity building of staff so as to make them relevant.

All agricultural research for the region is under the mandate of KALRO in Kilifi County. Our county relies on research information from this institution and also sister institution in Machakos (Katumani). Other services like soil analysis and maize aflatoxin level determination are referred to the National Agricultural Labs, Kabete.

Market Information services are still undeveloped in the county. One of the stakeholders in the county namely WHH/GAA has however started collecting market information in 3 major markets in the county.

2.14. Water and sanitation

2.14.1. Water resources and water quality

River Tana is the longest river in Kenya covering about 850 Km long with catchments area of about 95,000 Km2 traversing the landscape from its source in Aberdare Ranges in central Kenya to the Indian Ocean. It discharges on average 4,000 million litres of fresh water annually into the ocean near Kipini at Ungwana Bay. The Seven Folks Hydro Electric power Stations and Bura and Hola irrigation schemes are located upstream of the delta. Tana River supports industrial and other socioeconomic

functions such as power generation upstream, agriculture, livestock, tourism and micro-enterprises found within the basin.

Water in the county remains a problem for domestic use, livestock and irrigation. The county has 492 shallow wells, 120water pans, 8 Small earth dams and 36 boreholes. The proportion of households with access to piped water is 17% while proportion of households with access to portable water is 40%.

2.14.2. Water supply schemes

Tana River County has a total of five (5) Gazetted Water Supplies, three (3) community water supplies, 36 Boreholes, 492 shallow wells and 120 water pans. Some of these water supplies were done by the County Government and other by the National Government through development partners. The major water supplies serve a total area of 140Km2, with a total production of 6610.m3/day. The total population served is 50,000 directly by these water supplies. The number of storage tanks in these water supplies range between 10m3 to 500m3. This gives the County a total storage capacity of 2265m3 with a total pipe network covering 200Km.

The county is served by two Water Service Providers (WSP) namely Tana Water and Sanitation Company and Lamu Water and Sanitation Company and Community managed supplies with majority of these water supplies concentrated in Tana Delta Sub-County. In its effort to ensure an integrated water resources management and development through stakeholder's participation to ensure availability and accessibility to water, The Ministry of Water & Irrigation through Coast Water Services Board (CWSB) and development partners have been rehabilitating most of these water supplies within each sub-county and assisting community water supplies. There are also institutions with private water supplies which, other than supplying their various institutions, also serve the neighbourhoods.

Table 1-6 Gazetted Water Supplies

Name of Water Supply	Sub-county	Status	WSP
Madogo Water supply	Tana North	Partial treatment	TAWASCO
Bura Water Supply	Tana North	Full treatment	TAWASCO
Hola Water Supply	Tana River	Full treatment	TAWASCO
Garsen Water Supply	Tana Delta	Partial treatment	TAWASCO
Ngao Water Supply	Tana Delta	Partial treatment	TAWASCO

Table 1-7 Major Community Water Supplies

Name of water supply	Sub-county	Service area	Management
Chardende	Tana North		CBO/County Govt
Bokawan	Tana North		CBO
WIWA	Tana Delta		CBO
Kipwa	Tana Delta		CBO
Katsangani	Tana Delta		CBO

Proposed new water supplies include Kipini Water Supplies, Handarako Water Supplies, Wema Water Supplies, Emmaus

Water Supplies, Kelokelo Water Supplies and Boji Water Supplies.

2.14.3. Water sources distance to nearest water point

The county's water resource comprises of both ground and surface water. Surface water consists of permanent rivers such as River Tana and ground water sources that include; boreholes, shallow wells, and earth pans. In Tana River County, the average distance to nearest water point (either surface or underground) is four kilometres.

The River Tana

2.14.4. Sanitation

The reference on sanitation is on housing-ventilation and rendering of floors and walls of buildings, provision of dish-racks, cloth hang-line, waste disposal at household level and public in general at market centres. At the market centre level the attention is on waste disposal. Of all the centres, only Hola has a Public toilet, collection of waste is done by the county government within Hola town and there is no designated disposal point for the waste. The situation in most of our institutions especially schools, is reasonably good as they have latrines albeit not adequate.

Generally, the average sanitation level in the county is at 48 per cent. As much as 40 percent of the households in the county have pit latrines, five percent of which are uncovered. Open defecation by adults and disposal of children feaces in the open is still rampant in most rural areas of the county. The use of buckets is disappearing and only three households still use them. The County has never developed a sewerage system but Coast Water Services Board commissioned a feasibility study on Water and Sanitation Improvement. The project objective was to identify sound, feasible and rational strategies through to 2040 for

the development of wastewater management services for the growing urban centres on the Coast region including developing logical Framework Matrix for Planning, Design, implementation and Evaluation of the Wastewater Management Strategies.

2.15. Ranches

There are about seven ranches in the whole county namely Wachu-30,725ha, Kibusu-25,000ha, Haganda-12,000ha, Kitangale-20,000ha, Idasa Godana-51,000ha, Giritu-43,340ha and Kondertu-20,000ha. Out of the seven ranches only Idasa Godana ranch is active with about ten per cent area being exploited.

2.16. Tourism and Wildlife

Tourism plays a very crucial role in the Kenyan economy and is a major source of potential growth and employment. As such, the County Government of Tana-River is committed in working with the private sector in removing the bottlenecks that hinder its growth by strengthening the linkages between tourism and other sectors of the economy

To diversify tourism the county government will implement marketing campaign of Tana- River county as a major tourism destination by marketing domestic tourism, rehabilitate tourism infrastructure, diversify and develop tourism products , develop high value cultural centres and festivals and develop niche products such as conference, eco based, cultural, bird watching and heritage tourism.

The main tourist attractions in the county are Kora National Reserve, Arawale National Reserve and Tana Primate National Reserve.

The main wildlife found in the county is Red Columbus Monkey, Tana River Crested Mangabey monkeys, Elephants and Heartbeast (Hirola). Tana River delta is one of the six deltaic areas of Eastern Africa and the largest freshwater wetland systems in Kenya. The Delta is rich in biodiversity supporting diverse species of flora and fauna. It is internationally important for the survival of no less than 22 species of birds making the delta one of the key sites in the country for water bird conservation. It also holds the breeding sites of valuable edible fish and shellfish and a rich biodiversity of other wildlife

There are no tourist class hotels in Tana River County. All hotels in the county fall under unclassified category.

2.17. Industry

There is a mango and honey processing factory in Tana River County though there is a great potential for agro-based industries for maize, milk and meat processing.

2.18. The blue economy

Tana River County has a coastline of about 76 km and forms one of the richest fishing areas of crustaceans around Malindi – Ungwana Bay especially prawns which are highly valued crustaceans. The county needs to tap into it by having right investment towards value addition and use of modern fishing technologies to increase fish catches thus improving household incomes, food security and employment creation to fisher folk. This will boost the county share of revenue.

2.19. Major DevelopmentChallenges

2.19.1. Unemployment levels

A majority of the labour force composed of 42.8 per cent in the county is unemployed. Unemployment levels are still very high in the county with poverty incidence standing at 76.9 per cent.

2.19.2. Landlessness and poor land management

The incidence of landlessness is high at 95.7 per cent with a majority of the communities in the county living as squatters since they hold no titles to the land they occupy. There has been a major invasion by squatters into Chakamba area of Tana Delta which is a designated grazing corridor; Kurawa holding grounds, a Government land for livestock holding; Majengo area by Ijara people and Madogo area is also invaded by people from Garissa in search of pasture and water for their animals. Spatial planning is therefore necessary to determine the land use patterns in the county.

Only about 4.3 per cent of the land in the county has title deeds. Most land owners have no title deeds since the land is communally held in trust by the County Government/Government of Kenya.

2.19.3. Environment and Climate change

Shifting weather patterns, for example, threaten food production through increased unpredictability of precipitation, rising sea levels contaminate coastal freshwater reserves and increase the risk of catastrophic flooding, and a warming atmosphere aids spread of pests and diseases once limited to the tropics

Climate change has also changed recharge level of all the water sources in the county and made it very low due to prolonged drought spell. The level of flow of River Tana is at 25 percent of its normal level. Water pans had a recharge of less than 50 percent of their normal level. Underground water sources including boreholes and shallow wells were equally affected by poor recharge (Less than 50 percent of normal). It is alarming in the Tana delta area especially the Ngao water works intake where the river is almost drying up due to drying of Matomba channel mouth. Water stressed areas are Chifiri, Hakoka, Kesi, Roka, Koticha Mlima and Koticha odwani in Tana River sub-county. Other water stressed wards are Bangale, Hirimani and Sala Wards in Tana north sub county as well as Kipini west ward in Tana delta sub- county

2.19.4. Poor Access to Quality Social Services

2.19.4.1. Poor healthcare and nutrition

There are 71 health facilities in the countywith two level four public hospitals located in Hola and Ngao. There is one sub-county hospital in Bura, five public health centres, 40 dispensaries and 20 private clinics, two mission dispensaries and one private health centre. The bed capacity is 158 while the average distance to a health facility is six kilometres. The county has six doctors, 126 nurses, 1,149 CHEWs, 25 PHOs, and three nutritionists against a projected population of 265,854.

Tana River County has low numbers of healthcare providers owing to difficulties in attracting and retaining them. There is a

chronic shortage personnel in almost all areas of medical practice and management. There has never been a medical officer specialist in the county. However, the situation has been steadily improving since devolution, with core clinical staff numbers growing in almost twofold. There still remains a big room for improvement as shortage of staff exists in all critical areas.

In service capacity building has been weak, both in technical and management areas. There is need to provide opportunities for training in specialty areas for all technical staff. Management staff need to be offered opportunities to build their capacity in training.

On the advent of devolution, the number of health facilities has tremendously increased. However there is need for expansion of the current facilities to enable them offer services in line with best practices. Some existing facilities need to be improved. Laboratories need to be refurbished to mirror current best practices in infection control and meet standards towards accreditation. Hospitals need to be improved to offer more patient friendly environment to clients. Supportive infrastructure like offices need to be equipped with furniture and other office equipment to enable management officers discharge their duties in a supportive environment. There is need to take inventory of exiting laboratory, pharmacy and other hospital equipment with the view of establishing obsolescence and shortage of critical equipment due for replacement. This will increase quality service delivery and will significantly reduce referrals.

There is need to increase staff houses in most facilities, being a factor towards retention of the health workforce.

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3.0. REVIEW OF EXISTING POLICIES, LEGAL, REGULATORY AND INSTITUTIONAL FRAMEWORKS

3.1. Review

This chapter presents a review of policy, legal and regulatory frameworks applicable to environmental management of the proposed Giritu Sugar Factory Project at National and international levels. Kenya Government has a wide range of policy, institutional and legislative frameworks to address the major causes of environmental degradation on ecosystems emanating from industrial and economic development programs. However, they are spread over several sectors. In spite of this, the Kenya legal and institutional framework is currently undergoing several changes to be aligned with the requirement of the new constitution. The literature reviewed in this section puts into consideration the anticipated changes and the current laws that govern natural resource sharing, management, utilization and protection.

ESIA studies are carried out in order to identify potential positive and negative impacts associated with the proposed project with a view to taking advantage of the positive impacts while providing effective mitigation measures for the negative effects. The requirements on ESIA are contained in sections 58 to 67 of the Act.

According to section 68 of the environmental management and coordination Act (EMCA) 1999, reviewed 2105) the Authority shall be responsible for carrying out environmental audits on all activities that are likely to have a significant effect on the environment.

Environmental auditing (EA) is a tool for environmental conservation and has been identified as a key requirement for existing facilities to ensure sustainable operations with respect to environmental resources and socio-economic activities in the project neighborhoods. The government has established regulations to facilitate the process on ESIAs and environmental audits. The regulations are contained in the Kenya Gazette Supplement No. 56, legislative supplement No. 31, and legal notice No. 101 of 13th June 2003.

3.2. Policy Frameworks

3.2.1. Kenya Vision 2030

Vision 2030 is geared towards transformation of Kenya into an industrialized middle-income country by 2030. The blueprint recognizes that Kenya is a water scarce country and further that the economic and social development envisaged in the vision 2030 will require more high quality water supplies. The water and sanitation sector goal in line with the Vision 2030 is “to ensure that improved water and sanitation are available and accessible to all”.

It is based on the 3 pillars of political, social and economic advancement and it aims to transform the economy and achieve sustainable growth. Environmental considerations of development are contained within the social and economic pillar just like for Agriculture. The vision aims at reducing poverty through creating opportunities for the poor by making

institutions stronger.

It recognizes Agriculture as the mainstay of the country's economy with predominantly small-scale farmers who accounts for over 75% of agriculture output. The government on the other hand remains committed to improving agricultural productivity for food security, poverty reduction, employment and wealth creation. Vision 2030 further point out that food crop production makes significant contribution to food security and Gross Domestic Product. However, the levels of productivity are below potential and over-dependency on rain-fed agriculture was identified as being one of the causes and therefore intensification and expansion of irrigation is critical to increasing agricultural productivity in Kenya.

One of the strategies proposed is to construct water and sanitation facilities to support industries and the growing urban population. Regarding environment, the Vision states that Kenya aims to be a nation living in a clean, secure and sustainable environment by 2030. The goals for 2012 are: (i) to increase forest cover from less than 3% at present to 4%; and (ii) to lessen by half all environment related diseases. Specific strategies involve: promoting environmental conservation for better support to the economic pillar flagship projects and for the purposes of achieving the Millennium Development Goals (MDGs); improving pollution and waste management through the design and application of economic incentives; and the commissioning of Public-Private Partnerships (PPPs) for improved efficiency in water and sanitation delivery.

The Giritu Sugar project is in line with Vision 2030 in that it is geared towards promoting environmental conservation for better support to the economic pillar flagship projects and for the purposes of achieving the Millennium Development Goals (MDGs). The project has a catchment management component, which aims at combating climate change.

3.2.2. 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, 14 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 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,

combat desertification and halt and reverse land degradation, and halt biodiversity loss and,

- ✓ Conservation and sustainable use of oceans, seas and marine resources

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.

3.2.3. National Environmental Action Plan (NEAP)

According to the Kenya National Environment Action Plan (NEAP, 1994) the Government recognized the negative impacts on ecosystems emanating from industrial, economic and social development programmes that disregarded environmental sustainability. Under the NEAP process Environmental Impact Assessments were introduced targeting the industrialists, business community and local authorities.

Giritu Sugar Factory is abiding by this policy guideline by ensuring that the environmental and social baseline surveys are carried out and then an ESIA that will develop an Environmental Management and Monitoring Plan to manage the Environment and ensure that the post project period will have better environment than it was before the project.

3.2.4. National Policy on Water Resources Management and Development

While the National Policy on Water Resources Management and Development (1999) enhances a systematic development of water facilities in all sectors for promotion of the country's socio-economic progress, it also recognizes the by-products of this process as wastewater. It, therefore, calls for development of appropriate sanitation systems to protect people's health and water resources from institutional pollution.

Industrial, business and large scale agricultural development activities, therefore, should be accompanied by corresponding waste management systems to handle the wastewater and other waste emanating there from. The same policy requires that such projects should also undergo comprehensive EIAs that will provide suitable measures to be taken to ensure environmental resources and people's health in the immediate neighborhood and further downstream are not negatively impacted by the discharges. As a follow-up to this, EMCA 1999 requires annual environmental audits to be conducted in order to ensure that mitigation measures and other improvements identified during EIAs are implemented.

The key objectives of the Policy include:

- To ensure that from the onset, all development policies, programmes and projects take environmental considerations into account,
- To ensure that an independent environmental impact assessment (EIA) report is prepared for any industrial venture or other development before implementation,

- To come up with effluent treatment standards that will conform to acceptable health guidelines.

Under this paper, broad categories of development issues have been covered that require a "sustainable development" approach. These issues relate to waste management and human settlement. The policy recommends the need for enhanced reuse/recycling of residues including wastewater, use of low or non- waste technologies, increased public awareness raising and appreciation of a clean environment. It also encourages participation of stakeholders in the management of wastes within their localities. Regarding human settlement, the paper encourages better planning in both rural and urban areas and provision of basic needs such as water, drainage and waste disposal facilities among others.

The proposed project is in line with this sectoral policy as it will involve inter-basin transfer and also serve to increase access to water in the catchment through rehabilitation and management of the catchment. It will also increase access of water to the beneficiaries.

3.2.5. The National Poverty Eradication Plan (NPEP) and the Kenya Poverty Reduction Strategy (KPRS)

The NPEP has the objective of reducing the incidence of poverty in both rural and urban areas by 50 percent by the year 2015 as well as strengthening the capabilities of the poor and vulnerable groups to earn an income. The paper further aims at narrowing the gender and geographical disparities as well as creating a healthy, educated and more productive population. This plan has been prepared in line with the goals and commitments of the World Summit for Socio Development (WSSD) of 1995. Just like the main objectives of improving the irrigation schemes in the project area, the plan focuses on the four WSSD themes of poverty eradication, reduction of unemployment, socio integration of the disadvantaged people through improved agricultural productivity and food security.

The PRSP on the other hand has the twin objectives of poverty reduction and economic growth. The paper articulates Kenya's commitment and approach to fighting poverty; with the basic rationale that the war against poverty cannot be won without the participation of the poor themselves.

The proposed development is seen as setting an enabling environment for robust and intensive livestock and crop production that will lead to improved incomes and hence better living standards. Thus, viable strategies have been considered in the design to ensure that the proposed Project yields maximum benefits to the Proponent and the local communities.

3.2.6. Land Policy

The National Land Policy in section 3.4 on Environmental Management Principles provides for the policy actions for addressing the environmental problems such as the degradation of natural resources, soil erosion, and pollution of air, water and land. The policy advocates for environmental assessment and audit as a land management tool to ensure environmental impact assessments and audits are carried out on all land developments that may degrade the environment and take appropriate actions to correct the situation. Public participation has also been indicated as key in

the monitoring and protection of the environment. Section 3.4.3.3 advocates for the Implementation of the polluter pays principle which ensures that polluters meet the cost of cleaning up the pollution they cause, and encourage use of cleaner production technologies. In section 131 (d) the government undertakes to provide mechanisms for resolving grievances arising from human/wildlife conflicts for sustainable management of land based natural resources.

The proposed project works shall implement the Environmental and Social Monitoring Plans to ensure that no rivers and streams within the project area are polluted by the subsequent activities during construction and operational phases.

3.2.7. Principles of Land use

From the constitution of Kenya 2010, Land in Kenya shall be held, used and managed in a manner that is equitable, efficient, productive and sustainable, and in accordance with the following principles--

a. Equitable access to land;
b. Security of land rights;
c. Sustainable and productive management of land resources;
d. Transparent and cost effective administration of land;
e. Sound conservation and protection of ecologically sensitive areas;
f. Elimination of gender discrimination in law, customs and practices related to land and property in land; and
g. Encouragement of communities to settle land disputes through recognized local community initiatives consistent with this Constitution.

These principles shall be implemented through a national land policy above developed and reviewed regularly by the national government and through legislation. The development of the GirituSugar Factory project shall observe the above principles in its entire project cycle i.e. construction and operation.

3.2.8. National Food and Nutritional Security Policy 2011

Food and Nutritional Security Policy recognizes that over 25% of Kenya's population suffers from chronic food insecurity and poor nutrition. Food availability and access are influenced by the ability of individuals and households to produce their own food in sufficient quantity and to generate income to purchase food, the adequacy of infrastructure, effectiveness of food distribution systems and the affordability of food prices.

Improving food security and nutritional situation in the country is faced by high poverty levels and food shortage. The policy therefore addresses existing food insecurity and poor nutrition through synergy with other sectoral policies and strategies. The government through the policy is committed to increase the quality and quantity of food by improving its availability, accessibility and affordability. To achieve these, it aims to improve and diversify food production, improve storage and value addition, maintain strategic reserves, improve the food market and trade in both rural and urban areas,

create employment opportunities, improve the regulatory and institutional framework. The Project key stakeholders need to ensure the implementation of the policy through supporting agricultural production in the project area and distribution of the products to support the government's efforts in meeting food and nutritional security.

The project is in line with this policy since it is an irrigation project and is geared towards improved food production and diversity hence improving people's health.

3.2.9. Draft National Irrigation and Drainage Policy 2016

The proposed National Irrigation and Drainage policy if adopted will facilitate coordinated resolution of sector constraints and promotion of development of irrigation sector in the country. The Sector growth is planned to achieve accelerated development of irrigation infrastructure, increased productivity per unit volume of water, increased water harvesting and storage, improved scheme management, enhanced stakeholder participation and improved business orientation in the sector. The proposed policy seeks to stimulate irrigation development through targeted technical support, effective co-ordination of the sector, institutional reforms, and the enactment of a comprehensive legal framework for irrigation development.

To achieve the goals of the proposed policy, several policy statements have been suggested including;

- Increasing land under irrigation and drainage,
- Increasing agricultural productivity (crops, livestock, aquaculture),
- Improve quality of agricultural produce,
- Improve marketing and market linkages,
- Increase local processing and better handling of produce,
- Increase incomes of farmers and the full value chain,
- Mitigating drought, famines and other disasters,
- Enhance Public-Private Partnerships,
- Improve service delivery of all sectors in irrigation and drainage,
- Increased farmer participation in planning, development and management,
- Support the ownership of irrigation schemes by local organizations
- Enhanced gender equity in irrigation,
- Improved resource mobilization for irrigation,
- Greater utilization of science and technology in irrigated agriculture,
- Improved research and innovation,
- Improve physical and social infrastructure,
- Comply with environmental and health requirements,
- Enhance sustainability of the irrigation sector, and

- Legal, regulatory and institutional framework for Policy implementation.

With enactment of the proposed policy statements by various stakeholders, the irrigation sector is bound to improve food productivity in the country. Implementation of the policy statements will come in hand to solve challenges that can affect community irrigation scheme to be implemented in Giritu Sugar Factory project.

Once this project is accepted and implemented, it will gain immensely from the approved policy through sectoral support / technical training of farmers

3.2.10. Sessional Paper No. 6 (1999)

The key policy objectives of Sessional Paper No. 6 of 1999 include:

- Ensuring that all development projects at the inception stage and programs, as well as policies, consider environmental conditions;
- Ensuring that an EIA report is prepared for any undertaking or development project before implementation; and
- Coming up with effluent treatment standards that will conform with acceptable health guidelines;

It is important to note that issues of waste water management and human settlements are given prominence and, therefore, the policy recommends re-use and recycling of residues (i.e. waste water), use of low waste generation technologies and increasing public awareness on the benefits of a clean environment. It also recognizes the role of stakeholders in all these initiatives within their localities.

The paper encourages better planning in rural and urban areas in the provision of needs, i.e. water, drainage system, waste disposal facilities, etc.

This assessment has been undertaken to be in line with this sessional paper that requires EIA for proposed projects so that impacts can be identified and mitigated.

3.2.10.1. The shared surface water resources

They include;

a. Tana River which is shared by with several counties in Kenya i.e Nyandarua County, Nyeri County, Garissa County and Tana River County .

b. Lake Victoria, which is shared with Tanzania and Uganda. The lake is the world's second largest fresh water lake and with a catchment area which extends to the five East African countries. It also forms part of the Nile River System and contains about 50% of Kenya's surface water resources;

c. Lake Turkana, which is shared with Ethiopia, is the world's second largest desert lake with a catchment

extending to the Ethiopian highlands and drained by River Omo;

d. River Daua, which is shared with Ethiopia and Somalia[1]; and

e. Rivers Mara, Umba, Lumi and Pangani and Lakes Natron, Jipe and Chala which are shared with Tanzania.

The proposed project is to be implemented on Tana River that is also shared with other counties hence triggering application of the recommendations in this policy.

3.3. LEGAL FRAMEWORKS

3.3.1. Constitution of Kenya, 2010

Environmental management and natural resources utilization is enshrined in the Kenya constitution 2010 under several articles.

In article 69 of the Constitution of Kenya, 2010, the State clearly undertakes to carry out the following:

- Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
- Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;
- Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;
- Encourage public participation in the management, protection and conservation of the environment;
- Protect genetic resources and biological diversity;
- Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;
- Eliminate processes and activities that are likely to endanger the environment; and
- Utilize the environment and natural resources for the benefit of the people of Kenya.

The constitution in article 42 emphasizes the need for a clean and healthy environment through management of substances that may pollute the environment or cause harm to human health. The right to a clean environment is further enforced by article 70. Article 186 and the fourth schedule allocate functions of natural resources management and environmental protection to both the national and county governments. In article 2 of the fourth schedule, the national government governs the use of international waters and water resources. Indian Ocean where the river Tana drains is an international water body that will be affected directly or indirectly by the development. The national government is required to protect the environment and natural resources with a view of establishing a durable and sustainable system as stated in article 22 of the fourth schedule.

The county government on the other hand shall Control air pollution, noise pollution and other public nuisances as stipulated in article 3 of the fourth schedule and in article 10, the county government shall implement specific national government policies on natural resources and environmental conservation. Some of the development impacts will be a concern to the county government hence need for collaboration between NELSAP, the contractor and the local government.

The principles of land policy that ensure land is held, used and managed in a manner that is equitable, efficient, productive and sustainable is set out in article 60 of the constitution. Giritu Sugar Limited intends to develop the land in the proposed Giritu Sugar factory and irrigation scheme to ensure its efficient management and utilization. Proper land management by regulating the use of any land, or any interest in or right over any land, in the interest of defending, public safety, public order, public morality, public health, or land use planning is ensured by the constitution in article 66.

In regard to environmental protection and natural resources management, article 62 sub-article 1 stipulates what constitutes public land. These include water courses and high flood areas that are common in the project area. The public land areas are held by the national government in trust for the people of Kenya and shall be administered on their behalf by the National Land Commission as stated in article 62 sub-article 3. The land commission shall also monitor and have oversight responsibilities over land use planning throughout the country regardless of the classification as stated in article 67-2(h).

For the purposes of this project, the constitution of Kenya provides for sound environmental management and sustainability and therefore this study provides one of the tools through which this can be achieved.

3.3.2. The Environmental (Impact Assessment and Audit) Regulations, 2003

The Environmental Impact Assessment guidelines require that a study be conducted in accordance with the issues and general guidelines spelt out in the second and third schedules of the regulations. These include coverage of the issues on schedule 2 (ecological, social, landscape, land use and water considerations) and general guidelines on schedule 3 (impacts and their sources, project details, national legislation, mitigation measures, a management plan and environmental auditing schedules and procedures. The Act further stipulates that ***No*** licensing authority under any law in force in Kenya shall issue a license for any development 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 NEMA. The project proponent was also required to pay mandatory fees that are due before processing of EIA or EA license but NEMA no longer charges for this services.

This report process and structure/format has adhered to this regulation

3.3.3. Environmental Management and Coordination Act, 1999

The main objectives of EMCA (1999) and the related regulations are to provide for the establishment of an appropriate legal and institutional framework, including procedures for the management of the environment in Kenya. The Act further aims to improve the legal and administrative coordination of the diverse sectoral initiatives in the field of environment, to enhance the national capacity for its effective management. In addition, the Act seeks to harmonize all the sector specific legislation touching on the environment in a manner designed to ensure protection of the environment. This is in line with national objectives and sustainable development goals enunciated in Agenda 21 of the Earth Summit. As such, in terms of environmental management, EMCA (1999) provides a comprehensive and an appropriately harmonized legal and institutional framework for the handling of all environmental issues in Kenya, and supersedes all sectoral laws.

Part VI of EMCA (1999) makes provision for the carrying out of EIA. It is mandatory for any proponent of a project to submit a project report to NEMA in a prescribed format. After reviewing the proponents‟ report, and NEMA is satisfied that the proposed project is likely to have significant negative impacts in the environment, it will direct the proponent of the project to undertake at his or her own expense an environmental impact assessment study and prepare a report. NEMA shall publish such a report and invite comments thereon from the public before deciding to issue an environmental impact license. NEMA, at any time after issuing the environmental impact assessment license, may direct the proponent to submit a fresh environmental impact study, where there is substantial change in the project or where environmental threats, not earlier foreseen, have emerged.

Environmental Management and Coordination Act (EMCA), 1999 in its Second Schedule 4 (b) requires river diversions and water transfer between catchments undergo Environmental and Social Impact Assessment (ESIA). A report will be compiled to comply with EMCA and the Environmental (Impact Assessment and Audit) Regulations, 2003.

Some key Sections of the Act relevant to the proposed project are:

3.3.3.1.1. Environmental Impact Assessment and Audit Regulations 2003 (Legal Notice No. 101) and Environmental Impact Assessment and Audit Regulations (Amendment) 2009

Regulation 24 – Annual Environmental Audit

Annual environmental auditing after presentation of an EIA study report shall be undertaken by the licensee to ensure implementation of environmental management plan is audited on regular basis, an audit report submitted to NEMA annually, and ensuring that the criteria to audit is based on environmental management plan developed during the EIA process or after the initial audit.

Regulation 40 - Monitoring changes after project implementation Monitoring by NEMA and Lead Agencies shall be done to establish any possible changes in the environment and their possible impacts, immediate and long term effects of its operations, identify and determine parameters and measurable indicators, and conduct changes that

occurred after implementation. The aim of this section is to provide the Proponent and Contractors with quick reference to most critical legal and policy provisions to enable proper planning and impact assessment during project planning and implementation. The Environmental Management and Coordination Act (EMCA, 1999) is the main framework environmental law in Kenya. The Act guarantees every Kenyan the right to a clean and healthy environment. However, there are other sectoral laws that guide management of various environmental components. It is worth noting that if a sectoral law conflicts with EMCA, EMCA prevails and the other law is null and void to the extent of that inconsistency.

The proponent-Giritu Sugar Factory will submit an Environmental Audit report yearly in accordance to these regulations

3.3.3.2. Water Quality Regulations, 2006, (Legal Notice No.121)

Water Quality Regulations apply to water used for domestic, industrial, agricultural and recreational purposes; water used for fisheries and wildlife purposes; and water used for any other purposes. Different standards apply to different uses. These regulations provide for the protection of lakes, rivers, streams springs, wells and other sources. The overriding objective of the regulations is to protect human health and the environment. Proper enforcement of the regulations can lead to marked reduction in water-borne diseases. The regulations provide guidelines and standards for the discharge of poisons, toxins, radioactive and other pollutants into the aquatic environment. Standards have also been set for discharge of effluent into the sewer and aquatic environment. The National Environment Management Authority regulates discharge into the aquatic environment.

The regulations provide for the creation of a buffer zone for irrigation schemes of at least fifty (50) metres in width between the irrigation scheme and the natural water body. The First and the Ninth Schedule of the Regulations stipulates standards for sources of domestic water supply and irrigation water respectively (Annex 1 and 2). Persons (real or legal) discharging effluent into the environment are required to submit quarterly discharge monitoring records to NEMA.

The proponent will ensure that the sources of water for Giritu Sugar Factory meet the specified standards provided in these regulations.

3.3.3.3. Environmental Management and Coordination (Air Quality) Regulations, 2008

The objective is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. It provides for the establishment of emission standards for various sources, such as mobile sources and stationary sources.

The proponent and contractor will ensure mitigation measures are put in place to control dust and exhaust emissions especially during construction of the project infrastructure.

3.3.3.4. The Environmental Management and Coordination Act (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009

These regulations were published as legal Notice No. 61 being a subsidiary legislation to the Environmental Management and Co-ordination Act, 1999. The regulations provide information on the following:

- Prohibition of excessive noise and vibration;
- Provisions relating to noise from certain sources;
- Provisions relating to licensing procedures for certain activities with a potential of emitting excessive noise and/or vibrations; and
- Noise and excessive vibrations mapping.

According to regulation 3 (1), no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

Regulation 4 prohibits any person to (a) make or cause to be made excessive vibrations that annoy, disturb, injure, or endanger the comfort, repose, health, or safety of others and the environment; or (b) cause to be made excessive vibrations that exceed 0.5 centimeters per second beyond any source property boundary or 30 metres from any moving source.

Regulation 5 further makes it an offence for any person to make, continue or cause to be made or continued any noise in excess of the noise levels set in the First Schedule to these Regulations, unless such noise is reasonably necessary to the preservation of life, health, safety or property. The First and Second schedules of the regulations have set standards for maximum permissible noise levels at construction sites and intrusive noise levels respectively.

Part II section 3(I) of these Regulations states that: no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. Section 3(2) states that in determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered;

i. Time of the day,
ii. Proximity to residential area,
iii. Whether the noise is recurrent, intermittent or constant,
iv. The level and intensity of the noise,
v. Whether the noise has been enhanced in level or range by any type of electronic or mechanical means, and
vi. Whether the noise can be controlled without much effort or expense to the person making the noise.

Part II Section 4 states that: except as otherwise provided in these Regulations, no person shall (a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations which exceed 0.5 centimeters per second beyond any source property boundary or 30 metres from any moving source.

Part III, Section 11(1) states that any person wishing to (a) operate or repair any machinery, motor vehicle, construction equipment or other equipment, pump, fan, air-conditioning apparatus or similar mechanical device; or (b) engage in any commercial or industrial Activity, which is likely to emit noise or excessive vibrations shall carry out the Activity or Activities within the relevant levels prescribed in the First Schedule to these Regulations. Any person who contravenes this Regulation commits an offence.

Section 13(1) states that except for the purposes specified in sub-Regulation (2) hereunder, no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations. These purposes include emergencies, those of a domestic nature and /or public utility construction. It is expected that the regulations will be relevant to the project during implementation and constructions works or decommissioning phase where construction machinery and vehicles involved will lead to emission of noise and vibrations

The Giritu Sugar Project during construction activities will generate noise and vibrations. The contractor will be required to ensure compliance with the above regulations in order to promote a healthy and safe working environment throughout the construction phase. Most settlements in the project lie along the roads some of which will be used to haul the anticipated high volumes of spoil and relevant noise limits will have to be observed to make sure nuisance is reduced to the minimum.

3.3.3.5. The Environmental Management and Coordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009

The regulations provides for the conservation and sustainable use of wetlands and their Resources. It further in part III provides for the sustainable utilization and conservation of resources on river banks, lake shores, and on the seashore by and for the benefit of the people and community living in such areas. To achieve the intended aim, the regulations enshrine community participation in the management of such designated riparian resources to prevent pollution and siltation. The wetlands, River Banks, Lake Shores and Sea Shore Management Regulations in part II and III has set principles that should be adhered to, to manage wetlands and that EIA/EA is mandatory for all Activities that are likely to affect the wetlands.

The minister (now Cabinet secretary under the new constitution) for environment can declare an area a protected wetland depending on its significance. Therefore Activities in such a protected area will be controlled in accordance to such wetland management plan. Cultivation is among those Activities allowed in wetlands but is subject to determination of the impacts of such Activities to the wetland. However the regulation in section 12 requires acquisition of a permit before commencement of such Activities from relevant institutions.

NEMA for that matter in consultation with other lead agencies is obligated to develop a wetland management inventory nationally. But regardless of the ownership of the wetland, the regulations stipulate that the land owner or users have an obligation to observe the integrity of the wetland. The regulations further in part III articulate that special measures should be taken to prevent soil erosion siltation and pollution for management of river banks, lake shores and sea shore.

The regulations are relevant to the Giritu Sugar project because it is anticipated that the schemes within the project area will affect the wetlands along the project and there is need to establish a balance between conservation and sustainable utilization.

The Proposed Giritu Sugar Factory project in operation will continuously abstract water from Tana river and restructure sections of their banks at particular spots through intake works. It is thus paramount that this legislation be integrated during planning, construction and operation of the project.

3.3.3.6. The Environmental Management and Coordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006(Legal Notice No. 160)

The regulations prohibits any person from engaging in Activities that could be detrimental to ecosystems integrity, introduction of alien species in local environment or unsustainable utilization of natural resources without an EIA license issued by NEMA. NEMA on the other hand in consultation with other lead agencies is obligated to develop an inventory of biological diversity resources. The Regulations further provides for monitoring of biological diversity and protection of environmentally significant areas, access to genetic resources, benefit sharing and offences and penalties. The Tana river region has plants and animal (insects, fish, birds, amphibians, reptiles and mammals) species of interest to the nation, region and the international community. Introduction or augmentation of the irrigation schemes may have impacts on the biological diversity of the project area particularly on aquatic species during diversion of water for use or chemical pollution of aquatic system. Hence there is need to observe the regulations during project implementation, operation or decommissioning. However an inventory of biological diversity within the project area is scattered over several agencies within the project area based on their mandate and interests including but not limited to; National Museums of Kenya, Kenya wildlife, Kenya forest services, fisheries, Kenya Marine and research institute, nature Kenya, wildlife club etc. consequently there is need to develop an integrated database that is shared by all stakeholders on biological diversity in the project area.

This regulations aim at enhancing preservation of biodiversity and safeguarding of endangered and rare plant and animal species within any human activity area. Section 4 of the legislation expressly prohibits any activity which may have adverse effects on any ecosystem, lead to introduction of alien species in a given area or result in unsustainable utilization of available ecosystem resources.

3.3.3.7. Environmental Management and Coordination (Fossil Fuel Emission Control) Regulations 2006

These regulations are described Legal Notice No. 131 of the Kenya Gazette Supplement no. 74, October 2006 and apply to all internal combustion engine emission standards, emission inspections, the power of emission inspectors, fuel catalysts, licensing to treat fuel, cost of clearing pollution and partnerships to control fossil fuel emissions. The fossil fuels considered are petrol, diesel, fuel oils and kerosene.

Giritu Sugar Project will follow the regulations applicable to equipment and machinery used by the contractor during the irrigation infrastructure construction.

3.3.4. The Water Act, 2016

This Act provides the guidelines for proper management of water, conservation and control of water resources to ensure the water resources are sustainable. Under this Act waste water, storm water, sewage systems and drainages are supposed to be put in design drawings in the building plan of the project components; This Act also prohibits water pollution by a developer in his/her area of jurisdiction.

Since the project will involve irrigation areas, the proponent will ensure that appropriate measures to prevent pollution of underground and surface water resources are implemented throughout the project cycle. The proponent shall also seek the necessary approvals of sources of water supply to the proposed project site throughout the project cycle.

The Act also provides for establishment of a Water Resource Authority, whose functions include:

- Formulate and enforce standards, procedures and Regulations for the management and use of water resources and flood mitigation;
- Regulate the management and use of water resources;
- Enforce Regulations made under this Act;
- Receive water permit applications for water abstraction, water use and recharge and determine, issue, vary water permits; and enforce the conditions of those permits;
- Collect water permit fees and water use charges;
- Determine and set permit and water use fees;
- Provide information and advice to the Cabinet Secretary for formulation of policy on national water resource management, water storage and flood control strategies;

- Coordinate with other regional, national and international bodies for the better regulation of the management and use of water resources; and
- Advise the Cabinet Secretary generally on the management and use of water resources.

The act also provides for establishment of a Water Service Regulatory Board whose functions are:

- Determine and prescribe national standards for the provision of water services and asset development for water services providers;
- Evaluate and recommend water and sewerage tariffs to the county water services providers and approve the imposition of such tariffs in line with consumer protection standards;
- Set license conditions and accredit water services providers;
- Monitor and regulate licensees and enforce license conditions;
- Develop a model memorandum and articles of association to be used by all water companies applying to be licensed by the regulatory board to operate as water services providers;
- Monitor compliance with standards including the design, construction, operation and maintenance of facilities for the provision of water services by the water works development bodies and the water services providers;
- Advise the cabinet secretary on the nature, extent and conditions of financial support to be accorded to water services providers for providing water services;
- Monitor progress in the implementation of the water strategy and make appropriate recommendations; powers and functions of the regulatory board;
- Maintain a national database and information system on water services;
- Establish a mechanism for handling complaints from consumers regarding the quality or nature of water services;
- Develop guidelines on the establishment of consumer groups and facilitate their establishment;
- Inspect water works and water services to ensure that such works and services meet the prescribed standards;
- Report annually to the public on issues of water supply and sewerage services and the performance of relevant sectors and publish the reports in the gazette;
- Make regulations on water services and asset development which shall include business, investment and financing plans in order to ensure efficient and effective water services and progressive realization of the right to water services;
- Advise the cabinet secretary on any matter in connection with water services; and
- Make recommendations on how to provide basic water services to marginalized areas.

The proponent should ensure that a Water abstraction permit for the project is obtained from WRMA. The

proponent will be required to ensure that project activities throughout all phases do not cause pollution of the water resources and also continuously monitor the quantity and quality of water being abstracted from the rivers.

3.3.5. The Water Resources Management Rules, 2007

As a subsidiary to the Act, a legislative supplement, The Water Resources Management Rules, 2007 was gazetted to guide all policies, plans, programmes and activities that are subject to the Water Act, 2002. The Water Resources Management Rules empower Water Resources Authority (WRA) to impose management controls on land use falling under riparian land. It also enables any person with a complaint related to any matter covered by these rules to the appropriate office in WRA as per the Tenth Schedule which provides a format for report on complaints.

Part A of the Sixth Schedule: Conservation of Riparian and Catchment Areas Rules (Rule 116) define the riparian land on each side of a watercourse as a minimum of six metres or equal to the full width of the watercourse up to a maximum of thirty metres on either side of the bank. It further provides activities proscribed on riparian land as:

- Tillage or cultivation;
- Clearing of indigenous trees or vegetation;
- Building of permanent structures;
- Disposal of any form of waste within the riparian land;
- Excavation of soil or development of quarries;
- Planting of exotic species that may have adverse effect to the water resource;
- Any other activity that in the opinion of the Authority and other relevant stakeholders may degrade the watercourse.

Rule 63 provides for Compensation flow and a permit holder storing or arresting the flow of water by means of a site or weir located on a body of water or watercourse shall unless otherwise decided by WRA, provide at a depth measured from the top of the site or weir and to be specified by WRA in each particular case, an outlet, controlled by a valve, sluice gate or other device, which shall be capable of being operated at all stages of the flow of such body of water or watercourse so that the normal flow, or other flow as required by WRA, of such body of water or watercourse can be passed through or around such site or weir at all stages.

The project intends to interfere with the flow of Tana River. The design has to be in line with these rules and any other WRA requirements. The Design has been attached in the annexes.

3.3.6. Public Health Act (Cap 242)

The Public Health Act is the principle instrument for ensuring the health and safety of the people. Its core function is the prevention of disease, treatment and care of the sick (curative services) and control of nuisance. The Act therefore makes regulations and lays standards for a healthy living environment. Part XI Section 129 of the Act places

the responsibility of protecting water supplies on the local authorities. The Ministry of Health is in charge of administration of the Act, with the Director of Medical Services as the Principal Officer. However, where a municipality is capable of discharging responsibilities under the Act, such a municipality is designated as a local health authority. In such a situation, the relevant powers under the Act are delegated to the municipality, but the Director of Medical Services may take over if the Authority is in default. During the execution of the proposed project, this Act is relevant in various ways.

Section 115

During construction, nuisance is prohibited especially for all conditions liable to be injurious or dangerous to health.

Section 118

Section 118 outlines nuisance liable to be dealt with, i.e. accumulation or deposit of refuse, offal, manure or any other material that is offensive or injurious or dangerous to health, and an accumulation of stone, timber or other machine likely to harbor rats or rodents.

Section 126 rule 62 – Drainage and Latrine Rules

It is a statutory requirement that drainage, latrines, septic and conservancy tanks and any other pretreatment methods of sewage effluents seek written permission or/and approval from the local authority, and be built in conformity to provisions of sub-rules (a) to (e) of this section.

The project construction and operation activities are bound to expose both workers and members of the general public to situations injurious to health. All activities of the project are thus expected to abide by this act to ensure a healthy environment.

Sections 136–143 Breeding Places of Mosquitoes

The civil and building contractors will ensure that during construction, breeding places of mosquitoes and nuisance yards are kept free from bottles, whole or broken. The project area shall not be overgrown by grass. The wells and any pits should be covered. Gutters may be perforated. Larva should be destroyed to eradicate mosquitoes completely by introduction of fish in the site, as mere presence of mosquito larvae is an offence.

The implementation of Giritu Sugar project will make sure that no waste is disposed into the environment to cause nuisance to the public. Also in the project operation, the operator will control the spread of mosquitoes through spraying on trees and introduction of fish into the site to feed on larvae.

3.3.7. Forest Act, 2005

The Forest Act, 2005 was enacted in November 2005 to repeal the Forest Act, Cap 385 and awaits the Minister to gazette the commencement date. The Act provides for the establishment, development and sustainable management, including conservation and rational utilization of forest resources for the social economic development

of the country, recognizing that forests play a vital role in the stabilization of soils, ground water, protecting water catchments, and moderating climate by absorbing greenhouse gases, among other things. Its provisions apply to all forests and woodlands on state, local authority and private land of the country declared as provisional forest by the Minister. The administration of forests is headed by the established Kenya Forest Service, managed by a board. Community participation is integrated through forest community associations and forest user associations. The Act also establishes the forest management and conservation fund headed by a finance committee. The Act requires sustainable management of indigenous forests and woodlands and presidential decree for protection of trees can be issued. Variation of forest boundaries or revocation of state or local authority forests and state forest concession are subject to an independent EIA and public consultation.

Section 42 of the Act states that (1) The conditions on which a license for mining and quarrying, or any other activity carried out in the forest, shall, where the activity concerned is likely to result in the depletion of forest cover in any forest, include a condition requiring the licensee to undertake compulsory re-vegetation immediately upon the completion of the activity. It further states that re-vegetation shall be undertaken in consultation with the Kenya Forestry Service, which shall determine the seeds and seedlings proposed to be used in such re-vegetation. The Director of Kenya Forest Service (KFS) is required to maintain register of all licenses issued under the Act.

Provisions of part VI and part XII of EMCA 1999 shall apply mutatis mutandis to and in respect of a license under this Act, and any EIA as well as reference to the National Environment Tribunal required under this Act. The provisions of EMCA 1999 regarding reference to the Tribunal established under that Act shall apply to the settlement of disputes arising under the Forest Act, 2005. Offences under the Act are punishable under the law, and citizens can petition the High Court for a declaration of contravention of the Act provisions. Thus, the Act directs, regulates and harmonizes development and use of forests in the country. In addition, the Act provides a vital link with the Environment Management and Coordination Act.

The implementation of Giritu Sugar project will not interfere with any gazetted natural forest.

3.3.8. Irrigation Act CAP 347

This is the specific Act of Parliament that provides for the development, control and improvement of irrigation schemes, and for purposes incidental thereto and connected therewith.

Section 3(1) of Part II of the Act grants legal recognition of the establishment of the National Irrigation Board ***"with powers to sue and to be sued, and capable of purchasing or otherwise acquiring, holding, managing and disposing of any property movable or immovable, entering into contracts, and doing all things necessary for the proper performance of its duties, and discharge of its functions under this Act and any subsidiary legislation made thereunder."***

The implementation of Giritu Sugar project will make sure that it meets all requirements by The National Irrigation Board.

3.3.9. Agricultural Act CAP 318 Revised 2012

An Act of Parliament to promote and maintain a stable agriculture, to provide for the conservation of the soil and its fertility and to stimulate the development of agricultural land in accordance with the accepted practices of good land management and good husbandry.

During the entire course of the project, there will be need for practice of good crop husbandry as well as soil fertility maintenance as a vital component of enhancement of agricultural output. Following the provisions in the Act, legally acceptable practices will have to be upheld by all farmers for sustainable production out of the scheme.

3.3.10. The Draft National Irrigation Bill 2016

According to section 6 (1) of the irrigation bill 2016, the National Irrigation Development Service was established. The Service shall be the successor to the Board known as the National Irrigation Board existing immediately before the commencement of this Act, and subject to this Act, all rights, obligations, assets and liabilities of that Board existing at the commencement of this Act shall be automatically and fully transferred to the Service, and any reference to the National Irrigation Board in any contract or document shall, for all purposes, be deemed to be a reference to the Service established.

The mandate of the service shall be;

a) Develop and improve irrigation infrastructure for large, public national, medium and smallholder schemes,
b) Provide support services to private medium and smallholder schemes, in consultation and cooperation with county governments and other stakeholders, and
c) Provide advisory and technical services to irrigation schemes in design, construction supervision, administration, operation and maintenance under appropriate modalities.

Section 8 (2) of the Act states that the Service shall exercise all such powers necessary to enable it to perform its functions under this Act, and, without prejudice to the generality of the foregoing, the Service may:-

a) undertake irrigation development, including infrastructure, in national or public and smallholder schemes, including schemes which traverse or straddle more than one county,
b) In consultation with the Cabinet Secretary, establish and enforce regulations concerning operations and maintenance of national or public irrigation infrastructure and undertake gradual irrigation management transfer wherever possible,
c) In consultation with county governments facilitate formation and strengthening of irrigation water users" associations at scheme level for operation, maintenance and management,
d) In consultation with the Cabinet Secretary and the Cabinet Secretary for the time being responsible for finance, raise funds for the development of infrastructure in national and smallholder schemes under appropriate mechanisms,

e) In consultation with county governments coordinate and plan settlement on national or public irrigation schemes, as well as schemes which traverse or straddle more than one county and determine the number of settlers thereof,
f) conduct periodic technical and management audits of irrigation schemes to identify problems with scheme infrastructure, governance, management and financing, and recommend solutions to the irrigation water users‟ associations,
g) provide advisory services on irrigation water management, including water harvesting and storage for agricultural use to all schemes under appropriate modalities,
h) In collaboration with county governments and other stakeholders, provide advisory and technical services to community and smallholder irrigation schemes concerning design, construction, supervision, administration and maintenance of irrigation infrastructure under appropriate modalities,
i) facilitate linkages between national Government, county governments, private sector, civil society organizations, communities and other stakeholders for the provision of support services to irrigation water user associations,
j) In collaboration with county governments, encourage the uptake of micro-irrigation technologies distributed through the private sector and civil society organizations and finally, and
k) In collaboration with county governments gather information and maintain databases on irrigation development and management, including but not limited to data on irrigation water supplies, demands, projects, irrigated areas, management performance, potential for expansion, human resources, and the like.

According to part iv section 10 (2) the bill, the County Government shall within its area of jurisdiction be responsible for irrigation matters in accordance with Part 2 of Fourth Schedule to the Constitution, and may in this regard establish a county irrigation development unit for the better carrying out of the county government‟s irrigation mandates.

The functions of the county irrigation development units shall include to:

a) Implement irrigation policy at the county level as per its mandate,
b) Formulate and implement county irrigation strategy in collaboration with relevant stakeholders, in line with national policies and strategies,
c) Develop and maintain an irrigation database and integrate systematic monitoring and evaluation of the sub-sector development at the county,
d) Provide technical (surveys, designs, supervision of construction), financial and other support services for the development of the irrigation sub-sector,
e) Identify community-based smallholder schemes for implementation in line with national guidelines,
f) Mainstream irrigation related statutory obligations such as environmental, water and health;
g) Undertake rehabilitation of existing irrigation schemes within the counties,

h) Capacity build farmers and support establishment of viable farmer organizations to develop and manage irrigation schemes including actively participating in conflicts resolution within irrigation schemes,

i) Set up measures to implement adaptation and mitigation to climate change, and enhance sustainable environmental management,

j) Implement the regulatory function in line with national standards, and

k) The irrigation bill will play pivotal role in the operationalization of the GirituSugar project hence it will be consulted in the final documentation of laws and legislations in the final ESIA report.

3.3.11. Plant protection Act CAP 324

It is an act of parliament that encompasses rules for prevention of introduction and spread of pest and diseases destructive to plants. This Act concerns the protection of the health of plants in Kenya. Section 3 specifies regulation making powers of the Minister. Every occupier or, in the absence of the occupier, every owner of land shall take all such measures as he may be required to take by virtue of any rules made under section 3, and in addition such other measures as are reasonably necessary for the eradication, reduction or prevention of the spread of any pest or disease which an inspector may by notice in writing order.

This act will guide the project during irrigation as there will be use of pesticides to control pests in the irrigated fields.

3.3.12. Pest Control Products Act (Cap 346)

This Act of Parliament regulates the importation, exportation, manufacture, distribution and use of products used for the control of pests and of the organic functions of plants and animals and for connected purposes. It also regulates against use of pest control products without due analysis from a certified analyst and inspection from an appointed inspector, in addition to granting due guidance on the licensing of use and storage of the said products.

Section 2 of the Act refers to " pest control product" as " a product, device, organism, substance or thing that is manufactured, represented, sold or used as a means for directly or indirectly controlling, preventing, destroying, attracting or repelling any pest and includes-

a) any compound or substance that enhances or modifies or is intended to enhance or modify the physical or chemical characteristics of a pest control product to which it is added; and

b) any active ingredient used for the manufacture of a pest control product;"

This act will guide the project during irrigation as there will be use of pesticides to control pests in the irrigated fields. The act will guide the farmers in selection of pesticides.

3.3.13. Malaria Prevention Act Cap 246

Section 5–Drainage System

No operations shall obstruct flow of water into or out of any drainage. The management shall be required to maintain

the drainage system within the area of the project for removal of water from any land around the project to prevent larvae breeding.

3.3.14. Penal Code, Cap. 63

Section 191–Fouling Water

The management shall ensure that no foul water of any public spring or reservoir is rendered unfit for the purpose for which it was ordinarily used for by the community.

Section 192–Dwellings and Neighbourhood

The operation phases of the project shall ensure that health of persons in general dwellings or carrying on business in the neighbourhood or passing along a public facility are protected.

3.3.15. Legal Notice 40 (Building, Operation & Work of Engineering) Rules 1984

These rules require the contractor to ensure health, safety and welfare of employees and states. It further requires the main contractor to notify the chief inspector within 7 days of commencing or undertaking building operation or works of engineering.

The rules require that walls of excavations deeper that 1.2m be reinforced with timber of suitable quality or with other suitable material to prevent so far as is reasonably practicable the danger or injury resulting from a fall or dislodgement of earthwork. A first aid box shall also be provided and be distinctively marked „FIRST AID" and placed under the charge of a responsible person whose name shall be plainly indicated in a prominent place or near the box.

The proponent has taken cognizance of the applicable legal obligations pertaining to this proposed development by demonstrating full commitment to compliances with applicable laws and regulations applicable to the implementation of this proposed project.

3.3.16. Occupational Health and Safety Act, 2007

This legislation provides for protection of workers during construction and operation phases. The Act applies to all workplaces whether temporarily or permanently with an aim of securing safety, health and welfare of persons at work and non-workers. During project implementation, operation and decommissioning stages, the safety of people who will be hired or in constant interaction within the working area need to be ensured. The project proponent and the contractors will guarantee safety within the project area at different stages of the project cycle. The project proponent in consultation with the contractors are required to prepare a safety and health policy statement with respect to safety and health at work places of workers and any other person in the vicinity (section 7).In the event that there will be more than twenty employees at site, the project proponent or contractor should establish a safety and health committee at the workplace. In spite of this, workers on the other hand are responsible of their own safety and should bring to the attention of the person in charge any dangerous situation. Regular auditing of the workplace should also

be done annually to establish the state of health and safety at site.

The Act requires that all workplaces must be registered with the director. Occupational health and safety officer on notification has power at any time to enter examine or inspect a workplace. Safety of workers therefore should be ensured at all-time including using personal protective gears. People will be hired during project implementation, operation and decommissioning stages and their safety should be ensured according to the provisions of this Act. However, it is sometimes challenging to monitor implementation of safety at workplaces and most often steps are taken after an incident. For instance, there are no air quality standards in Kenya and also capacity to determine air quality levels.

Sufficient and suitable sanitary conveniences for persons employed in the factory/ workplaces shall be provided, maintained and kept clean, and effective provision shall be made for lighting the conveniences, and where persons of both sexes are, such conveniences shall afford proper separate accommodation for persons of each sex.

The contractor will have to fulfill this legislation during the entire project implementation.

3.3.17. Energy Act of 2006

This is an Act of Parliament passed to amend and consolidates the law relating to energy, to provide for the establishment, powers and functions of the Energy Regulatory Commission and the Rural Electrification Authority and for connected purposes. The Energy Act of 2006 replaced the Electric Power Act of 1997 and The Petroleum Act, Cap 116. The Energy Act, amongst other issues, deals with all matters relating to all forms of energy including the generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes.

The Energy Act, 2006, also established the Energy Regulatory Commission (ERC) whose mandate is to regulate all functions and players in the Energy sector. One of the duties of the ERC is to ensure compliance with Environmental, Health and Safety Standards in the Energy Sector, as empowered by Section 98 of the Energy Act, 2006.

In this respect, the following environmental issues will be considered before approval is granted:

- ***The need to protect and manage the environment, and conserve natural resources;***
- ***The ability to operate in a manner designated to protect the health and safety of the project employees; the local and other potentially affected communities.***

Licensing and authorization to generate and transmit electrical power must be supported by an Environmental Impact Assessment Report (EIA) approved by NEMA.

3.3.18. The Radiation Protection Act (Cap 243 Laws of Kenya)

This is an Act of Parliament to provide for the protection of the public and radiation workers from the dangers arising from the use of devices or material capable of producing ionizing radiation and for connected purposes. Since 1982,

Kenya decided to join in the global movement for the use of nuclear energy for peaceful purposes, a movement lead by the International Atomic Energy Agency (IAEA). Most of such uses are in the fields of medicine, agriculture, energy and environmental monitoring. The dangers of injury to the public prompted the adoption of the Radiation Protection Act (Cap 243) in November 1984 to provide according to its citation, protection of the public and radiation workers from the dangers arising from the use of devices or materials capable of producing ionizing radiation and for connected purpose.

The Act prohibits the unauthorized manufacture, production, possession or use, sale, disposal, lease, loan or dealership, import, export of any irradiating device or radioactive material. All authorized buyers, sellers, users, of such device must be properly licensed.

The Act is administered by the Chief Radiation Protection Officer assisted by a Radiation Protection Board.

The proposed project won't emit/produce ionizing radiations.

3.3.19. Land Control Act Cap. 302

The proposed project will be carried out on communal land. ***The project land is owned communally and has been leased by the proponent for a span of 45 years.***

3.3.20. The County Government Act, 2012

The Kenya constitution 2010 provides for two tier government levels. Local area planning and development will be controlled at county government level. The county government Act provides local governance principles, guide planning and development process as well as community participation. Section 5 of the Act stipulates the functions of the county governments as provided for in the constitution.

The Act in part VIII on the other hand indicates the significance of community participation in decision making. It articulates how the local people can be involved in the management of the county government affairs and decision making process. In Part IX and X, the Act compels the county governments to provide adequate information and public civic education as a way of capacity building to ensure meaningful participation.

To ensure integrated and sustainable development at both national and county government level, the Act in part XI states the principles of county planning and development process. Section 102 in particular outlines the principles of planning and development facilitation in a county. One of the objectives of county planning is to harmonize between national, county and sub-county spatial planning requirements as stated in section 103(a) of the Act. Section 104 in subsection 2 on the other hand states that such planning framework should integrate economic, physical, social, environmental and spatial planning.

The county planning unit is responsible of coordinating all integrated development plans within the county. However Counties are required to prepare a five year integrated development plan as stipulated in section 108. Such plans will

be informed by among other things, all known projects, plans and programs to be implemented within the county by any organ of state (Section 108, (2b) iii). Therefore the project proponent should liaise with the county planning unit during project implementation process to ensure the project is in line with the goals and objectives of the integrated development plan.

***For the project to be implemented it has to be acceptable to the County Government of Tana River and it has to be in line with their development agendas**.*

3.3.21. Physical Planning Act, Cap 286

The protection of the environment, the conservation of the natural resources and pollution are basically tied up with the question of the permitted use of land. The land planning law in Kenya is found in the Physical Planning Act, Cap 286. The main purpose of the physical planning legislation is to control the use of land, which is of great importance since it affects the environment. When an owner seeks to develop a plot of land, which is within the jurisdiction of the local authority, approval from the Director of Physical Planning is mandatory. The Act defines „Development" to mean any material change in the use or density of any building or land. Section 36 specifically provides that in connection with a development activity, which will have an injurious impact on the environment, the applicant shall be required to submit together with the application an Environmental Impact Assessment Study Report (EIASR). Section 29 of the Act allows for prohibition or control of the use and development of land and buildings in the interest of proper and orderly development of an area. Section 30 of the Act states that any person who carries out development without permission will be required to restore the land to its original condition, and that no other licensing authority shall grant license for commercial and industrial use or occupation of any building without development permission granted by the local authority. Section 36 states that where the project will be injurious to the environment, the developer shall be required to submit an Environmental Impact Assessment Report and thereafter, an Environmental Audit every year.

This act guides the implementation of projects. The act zones areas as agricultural and industrial. The project area has been zoned as agricultural land and hence the proponent will not be required to do a change of user report.

3.3.22. Work Injury Benefits Act (WIBA), 2007

It is an act of Parliament (No. 13 of 2007) to provide for compensation to workers for injuries suffered in the course of their employment. It outlines the following:

- Employer's liability for compensation for death or incapacity resulting from accident;
- Compensation in fatal cases;
- Compensation in case of permanent partial incapacity;

- Compensation in case of temporary incapacity;
- Persons entitled to compensation and methods of calculating the earnings;
- No compensation shall be payable under this Act in respect of any incapacity or death resulting from a deliberate self-injury; and
- Notice of an accident, causing injury to a workman, of such a nature as would entitle him for compensation shall be given in the prescribed form to the director.

During construction period, the contractor will need to abide by all the provisions of WIBA. Similarly, the same will be required of the proponent during operation phase of Giritu Sugar Project.

3.3.23. The Wildlife Conservation and Management Act, 2013

This Act became operational on 10 January 2014. One of its guiding principles is the devolution of conservation and management of wildlife to landowners and managers in areas where wildlife occurs, through in particular the recognition of wildlife conservation as a form of land use, better access to benefits from wildlife conservation, and adherence to the principles of sustainable utilization. Section 25 of the act provides for compensation for injuries and siteages caused by wildlife (species listed in its third schedule) to humans and their properties respectively. Such compensation claims are to be reviewed and awarded by County Wildlife Conservation and Compensation Committees at the ruling market rates: provided that no compensation shall be paid where the owner of the livestock, crops or other property failed to take reasonable measures to protect the properties from siteage by wildlife or land use practices are incompatible with the ecosystem-based management plan for the area.

The act in its sixth schedule list various animal and tree species that are nationally considered as critically endangered, vulnerable, nearly threatened and protected. It also lists in its seventh schedule, national invasive species for which control is required. Section 48 restricts activities involving the above listed species without a permit from KWS. KWS can make recommendations to the responsible cabinet secretary, to prohibit carrying out of any activity which: is of a nature that may negatively impact on the survival of species listed in sixth schedule; or is specified in the notice or prohibit the carrying out of such activity without a permit issued by KWS.

Any critically endangered, vulnerable, nearly threatened or protected species found within the project area will have to be managed in line with this Act.

3.3.24. The Kenya Roads Board Act, Cap 408 of 1999

This is the main legal instrument that governs management of road network in the country. The act whose commencement date was 01 July 2000 encourages participation of all stakeholders in the road sector during the planning, design, construction and maintenance.

3.3.25. Public Roads and Road of Access Act (Cap 399)

The Act provides for the following with regard to public roads:

- Dedication of line of public travel;
- Application to construct roads of access;
- Notice to be served on land owners affected;
- Granting of leave to construct road of access;
- Notification of order to be registered;
- Right of way over road of Access;
- Power to cancel or alter road of access; and
- Prohibition of classes of traffic

Of relevance with the proposed Giritu Sugar Project is the need for rehabilitation of existing roads and laying out of access roads.

3.3.26. The Kenya Roads Act of 2007

The act stipulates the legal and institutional aspects of the road sub-sector policy. The Act provides for the establishment of three independent Road Authorities, namely:

1) Kenya National Highways Authority (KeNHA), responsible for the administration, control, development and maintenance of all class A, B and C roads in Kenya,
2) Kenya Rural Roads Authority (KeRRA), responsible for rural and small town roads including class D, E roads and Special Purpose Roads; and
3) Kenya Urban Roads Authority (KURA) responsible for all City and Municipal Roads.

The Authorities fall under the Ministry responsible for infrastructure and retains the role policy formulation and general oversight of public roads including regulatory aspects such as technical standards.

The proponent will require liaison with these institutions in the improvements existing and development of any new roads within the project area.

3.3.27. Land Legislation

3.3.27.1. The Land Act, 2012

This is an Act of Parliament intended to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land based resources, and for connected purposes. Parts 1 and 2 of section 4 of the Act outline the main guiding principles in land management and administration, binding to all land actors including state officers. These principles are to be applied when Enacting, applying or interpreting any provisions of this Act; and when making or implementing public policy decisions. The act vests management of land on National Land Commission (NLC). In discharging their functions and exercising of their powers under this Act, the Commission and any State officer or public officer shall be

guided by the following values and principles;

a) Equitable access to land;
b) Security of land rights;
c) Sustainable and productive management of land resources;
d) Transparent and cost effective administration of land;
e) Conservation and protection of ecologically sensitive areas;
f) Elimination of gender discrimination in law, customs and practices related to land and property in land;
g) Encouragement of communities to settle land disputes through recognized local community initiatives;
h) Participation, accountability and democratic decision making within communities, the public and the Government;
i) Technical and financial sustainability;
j) Affording equal opportunities to members of all ethnic groups;
k) Non-discrimination and protection of the marginalized;
l) Democracy, inclusiveness and participation of the people;
m) Alternative dispute resolution mechanisms in land dispute handling and management.

Land in Kenya is classified as either public, private or community land. One can acquire certificate of title to land through allocation, adjudication, compulsory acquisition, transfers, transmission or lease exceeding twenty one years. The Act further guarantees equal recognition and enforcement of land rights regardless of the type of tenure whether freehold or lease hold.

Access to land and use on the other hand plays a role in environmental management and sustainability. In recognition of this, the land commission has the obligation under the Act in section 19 to conserve land based natural resources. The commission is supposed to identify ecologically sensitive area that has endangered or endemic species of flora and fauna, demarcate to prevent environmental degradation or climate change (section 11). In addition, the cabinet secretary ensures quality control through regulation of service providers. However the Act is not clear on land use or management practices that are deleterious to the environment.

The commission can acquire land for public purpose or interests where need be as stipulated by the Act in part VIII. In the event of such acquisition, a just compensation is to be paid to persons with interest in the land. The Act further articulates the procedure to be followed by any party with interest in the land before compensation is paid. Any person with dispute over land matters or is not satisfied by the process of land acquisition can seek redress from the land and environment court. The court is constituted with exclusive jurisdiction to hear and determine disputes, Actions and proceedings related to land issues.

If need be, the commission has a power to create public right of way under section 143 and any institution or person

has a right to execute any works, installation or structure on such way leave. For such away leave to be granted, an application can be done by state department, county government, public authority or cooperate bodies as stipulated in section 144. Section 129 gives the commission or any authorized person a right of entry to any land whereas anyone who obstructs such an officer commits an offence under the Act as articulated in section 130. The courts have power to enforce public right of way as stipulated in section 149 of the Act. However section one 148 stipulates that compensation should be paid for the use of such a land to the lawful owner or occupier. The compensation shall be paid from a land compensation fund established under section 153. It is prohibited under the Act in section 156 for a person to wrongfully obstruct or encroach on any public right of way. In the event of such a breach, the commission can seek redress from the court.

The land is owned by the proponent and no settlement of people will be done.

3.3.27.2. Acquisition of Private Land for Public Use

Section 110(1) of the Act provides that land may be acquired compulsorily under this if the Commission certifies, in writing, that the land is required for public purposes or in the public interest as related to and necessary for fulfillment of the stated public purpose. In such an acquisition, this Act, in section 111(1) provides that just compensation shall be paid promptly in full to all persons whose interests in the land have been determined.

The procedure for land acquisition is laid out in Part VIII of the Act. Elements for consideration under this procedure include the following:

- ✓ The Act requires that the owners, residents and their spouses should also be notified; as opposed to just the owners;
- ✓ The inspector would also have to get the consent of the occupier and give them not less than seven days" notice to enter the premises;
- ✓ The Commission shall have the power of a court to summon and examine witnesses and compel the production and delivery to the Commission of documents of title to the land;
- ✓ Separate award of compensation to every person. An award is final and conclusive evidence of the size of the land, the value in the opinion of the Commission and the amount of compensation payable, whether or not the person attends the inquiry;
- ✓ Regulations and rules pertaining to this process are yet to be gazetted;
- ✓ Section 107(4) allows for circumstances where the acquiring authority may proceed with land acquisition at stage 1;
- ✓ The Commission shall make rules to regulate assessment of just compensation;
- ✓ The Act does not explicitly state when the inspection will be done. Whether it is before approval of the request for compulsory acquisition or before serving the notice for acquisition.
- ✓ The Commission may postpone an inquiry or adjourn the hearing of an inquiry from time to time for sufficient

cause.

The land is communally owned and has been leased by the proponent.

3.3.27.3. Provisions on Acquisition of Way Leave

The Land Act, 2012 provides for mechanisms of way leave acquisition either as public right of way or communal right of way. Section 143 of the act empowers NLC to create public rights of way. A public right of way may be: (a) a right of way created for the benefit of the national or county government, a local authority, a public authority or any corporate body to enable all such institutions, organizations, authorities and bodies to carry out their functions, referred to in the Act as a way leave; or (b) a right of way created for the benefit of the public, referred to in section 145 of this Act as a communal right of way.

A public right of way shall attach to and run with the servient land in respect of which it has been created and shall be binding on all owners from time to time of the servient land, any manner they are occupying the land, whether under a land or a derivative right thereof, or under customary law or as a successor in title to any such owner or as a trespasser.

Section 144 (1) states that an application, for the creation of a way leave, shall be made by any State department, or the county government, or public authority or corporate body, to the NLC.

In applying for way leave, section 144(4) requires the applicant to serve a notice on:

a) All persons occupying land over which the proposed way leave is to be created, including persons occupying land in accordance with customary pastoral rights;

b) The county government in whose area of jurisdiction land over which the proposed way leave is to be created is located;

c) All persons in actual occupation of land in an urban and per-urban area over which the proposed way leave is to be created; and

d) Any other interested person.

Subsection (5) requires NLC to publish the application along the route of the proposed way leave calculated to bring the application clearly and in a comprehensible manner to the notice of all persons using land over which the proposed way leave is likely to be created.

Section 145 (1) provides that a county government, an association, or any group of persons may make an application to the commission for a communal right of way. Once an application has been made to NLC, the determination for creation of a way leave is conducted as per section 146 of the act and includes:

- NLC, after at least ninety days from the date of the serving of notices, considering all the information received and all representations and objections made by any person served with a notice and recommending to the

Cabinet Secretary whether to:

a) appoint a public inquiry to give further consideration to the representations and objections; or

b) refer the application to the County Government for its opinion on whether to approve the application; or

c) initiate and facilitate negotiations between those persons who have made representations on the application and the applicant with a view to reaching a consensus on that application;

- The Cabinet Secretary determining whether or not to create to create a public right of way, after taking account, as the case may be, of:
- The recommendations of the Commission; or
- The advice of the county government; or
- The outcome of any negotiations referred to above;
- The Cabinet Secretary creating a public right of way by order in the Gazette.

The order comes into force thirty days after its publication in the gazette. An appeal against an order creating the way leave is allowed within six weeks after the order has been made. Such appeal is made to the Court on a point of law against an order made by the Cabinet Secretary, but apart from such an appeal, an order of the Cabinet Secretary shall not be questioned by way of judicial review or otherwise in any court.

According to section 148, prompt compensation shall be payable (by the State Department, county government, public authority or corporate body that applied for the public right of way) to any person for the use of land, of which the person is in lawful or actual occupation, as a communal right of way and, with respect to a way leave, in addition to any compensation for the use of land for any siteage suffered in respect of trees crops and buildings as shall, in cases of private land, be based on the value of the land as determined by a qualified valuer.

In case of disagreement or dissatisfaction on amount or method of or time taken to make payment, the affected individual may apply to court for determination and award. Section 148 (6) stipulates that NLC shall make regulations prescribing the criteria to be applied in the payment of compensation. However, these regulations have not yet been formulated.

This legislation will be applied in the Giritu Sugar Project irrigation command area where communal land will be used for irrigation. The land shall remain communal. The acquired way-leave shall allow for access to developed irrigation command area for locals and this will aid in the process of maintenance of the irrigation infrastructure and other project facilities when they are dilapidated.

3.3.27.4. Commissions on the National Land Act, 2012

This is an Act of Parliament to make further provision as to the functions and powers of the National Land Commission, qualifications and procedures for appointments to the commission; to give effect to the objects and principles of devolved government in land management and administration, and for connected purposes.

The mandate of the Commission, as provided for in the Act, Pursuant to Article 67(2) of the Constitution, shall be:

- To manage public land on behalf of the national and county governments;
- To recommend a national land policy to the national government;
- To advise the national government on a comprehensive programme for the
- Registration of Title in land throughout Kenya;
- To conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities;
- To initiate investigations, on its own initiative or on a complaint, into present or historical land injustices, and recommend appropriate redress;
- To encourage the application of traditional dispute resolution mechanisms in land conflicts;
- To assess tax on land and premiums on immovable property in any area designated by law; and
- To monitor and have oversight responsibilities over land use planning throughout the country
- On behalf of, and with the consent of the national and county governments, alienate public land; To monitor the registration of all rights and interests in land;
- To ensure that public land and land under the management of designated state agencies are sustainably managed for their intended purpose and for future generations;
- Develop and maintain an effective land information management system at national and county levels;
- Manage and administer all unregistered trust land and unregistered community land on behalf of the county government; and
- Develop and encourage alternative dispute resolution mechanisms in land dispute handling and management.
- This Commission will be integral in the management of land issues arising from the project implementation, especially as far as portals and pipelines way leave acquisition is concerned.

The proposed project will involve relocation of people. Since part of the project area has settlement.

3.3.27.5. The Land Registration Act, Act No. 3 of 2012

This is an Act of Parliament intended to revise, consolidate and rationalize the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes.

3.3.27.6. Land Registry

Section 7(1) of the Act provides for establishment of a land registry in each registration unit which shall keep

registers of the following regarding land:

- ✓ A land register, in the form to be determined by the Commission;
- ✓ The cadastral map;
- ✓ Parcel files containing the instruments and documents that support subsisting entries in the land register.
- ✓ Any plans which shall, after a date appointed by the Commission, be geo-referenced;
- ✓ The presentation book, in which shall be kept a record of all applications numbered consecutively in the order in which they are presented to the registry;
- ✓ An index, in alphabetical order, of the names of the proprietors; and
- ✓ A register and a file of powers of attorney.
- ✓ Maintenance of documents, including land title deeds

Further, section 9(1) provides that the Registrar shall maintain the register and any document required to be kept under this Act in a secure, accessible and reliable format. These documents include:

- ✓ Publications, or any matter written, expressed, or inscribed on any substance by means of letters, figures or marks, or by more than one of those means, that may be used for the purpose of recording that matter;
- ✓ Electronic files; and
- ✓ An integrated land resource registers.

The register, as provided for in part 2 of section 9, shall contain the following particulars;

- ✓ Name, personal identification number, national identity card number, and address of the proprietor;
- ✓ In the case of a body corporate, name, postal and physical address, certified copy of certificate of incorporation, personal identification numbers and
- ✓ passport size photographs of persons authorized and where necessary attesting the affixing of the common seal;
- ✓ Names and addresses of the previous proprietors;
- ✓ Size, location, user and reference number of the parcel; and
- ✓ Any other particulars as the Registrar may, from time to time, determine.

These provisions are essential to any new land acquisition or transaction processes arising from implementation of the project.

3.3.27.7. The Land and Environment Court Act, 2012

This is an Act of Parliament to give effect to Article 162(2) (b) of the Constitution; to establish a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land, and to make provision for its jurisdiction functions and powers, and for connected purposes. The principal objective of this Act is to

enable the Court to facilitate the just, expeditious, proportionate and accessible resolution of disputes governed by this Act. Section 13 (2) (b) of the Act outlines that in exercise of its jurisdiction under Article 162 (2) (b) of the Constitution, the Court shall have power to hear and determine disputes relating to environment and land, including disputes:

- Relating to environmental planning and protection, trade, climate issues, land use planning, title, tenure, boundaries, rates, rents, valuations, mining, minerals and other natural resources;
- Relating to compulsory acquisition of land;
- Relating to land administration and management;
- Relating to public, private and community land and contracts, chooses in action or other instruments granting any enforceable interests in land; and
- Any other dispute relating to environment and land.

Section 24 (2) also states that the Chief Justice shall make rules to regulate the practice and procedure, in tribunals and subordinate courts, for matters relating to land and environment. Section 30 (1) states that all proceedings relating to the environment or to the use and occupation and title to land pending before any Court or local tribunal of competent jurisdiction shall continue to be heard and determined by the same court until the Environment and Land Court established under this Act comes into operation or as may be directed by the Chief Justice or the Chief Registrar. Any land or/and environmental cases arising from the project will be handled in accordance with the provisions of this act.

This act will be used by those aggrieved by the ESIA process or the project within their neighbourhood

3.4. NATIONAL REGULATORY FRAMEWORKS

3.4.1. Waste Management Regulations, 2006 (Legal Notice No.121)

These are meant to stream the handling, transportation and disposal of various types of waste. The regulations emphasize on waste minimization, cleaner production and segregation of waste at the source. Under the Regulations, NEMA licenses transporters, incinerators, landfills, composers, recyclers and transfer stations. Licensing employs a risk based approach by concentrating on facilities considered to pose a high risk to the environment.

In article 87 section 1 of the Environmental Management and Coordination Act 1999, no person shall discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any person. There is need for one to acquire a license for generation, transporting or operating waste disposal facility as is provided for in article 88. Article 90 through to 100 outlines more regulations on management of hazardous and toxic substances including oils, chemicals and pesticides. Under the regulations, a waste generator is defined as any person whose activities produces waste while waste management is the administration or operation used in handling, packaging, treatment, conditioning, storage and disposal of waste. The

regulations requires a waste generator to collect, segregate and dispose each category of waste in such manners and facilities as provided by relevant authorities. Regarding transportation, licensed persons shall operate transportation vehicles approved by NEMA and will collect waste from designated areas and deliver to designated disposal sites.

It is expected that waste from use of agro-chemicals, established agro-processing industries due to the project or other waste generating Activities will result during project implementation, operation and decommissioning and that such waste should be handled according to set regulations.

This regulation will be applicable during the project implementation. It will guide the handling of wastes from production/agro-processing.

3.4.2. Noise and Excessive Vibration Pollution (Control) Regulation, 2009

The Regulations prohibit any loud, unreasonable, unnecessary or unusual noise that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. In determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered:

1. Time of the day;
2. Proximity to the residential area;
3. Whether the noise is recurrent, intermittent or constant;
4. The level and intensity of the noise;
5. Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and,
6. Whether the noise can be controlled without much effort or expense to the person making the noise.

The regulation will be applicable during construction and operation of the project. All operations like blasting during excavations will be guided by these regulations

3.5. INTERNATIONAL POLICY FRAMEWORK

Kenya is a signatory as well as a party to various international conventions, treaties and protocols relating to the environment and aimed at achieving sustainable development. According to the Registrar of International Treaties and other Agreements in Environment (UNEP 1999), there are 216 treaties, 29 of which are of interest to Kenya. The country is a signatory to 16 such agreements, which range from use of oil, protection of natural resources and protection of the atmosphere.

3.5.1. Protection of Natural Resources

There are 12 agreements of significance to Kenya under this category which the country has signed and ratified. This

section reviews a number of policies that are triggered or met by the proposed project.

3.5.2. Convention on Biological Diversity

This global convention was held to foster conservation and sustainable use of biological resources, to preserve their diversity for posterity. Kenya is a signatory to this convention, having ratified it in 1994. The provisions of this Convention have since been integrated in the laws of Kenya, climaxed by the development of the Kenya National Biodiversity Strategy and Action Plan in 2000 by the Ministry of Environment and Natural Resources.

This project is in line with the spirit of the convention, there is need to integrate biodiversity in water resource planning as the environment has been considered a legitimate user of water thus the project shall consider the volume of water abstracted which leaves enough water for the existent ecosystems.

3.5.3. The Ramsar Convention

This is the Convention on Wetlands of International Importance. It was held in Ramsar, in 1971 and came into force in 1975, hence the name Ramsar Convention. The aim of this convention was to raise to global context the value of wetlands in our ecosystem and encourage partner states to develop instruments for conservation and management of wetlands. Kenya ratified the convention in June 1990. The convention defines “Wise use of wetlands” as "the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development". "Wise use" therefore has at its heart the conservation and sustainable use of wetlands and their resources, for the benefit of humankind. Under the "three pillars" of the Convention, the Parties have committed themselves to:

- ✓ Work towards the wise use of all their wetlands through national land-use planning, appropriate policies and legislation, management actions, and public education;
- ✓ Designate suitable wetlands for the List of Wetlands of International Importance ("Ramsar List") and ensure their effective management; and
- ✓ Cooperate internationally concerning trans-boundary wetlands, shared wetland systems, shared species, and development projects that may affect wetlands.

Tana River has wetlands and to avoid detrimental effects of water abstraction, hydrological survey has been done to ensure that the development of Giritu Sugar Project is sustainable by abstracting water in quantities that will have minimal effect on water uses downstream. The hydrological report has been attached in the annexes.

3.5.4. African Convention on the Conservation of Nature and Natural Resources

It was held on 15 September, 1968 in Algiers. The convention sought to awaken the continent on the need to

preserve natural ecosystems and employ sustainable use of natural resources of economic importance, particularly the soil, water, flora and fauna.

Some indigenous trees exist within the project area whose conservation are important. The project shall encourage the planting of indigenous trees to try to restore a balance within the ecosystem.

3.5.5. Kyoto Protocol to the United Nations Framework Convention on Climate Change

The Kyoto Protocol requires signatories to the United Nations Framework Convention on Climate Change to reduce their greenhouse emissions levels to 5% below 1990 levels by the year 2012. The Protocol came into force on 16th February 2005, after it received the prerequisite signatures. However, major countries like United States, China, India, and Australia are not signatories to the Protocol.

Compliance with this convention will largely inform the technical and environmental evaluation of the project if any additional funding may be required in future. There is thus a necessity that proper adherence to minimal carbon emission levels be ensured during the operational phases of the project.

3.5.6. The 1992 United Nations Framework Convention on Climate Change (UNFCCC);

The primary purpose of the convention is to establish methods to minimize global warming and in particular the emission of the greenhouse gases. The UNFCCC was adopted on 9th May 1992 and came into force on 21st March 1994. The Convention has been ratified by 189 states. Kenya ratified the Convention on 30th August 1994. The project implementation will most certainly be accompanied by use of a variety of hydrocarbon based fuels and other chemical substances. Some of the gases or compounds resulting from consistent use of these substances are real ozone layer threat. The result is increase greenhouse gas emission into the atmosphere. ***There will thus be need to employ domesticated versions of the agreed carbon-curbing measures to protect the ozone layer from further depletion.***

3.5.7. Vienna Convention for the Protection of the Ozone Layer

Intergovernmental negotiations for an international agreement to phase out ozone depleting substances concluded in March 1985 with the adoption of the Vienna Convention for the Protection of the Ozone Layer. This Convention encourages intergovernmental cooperation on research, systematic observation of the ozone layer, monitoring of CFC production, and the exchange of information.

The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted in September 1987, and was intended to allow the revision of phase out schedules on the basis of periodic scientific and technological assessments. The Protocol was adjusted to accelerate the phase out schedules. It has since been amended to introduce other kinds of control measures and to add new controlled substances to the list. Kenya signed the Montreal Protocol in February 1988 and has ratified the Protocol and its four amendments, namely; London (1990),

Copenhagen (1992), Montreal (1997), and Beijing (1999).

3.5.8. United Nations Convention to Combat Desertification (UNFCCC) of 1994

The convention requires parties to take climate change considerations into account in their relevant social, economic and environmental policies and actions. ***The proponent has undertaken this ESIA with the aim of minimizing adverse effects of the project on the economy, on public health and on the quality of the environment.***

3.5.9. The World Commission on Environmental and Development

The commission focuses on the environmental aspects related to development and requires all development projects to be sustainable economically, socially and environmentally. The principle of the organization emphasis that development project should have no permanent negative impact on the biosphere and in particular the ecosystems. It is recommended that the project proponent incorporate mitigation measures to ensure that the project impacts on the ecosystem in reduced.

The consultants are using participatory methods to involve the target group and concerned stakeholders in order to inform and enlighten them on the likely negative environment and social impacts for them to prepare mitigation measures so as to ensure the proposed project is sustainable throughout its life span.

3.5.10. The Convention of Control of Desertification (UCCD) (1992)

This convention requires Parties to promote cooperation among affected parties in the fields of environmental protection and the conservation of land and water resources, as they relate to desertification and drought. Kenya ratified this on 24 Jun 1997.

The beneficiaries are advised to engage in activities geared towards eradicating drought through engaging in tree planting activities, encouraging clean energy use and water conservation.

3.5.11. Protocol for sustainable utilization of Tana Delta Basin

This protocol was developed in recognition of the demand for water in various sectors including agriculture within the delta Basin. The member states of the East Africa Community agreed to cooperate in Article 3 areas as they related to conservation and sustainable utilization of resources of the basin including:

a) Sustainable development and equitable utilization of water resources

b) Promotion of sustainable agriculture and land use practices including agriculture

c) Promotion of sustainable development and management of forest resources

d) Environmental management and protection of the basin

The protocol further states that in ensuring equitable utilization of resources in Article 5 „partners shall take into

consideration among other things:

- Population dependent on the water resource in each partner state
- The effect of the water use in one partner state on other partner states
- Availability of alternatives of comparative value for the planned use

The Protocol was signed on 29th November 2003.

The proponent should therefore work in consultation with the Tana Delta Basin Commission to ensure the project promotes the agenda of this treaty.

3.6. WORLD BANK SAFEGUARD POLICIES

The objective of the World Bank's environmental and social safeguard policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for the bank and borrower staffs in the identification, preparation, and implementation of programs and projects. Safeguard policies have often provided a platform for the participation of stakeholders in project design, and have been an important instrument for building ownership among local population.

The Safeguard Policies aims at improving decision making, to ensure that project options under consideration is sound and sustainable, and that potentially affected people have been properly consulted. This section describes how these World Bank Safeguard Policies will be triggered by the proposed project. The table below shows the safeguards which may or may not triggered by the project implementation

Table 4-1: Table of World Bank Safeguard Policies triggered by the project

Safeguard Policies Triggered by the Project	Yes	NO
Environmental Assessment (OP 4.01)	✔	
Natural Habitats (OP 4.04)	✔	
Cultural Property (OP 4.11)	✔	
Involuntary Resettlement (OP 4.12)	✔	
Indigenous Peoples (OP 4.10)		✔
Forests (OP 4.36)		✔
Safety of Sites (OP 4.37)	✔	
Projects in Disputed Areas (OP 7.60)		✔
Projects on International Waterways (OP 7.50)	✔	
World Bank Policy OP 4.09 Pest Management	✔	
Safety of electrical transmissions (Operational Policy, OP/BP 4.37)	✔	

3.6.1. World Bank Policy OP 4.01 Environmental Assessment

World Bank requires environmental assessment for projects proposed for the Bank financing to help ensure that they are environmentally sound and sustainable, and thus improve on decision making. Projects are screened and assigned categories (A, B, C or FI) depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

Category A: A proposed project is classified as Category A if it is likely to have significant adverse impact on the environment. A project with complicated impact or unprecedented impact which is difficult to assess is also classified as Category A. The impact of Category A projects may affect an area broader than the sites or facilities subject to physical construction.

Category B: A proposed project is classified as Category B if its potential adverse environmental impact is less adverse than that of Category A projects. Typically, this is site-specific, few if any are irreversible, and in most cases normal mitigation measures can be designed more readily.

Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impact. Projects that correspond to one of the following are, in principle, classified as Category C.

Following screening of the Main project, irrigation and power generation, this project has been classified as category A, requiring a full Environmental and Social Impact Assessment (ESIA).This is because the environmental and social impacts of Giritu Sugar Project are anticipated to be significant .Implementation of Project is required to take place within WB policy framework on the best practices when it comes to ensuring that the project does not destabilize the riverine aquatic ecosystem, affect downstream users or degrade the environment.

3.6.2. World Bank Policy OP 4.04 Natural Habitats

The WB recognizes that conservation of natural habitats, like other measures that protect and enhance the environment, is essential for long-term sustainable development. The Bank therefore supports the protection, maintenance, and rehabilitation of natural habitats and their functions in its economic and sector work, project financing, and policy dialogue. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development.

Although the natural terrestrial vegetation cover in the project area has been significantly altered, Giritu Sugar project will occur on a natural river dominated by native species. Precaution is thus required in line with OP 4.04 to ensure the riverine resources management is sustainable.

3.6.3. World Bank Policy OP 4.09 Pest Management

The objective of this policy is to: promote the use of biological or environmental control and reduce reliance on

synthetic chemical pesticides; strengthen the capacity of the country's regulatory framework and institutions to promote and support safe, effective and environmentally sound pest management. More specifically, the policy aims to:

- Ascertain that pest management activities in Bank –financed operations are based on integrated approaches and seek to reduce reliance on synthetic chemical pesticides (Integrated Pest Management (IPM) in agricultural projects and Integrated Vector Management (IVM) in public health projects;
- Ensure that health and environmental hazards associated with pest management, especially the use of pesticides are minimized and can be properly managed by the user;
- As necessary, support policy reform and institutional capacity development to (i) enhance implementation of IPM -based pest management and (ii) regulate and monitor the distribution and use of pesticides.

This guideline is triggered in this project because there is an irrigation development component that will lead to farming on new and high value crops. This will lead to procurement of pesticides or pesticide application equipment and this will lead to a substantial increase in pesticide use and subsequent increase in health and environmental risk due to use of pesticides and fertilizers. There should be incorporation of capacity building for farmers on safe use of agro chemicals and disposal of chemical containers. There should be promotion of organic farming and Integrated Pest Management in the project.

3.6.4. World Bank Policy OP 4.11 Physical Cultural Resources

OP 4.11 on Physical Cultural Resources, was revised on April 2013 to takes into account the recommendations in Investment Lending Reform: Modernizing and Consolidating Operational Policies and Procedures, Given that some cultural resources may not be known or visible, it is important that a project's potential impacts on cultural resources are considered at the earliest possible stages of project processing. The assessment of impacts to cultural heritage has been based on identified above ground features and known sites of archaeological interest, this is because, there is no archaeological cultural and settlement inventory covering the project area throughout the history of human occupation. However, as the policy requires, precaution is necessary in case of chance find.

This policy will not be triggered because the proposed project is not located in, or in the vicinity of, recognized cultural heritage sites. However, the contractor and Giritu Sugar Factory Limited will be required to follow Procedures and contact the National Museums of Kenya (NMK) should any archaeological site or artifact be encountered during construction.

3.6.5. *World Bank Operational Policy 4:12 Involuntary Resettlement*

The World Bank safeguard policy on involuntary resettlement, Operational Policy (OP 4.12) establishes guidelines for land acquisition and compensation of people affected by a world bank sponsored project. Key principles and policy objectives of OP 4:12 can be summarized as:

- To minimize or avoid involuntary resettlement where feasible and to explore all viable alternative project

designs;

- To conceive and implement resettlement activities as sustainable development programs where affected people are provided with sufficient investment resources and opportunities to share in project benefits;

The project triggers this policy as there will be areas where people will be partially displaced by the project.

3.6.6. World Bank Policy OP 4.20 Indigenous Peoples

To design and implement projects in a way that fosters full respect for Indigenous People's dignity, human rights, and cultural uniqueness and so that they: (a) receive culturally compatible social and economic benefits; and (b) do not suffer adverse effects during the development process.

This policy is not triggered because during reconnaissance survey, screening was done to determine whether Indigenous Peoples are present in, or have collective attachment to, the project area. It was concluded that there are no indigenous people in the project area.

3.6.7. Safety of electrical transmissions (Operational Policy, OP/BP 4.37)

The objectives of this policy are as follows: For new electrical transmissions, to ensure that experienced and competent professionals design and supervise construction; the borrower adopts and implements electrical transmission safety measures for the electrical transmission and associated works. For existing electrical transmissions, to ensure that any electrical transmission that can influence the performance of the project is identified, an electrical transmission safety assessment is carried out, and necessary additional electrical transmission safety measures and remedial work are implemented.

This policy is triggered because Giritu Sugar project has an electricity transmission component thus it would be important to adhere to these safety guidelines.

3.6.8. World Bank Policy OP 4.36 Forests

The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development and protect the vital local and global environmental services and values of forests. Where forest restoration and plantation development are necessary to meet these objectives, the Bank assists borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The Bank assists borrowers with the establishment of environmentally appropriate, socially beneficial and economically viable forest plantations to help meet growing demands for forest goods and services.

This policy is not triggered because in the project area, there are no natural forests. However there are woodlots and de-vegetation is inevitable as land has to be cleared to provide for construction of the factory,

its components and power transmission infrastructure. Engagement with local communities will be done to discuss on compensation mechanisms if need arises.

3.7. INSTITUTIONAL FRAMEWORKS

The following are the main institutions that perform regulatory roles and are relevant to the project.

3.7.1. Ministry of Water and Sanitation

The mandate is formulation, review and implementation of policy on the water sector, for sustainable development of our Nation.

The functions include:

- Water harvesting and storage infrastructure for water conservation, which will help in mitigating droughts and famine;
- Catchments area conservation;
- Water resources management policy;
- Urban and rural water development and supply;
- Wastewater treatment and control;
- National water conservation and Pipeline Corporation;
- National irrigation policy which aims to sustainably accelerate development and performance improvement of irrigation, drainage and water storage;
- Irrigation and site construction schemes;
- Flood preparedness and management to cope with and mitigate the impacts;
- Water quality and pollution control by adopting the „Polluter Pays" principles in order to ensure water user responsibility.

3.7.2. Ministry of Environment and Forestry

This is the state office in charge of all issues affecting, and affected by, the environment and all its components.

The ministry's core mandate includes the following:

- Environment and forestry Policy formulation, analysis and review;
- Sustainable management of forestry and conservation of environment;
- Continuous development of geo-database for integrated natural resources and environmental management systems;
- Conduct applied research and dissemination of research findings in land resources and geology;
- Carry out geological surveys, mineral exploration and regulation of mining and use of commercial explosives;

- Promote, monitor and coordinate environmental activities and enforce compliance of environmental regulations and guidelines;
- Meteorological services.

Water resources, land, flora and fauna and the air are core components of the natural environment. The proposed project will utilize surface water and all the other resources at one stage or another. Any extractive or depository uses of the resources are guided by the various programmes and regulations under the ministry and consistent consultative partnerships, including adherence to relevant legal provisions will be required in the entire course of the project.

3.7.3. The Government of Kenya

The Government of Kenya (GoK) is the project-implementing agency and its core mandate is:

- To assess, manage and safeguard the water resource base that supports the peoples of the Tana delta through applying the principles of knowledge-based integrated water resources management to water development planning and assessment. The Government of Kenya will be responsible for the development of the project and its operation in collaboration with The county Government of Lamu.

3.7.4. National Irrigation Board (NIB)

The mission of the National Irrigation Board is to develop, promote and improve irrigated agriculture through sustainable exploitation of available irrigation and drainage potential in Kenya in order to ensure food security and create wealth and employment, therefore improving the living standards of Kenyans.

The core functions are:

- Controlling and improving national irrigation schemes in the country;
- Conducting research and investigation into the establishment of national irrigation schemes;
- Designing, constructing, supervising and administering irrigation schemes;
- Coordinating and planning settlement on national irrigation schemes;
- Determining the number of settlers to be accommodated in national irrigation schemes;
- Promoting marketing of crops and produce grown or produced in national irrigation schemes in liaison with organizations responsible for marketing of agricultural produce;
- Formulating and executing policy regarding national irrigation schemes in conjunction with the Water Resource Authority.

The NIB Strategic Plan aims at setting the overall direction and activities in the irrigation and drainage sub-sector to ensure effective implementation of Vision 2030 and the First Medium Term Plan (2008- 2012). The First Medium Term Plan (MTP) recognizes the important role that irrigation is expected to play in improving agricultural productivity and meeting Kenya's food security needs. The MTP stipulates that irrigation can increase agricultural productivity

substantially. The government plans to increase the area under irrigation and drainage from the current 140,000 hectares to 1.2 million hectares by 2030; an expansion of irrigation acreage by 48,000 hectares per year to promote agricultural productivity.

In view of the above, NIB is expected to support development of irrigated land by among others:

- Giving priority to development of new irrigation areas in the Strategic Plan period;
- Building capacity of Water User Associations in irrigation management;
- Conducting and coordinating research on irrigation development;
- Training farmers and farmer organizations on use of appropriate irrigation technologies;
- Building capacity of both staff and private sector in irrigation development; and mobilizing resources for accelerated irrigation development.

3.7.5. The National Environment Management Authority (NEMA)

The authority is mandated to carry out, among others, the following activities in the sector;

- Responsible for approval of ESIA reports before project implementation
- Promote the integration of environmental considerations into development policies, plans, programmes and projects, with a view to ensuring the proper management and rational utilization of environmental resources, on sustainable yield basis, for the improvement of the quality of human life in Kenya;
- Undertake and coordinate research, investigation and surveys, collect, collate and disseminate information on the findings of such research, investigations or surveys;
- Identify projects and programmes for which environmental audit or environmental monitoring must be conducted under this Act;
- Initiate and evolve procedures and safeguards for the prevention of accidents, which may cause environmental degradation and evolve remedial measures where accidents occur e.g. floods, landslides and oil spills;
- Undertake, in cooperation with relevant lead agencies, programmes intended to enhance environmental education and public awareness, about the need for sound environmental management, as well as for enlisting public support and encouraging the effort made by other entities in that regard;
- Render advice and technical support, where possible, to entities engaged in natural resources management and environmental protection, so as to enable them to carry out their responsibilities satisfactorily.

The responsibility of NEMA is to exercise general supervision and coordination over all matters relating to the environment and to be the principal instrument of Government in the implementation of all policies relating to the environment. Some of the NEMA functions are performed through committees established by EMCA as follows.

3.7.5.1. Standards and Enforcement Review Committee (SERC)

EMCA provides for the establishment and enforcement of environmental quality standards to be set by a technical committee of NEMA known as the Standards and Enforcement Review Committee (SERC).

3.7.5.2. Public Complaints Committee

EMCA has also established a Public Complaints Committee, which provides the administrative mechanism for addressing environmental harm. The Committee has the mandate to investigate complaints relating to environmental siteage and degradation. The members of the Public Complaints Committee include representatives from the Law Society of Kenya, NGOs and the business community.

3.7.5.3. County Environmental Offices

NEMA has offices at county levels contributing to decentralized environmental management.

The project will have to be licensed by NEMA before construction starts and during operation NEMA will have overall supervision of environmental matters.

3.7.6. Water Resources Authority (WRA)

The Water Resources Authority is a national organization with the mandate of regulation of water resources issues such as water allocation, source protection and conservation, water quality management and pollution control and international waters. The services provided by WRA include:

- Planning, management, protection and conservation of water resources.
- Planning, allocations, apportionment assessment and monitoring of water resources.
- Issuance of water permits.
- Water rights and enforcement of permit conditions.
- Regulation of conservation and abstraction structures.
- Regulation and control of water use.
- Coordination of the Water resources management plan. The

Authority has the following powers and functions:

- To develop principles, guidelines and procedures for the allocation of water resources;
- To monitor, and from time to time reassess, the national water resources management strategy;
- To receive and determine applications for permits for water use;
- To monitor and enforce conditions attached to permits for water use;
- To regulate and protect water resources quality from adverse impacts;

- To manage and protect water catchments;
- in accordance with guidelines in the national water resources management strategy, to determine charges to be imposed for the use of water from any water resource;
- To gather and maintain information on water resources and from time to time publish forecasts, projections and information on water resources;
- To liaise with other bodies for the better regulation and management of water resources;
- To advise the Minister concerning any matter in connection with water resources.

WRA sub-regional office in Tana River County will be responsible for issuance of water rights and enforcement of any conditions attached.

3.7.7. Water Services Regulatory Board

Water Services Regulatory Board (WSRB) regulates the provision of services by registered Water Services Providers (WSP) through the Water Services Boards (WSB). WSBs have been created for the various regional drainage basins in the country.

3.7.8. Ministry of Agriculture

The overall function of the Ministry is to enhance crop production, marketing and processing, land use and development, soil conservation, survey and control of pests and diseases. The Ministry is also mandated to provide agricultural development and extension services to smallholder farmers through its Sub-County extension offices.
The specific functions of the ministry of agriculture are as follows:

- Formulate, implement and monitor agricultural legislations, regulations and policies;
- Provide agricultural extension services;
- Support agricultural research and promote technology delivery;
- Facilitate and represent agricultural state corporations in the government;
- Develop, implement and coordinate programmes in the agricultural sector;
- Regulation and quality control of inputs, produce and products from the agricultural sector;
- Management and control of pests and diseases in crops;
- Promote management and conservation of the natural resource base for agriculture;
- Collect, maintain and manage information on the agricultural sector.

The project area is a sugarcane farming zone with potential for development of other crops under both rain fed and irrigation agriculture. Agricultural practices within the project area will require strict management to conserve its natural resources without harming its water production potentials. Any future irrigation development in the project area is likely to have implications on future water balance and hence

sustainability of the project among other heavy water-reliant activities.

3.7.9. Kenya Plant Health Inspectorate Service (KEPHIS)

It is a regulatory agency for quality assurance on agricultural inputs and produce in Kenya. It undertakes, plant variety protection, seed certification, phytosanitary inspection of imports and exports, analysis of soil, water and agro-inputs.

It is mandated to perform the following functions:

- Certification of the quality of seeds and fertilizers;
- Testing and monitoring the presence of harmful residual agro-chemicals on agricultural produce, soils and water systems;
- Coordination of the release of superior and well adapted varieties/cultivars to the farming community;
- Protecting the rights of the breeders/discoverers of new plant varieties through grant of rights to the owners of such varieties and registering them;
- Preventing introduction into the country of harmful foreign weeds, pests and diseases through adherence to strict quarantine regulations and procedures;
- Inspecting and grading agricultural produce for import and export to ensure that they are of high and acceptable quality;
- Implementing the national policy on the introduction and use of genetically modified plant species, insects and micro-organisms in Kenya.

3.7.10. Pest Control and Products Board

It is a statutory organization of the government established to regulate the importation and exportation, manufacture, distribution and use of pest control products. It performs the following functions:-

- To facilitate the availability of new pesticides with proven safety, economic value, quality and efficacy through efficient registration process;
- To reduce environmental contamination and health risks (considering education, proper disposal of unsafe or unusable chemicals and adherence to minimum residue levels);
- To revise the Act governing the regulation of pesticides to include obsolete pesticides disposal, transport, penalties and other shortfalls;
- To monitor the quality of pest control products already in the market.

3.7.11. Kenya Forest Service

Kenya Forest Service (KFS) is mandated to manage protected forests within the country. Protection of the hills in the area will be vital for sustained water supply for the project.

3.7.12. Kenya Wildlife Service

Kenya Wildlife Service (KWS) is principal institution responsible for implementation of the Wildlife Management Act, 2013. KWS is responsible for protection of all wildlife within an area.

3.7.13. Directorate of Occupational Safety and Health

Directorate of Occupational Safety and Health (DOSH) is a government agency responsible for enforcement of Occupational Safety and Health throughout the country for the protection of workers and the general public at all workplaces in line with OSHA, 2007.

3.7.14. County Government of Tana River

Tana River County government is hosting the project and will have various inputs in the project implementation in line with constitutional functions of county governments. The functions of the county government relevant to the proposed project, as outlined in the Fourth Schedule, Constitution of Kenya 2010 are as follows:

- Agriculture and husbandry;
- Provision of essential services such health services, county transport, education;
- Control pollution and disasters management;
- Monitor cultural activities, public entertainment and public amenities;
- County planning and development;
- County public works and services;
- Implementation of specific national government policies on natural resources and environmental conservation; and
- Encourage public participation in county governance and development

The county government of Giritu is expected to help in coordinating various project related activities as far as general environmental conservation and public participation are concerned. This will be better achieved through the respective county ministries of Environment and Natural Resources and ministries of Water and Irrigation.

3.7.15. Water Resources Users Association (WRUA)

In the project area, WRUA exists. It is registered by Water Resource Authority. The WRUA's mandates are to;

- ✓ Exchange of information and ideas on the water resource use;
- ✓ Discuss potential projects and developments that may affect water usage with a view to obtain the consent of other WRUA members and the public;
- ✓ Resolve conflicts on water use;

- ✓ Monitor water availability and use;
- ✓ Lobby for resources to improve availability, reliability, quality or other aspects of the water resources.

3.7.16. Energy Sector Players

Kenya Power and Lighting Corporation (KPLC): Kenya Power owns and operates most of the electricity transmission and distribution system in the country and sells electricity to consumers in Kenya. The electricity to be produced will be added to the Kenyan Grid.

Kenya Electricity Generating Company (KenGen): Manages and develops all public power electricity generating facilities. It sells electricity in bulk to Kenya Power.

Kenya Renewable Energy Portal: The purpose of the portal is to provide easy access to relevant information about administrative entry requirements and procedures for operating a power plant based on renewable energy, the legal and regulatory framework for such investments (e.g., tariff regulation) and relevant market information.

Independent Power Producers (IPPs): build, own and operate power stations and sell the power in bulk to Kenya Power.

Energy Regulatory Commission (ERC): reviews electricity tariffs and enforces safety and environmental regulations in the power sector as well as safeguarding the interests of electricity consumers.

Rural Electricity Authority (REA): implements rural electrification projects on behalf of the government.

Kenya Electricity Transmission Company (KETRACO): It is mandated to construct new transmission lines with government funding to accelerate infrastructure development.

Geothermal Development Company (GDC): It is tasked with developing steam fields to reduce upstream power development risks so as to promote rapid development of geothermal electric power.

Kenya Nuclear Electricity Board (KNEB): Established in 2010, the board is tasked with driving the nuclear energy generation programme for Kenya. This will be achieved through development of a road map for the realisation of the requirements and guidelines by the International Atomic Energy Agency (IAEA).

4. DESCRIPTION OF THE PROJECT LOCATION, COMPONENTS AND ACTIVITIES

4.2. Site location

The project is located at Giritu ranch in Mwima and Salama Locations in Tana River County. The project will cover an area of 5280 ha of estate sugarcane farming and 1,500 ha of smallholder sugarcane blocks all under sub surface drip irrigation. The project area is at the boarder of Lamu County. The proposed project will be on plot LR no.13598, Garsen, Tana River County. ***The Tana River County spatial map and site GPS coordinates has been attached in the annexes.***

4.3. Irrigation Command Area

The command area extends along the Tana River to the west of Tana River County. The boundary of the command area is defined by the canal slope (0.1%) and canal alignment. The largest part of the command area is characterized as a narrow zone, 10 km in average along Tana River. The project command areas cover parts of Mwima and Salama Locations in Tana River County .The size of the command area is highly dependent on the water availability and the hydraulic characteristics of the network. The net irrigation area has been determined to 6,780ha.

Figure 4-1; River Tana

Source; Giritu sugar factory prefeasibility study report

4.4. Proposed Project components and activities description

4.4.1. Project Components

The proposed project consists of building and installation of sugar milling equipment and an irrigation scheme covering parts the project area. Specific project components include the following:

a) Sugarcane plantation

b) Factory

i) Sugar factory with an initial cane crushing capacity of 2500 tcd expandable to 3,500 tcd.

ii) Co-generation capacity up to 8 MW power for use in the Project area and balance to the national grid.

iii) Ethanol production plant

c) Other Project Components

i) Fodder production

ii) Feed lot system for fattening beef cattle

iii) Biogas Production

d) Social Amenities and Benefits

The communities participating in the project will be supplied with the following:

i) Water

ii) Electricity

iii) Roads and bridges

iv) Schools

v) Health facilities.

vi) Tree seedlings

4.4.2. Types of Machines to be utilized

The machines to be utilized in the project implementation shall include but not limited to the following;

- ✓ Earth moving equipment;
- ✓ Hauling equipment;
- ✓ Hoisting equipment;
- ✓ Conveying equipment;
- ✓ Aggregate and concrete production equipment;
- ✓ Pile driving equipment;
- ✓ Tunneling and rock drilling equipment;
- ✓ Pumping and dewatering equipment.

4.4.3. Project activities description

Project's main activities will include the irrigation, the sugar processing activities and power generation.

4.4.3.1. The Proposed Irrigation System Design

Giritu Sugar Factory will adopt sub surface drip irrigation. This is because of the following reasons:

- Drip Irrigation yields 50% and more when compared to rained farming

- When compared to flood irrigation, drip will achieve yields of 20-50% more,
- Sprinkler & mechanized irrigation is 15-35% lower in yield compared to Drip Irrigation

Farm lay out will be planned for sub surface drip irrigation with double raw cane planting allowing for a centre of 1.83 to facilitate Control Traffic Farming (CTF).

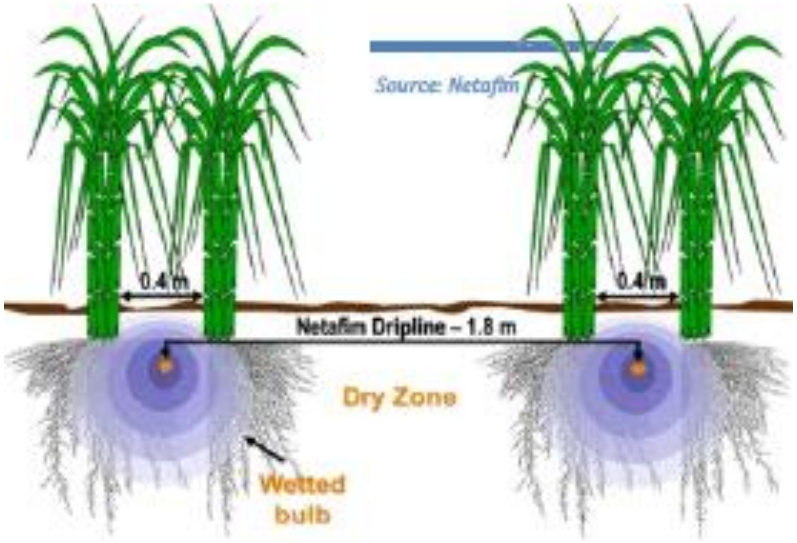


Figure 4-2; Sub-surface irrigation
Source; Netafim

Sub Surface Drip irrigation system, which is considered the most advance irrigation system available worldwide is proposed for this project owing to the scale of irrigation and water availability in the region. This system due to its capacity to deliver efficient nutrigation to plants, will bring with it the value of sustainable high yields necessary to make this project competitive compared to yields in SADAC and COMESA sugar producers. The drippers recommended are those with technology to utilize an advanced diaphragm and pressure compensation to maintain constant discharge rate whilst minimizing maintenance and maximizing efficiencies. The proposed irrigation layout will be;

- Total area: 5280 Has. + 1500 Ha out grower
- Daily maximum irrigation necessities: 6 mm
- Number of sub-areas: 14
- Size of the sub-areas : 500 Has.
- Average number of plots / sub-area: 5
- Average surface of the plot: 100 Has
- Water source: river pump sub Surface drip
- Number of pumping stations: 20
- Maximum water flow requested: 25,000 m3/hour
- Irrigation system: Sub Surface Drip

4.4.3.1.1. Water supply

The Factory will require between 5000 and 7000 cubic metres per day, while the sugar irrigation fields will require another at least 4mm of irrigation per plant per schedule, bringing the water abstraction requirements for the project to 25,000 cubic metres per second, 60,000.0m^3 /day. Water Requirements for the factory will be used to support factory processes in all the three plants of Sugar Milling, Co-Generation and Ethanol Production. Water requirements will be highest at the beginning of the project and will fall gradually as the mill is commissioned owing to the absence of hot condensate from cane at the start. The company will apply for a permit from the Water Resources Management Authority (WRMA) to abstract and utilize approximately from River Tana. The company will also invest on water storage by excavating water storage dams at various sites in the project area with a target to store 30% of all water requirements for the factory, the Estate and terrestrial life.

A reservoir for raw water from the river will be built close to the factory where a treatment plant will be built to clarify the water before being distributed to the various user sections of the project. The design of the project will envisage water recycling of at least 60% of the input, meaning therefore, less water abstraction at full operation of the mill. The project proponents recognise the need for rain water harvesting and maximization of flood waters from River Tana to ensure stable supply during the dry season.

The installation of the water pumping station will be undertaken carefully to avoid the disturbance of the riverine wetland. The proponent will consider pumping water with a lift of 14 m from River Tana to be delivered to the farm which is 1 km from the proposed source. ***The hydrological report is attached in the annexes***

4.4.3.2. Sugar Milling/ Processing Unit

The sugar processing plant will be based on a milling capacity of 2500 TCD. This is a simple three step process which will include Cane milling, Evaporation and Crystallization. The standard flow sheet as will be adopted can be given as;

4.4.3.2.1. Extraction of juice

The process of extraction of juice starts with the cane passing through a series of cuts into chips, then through a crusher, a succession of rollers mostly four to six stage rollers in a row. The mills recommended for this project are of modern design, equipped with turbine drive, special feeding devices, efficient compound imbibition system etc. In the best milling practice, more than 95% of the sugar in the cane goes into the juice

A by-product of this process is a residue called bagasse. A fibrous residue with a low sucrose content. In each ton of sugarcane processed, bagasse will be between 25 to 30% of the total cane.

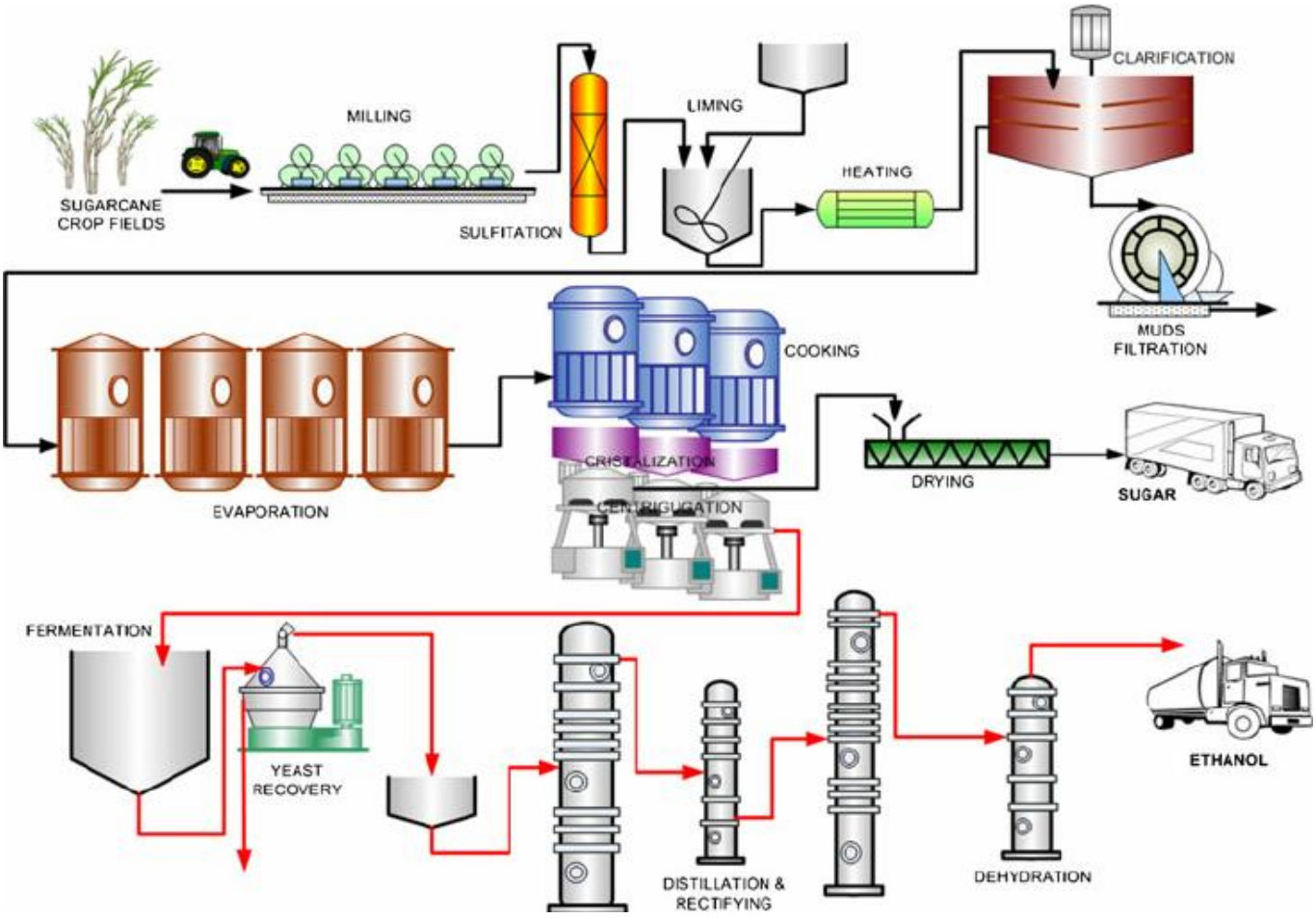


Figure 4-3; Sugarcane processing flow chart

Source; Argentina Agriculture

4.4.3.2.2. Clarification

Dark-green acidic turbid juice, extracted from the process above is raw juice. This raw juice will be taken through a heating ratures as high as 65 to 75 degrees Celsius before being treated with phosphoric acid, sulphur dioxide & milk of lime to remove impurities. The treated juice, on boiling, is fed to continuous clarifier from which the clear juice is decanted while the settled impurities known as mud is sent to the field as fertilizer. The clear juice goes to the evaporators without further treatment.

4.4.3.2.3. Evaporation

The clarified juice contains about 85 % water. About 75% of this water is evaporated in vacuum multiple effects consisting of a succession of four increasing vacuum boiling cells. The vapours from the final body go to condenser. The syrup leaves the last body continuously with about 60% solids & 40% water.

4.4.3.2.4. Crystallization

The syrup received from the evaporation process will be treated with sulphur dioxide after which it is sent to the pan station for crystallization of sugar. In this stage syrup is evaporated until saturated with sugar.

4.4.3.2.5. Centrifugation

The suspension of sugar crystals (massecuite) received from the crystallizer is deposited into revolving machines called centrifuges. The perforated lining retains the sugar crystals, which may be washed with water if desired. The mother liquor 'molasses' passes through the lining because of the centrifugal force exerted & after the sugar is 'Purged'. It is cut down leaving the centrifuge ready for another charge of massecuite. Continuous centrifuges may purge low grades. The mother liquor separated from commercial sugar is again sent to a pan for boiling and re-crystallization. Three stages of re-crystallization are adopted to ensure maximum recovery of sugar in crystal form. The final molasses is sent out of the factory as a by-product used for animal feed etc.

4.4.3.3. Co-Generation

The company proposes to establish a bagasse based 14 MW Co-Gen Power Plant. This will be a simple three step process namely Water preparation, Steam Generation and Power Generation.

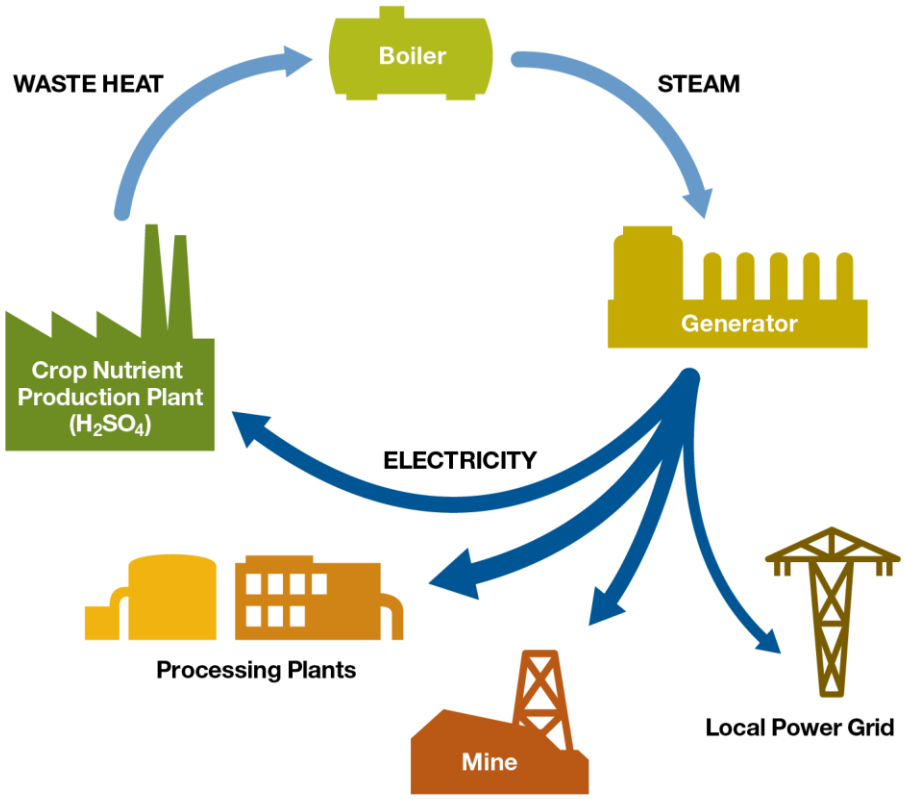


Figure 4-4; Simplified Co-generation process

Source; Wikipedia

The production output can be summarized as below;

#	Production Unit	Cat	Unit	Proposed Capacity
1	Ethanol	A	KLPD	24
2	Sugar	B	TCD	2500
3	Co-Gen Power	A	MW	14

Figure 4-5; Output summary

Source; GirituSugar factory prefeasibility study report

4.4.3.4. Ethanol Processing Process flow 24 KLPD

For this process to guarantee a desirable eco-friendly process flow, a continuous fermentation and multi- pressure distillation will be practiced. The CO2 will be scrubbed in water. Escaping alcohol fumes will be recycled for molasses preparation.

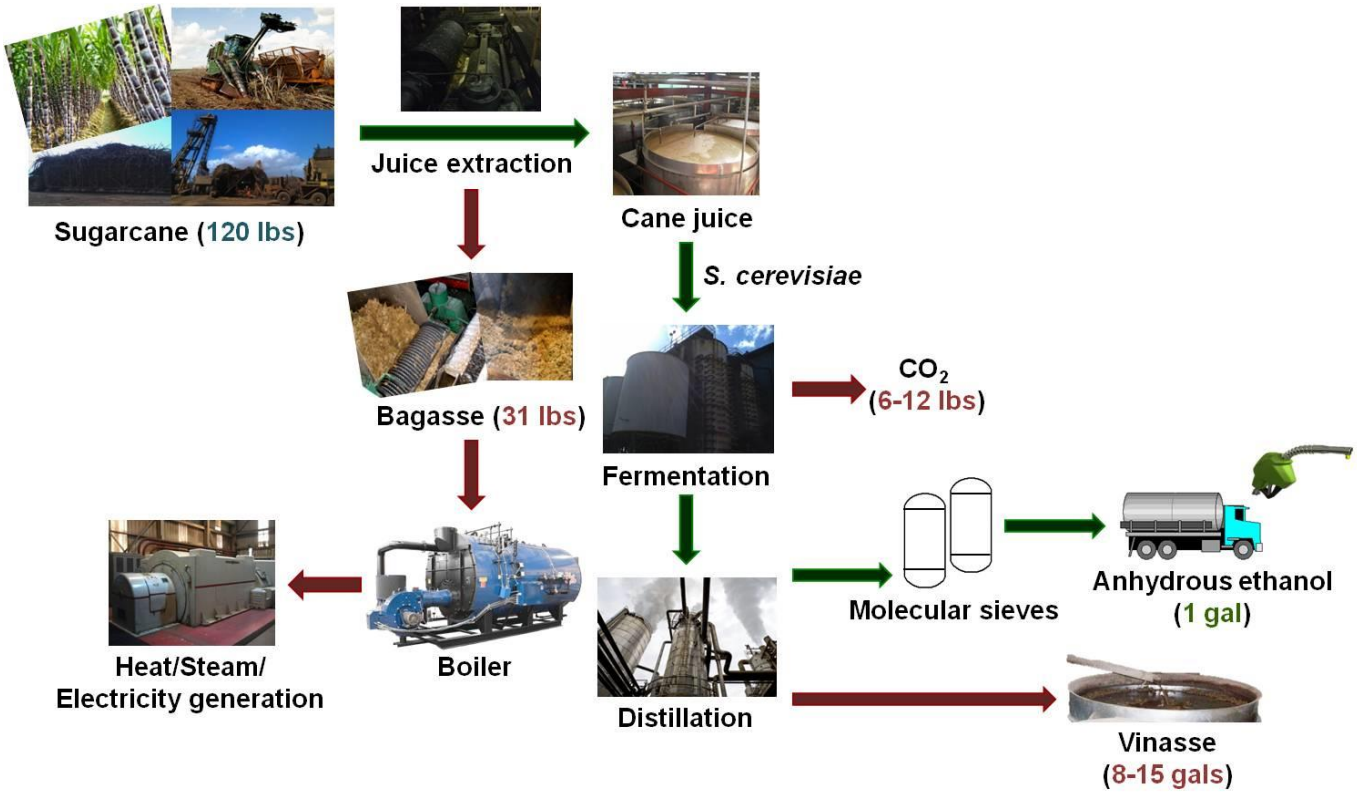


Figure 4-6; Ethanol production process

Source; Bioenergy research group

4.4.4. Other amenities

The factory will have the following;

- Administration blocks

- Factory water needs of approx. 1000 cu m per day to be drawn from River Tana
- Molasses storage Tanks
- Steel Tanks for ethanol
- Warehouses for sugar storage
- Spares stores
- Stores for filler material for composting and press mud
- Sugar plant lay out will utilise approximately. 8 ha
- Co Gen will utilise 6 ha including bagasse storage
- 110 KV switch yard
- Staff houses
- Clinic/ dispensary/hospital

4.4.5. The desirability of the proposed project

The facility's contribution towards food security and the associated benefits to society in general is discussed below:

Food security - Food security was prioritized as one of the top priorities for Kenyan government. This is in line with the millennium development goals which aim to reduce the proportion of people who go hungry and to reduce poverty and unemployment. Making agriculture work must be central component of policy approaches to food insecurity reduction and increasing economic growth. Increased investment in agriculture will help redress the current inequalities.

Local economic growth - The proposed project will contribute towards local economic growth by supporting agricultural development in line with county government's development goals. Building material for the site wall will also be procured from local producers.

Provision of job opportunities - Small-scale farmers, medium to large scale commercial farmers, permanent workers and an unknown number of seasonal workers will be involved in irrigation farming after the development of the project. The factory will require an average workforce of 200 permanent staff and a further 400 casual workers, while the Sugar Estate will employ a further 500 people. The factory workforce requirements will include both permanent and casual workers. The projected initial number of permanent staff will be approximately 200 while the casual workers will be around 300. There will be three shifts in a day and each will require 65 staff for operations. There will also be a general shift for administrative and housekeeping staff. The future requirement in terms of manpower is expected to be over 800 people.

Improving farm income – Agriculture contributes to poverty alleviation by reducing food prices, creating employment, improving farm income and increasing wages (FAO, 2016). With this in mind, the development of the project will be a major boost to the economy of people's lives in the project area.

Land capability: The agricultural potential in terms of crop production of the irrigation command area is moderate, but under

irrigation the expected yield of the area will dramatically increase.

4.4.6. Potential Beneficiaries

The potential beneficiaries include unemployed youth who are expected to work at the out grower farms while others will have employment opportunities in the factory. Above all, the people of Kenya will benefit from the increased sugarcane production from the project.

4.4.6.1. Economic benefits

The planned Investment will support Governments agenda in addressing unemployment through Agri Industrial Development. It responds to all the four pillars identified by the Jubilee Government as key sectors for generating the much needed development and employment of the youth. It also aligns to ASDS and GiritуCounty CIDP. The project will produce 100,000 tons of sugar every year equivalent to 50% of the deficit currently imported from COMESA. This investment will, spin national benefits through narrowing of the deficit in the domestic sugar demand, reducing sugar imports, and saving foreign exchange. The provision of a renewable energy resource will diversify Kenya's electricity supply system and spur Jua Kali industry in villages hitherto living below a dollar a day.. The savings of foreign exchange to be realised from this project will be in excess of USD 60 million while foreign exchange inflows from export of ethanol will contribute in increasing the country's GDP. Five villages will be involved through their cooperatives as out growers and effort that will increase household incomes. Out growers earnings alone will generate a further USD9 million each year on related businesses and services.

4.4.6.2. Local Benefits

The primary local benefits would be the stimulation of rural economic development through creating jobs, improving livelihoods, and improving social services (such as schools, water supply, and clinics) to the local population. The new sugar industries should be accountable to their stakeholders in all operations and activities, with the aim of achieving sustainable development in the economic, social and environmental dimensions.

4.4.6.3. Employment

The project will generate a minimum of 1000 jobs directly at full development and a further 10,000 jobs indirectly.

4.4.6.4. Health

To ensure that the workers are healthy and always available for duty, the project will invest on the development of a level 3 health facility with plans to scale it up to a referral Hospital in the Long run. This facility will improve health delivery to neighbouring communities.

4.4.6.5. Education

Modern Educational Facilities will be built as a move to provide education to the families of the workers and the community. This is a standard practice in projects of the size planned by Giritu Sugar Factory.

4.4.6.6. Security

On top of investing on modern farm security, Giritu Sugar project will built facilities to support the setting up of a police post within the project as a way of ensuring that the project is sound on security issues.

5. CONSULTATIONS AND PUBLIC 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. However, it was observed during the literature review that there are no standard rules on how to involve thepublic.

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 feasibility study, environmental assessment and detailed design of the proposed bus park facilities, recreational parks and access roads 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 Giritu Sugar Factory and irrigation project in Tana River 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 development of Giritu Sugar factory and Irrigation 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 development of the Giritu Sugar Factory and irrigation 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.
- 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 Tana River.

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, irrigation, water, gender, tourism, health, water, roads and human resource. These stakeholders were consulted by use of structured questionnaires and interviews. To ensure that no major player is left out, a desk top study/mapping was done to determine relevant stakeholders to the project.
- ✓ Some of the stakeholders identified at scoping phase are; National and County Government of Tana River; Water Resource Users Association members; Irrigation Water User Association; County Irrigation Office(Tana River); Local communities; Kenya Forest Service; National Environment Management Authority; Youth and

women groups just to mention

- ✓ 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/program 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, local governments, civil society, NGOs and CBO. The consultation programme was developed and implemented taking into account the various areas of influence.

Below is an illustration of the Stakeholders identified and their roles and interests.

Table 7-1: List of stakeholders and their roles

Stakeholder	Roles/Responsibility	Interest	Likely Influence
1. Ministry of Agriculture	• County policies and plans • Extension services to farmers • Organization of farmers into cooperatives • Food security and agribusiness development	• Increased land under irrigation to alleviate food insecurity and poverty • Capacity building on appropriate agricultural practices • -Provision of certified seeds • -Soil and water conservation	• Project may contribute towards county government policies • Project will influence both county government and farmers participation
2. Ministry of Livestock, and fisheries development	• Food security and livestock sector development	• Capacity building on appropriate livestock production practices • -Treating livestock diseases • -Administration of vaccines • -Artificial insemination	• Adoption of zero grazing • Adoption of fish farming

3. Cooperative Marketing Department	• Facilitating co-operatives development • Adopting efficient and effective marketing systems • Promoting value adding, processing and co-operative ventures	• Marketing research and development • Marketing Information and intelligence • Promotion of co-operative ventures, value addition and processing	• Establishment of marketing cooperatives for emerging crops
4. Ministry of water	• Ensuring supply of irrigation and clean drinking water • Ensures payment for the water for sustainability -Water conservation -Pollution prevention -Equitable access to all -Design of intakes, sites and other water supply infrastructure • -Permitting	Supply of affordable water to communities	• Community ownership of the project through mobilization • Supply of drinking water to safeguard vandalism of the system
5. Natural Environment Management Authority (NEMA)	• Ensures compliance with wetland and water quality regulations • Environmental Impact Assessment (EIA) is conducted • Issues approval licenses for project implementation	• Lower and upper catchment conservation • Involvement of all stakeholders at all stages	• Ensuring the project strikes a balance between gains and losses • investment in mitigation activities against negative impacts • Ensuring communities understand the benefits and the bearer of burdens
6. Kenya Farmers Association (KFA)	• Farm distribution inputs to scale farmers small	• Supplying farm inputs	• Success of horticulture through supply of quality seeds • Has farm inputs supply and distribution networks at near command area • Connects with farmers cooperatives to meet their needs
7. Agriculture Sector Development Program (ASDSP)	• Supports transformation of agriculture sector • Value chains and capacity building	• Promotes commercial horticulture	• Its extension agents will help to mobilize farmers to participate in irrigated farming

8. Water Resources Authority (WRA)	• Management of water resources • Providing guidelines and procedures for the allocation of water resources; • Determines applications of permits for water use; • Regulates and protects water resources quality from adverse impacts; • Manages and protects water catchments; • Determines charges to be imposed for the use of water from any water resource	• Construction of site as per the approved standards	• Enforcement of conservation activities around the site catchment areas
9. Communities in the area	• Participation in all stages of the project • Operation and Management of the water system • Provision of a suitable site for site construction	• Water for irrigation of high value crops, and water supply for domestic and livestock	• Formation of farmers cooperatives which will enhance commercial farming and incomes • Community participation in irrigated farming and sustainability of operations and maintenance of the water system through Payments
10. Kenya Power & lighting Company	• Owns and operates most of the electricity transmission and distribution system in the country and sells electricity to customers- • key mandate is to plan for sufficient electricity generation and transmission to meet demand; • Building and maintaining the power distribution and transmission network and • Retailing of electricity to its customers. • It's mandated to purchase bulk electricity supply, generate in off grid areas, transmit	• Buying power generated from Giritu Sugar Project	• Acceptance of household applicants for power connectivity • Pricing of power connectivity can determine affordability/connectivity of households

11. Energy Regulatory Commission (ERC)	• Enforces regulations, licensing power companies • Regulate the electrical energy, • Protect the interests of consumer, investor and other stakeholder interests. • Maintain a list of accredited energy auditors as may be prescribed. • Monitor; ensure implementation of, and the observance of the principles of fair competition in the energy sector, in coordination with other statutory authorities. • Collect and maintain energy data. • Prepare indicative national energy plan.	• Compliance by energy sector	• Processing permit or license where generation and supply of electricity exceeds 3,000kW

✓ Vulnerability refers to two socio- economic dynamics. At a general level it refers to the insecurity experienced by all project-affected persons because of the loss of private and communal property, severed/constrained access to social services, etc. At a more specific level, it refers to those persons who, because of their socio-economic position, are especially susceptible to project-induced impacts. This study has identified; children under 15 years, disabled family members and elderly family members for analysis.

Household with disabled with disabled member was at 13% while the elderly at 65 year and above was at 61%. The livelihood of the vulnerable should be improved by the project so that they are better equipped to deal with project-induced changes. The project should also ensure their participation and consultation at every step of the project.

Female household members were the majority at 53%. This forms a percentage of the vulnerable household and should be taken into consideration by the project while addressing the vulnerable members of the society. This was the analysis finding on the baseline socioeconomic study, giving a clear indication that the project area has vulnerable persons. RAP study should undertake in depth study to identify specific persons affected by the project.

✓ Prior to the public meeting/baraza 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 develop 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 verbally through the area chiefs/village elders and posters. The team in liaison with the chief settled on appropriate venues and dates for public meetings. The ESIA team documented minutes and ensured that list of attendance was well documented.

- ✓ Focussed Group Discussions (FGDs) were done after each baraza so as to get group specific comment regarding the project. This was done to ensure the different members of the community give their concerns independently. The study team conducted FGDs with women, youth and elderly.

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 will be 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

A number of Key stakeholder consultations will be undertaken in the project area. The team will identify stakeholder who are key to implementation of the proposed project as well as those who rely on such services. The stakeholders will include County Government officials, National Government officials, Non-governmental organization, businesses, institutions among others.

It is thus very important that all key stakeholders (Primary and Secondary) are consulted and their views and concerns are solicited and incorporated when developing the ESIA.

The community meetings will be useful in that they will be used to corroborate the information obtained from key

stakeholders as well as to get different perspective regarding issues dear to the community.

5.6. Tools used in public consultations

The tools used for public consultations process are discussed below;

- **Key informant interview guide**s. - This tool will be used during the preliminary survey to collect broad descriptive data from key institutions. In addition, the public administration mainly the chiefs and assistant chiefs will also be visited to get fine details on population, social structure of the communities, land use among others. The tool targeted the officers at the local government level. The tool is for guiding the consultant in carrying out discussions with the selected officers.
- **Socio-economic Survey (Household questionnaires**) - This will be structured questionnaires to gather information on socio economic aspects of the communities in the study area. It will be administered through face to face interviews at the household level. This tool will be used during the detailed surveys. The survey will be conducted on selected (sampled households). The sampling process was confined to communities living around identified project sites and the neighbors that will be affected by the project.
- **Focus group discussion guide.** - A focus group discussion guide will be used to gather information on social cultural aspects of the communities especially with an aim to understand the likely effects on their culture, community structure, cultural properties, forms of social organization and social infrastructure if the project is implemented. This method will elicit information through discussions with selected representative of all groups in the community. The target participants will be representatives of to be affected households.

5.7. Initial consultations

Prelance co. Limted carried out public participation on the Giritu Sugar Factory project. In their consultations, the community sensitization meetings targeted in general all community members within the project area. The meetings were held in the six (6) areas. The meeting was attended by Chiefs, sub chiefs and village elders.

During the meetings, the Giritu Sugar Limited representatives 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 air their views and bring out the issues that were of concern to them. The meetings addressed the following topics: Overview of the project; irrigated agriculture; Hydropower generation, fish farming, possibility of domestic water supply; socio-economic aspects including anticipated project benefits; community participation in the project; natural resources including water, land and wildlife and environmental and social issues including likely negative impacts and the proposed mitigation measures.

From the consultations, the majority of the community at the upstream and the downstream of the site axis indicated that they were aware of the proposed project and they were willing to support the venture. The community indicated that the project will benefit the local people both socially and environmentally.

The consultant organized four FGDs with local communities to explain the project and the format of the ESIA exercise and more especially the social economic components so that the local people understand what the project will bring to their community and what they should expect from the project. The workshop targeted local leaders including chiefs, Assistant chiefs, farmers, women and youth leaders. The agenda addressed during the meetings were:

- ✓ Brief on the study by the consultant –scope, activities and work plan, study methodology etc
- ✓ Informing the community about the data collection process that was to be conducted in their villages and asked them to assist the enumerators
- ✓ Asking the local communities on the direct benefits that they envisage the project would bring to them
- ✓ Probe the communities to identify the negatives effects that the project would bring to their communities and ask them to suggest solutions as mitigation measures
- ✓ Probe the local communities on any other anxiety that they have regarding the project.
- ✓ Establish community awareness on environmental management issues, traditional environmental management approaches;
- ✓ Get feedback from project stakeholders in form of questions / comments / issues on the presentation by the Consultant Team on various issues;
- ✓ To respond to questions, discuss and agree on various issues/concerns raised by the participants/beneficiaries, as much as possible so that they understand the project and own it.

5.8. Some of the issues raised by stakeholders during the public consultation

The concerns rose included:

- ✓ The residents were kin to know the mode of water supply into their farms and if that supply is associated with any cost on their side.

Consultant answer: the consultant assured the farmers that water supply will be through trapezoidal channels which will be the cost of the project. Farmers will not pay for their construction.

- ✓ There was also an issue of increased diseases in the area due to site presence. Residents were concerned that presence of the site in the area will make it somehow vulnerable to weather related diseases and insect caused disease. The site may provide a safe breeding ground for mosquitoes hence making the area more vulnerable to malaria.

Consultant answer: The consultant assured the residents that there will be provision of mosquito nets to prevent

malaria. Also hospitals will be built and equipped to treat project related illnesses. The area will be well maintained. The locals were keen to know if they will receive any training on sugarcane and the mode of planting them.

Consultant answer: The consultant assured the farmers that they will work closely with extension officers in crop related issues by giving them advice on the crop and how to maintain them.

- ✓ They also wanted to know if they will receive any guidance on personal organization or otherwise group formation. They were aware that they will have to be in groups so as to fully benefit from irrigation water but their worry was how to form those groups.

Consultant response: The consultant assured the residents that water users associations will be formed to assist in managing the water and irrigation projects. They will work closely with NEMA, WARMA and Ministry of Water and Irrigation to form them for collective bargaining power.

- ✓ The local leaders wanted to know how soon the construction phase will commence as some residents were also concerned about the project life cycle. They were worried that the project was taking too long to kick off.

Consultant Response: The consultant assured local leaders that immediately after the ESIA, they will open the gateway for development once they are approved by NEMA and other state bodies relevant to the project. The consultant assured the locals that the consultancy will end by 22nd March 2019.

- ✓ The residents had a concern over excessive water in their farms during the rainy season. They feared that their farms might be flooded or undergo leaching due to excessive water during rainy season. They therefore wanted to know if there are any safety measures to ensure that only enough water is supplied to them.

Consultant Response: The consultant assured the residents that drain channels are all connected to the outlet back to the river channel.

- ✓ Some locals, especially the youths were kin to find out if there are any employment opportunities reserved for them both during and after the site construction.

Consultant response: the consultant assured the locals that they will be given first priority in job distribution during construction. Only skills that will not be available from the project area will be sourced from outside. They were also assured that locals will be responsible for maintaining irrigation activities in the project area.

- ✓ Apart from water for irrigation, the residents wanted to find out if there is any other benefit the site will offer to them. They wanted to be enlightened on all the project components, project benefits and a detailed explanation on any possible project related risks.

Consultant response: the consultant explained to the residents that the project will also generate power. Over the risks, the consultant told them of possible mosquitoes which will be handled by giving out mosquito nets. He also told them that hospitals will be built to handle project related illnesses. The other impacts of the project were on clearance of vegetation where the site will be but more vegetation will be planted to compensate the lost vegetation.

- ✓ The area residents raised an issue of squatters living in the ranch and wanted them evicted since they were not part of the community owning the ranch.

Consultant Response: The consultant assured residents that a proper procedure will be taken to ensure that the squatters are settled and that they will also benefit from the project like the rest of the community.

5.9. Public participation concluding remarks

Despite some of the concerns raised by the locals and their area leaders, they expressed a lot of gratitude to Giritu Sugar Limited for the project.

They said that they were expecting the project as soon as possible. ***A detailed record of the consultation meetings are presented as an annex at the end of the second volume of the report***.

5.10. How the public participation opinions/views/concerns have been addressed in the report

The views obtained have been included in the report through recommendations for them to be put into consideration during project implementation for project acceptability. The table below shows how the issues have been addressed;

Table 5-2: Table of how community concerns were addressed

No.	Issue raised	How it was addressed.
1.	Mode of water supply and the bearer of the cost	The designs use pipes and the cost will be part of the project cost.
2.	High cost of water for use in irrigation	This has been put into recommendations on affordable water through water users associations to be responsible for paying the levies to WRA.
4.	Increased diseases	This has been addressed through provision of mosquito nets, safety gears and hospitals equipped with qualified medics to treat locals
5.	Market for the products	This has been addressed through the formation of cooperatives.
6.	Need for training	This has been captured in the ESMP to train farmers on various agricultural practices.
7.	Guidance on organization/group formation	The report highlights the formation of Irrigation water users associations with the help of Irrigation boards and the County Governments.

8.	Commencement of construction of the project	The project will be ready for implementation of the project after this study and upon availability of funds from Giritu Sugar Limited.
9.	Excessive water in the farms during rainy season	The design of the irrigation command area has drainage channels that will remove excess water from the farms.
10.	Employment opportunities	The report recommends that locals will be employed during the project implementation unless the expertize cannot be found locally.
11.	The entire project components to be developed	This has been brought out in the description of the project where it highlights the components like Giritu Sugar Site, water supply, Hydropower, Irrigation scheme and catchment management activities.
12.	Squatters living in the ranch	The squatters are to be settled and made to benefit like the rest of the community.

6. DESCRIPTION OF ENVIRONMENTAL/SOCIO-ECONOMIC IMPACTS, RISKS AND MITIGATION

6.1. Overview

Irrigated agriculture and a processing factory have both positive and negative impacts that are direct or indirect and may be felt locally, regionally or at international level. The impacts could be of economic, social, cultural, biological or physical nature due to farm level agricultural practices and processes, field level water application systems, water distribution systems, water supply or drainage systems or reservoirs/water storage systems. The impacts will either be reversible or irreversible. They will also be exhibited at different stages of the project cycle, either at project; design, implementation, operation or decommissioning phase.

6.2. Key Environmental and Socio-Economic Impacts Identified

6.3. Anticipated Positive Impacts and Enhancing Measures at Construction Phase

The implementation of Giritu Sugar factory project is anticipated to have positive impacts to the physical, social, economic and biological environment. The socio-economic benefits will be manifested to local communities by improving their living standards, the nation through improving the food security situation, the region and global community through export of agricultural produce or importing of farm inputs. However, it is upon all stakeholders to ensure the sustainability of the proposed project for long- term positive impacts to be realized. The following describes the positive impacts anticipated at construction phase;

6.3.1. Employment Opportunities

From the sample survey undertaken in the project site, it was found that 64% of the population is between 19-55 years. This is therefore an active population able to work in the proposed project. The project thus will create direct employment to a number of people during construction and operation phase as skilled and non-skilled laborers. The living standards of a significant number of people will improve due to the availability of income from the construction of the project. Finally, during the construction phase, there will be a significant increase in the people working in the area and this will promote the economy of the county both directly and indirectly.

6.3.1.1. Enhancing Measures

However, for the local people to benefit, the local people need to be given first preference in employment opportunities particularly unskilled and skilled labour unless it cannot be found within the project area. The contractor should source materials locally from suppliers to employ more people. Project stakeholders should also enforce the government policy of providing 30% of jobs or supplies of goods and services to Vulnerable and Marginalized groups within the project area.

6.3.2. Increased income

The majority of the people in the project area have low income. On average incomes is less than Ksh. 12,000. Many of the income also come from motorcycle transport and mixed farming. With the new project, it is anticipated that there will be an increase in household income generated from various activities including; Supply of goods and services for construction, and incomes from the employed youths from the project area

6.3.2.1. Enhancing Measures

For the income to be of significance to the local population, deliberate moves should be taken including; Local people to be given preferential treatment in supplies and provision of labour particularly manual and skilled jobs when available skilled personnel are present in the project area.

6.3.3. Opportunities for skill acquisition

With generally young population of between 19-55 and many of them with primary and above qualification, the project will provide a good opportunity for skill acquisition. They will acquire skills which will be vital for them to work in other similar projects in future.

6.3.3.1. Enhancement

More locals should be trained on various trainings for maximum skill acquisition and majority unskilled workers should be utilized during project implementation for them to acquire necessary skills vital for their future endeavors.

6.4. Anticipated Positive Impacts and Enhancing Measures at Operation Phase

6.4.1. Employment Opportunities

The proposed project has several components such as sugar processing, power generation and irrigation; this will require several people to work. The project therefore will create direct employment to a number of people during operation as farm laborers. A larger proportion of the population will also be employed indirectly in the farm service provision sector, marketing and supply chain through the sale of products. The living standards of a significant number of people will improve due to the availability of income from produce of the project.

6.4.1.1. Enhancing Measures

For the local people to benefit, the local people need to be given first preference in employment opportunities particularly unskilled labour and skilled labour in the operation of the project components. The key stakeholders in consultations with the government should consider value addition process to be done in the project area to provide more job opportunities. Project stakeholders should also enforce the government policy of providing 30% of jobs or supplies of goods and services to Vulnerable and Marginalized groups.

6.4.2. Increased income

It is anticipated that there will be an increase in household income generated from various activities including; Supply of goods and services during operation, increased demand for farm labour or from construction activities, increased sales from farm production due availability of markets, increased demand for farm inputs and equipment, Increased demand for agricultural production service provision and need for labour services in agro-industries among others. This will be a boost to a community whose income levels are in the average of Ksh. 12,000.

6.4.2.1. Enhancing Measures

For the income to be of significance to the local population, deliberate moves should be taken including; Local people to be given preferential treatment in supplies and provision of labour particularly manual jobs, Farmers to form cooperatives that will assist in marketing the produce through other state institutions, relevant institutions to ensure accreditation of farm inputs and equipment supplied to farmers and public awareness on quality agricultural production to be emphasized among the local farmers.

6.4.3. Opportunities for skill acquisition

The implementation of the project activities will require several training to the farmers by extension officers e.g. on farm water management and various aspects of crop husbandry so as to promote productivity. This is meant to capacity build the farmers to pass knowledge across the board. Qualified personnel shall be hired and further training enhanced to sharpen the farmers skills in the delivery of extension information.

6.4.3.1. Enhancement

More locals should be trained on various trainings for maximum skill acquisition and majority unskilled workers should be utilized during project operation for them to acquire necessary skills vital for their future endeavors.

6.4.4. Improved Food Security and Nutrition

Although the area receives rainfall throughout the year and with two planting seasons, the area still has food insecurity. During the study survey, 68.7% of respondence indicated that food was not enough for the family. Therefore, the project will increase quantity of food produced once its implemented and irrigation schemes become operational. Food security will be achieved both at an individual household level and at the national level resulting from the increase in agricultural production. The project proponent proposes planting of a variety of crops at different times in the cropping seasons. It is also proposed that local people to adopt high yield livestock. Therefore, a variety in agricultural production will serve the nutritional needs of the local people, improving their health.

6.4.4.1. Enhancing Measures

To achieve sustained production of increased amount of food requires provision of farm inputs and extension services.

There is also need to control and manage pre and post-harvest pests and diseases to reduce the associated food loss. Where possible the farmers should be assured access to post harvesting facilities. However, for food security situation to be attained there is a need to ensure access to food produced by the locals as well as in areas where it is needed through sustainable distribution networks.

Farmers in the schemes will also need to work with extension officers in adopting high nutritional value crops and animal breeds. The research institutions working in the project area need to develop nutritious crop varieties. Agricultural and value addition technologies should be adopted and should preserve the food nutritional value. Farmers groups need to link farmers to relevant institutions for these to be achieved effectively.

6.4.5. Improved Animal husbandry and productivity

Currently, the baseline should large swathes of land set aside for grazing. It is anticipated that cropping of different crops will reduce the availability of grazing areas in the project area and reduced grazing area will necessitate the adoption of high yield livestock by the local people. Improved animal husbandry and productivity will improve income of the local people and their nutritional status. The manure from livestock can also be used to improve land productivity.

6.4.5.1. Enhancing Measures

For improvement of animal husbandry and productivity to be achieved, the locals need to adopt high production animals. Therefore public awareness on need for improved animal husbandry is required as well as provision of veterinary services, production of fodder crops and processing animal feeds from paddy crop residues.

6.4.6. Agro-Industrial growth

Increase in agricultural production, crop variety and implementation of both government and county government strategies on value addition on agricultural products is anticipated to lead to agro-industrial growth in the project area at operation phase. Growth of such value addition industries will increase the value of products hence fetching high prices and reducing loses on perishable products.

6.4.6.1. Enhancing Measures

To ensure sustainability and need for the Agro-industries, farmers in the project area should sustain high yields and quality agricultural production. The county governments of Tana River should encourage public private partnership to invest in the light/cortege industries. Nevertheless, even with advocacy of private partnerships, farmers should be encouraged to form cooperatives to invest in such capital intensive ventures.

6.4.7. Poverty Alleviation

The project area has relatively high poverty rates with high dependency rates (6-10 household members). However, the

revitalization of the irrigation schemes in both counties is anticipated to create employment opportunities and direct income from the agricultural production chain activities. These are anticipated to improve the local economy thereby reducing the cost of living as well as reduce poverty indices among the local people.

6.4.7.1. Enhancing Measures

Sustainable poverty reduction requires that public awareness on the importance of adopting agricultural production as a business venture by the local people is created. Increased agricultural productivity on the other hand requires the key stakeholders to ensure availability and access to markets by the local people. The local government should also ensure value addition facilities to reduce associated losses and that product fetch a higher price.

6.4.8. Increased Access to the market and project area

Inaccessibility of ready markets is a main challenge to most farmers in Kenya with the social survey showing 81% unable to access proper storage, market, get poor prices for their produce. However, the proposed Giritu Sugar Factory project and irrigation if operated with farmers, county governments in conjunction with cooperatives will increase marketing of scheme produce. Improvement in quality control of produce and provision of access roads and other infrastructure will increase farmers‟ access to the market. This is anticipated to increase the income of the local farmers and their households. Anticipated increase in value addition to agricultural produce will also enhance market accessibility which would otherwise not be accessed by raw products.

6.4.8.1. Enhancing Measures

The relevant stakeholders should provide farmers with real time market information as well as assistance in marketing of farm products for optimal and sustained access to markets. County Government of Tana River should link farmers to relevant state corporations such as National Cereals and produce Board (NCPB), among others. Giritu Sugar Factory will also be their main buyer of sugarcane produced. Farmers should also form cooperatives to enhance bargaining power for their produce. Value addition through growth of agro-industries should serve to maintain high quality produces. Rehabilitate the access road networks to ensure that all farms are served adequately. The roads should also be kept in good working conditions particularly during the wet season.

6.4.9. Availability and access to financial services

Due to current low and unsustainable income, most financial institutions do not provide credits to farmers. However, with the new opportunities that will be presented by the project, more financial institutions will be willing to provide credits. On the other hand, increased demand for farm input will increase demand for financial assistance.

6.4.9.1. Enhancing Measures

Increased financial services in the area may also lead to exploitation of farmers either by intermediaries or by financial

institutions. Therefore farmers should form groups or cooperatives for enhanced bargaining power. They should liaise with state corporations to supply farm inputs and services in bulk to reduce over exploitation by commercial financial /credit institutions. Farmers should also consider seeking financial assistance from state corporations first before considering help from commercial ones.

6.4.10. Increased land value and demand.

The current market prices are about Ksh. 500,000. But with improvement in land productivity and availability of other services like water, power and improved roads will attract more people to the project area. This will result in the increase in demand of land for cultivation, settlement or development due to increased opportunities. The changes in the demand supply chain of land will push up its value.

6.4.10.1. Enhancing Measures

People within the project area should be protected against exploitation from people seeking for cheap land. They need to be enlightened on the value of land to be aware of the current market price.

6.4.11. Improved Soil fertility

Intensification of agricultural production will require replenishing of soil fertility. It is anticipated that Agro-forestry and conservation agriculture in the project area will improve soil fertility. The operation of the project on the other hand is anticipated to increase affordability and accessibility of inorganic fertilizers due to increased income and the willingness of financial institutions to provide credits for farm inputs. Controlled use of inorganic fertilizers and guidance by the extension service experts will also assist in improving soil fertility.

6.4.12. Enhancing Measures

Improving soil fertility will require sustained availability of extension workers to assist farmers in determining soil requirements and the best response. The farmers should be assisted to adopt Agro forestry plant species that improve soil fertility. Where inorganic fertilizers are required then they should be accredited and farmers provided by credit facilities to access the same.

6.4.13. Improved Catchment Management

Sustainable flow of rivers supplying water to the site need to be maintained and will require concerted efforts by key stakeholders to conserve catchment areas, which will in turn reduce sedimentations, siltation and eutrophication in watercourses and in the site at operation phase. Catchment management will improve the flow of water in the rivers to meet the demands and reduce any possible water users‟ conflicts.

6.4.13.1. Enhancing Measures

WRA in consultations with key stakeholders and IWUA should prepare catchment management strategies for the river supplying water in the site. These efforts should also be subjected to public awareness and participation in conservation activities by people living in the catchment areas. Incentives should be provided to communities conserving catchment areas.

6.4.14. Wildlife conservation

The Project area is endowed with diverse wildlife therefore an increase in human wildlife conflicts is anticipated. Regular destruction of crops by monkeys were reported during initial community consultations. However, the project will provide an opportunity for KWS officers to educate the local people on the importance of conservation of game. Increased co-existence of human and wildlife will improve tourism activities of the local communities.

6.4.14.1. Enhancing Measures

Conservation of wildlife and reduction in human wildlife conflicts will be enhanced if the following will be put into considerations;

- Prevention of human encroachment to wildlife habitats by gazetting the areas,
- Collaborative wildlife management on private lands",
- Provision of barriers in areas with cases of wildlife strays,
- Public awareness and stakeholders" participation in wildlife management activities,
- Shared benefits from wildlife conservation revenues with the local communities,
- Enforcement of the wildlife management Act and preparation of an action plan to implement such mitigation measures.

6.4.15. Increased Crop yields

Availability of enough water for crop growth, access to inputs and improved crop husbandry are anticipated to increase crop yields in the project area.

6.4.15.1. Enhancing Measures

To ensure increased crop yields; there is need to ensure timely and adequate availability of accredited farm inputs, public awareness on improved crop husbandry, provision of extension services to farmers, collaborate with research institutions for high yield crops, reliable supply of adequate and quality water for irrigation and ensuring Integrated Pest Management.

6.4.16. Agro-forestry

The need to compensate for vegetation cleared is anticipated to increase planting of Agro-forestry trees. Adoption of

Agro-forestry will increase income for farmers, improve on the biodiversity of the project area and enhance the practice of sustainable agriculture. Agro-forestry will contribute towards attaining statutory requirement of 10% tree cover for each plot. All these will enhance conservation practices in the project area and will act as a source of carbon sink reducing climate change.

6.4.16.1. Enhancing Measures

Public awareness on the benefits of practicing Agro-forestry should be emphasized to the local farmers. There is need for collaboration between farmers and research institutions in the best variety of agroforestry trees that can be adopted in the project area. There is need of further encouraging farmers to plant different species to enhance biodiversity in the area other than planting eucalyptus trees that are water unfriendly.

6.4.17. Water conservation

Construction of Giritu Sugar Factory and irrigational facilities will come in handy to help in water storage facilities thus conserving water that would have been discharged the Indian Ocean.

6.4.17.1. Enhancing Measures

In addition to investing in water storage facilities, farmers should practice agro-forestry to provide wind breaks, adoption of efficient irrigation methods within the project design, line canals and drains where there is seepage, use of crop varieties that conserve water such as planting highland rice and planting of water friendly trees.

6.4.18. Growth of local economy

The development of Giritu Sugar Factory and irrigation scheme in the project area is meant to ensure there are increased crop yields. Irrigation is also meant to bring more land under agricultural production all year round. This will boost the economic gains through the sale of farm products. Adoption of agriculture as a business venture will therefore improve the local economy due to increase in commercial activities.

6.4.18.1. Enhancing measures

The project proponent should ensure capacity building of the local farmers so as to take up farming as a business venture. The market for farm outputs should be ensured at all times through cooperative formation to assist in marketing of farm produce for better pay to the farmers that will lead to growth of local economy.

6.4.19. Water supply to the community

The implementation of the Giritu Sugar Factory project has a component of water supply to the local communities. This will improve water sanitation in the area and at the sometime will provide safe water for community reducing waterborne

diseases.

6.4.19.1. Enhancement

The water supply section should provide safe communal water points according to the settlements so that the locals do not travel long distances to get the water.

6.4.20. Electricity to the national Grid

The project has a component on electricity production which will be supplied to the national grid thus increasing the power availability to the people of Kenya. The locals will also have an opportunity to be supplied with power generated.

6.5. Anticipated positive impacts during decommissioning phase

6.5.1. Creation of Employment Opportunities

The project will create direct employment to a number of people during decommissioning phase that will include renovation of the dilapidated project facilities or demolishing them to restore sites back to their original conditions. The living standards of a significant number of people will improve due to the availability of income from decommissioning activities.

6.5.1.1. Enhancing Measures

For the local people to benefit, the local people need to be given first preference in employment opportunities particularly unskilled labour and skilled labour in the decommissioning of the project components.

6.5.2. Site restoration improving aesthetic value

During the project decommissioning, different project components will be renovated and where possible, demolished. They include irrigation canals and site sites. The sites will be restored back improving aesthetic value of the project area.

6.5.2.1. Enhancement Measures

- ✓ Restoring sites back to their original state or make it better than before the project.
- ✓ Planting of indigenous trees in the sites and maintain them to acclimatize with the area.

6.6. Anticipated Negative Impacts and Mitigation Measures at Construction Phase

Site and Irrigation agriculture is considered an effective way of increasing agricultural production and improved quality of life. However, their development/implementation has negative environmental and social impacts. The impacts will emanate from physical construction of the whole project components. There is need therefore to identify the adverse impacts and mitigation measures to improve environmental and social sustainability of the project before implementation stage.

The project activities at construction phase include;

- ✓ Contractor mobilization
- ✓ Building of contractor"s camp sites
- ✓ Clearing of sites for construction purpose of the site and its components
- ✓ Clearing of sites for construction of main canals
- ✓ Construction of sites and its components
- ✓ Rock blasting
- ✓ Material transportation to sites
- ✓ Diversion of river for room to build
- ✓ Using different machines for operation activities
- ✓ Building of access roads and tarmacking of the roads to the site
- ✓ Planting of trees in the catchment areas
- ✓ Building of live fence around the
- ✓ Disposal of wastewater generated during construction
- ✓ Disposal of solid and spoils generated

The environmental assessment team identified negative impacts of the proposed development and proposed mitigation measure at construction stage as described below.

6.6.1. Loss of habitat

The proposed site has a River Tana ecosystem that is a habitat to microbial organisms, and aquatic organisms including fish. The construction activities highlighted above especially for the site construction are likely to affect the fauna that is dependent to the project area thereby challenging the conservation of the local biodiversity.

Mitigation measures

Measures have been proposed to minimize such loses including; NEMA in collaboration with WRA to gazette wetlands if they exist in the project area. Farmers with plots in swampy areas need to be encouraged to participate in sustainable agro-forestry, KWS in consultations with the local people to gazette conservation areas where need be, Key stakeholders to enhance public awareness and participation in conservation activities, Enforcement of wildlife Act and EMCA 1999 (wetlands conservation) Act.

6.6.2. Loss of aquatic organisms

Construction of the Giritu Sugar Factory and its facilities affecting/interfering with the river will impede free movement or migration of aquatic organisms upstream or downstream for breeding purposes during the river diversion. Also the contractors activities on release of wastes into the river will impact on the living organisms in the river

Mitigation measures

To mitigate against loss of aquatic organisms, river diversion should be carried out in a way that minimal organisms will be affected. The contractor to observe that no wastewater is released into the river that will cause loss of aquatic life. Proper handling of chemicals and wastes to be observed so that NEMA standards are observed.

6.6.3. Loss of vegetation

The proposed development (factory, its components, access roads and water pipe) will necessitate the clearance of vegetation to develop an earth site, access roads; store houses and other infrastructure. Also it will bring up more land under cultivation. Reliance on fuel wood and charcoal by the local people on the other hand will create more pressure on the existing vegetation. It is however important to note that vegetation in most irrigation areas has been cleared with little vegetation on land boundaries. The vegetation will be cleared up to the impoundment area of 5280 Ha. The figure 4-6 and table 4-2 shows some of the vegetation that will be lost as a result of the project.

Mitigation measures

In spite of these, it is proposed that farmers need to practice Agro-forestry on at least 10% of their farms, introduce vegetation strips to unproductive land to compensate for what will be cleared, consider re- vegetation along the rivers as well encouraging local people in catchment areas to plant more vegetation that is water friendly during the component of catchment management. The site reserves area shall be planted of trees (local) to cover up the trees cut during project construction.

6.6.4. Loss of aesthetic value

The project site has nice scenery. Clearance of vegetation, rehabilitation and construction of factory and irrigation facilities will change the landscape of the community irrigation schemes" area. This with poor waste and waste water disposal may result to loss of aesthetic value of the project area during project construction. Also, the excavations to reach the formation levels of construction will lead to permanent change of the site to water body to an area of about 83.37Ha.

Mitigation measures

Loss of aesthetic value can be minimized through reinstating the site after construction and rehabilitation activities. The farmers will also vegetate the boundaries of plots through agro forestry concept.

6.6.5. Water of water resources

This impact stems from the changes in hydrological conditions owing to the development of the Giritu Sugar project. During construction, large quantities of water will be required. This will range from activities of construction and

contractors domestic workers.

Mitigation measures

These impacts can be minimized with the following measures;

- Recycling and Re-use of water within the project site
- Reduce water usage through efficient ways that safes of conserves water.

6.6.6. Changes in hydraulics of the rivers

Construction of the site will mean interference with Tana to irrigate the sugar plantation. This means there will be change of direction of river flow from the original route. This will have an impact on the downstream water quantity down stream.

Mitigation measures

During construction, the contractor will ensure that adequate water is released downstream through prior preparation of diversion channel. It shall be lined to prevent more percolation.

6.6.7. Excessive noise and vibration

The proposed project located in a village set up with a lot of tranquility. The construction works, delivery of materials by heavy trucks and the use of machinery/equipment including tractors, excavators, trucks, bulldozers, generators, grinders, mixers, blasting equipment, compactors and crushers together with drilling works will contribute to high levels of noise and vibration within the construction site and the surrounding area where ambient noise levels are low. This is anticipated to increase noise levels in the project area affecting particularly sensitive receptor areas such as immediate neighbors.

Mitigation measures

Excessive noise and vibration in the schemes can be reduced if the following will be observed;

- Switching of vehicles and machines when not in use;
- Avoiding unnecessary hooting, insulate noisy machines and activities during construction to minimize noise impact to neighboring communities;
- Workers to be provided with personal protection equipment, machines and equipment to be fitted with silencer devices where possible;
- Workers using drilling equipment to be provided with specialized anti-vibrating gloves, machines to be serviced to reduce generation of noise and vibrations;
- Warnings to be issued to the locals in case of any unusual noise;
- The noisy activities should be restricted to daytime but most important;
- The project proponent will ensure that NEMA noise and Vibration standards are observed in all project activities as shown in the baseline conditions.

6.6.8. Air Pollution and Climate Change

Project activities associated with implementation of the project will release pollutants that will affect the air quality and contribute to climate change. The pollutants will result from dust emission and exhaust fumes from vehicles for implementation. The clearance of vegetation for the area to be impounded by water will contribute to less carbon being sunk contributing to climate change. The following are the causes of pollutants and mitigation measures;

6.6.8.1. Dust Emission

Dust will be generated from the heavy movement of traffic on the earth roads present in the area during project construction and decommissioning. It is also anticipated that construction activities particularly construction of access roads, site and canals will increase dust emitted. Further, demolition activities will result in generation of dust as the works will be vigorous.

Mitigation measures

To mitigate against the impacts of dust emitted in the project area, several measures have been proposed including;

- ✓ The access roads to be watered during the construction period;
- ✓ Plant more vegetation for carbon sequestration;
- ✓ Limit the speed on dusty roads to 30km/hr;
- ✓ Construction to take the shortest time possible;
- ✓ Workers to use masks when working in dusty conditions;
- ✓ Using dust nets to trap dust at construction sites;
- ✓ Ensure dust levels do not surpass the NEMA standard highlighted in the chapter on baseline.

6.6.8.2. Exhaust fumes.

Increase in exhaust fumes is anticipated from moving automobile, construction machines and equipment during construction period. The emissions contain normally unburned hydrocarbons, nitrogen oxides, aromatic hydrocarbons, carbon dioxide, carbon monoxide and particulates. They are known to contribute to photochemical smog, health issues, acid rains and global climate change.

Mitigation measures

The following measures will be undertaken to mitigate against exhausted fumes; Construction vehicles to have catalytic devices to ensure complete burning of waste gases, use of clean petroleum that is low in sulphur, lead or other pollutants, proper servicing of vehicles and construction machines as well as plant more vegetation for carbon sequestration

6.6.9. Increase in Water pollution.

The current water quality levels as shown in table 4-5 conforms to NEMA requirements (except for PH 5.3). It is expected that with the development of site and irrigation schemes, water quality both for surface and ground water will be compromised. Activities that will be associated with water pollution at construction stage will include; Wash down of debris generated from various construction activities, surface runoff from non-point and point sources pollution from various human-economic activities, poor disposal of solid wastes from construction camps, Poor management of oil and greases from contractor's service bays and spills from use of construction machines and equipment such as oil and other hazardous chemicals.

Similarly the influx of populations in the project area will increase waste and waste water generated and since the area does not have water treatment facilities, it will be drained back to the river channel untreated. Water pollution will affect the water parameters hindering normal chemical characteristics of the water and indirectly affecting all organisms that come in contact with the contaminated water.

Mitigation measures

In spite of the possibility of affecting the water quality, measures will be proposed to reduce such possible impacts in the schemes including;

The contractor and NIB to prepare an integrated waste management plan during construction and operation period of the schemes;

- Proper handling of loose soils during construction to prevent it from getting into water channels;
- The contractor's camps to have adequate sanitation facilities that can treat waste water before releasing into the environment;
- Ensure all repairs and maintenance work are done at the contractors" yard to avoid spillages,
- Compact loose material/soils and;
- Ensure recommended water quality standards of effluents from the contractors camp are adhered to as per the provisions of NEMA water quality regulation as shown in the baseline section on water quality.

6.6.10. Soil erosion

During project construction, the following activities; construction of Access roads, head works, canals, Conveyance of irrigation water and clearance of vegetation in the command area are anticipated to increase soil erosion. This is because of loose soils and less vegetation to hold soil during construction period. These will impact on the fertility of the soils, siltation and eutrophication of aquatic ecology.

Mitigation measures

The following measures will be taken to minimize the impacts; intensive re-vegetation on bare grounds after construction,

Planting of grass on steep slopes, compaction of loose soils after excavations and reuse of materials for refill.

6.6.11. Soil pollution

Soil pollution is anticipated in the project area during construction phase of the project. During construction phase, Oil and diesel spill from construction machines, grease from repairs of construction machines and equipment from the contractor's camps is anticipated to pollute the soils. This is anticipated to change the chemical composition of the soils affecting the biochemical process.

Mitigation measures

- ✓ Proper servicing of construction equipment free of leaks and using a designated workshop and fueling areas that are paved will reduce the extent of anticipated soil pollution.
- ✓ Installation of oil traps in contractor's camps to prevent leakage of oil into the soils
- ✓ Collection and Reusing of used oil in other constructive uses will assist.

6.6.12. Wastewater effluent

The data on 4-7 shows water quality downstream. From the data, coliform was detected although at low levels. But, during the construction phase, it is anticipated that various liquid wastes including grey and black water, concrete washing and canal watering, runoff from workshop areas and various liquid wastes from the washing of construction vehicles and equipment. Population influx will result in increase in water consumption for domestic and other uses. The resultant by-product of all these activities will be generation of waste water. These liquid wastes are likely to cause imminent threats to the groundwater quality and other aquatic bodies. Negatively, the sites do not have sanitation facilities to treat on the generated effluents.

Mitigation measures

The contractor's camp shall have a fully comply with this ESIA report, which will address all the impacts of its operation during the project implementation and operation period.

- The grey water runoff from the working areas should be contained and properly channeled and be reused.
- Water containing pollutants such as cement, concrete, lime, chemicals and fuels should be discharged into a conservancy tank for removal from the site.
- Potential pollutants should be stored, kept and used in such a manner that any escape can be contained to avoid degrading the water table.
- Any pollution incidents on site should be resolved speedily.
- Any discharge from the site should meet the NEMA requirements on effluents as brought out in waste water quality standards in previous chapters.

6.6.13. Increase in solid waste generation.

Construction activities and the contractor's camp, factory and irrigation main canals will ultimately lead to the production of solid wastes such as excavated soil and rock debris, metal cut offs, plastics, cardboards, paper, wood and waste concrete among others. Population influx on the other hand together with improved standards of living during project implementation will improve the purchasing power of the people. Such will lead to more wastes being generated thereof. During decommissioning, debris of various materials is expected and is expected to add more wastes into the environment. The effects of improperly waste management could be detrimental causing environmental pollution, nuisance to the local communities, and increased vermin among other undesirable effects.

Mitigation measures

- ✓ Waste minimization in the schemes will require the contractor to promote the reuse,
- ✓ recycling and reduction of wastes generated during construction,
- ✓ adequate litter collection facilities,
- ✓ approval of waste disposal sites by NEMA in accordance with the waste management regulations,
- ✓ chemical and hazardous wastes should not be burnt or dumped in open pits as well as adequate
- ✓ Re-use of all excavated materials in the works.

6.6.14. Occupational health and safety

Occupation health concerns will be high in the project area particularly during construction of the project. Occupational risks expected during construction phase include; Fire or explosions due to flammable materials in the contractors" camps, spillage of corrosive or hazardous substances, injuries and accidents sustained by workers, moving machine parts/equipment or falling materials and debris in excavated areas. Occupational risks expected during operation include; Occupational health issues related to use of agrochemicals by the farmers, drowning in flooded pit holes and canals especially for small children and other community members, injuries and accidents sustained to farmers as they use various kind of farm equipment and machinery such as tractors, hay baler etc.

Mitigation measures

The following measures have been proposed to minimize the impacts of occupational risks;

- Ensure safety of the construction workers by putting first aid area and injury reporting mechanism
- Establish the appropriate safety measures in the O & M manual for the operation phases.
- Ensure safety of residents by providing safety signs at strategic places around the access roads.
- Ensure compliance to Occupational Safety and Health Act Cap. 514 and its Subsidiary Legislations.
- Provide personal protective equipment to workers.

- There should be adequate provision of the requisite sanitation facilities for human waste disposal
- The workers should receive the requisite training especially on the operation of the machinery and equipment.
- Provide clean drinking water for the employees.
- Develop a site safety action plan detailing safety equipment to be used, emergency procedures, restriction on site, frequency and personnel responsible for safety inspections and controls.
- Recording of all injuries that occur on site in the incident register, corrective actions for their prevention are instigated as appropriate.
- Provision of prevention tools such as condoms at the health center and construction site availed to all.

6.7. Anticipated Negative Impacts and Mitigation Measures at Operation Phase

A processing plant and Irrigation agriculture is considered an effective way of increasing agricultural production and improved quality of life. However, their operation have negative environmental and social impacts. The impacts emanate from management of the irrigation system and agricultural management practices in the schemes. There is need therefore to identify the adverse impacts and mitigation measures to improve environmental and social sustainability of the project at operation phase.

The operation activities during project operation include the following; Site Activities;

- ✓ Factory and its components construction
- ✓ Installation of machinery
- ✓ Power Plant Activities
- ✓ Generating electricity
- ✓ Maintenance of plant
- ✓ Disposal of waste generated

Irrigation activities

- ✓ Clearing of vegetation for more room for irrigation
- ✓ Ploughing of land
- ✓ Planting using fertilizers
- ✓ Using chemicals in spraying
- ✓ Harvested plant wastes disposal
- ✓ Burning of matter
- ✓ Use of machinery in operation activities

Access road Activities

- ✓ Grading and compacting of access roads

- ✓ Release of dust for marram roads

Catchment Conservation activities

- ✓ Planting of trees in the catchment areas
- ✓ Building of gabions in soil erosion prone areas
- ✓ Agroforestry in the entire project area

The environmental assessment team identified the negative impacts of the proposed development at operation stage and proposed mitigation measure as indicated below.

6.7.1. Increase in solid waste generation.

Operation activities of the project including staff quarters at the site site, irrigation activities will lead to the production of solid wastes such as plastics, cardboards, paper, wood, agricultural waste and food waste among others. The production of these wastes is expected to be higher during project operation considering waste from fertilizer and pesticides products associated with farming activities. Growth of the Agro Industry is expected to further introduce wastes into the environment. Agro Industries use agricultural products as raw materials therefore wastes of various kinds are expected to be generated. Population influx on the other hand together with improved standards of living will improve the purchasing power of the people. Such will lead to more wastes being generated thereof. The effects of improperly waste management could be detrimental causing environmental pollution, nuisance to the local communities, and increased vermin among other undesirable effects.

Mitigation measures

- ✓ Promote the reuse, recycling and reduction of wastes generated during operation,
- ✓ adequate litter collection facilities,
- ✓ approval of waste disposal sites by NEMA in accordance with the waste management regulations,
- ✓ Chemical and hazardous wastes should not be burnt or dumped in open pits
- ✓ Promote re-use of agricultural wastes.

6.7.2. Water loss

This impact stems from the changes in hydrological conditions owing to the installation and operation of the scheme. The irrigation project will draw water from the site and distributes it over the irrigated area in pipes then through drip irrigation.. As a hydrological result it is found that; the downstream river discharge is reduced, the evaporation in the scheme is increased, the groundwater recharge in the scheme is increased, the level of the water table rises and loss of water through seepage is increased. The establishment and operation of the Agro Industries and the population influx in the project on the other hand are anticipated to lead to consumption of large volumes of water to meet the various needs associated with various processes. All these are direct effects leading to water loss.

Mitigation measures

These impacts can be minimized with the following measures ;

- Irrigating at cool times of the day for instance morning and at night hours,
- Use of efficient irrigation methods,
- Practice of Agro-forestry for wind breaks and
- Lining of canals and drains where seepage is anticipated can significantly reduce anticipated water loss.

6.7.3. Air Pollution

During the operation phase of the project, chemicals (identified in the pest management plan) will be applied to crops which may lead to;

6.7.3.1. Agrochemical pollution

Pesticides and commercial fertilizers are some of the common agrochemicals used in agricultural production within the project area. It is anticipated that intensification of agricultural production particularly sugarcane will necessitate increased use of aerosol chemicals to control pests and diseases as well as improving soil fertility. However, the use of these chemicals products will lead to air pollution.

Mitigation measures

Use of personal protection gears during spraying, adoption of integrated pest management practices, planting of wind break vegetation, spraying of crops should be done on a calm day, adoption of sustainable agricultural practices and strict following of manufacturer's directions when using agrochemicals are anticipated to reduce the impacts of agrochemical pollution

6.7.3.2. Greenhouse gases

Agricultural activities stated in the project area will lead to production of greenhouse gases including water vapour, carbon dioxide (CO_2), methane (CH_4) through a process known as methanogenesis, nitrous oxide (N_2O: dinitrogen monoxide) and nitric oxide (NO). The gases will be generated from applied nitrogen fertilizers, digestive process of ruminant animals, animal wastes, evapotranspiration and microbial activities particularly in the paddy.

Mitigation measures

To reduce the amount of greenhouse gases produced, several measures should be taken within each community irrigation scheme including: Reducing water logging to allow aeration of the soils particularly after harvesting paddy crops by draining paddies once or several times during the growing seasons. Avoiding biomass burning but instead use it for compost organic manure. Apply crop residues or organic manure to dry fields to increase aerobic decomposition of the matter and practice agroforestry by planting plants with high primary productivity for carbon sequestration.

6.7.4. Increase in Water pollution.

It is expected that with the development of site and irrigation schemes, water quality both for surface and ground water will be compromised. Activities that will be associated with water pollution at operation phase will include; surface runoff from non-point and point sources pollution from various human- economic activities, poor disposal of chemical containers and other solid wastes, poor quality of tail water that could have concentration of agrochemicals, spills from use of farm machines and equipment such as oil and other hazardous chemicals and leaching from use of agrochemicals.

The establishment and subsequent operation of the agro industries will result in generation of waste and waste water which if not properly disposed of will affect the water quality. Similarly the influx of populations in the project area will increase waste and waste water generated. Water pollution will affect the water parameters hindering normal chemical characteristics of the water and indirectly affecting all organisms that come in contact with the contaminated water.

Mitigation measures

In spite of the possibility of affecting the water quality, measures will be proposed to reduce such possible impacts in the schemes including;

- the farmers and Giritu Sugar Limited to prepare an integrated waste management plan during operation period of the schemes;
- controlled use of agrochemicals to prevent deposition in water courses;
- Maintain a strip of 6m along riverbanks;
- Ensure all repairs and maintenance work are done at the contractor's yard to avoid spillages,
- Compact loose material/soils and;
- Ensure recommended water quality standards in the tail water are adhered to as per the provisions of NEMA water quality regulation.

6.7.5. Soil Pollution

Soil pollution is anticipated in the project area during operation phase of the project. Salts carried in the irrigation water are liable to build up in the soil profile, as water is removed by plants and the atmosphere at a much faster rate than salts. The salt concentration of incoming flows may increase in time with development activities upstream and if rising demand leads to drain water reuse; solutes applied to the soil in the form of artificial and natural fertilizers as well as some pesticides will not all be utilized by the crop; salts which occur naturally in soil may move into solution or may already be in solution in the form of saline groundwater. The accumulation of salts into the soil as a result of leaching contributes to soil pollution. Farming machine such as tractors may result in oil and grease spillage during farming activities. This is anticipated to change the chemical composition of the soils affecting the biochemical process. The end result will be the reduced crop production per acreage.

Mitigation measures

Use of integrated pest management practice, practice of organic farming, proper servicing of construction equipment free of leaks and using a designated workshop and fueling areas that are paved will reduce the extent of anticipated soil pollution. Use of bases to neutralize salts in the soil.

6.7.6. Soil erosion

During project operation, the activity of clearance of vegetation in the command area for irrigation will expose the soil to erosion due to decreased vegetation land cover. This is because of loose soils and less natural vegetation to hold soil during operation period. At the same time steep slopes which are cleared of vegetation will be prone to soil erosion. These will impact on the fertility of the soils, siltation and eutrophication of aquatic ecology.

Mitigation measures

The following measures will be taken to minimize the impacts;

- ✓ Intensive re-vegetation on bare grounds during operation phase in the irrigation command area and the Sio catchment areas,
- ✓ Planting of grass on steep slopes,
- ✓ The canal design to has be designed to adopt sub critical flow velocity to avoid erosion
- ✓ Farmers to practice conservation agriculture.

6.7.7. Increase in agricultural waste generation.

The production of agricultural waste is expected to be higher during project operation considering waste from fertilizer and pesticides products associated with farming activities. Growth of the Agro Industry is expected to further introduce wastes into the environment. Agro Industries basically use agricultural products as raw materials therefore wastes of various kinds are expected to be generated. Population influx on the other hand together with improved standards of living will improve the purchasing power of the people during operation phase. Such will lead to more wastes being generated thereof. During decommissioning, debris of various materials is expected and is expected to add more wastes into the environment. The effects of improperly waste management could be detrimental causing environmental pollution, nuisance to the local communities, and increased vermin among other undesirable effects.

Mitigation measures

Waste minimization in the schemes will require the farmers to promote the reuse, recycling and reduction of wastes generated during operation, adequate litter collection facilities, approval of waste disposal sites by NEMA in accordance with the waste management regulations, the chemical and hazardous wastes should not be burnt or dumped in open pits as well as adequate re-use of all excavated materials in the works. Finally, Giritu sugar factory intends to convert farm

wastes into animal feeds and to generate power which is an added advantage to operation of the project.

6.7.8. Increase in water bodies" siltation and eutrophication

The use of both organic and inorganic fertilizers may result in an excess of nutrients being washed to water bodies. This may lead to eutrophication resulting in degradation of the water quality. Cultivation on river banks or canal, continued degradation of catchment areas and poor farming and soil management practices in the project area will result in siltation that affect the turbidity of water. Eutrophication has been identified as the main cause of flourishing invasive plant species in the project area.

Mitigation Measures

However, these can be minimized through planting of buffer strips within the schemes, along the canals and the rivers, Dredging canals on a regular basis and delivering the sediments to surrounding plots, re- using of excavated materials as fill or for other works, adopting good agricultural and soil management practices and controlled use of inorganic fertilizers.

6.7.9. Changes in hydraulics of the rivers

The hydrological studies indicate a variation in peak river flows during the dry and wet seasons. It was observed that there is high water flow during wet seasons and low flows during the dry season. With the development of the Giritu Sugar Factory and irrigation activities the flows of the river will change in a way that water flowing downstream will be less than what has been flowing before the project implementation. The demand for irrigation water will be high its dry season, therefore water that will flow to the river channel will have impact on the hydrological flow of the riverine system in terms of quantity. The impact will affect the general hydrological flows including the shores of the river, water quality, aquatic organisms, and riverine ecology as well as resulting in user conflicts for shared rivers. These are operational impacts that may be permanent in nature.

Mitigation measures

To sustain environmental water requirement and also to meet the demands of downstream users the farmers groups will;

- Use high water conservation agricultural practices to reduce amount of water used (adoption of high land rice variety where possible),
- Harvest rain water for Agricultural use to supplement supplied irrigation water and
- Provision of water harvesting and storage facilities during wet seasons for farmers downstream

6.7.10. Excessive Noise and Vibration;

Operation of various Agro Industries and mechanized farming activities will be a potential source of noise and vibration within the project area. Similarly demolition works will involve movement of various heavy machinery which are anticipated to generate noise and vibration beyond the ambient level. This is anticipated to increase noise levels in the

project area affecting particularly sensitive receptor areas such as schools or health facilities.

Mitigation measures

Excessive noise and vibration in the schemes can be reduced if the following will be observed;

- Switching of vehicles and machines when not in use;
- Avoiding unnecessary hooting, insulate noisy machines and activities during operation to minimize noise impact to neighboring communities;
- Workers to be provided with personal protection equipment, machines and equipment to be fitted with silencer devices where possible;
- Warnings to be issued to the locals in case of any unusual noise;
- The noisy activities should restricted to daytime but most important;
- The project proponent will ensure that NEMA noise and Vibration standards are observed in all project activities presented in baseline conditions.

6.7.11. Occurrence of invasive species

It is anticipated that with intensified farming in the area, there will be an increase in the spread of the invasive species and a possibility of introducing those that are not known in the area in form of weeds.

Mitigation measures

Some of the measure that will be taken by key stakeholders in the schemes to minimize spread of invasive species will include; Improving soil fertility, use of seeds coated with pesticides, practicing crop rotation, Intercropping and Strip cropping, seeking approval from relevant institutions before planting any new crop or plant. Finally, extension services will be offered by Giritu Sugar Factory Limited and the county offices to eliminate the invasive species when it occurs.

6.7.12. Increase in pests and diseases.

Intensive and year round production of crops induces the continuous presence and building up of pests and diseases with the availability of food to pests throughout the year. Mono-cropping on the other hand which is common in the project area will exacerbate the buildup of pests particularly birds. Contaminated Irrigation water if reused on several plots may lead to spread of pest and diseases in the schemes. Poor storage of farm produce has a potential of introducing pest such as rats.

Mitigation measures

The farmers groups and key stakeholders will observe the following measures to minimize the buildup of pest and diseases in the schemes:

- Use of crop varieties resistant to pest and diseases,
- Adopting good agricultural practices like crop rotation by the farmers,
- Adoption of integrated pest management concept to minimize diseases vector breeding areas,
- Use of certified seeds,
- Provision of post-harvest produce storage facilities,
- Provision of food banks where applicable,
- Maintaining of adequate sanitation in the fields and
- Developing of training programs especially on integrated pest management.

6.7.13. Loss of aesthetic value

Clearance of vegetation for more room of agricultural activities at operation stage will change the landscape of the irrigation scheme area. This with poor waste and waste water disposal may result to loss of aesthetic value of the project area.

Mitigation measures

Loss of aesthetic value can be minimized through reinstating the site after all activities and ensuring that wastewater, solid waste and agricultural wastes are managed well. The factory and farmers will also vegetate the boundaries of plots through agro forestry concept.

6.7.14. Increased child labour and workload for women

The baseline data, shows high dependency ratio among households. It also highlights child headed households and women headed households. Due to high poverty rates in the project area and job opportunities that will be created by the project, it is anticipated that more children will be forced to work in the farms providing family labour or hired for a fee to supplement household income. Cases of school dropouts and child pregnancies will be on the increase in the area. Based on the cultural gender roles and practices, more women will have increased burden of providing family farm labour alongside performing other household duties. This will have a long term impact on their health and availability of time to meet and exchange ideas.

Mitigation measure

This will be controlled through enforcement of the Government policy on compulsory primary and secondary education, hiring people with national Identification Cards and promoting public awareness on gender roles.

6.7.15. Social cultural changes

The proposed development is anticipated to attract people to the project area. This might put pressure on various resources and influence change of culture of the local people. Further, the new farming technologies associated with the project is expected to shift the traditional system to highly skilled and mechanized farming practice. The establishment of

the Agro industry is expected to bring more changes to the local residents as a result of development of new technologies and crop variety that are foreign to the locals.

Mitigation measures

- ✓ Local people to adopt appropriate technology for crop and animal production.
- ✓ Improve local varieties through research.
- ✓ Preserve vegetative areas of cultural heritage.
- ✓ Synchronized celebration of cultural festive and agricultural production work related activities.

6.7.16. Increase in waterborne diseases.

People in the irrigation command area can decide to use canal water for domestic use that can contribute to increase in water borne diseases within the project area. The baseline shows that the project area has water borne diseases as one of the major diseases that affects the communities in the project area.

Mitigation measures

In spite of the possibility of an increase in waterborne diseases, public awareness and campaigns on hygiene behaviour change, promotion of household water treatment methods and provision of safe water for domestic use to the local people will go a long way in reducing impacts of water borne diseases.

6.7.17. Increase in communicable diseases.

Refers to diseases that are transmitted directly from one individual to another, sexually transmitted infections are the most common in the project area and an influx of population in the project area is anticipated to increase infection rate. Immoral behavior due to increase in income from construction activities" wages, income from farm labour or sell of produce will increase commercial sex activities. Changes in behavior may be exacerbated by high poverty levels among the locals. HIV was also identified as one of diseases that affect the project area.

Mitigation measures

To minimize the impacts of increase in communicable diseases, it is proposed that key stakeholders to carry out public awareness campaigns against HIV/AIDS, STIs, Tuberculosis and other communicable diseases present in the area, Accessible health care services to be provided to the local populace, free VCT centres to be provided in the project area as well as sex education and awareness among the youth.

6.7.18. Increase in vector borne diseases.

The irrigation scheme has the potential to increase the risk of vector breeding that transmits diseases such as Malaria,

Bilharzia, Filariasis, Dracontiasis or Trypanosomiasis. Factors such as Water stagnation, flooding in some parts of the schemes and inadequate sanitation facilities in the project area will increase breeding of vectors and transmission of vector borne disease. Malaria is common in children in the project area at the baseline stage.

Mitigation measures

If the following measures are adhered to; public awareness and sensitization on management and prevention of vector breeding for Malaria, Bilharzia, Filariasis, Dracontiasis or Trypanosomiasis, provision of sanitation services in the project area, provision and equipping of medical facilities in the project area, use of preventive measures such as protective clothing and controlling of flooding water in the project area through storage facilities will reduce impacts of vector borne diseases.

Human wildlife conflicts

The project area is habitat to monkeys, snakes and birds. It was noted during the survey that there exists a conflict between the monkeys and the local farmers. This conflict is expected to escalate with the development of the factrory's irrigation area and encroaching on the river plain. On the other hand snakes like cold places and they will be moving along the channels which will be a hazard to the human population in the project area.

Mitigation measures

Measures have been proposed to minimize such loses including; KWS in consultations with the local people to gazette conservation areas and where possible not to kill wild animals within the project area but work with KWS to take them to conservancy areas. Where need be, Key stakeholders to enhance public awareness and participation in conservation activities, Enforcement of wildlife Act and EMCA 1999 (wetlands conservation) Act.

6.8. Negative impacts during decommissioning phase

At decommissioning phase, different activities will take place on the project. The design life of the project will be over and the project components will be rehabilitated or demolished. During decommissioning phase, the following activities will be carried out;

- ✓ Rehabilitation of irrigation main canals
- ✓ Rehabilitation of site
- ✓ Rehabilitation of water supply
- ✓ Demolishing of site components
- ✓ Uninstallation of machinery
- ✓ Disposal of waste generated during the process

- ✓ Demolition of vehicles operations
- ✓ Noise from vehicle operation

The negative impacts associated with decommissioning are as described below;

6.8.1. Excessive Noise and Vibration;

Demolition works will involve movement of various heavy machinery which are anticipated to generate noise and vibration beyond the ambient level. This is anticipated to increase noise levels in the project area affecting particularly sensitive receptor areas such as schools or health facilities as renovation/demolition will be taking place on various project components.

Mitigation measures

Excessive noise and vibration can be reduced if the following will be observed;

- switching of vehicles and machines when not in use;
- Avoiding unnecessary hooting, insulate noisy machines and activities during operation to minimize noise impact to neighboring communities;
- workers to be provided with personal protection equipment, machines and equipment to be fitted with silencer devices where possible;
- Warnings to be issued to the locals in case of any unusual noise;
- The noisy activities should restricted to daytime but most important;

The project proponent will ensure that NEMA noise and Vibration standards are observed in all project activities presented in baseline conditions.

6.8.2. Increase in waste generation.

During decommissioning, debris of various materials is expected and is expected to add more wastes into the environment. The effects of improperly waste management could be detrimental causing environmental pollution, nuisance to the local communities, and increased vermin among other undesirable effects. At baseline, the project area is poor in waste management as they burn unwanted wastes polluting the environment.

Mitigation measures

Proper disposal of wastes generated at decommissioning phase. Recycling and re-use of waste where possible.

6.8.3. Air pollution

The demolition and renovation activities will lead to generation of dust, which affect the air conditions by increasing particulate matter in the air.

Mitigation;

- ✓ Watering of surfaces during decommissioning activities
- ✓ Ensuring that air quality standards highlighted in the baseline areadhered to.

6.8.4. Occupation Health and safety

Occupation health concerns will be high in the project area during decommissioning phase of the project. Occupational risks expected during decommissioning phase include; Fire or explosions due to flammable materials in the pump houses, spillage of corrosive or hazardous substances, injuries and accidents sustained by workers, moving machine parts/equipment or falling materials and debris in excavated areas. Injuries and accidents sustained to workers as they use various kind of farm equipment and machinery for renovation/demolition.

Mitigation measures

The following measures have been proposed to minimize the impacts of occupational risks;

- Ensure safety of the workers by putting first aid area and injury reporting mechanism
- Establish the appropriate safety measures in the O & M manual for the decommissioning phases.
- Ensure safety of residents by providing safety signs at strategic places around the access roads.
- Ensure compliance to Occupational Safety and Health Act Cap. 514 and its Subsidiary Legislations.
- Provide personal protective equipment to workers.
- There should be adequate provision of the requisite sanitation facilities for human waste disposal
- The workers should receive the requisite training especially on the operation of the machinery and equipment.
- Provide clean drinking water for the employees.
- Develop a site safety action plan detailing safety equipment to be used, emergency procedures, restriction on site, frequency and personnel responsible for safety inspections and controls.
- Recording of all injuries that occur on site in the incident register, corrective actions for their prevention are instigated as appropriate.
- Provision of prevention tools such as condoms at the health center and construction site availed to all.

6.9. Irreversible Impacts

The major irreversible impact is the change in land use at the site. Currently, the area is covered with heavy vegetation i.e. shrubs and bushes, after implementation, the same area of 6250Ha will be heavily developed and cleared for the sugarcane plantation. This impact will change the dynamic of the area in that the plants, which were there, will be removed and replaced with buildings and a plantation. This impact will be addressed by planting more vegetation (indigenous) within the project site to keep the same weather that was before.

6.10. Cumulative impacts

Development of Giritu Sugar Factory and abstraction of water from river Tana for the scheme will marginally reduce the net water volume available downstream and in the Indian Ocean (because of consumptive use by crops).

Mitigation Measures

The mitigation measure for this is planting of water friendly trees in the entire catchment of the Tana system to increase water flow that will meet the demand of the developments leaving excess water to flow into the Indian Ocean.

6.10.Impact Rating

6.10.1. Impact Rating Methodology;

A significance rating is allocated to each potential impact, based on consideration of the probability, intensity, extent, duration and possible mitigation of the potential impact. These terms are explained as follows:

- ✓ Probability: the likelihood of the impact occurring;
- ✓ Intensity: the „severity" of the impact or extent to which ecological and social processes are altered;
- ✓ Extent: the scale of the impact on a project area, regional, national level or at international level;
- ✓ Duration: the length of time the impact will last, which may be anything from several days to the entire lifetime of the development; and
- ✓ Mitigation: Ways, in which an impact can be avoided, minimized or managed to reduce its environmental significance.

Each rating is based on observations made during the site visits and on professional judgment. Based on a synthesis of the above criteria, significance of an impact is rated as follows:

- ✓ Very High significance: where the impact would influence the decision to authorize the proposed development with strict mitigation measures to reduce the impacts significantly;
- ✓ High significance: where the impact would influence the decision to authorize the proposed development regardless of any mitigation measures;
- ✓ Medium significance: where the impact should influence the decision to proposed development, and where mitigation measures can, and must, be specified to reduce the overall impact; and
- ✓ Low significance: where the impact would not have any influence on the decision to authorize the proposed development.

The above impacts are being evaluated on their severity using a matrix analysis. The matrix analysis provides a holistic indication of the relationship and interaction between the various activities, development phases and the impact thereof on the environment. The method aims at providing a first order cause and effect relationship between the environment and the proposed activity.

The following describes the phases of the project;

D&P: Design and Planning phase;

C: Construction phase;

O: Operation phase;

D: Decommissioning phase.

Rating of impacts is vital as it helps to provide mitigation measures that are relevant according to how the impacts affect the area locally or internationally. The table below brings out a matrix used during the ESIA study stage in rating impacts. The rating parameters are also described in table;

Table 6-1*: Impact Matrix Table*

No.	Environmental Aspects	Description	Nature / Direction of Impact	Phase of the project				Significance	Probability of Occurrence	Scale /Area of Impact	Magnitude	Duration of Occurrence	Average Score	Mitigation Needed
				D & P	C	O	D C							
1.	Biodiversity	Loss of habitats	-		x	x		-3	-3	-1	-2	-2	-11	Yes
	2.	Loss of Aquatic organisms	-		x	x		-3	-3	-3	-1	-4	-14	Yes
	3.	Loss of vegetation	-		x	x		-3	-3	-1	-1	-4	-12	Yes
	4.	Occurrence of invasive species	-			x		-4	-3	-2	-3	-3	-15	Yes
	5.	Increase in Pest and Diseases	-			x		-4	-5	-2	-3	-2	-16	Yes
6.	Soils	Increase in erosion	-		x	x	x	-3	-3	-1	-2	-2	-11	Yes
	7.	Improved Soil Fertility	+			x		+3	+3	+1	+2	+2	+11	Yes
	8.	Sedimentation	-		x	x	x	-3	-3	-1	-2	-2	-11	Yes

No.	Environmental Aspects	Description	Nature / Direction of Impact	Phase of the project				Significance	Probability of Occurrence	Scale /Area of Impact	Magnitude	Duration of Occurrence	Average Score	Mitigation Needed
	9.	Water logging	-			x		-3	-2	-1	-2	-1	-8	Yes
	10.	Pollution	-		x	x	x	-3	-3	-1	-2	-2	-11	Yes
11.	Water	Changes in Hydraulics of the river	-			x		-3	-3	-2	-3	-3	-14	Yes
	12.	Access to water	+			x		+4	+4	+1	+3	+3	+14	No
	13.	Water loss	-			x		-2	-2	-1	-2	-2	-8	Yes
	14.	Water quality	-		x	x	x	-3	-3	-2	-2	-2	-12	Yes
15.	Air	Dust pollution	-		x	x	x	-3	-3	-1	-3	-2	-12	Yes
	16.	Agrochemical pollution	-			x		-3	-3	-1	-2	-2	-11	Yes
	17.	Green house gases	-			x		-3	-2	-1	-1	-2	-9	Yes
	18.	Exhaust fumes	-		x	x	x	-2	-2	-1	-1	-1	-7	Yes

No.	Environmental Aspects	Description	Nature / Direction of Impact	Phase of the project				Significance	Probability of Occurrence	Scale /Area of Impact	Magnitude	Duration of Occurrence	Average Score	Mitigation Needed
19.	Noise	Noise	-		x			-2	-3	-1	-2	-1	-9	Yes
20.	Land	Loss of aesthetic value	-		x			-2	-3	-1	-1	-2	-9	Yes
	21.	Increase in Land value	+			x		+4	+3	+2	+3	+3	+15	No.
22.	Wetlands	Pollution	-		x	x		-3	-3	-2	-2	-3	-13	Yes
23.	Waste	Gaseous	-		x	x	x	-3	-2	-1	-1	-2	-9	Yes
	24.	Liquid	-		x	x	x	-3	-2	-1	-1	-2	-9	Yes
	25.	Solid	-		x	x	x	-3	-2	-1	-1	-2	-9	Yes
26.	Agriculture	Increase in crop yield	+			x		+4	+4	+4	+3	+3	+18	Yes
	27.	Increase in crop diversity	+			x		+4	+4	+4	+3	+3	+18	No
	28.	Increase in cropping intensity	+			x		+4	+4	+4	+3	+3	+18	No
	29.	Agricultural intensification	+			x		+4	+4	+4	+3	+3	+18	No
	30.	Increase in animal husbandry and	+			x		+4	+3	+1	+2	+2	+11	Yes

No.	Environmental Aspects	Description	Nature / Direction of Impact	Phase of the project				Significance	Probability of Occurrence	Scale /Area of Impact	Magnitude	Duration of Occurrence	Average Score	Mitigation Needed
		Productivity												
	31.	Overgrazing	-			x		-1	-1	-1	-1	-1	-5	Yes
	32.	Agro-Industrial growth	+			x		+3	+3	+4	+3	+3	+16	Yes
33.	Conservation	Adoption of Agro forestry	+			x		+4	+4	+4	+3	+3	+18	Yes
	34.	Enhanced Wildlife conservation	+			x		+2	+1	+1	+1	+2	+7	No
	35.	Catchment management	+			x		+4	+4	+4	+3	+3	+18	Yes
	36.	Water conservation	+			x		+4	+4	+4	+3	+3	+18	Yes
37.	Local Economy	Increase in employment opportunities	+		x	x	x	+5	+4	+4	+3	+3	+18	Yes
	38.	Improved access to market	+			x		+4	+4	+4	+3	+3	+18	No
	39.	Increased income	+		x	x		+4	+4	+4	+3	+3	+18	No
	40.	Reduced poverty	+		x	x		+4	+4	+4	+3	+3	+18	No

No.	Environmental Aspects	Description	Nature / Direction of Impact	Phase of the project				Significance	Probability of Occurrence	Scale /Area of Impact	Magnitude	Duration of Occurrence	Average Score	Mitigation Needed
		Rates												
	41.	Availability of financial institutions	+			x		+4	+4	+4	+3	+3	+18	No
42.	Infrastructure	Improved Access Roads	+		x	x		+4	+4	+4	+3	+3	+18	Yes
	43.	Improving Irrigation facilities	+		x	x		+4	+4	+4	+3	+3	+18	Yes
	44.	Improved Communication Systems	+			x		+4	+4	+4	+3	+3	+18	Yes
	45.	Provision of domestic Water facilities	+		x	x		+4	+4	+4	+3	+3	+18	Yes
46.	Food	Increased food security	+			x		+4	+4	+4	+3	+3	+18	No
	47.	Improved Nutrition	+			x		+4	+4	+4	+3	+3	+18	No
48.	Health	Occupation Health and safety	-		x	x	x	-4	-4	-2	-3	-3	-16	Yes
	49.	Increase in Communicable diseases	-		x	x		-4	-4	-2	-3	-3	-16	Yes

No.	Environmental Aspects	Description	Nature / Direction of Impact	Phase of the project				Significance	Probability of Occurrence	Scale /Area of Impact	Magnitude	Duration of Occurrence	Average Score	Mitigation Needed
	50.	Increase in waterborne diseases	-			x		-4	-4	-2	-3	-3	-16	Yes
	51.	Increase in Vector borne diseases	-			x		-4	-4	-2	-3	-3	-16	Yes
52.	Contractors camps	Increase in waste generation	-		x			-4	-4	-2	-3	-3	-16	Yes
	53.	Occurrence of spillage	-		x			-4	-2	-1	-3	-3	-13	Yes
	54.	Occurrence of accidents	-		x			-4	-4	-2	-3	-3	-16	Yes
55.	Human wildlife conflicts	Severance of wildlife and livestock movement routes	-			x		-1	-2	-1	-1	-2	-7	Yes
56.	Disruption	Social disruption	-		x	x	x	-2	-2	-1	-2	-3	-10	Yes
	57.	Land Conflicts	-		x	x	x	-2	-2	-1	-1	-1	-7	Yes
58.	Cultural heritage	Changes in Behaviour and local culture	-		x	x		-2	-1	-1	-1	-2	-7	Yes
59.	Gender	Child Labour	-		x	x	x	-2	-2	-1	-1	-2	-8	Yes

No.	Environmental Aspects	Description	Nature / Direction of Impact	Phase of the project				Significance	Probability of Occurrence	Scale /Area of Impact	Magnitude	Duration of Occurrence	Average Score	Mitigation Needed
60.	Settlement	Migration	-		x	x								Yes
	61.	Involuntary resettlement	-		x	x		-3	-3	-1	-3	-4	-14	Yes
62.	Floods	Reduced floods	+		x	x		+4	+4	+2	+3	+3	+12	NO
Total														

The figures in the table above can be justified basing on the impact rating parameters shown in the table below.

Table 6-2 ***: The Impact rating parameters***

Score	1 (- or +)	2 (- or +)	3 (- or +)	4 (- or +)	Assumptions
Significance	Low	Medium	High	Very High	
Probability of Occurrence	Low	Medium	High	Very likely	
Scale/area of impact	Project area	Regional	National	International	
Magnitude /Intensity	Low	Medium	High	Very High	
Duration of Occurrence	Short term	Medium term	Long term	Permanent	

7. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

7.1 Overview

Environmental management is an important aspect of project management and in protecting the environment. The objectives of environmental and social management plan is to ensure smooth implementation of environmental and social protection measures, mitigate adverse environmental impacts of project implementation, and ensure environmental and social protection activities are carried out smoothly in the project areas. Giritu Sugar Factory Project has been subjected to comprehensive environmental and social impacts assessment in accordance with prevailing environmental and agricultural policies, laws and guidelines. Various potential adverse environmental and social impacts associated with the project have been identified and an ESMP formulated at the ESIA study stage to guide in mitigating the negative impacts. However, the implementation of some of the ESMP actions will require a response beyond the project level. There is need therefore to have a multi- sectoral approach that will require unified management structures for such proposed measures. The project proponent is required to identify the actions and respond appropriately. Where the expert team could not determine the realistic costs of some of the proposed environmental management activities due to the associated hidden costs, further actions will be proposed to come up with more accurate costs. It is upon the project proponent and the environmental enforcement agencies to ensure that the proposals are adhered to during the project implementation.

As part of the ESMP a pest management Plan and site safety Plan will be prepared to guide on operation of cropland in the irrigation command area and the safety of the site in case of failure to the downstream people. The ESMP prepared below brings out the potential impact, mitigation measures, responsibility during the time of its implementation, time frame which the impact will occur (preliminary &Design, Implementation/construction, operation and decommissioning) and the cost of the mitigation measure.

Table 7-1*: Environmental and Social Management Plan-Construction Phase*

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
Biodiversity.						
1.	Loss of Aquatic organisms.	● Factory buildings construction, irrigation canals ✓ Building of contractor's camp sites ✓ Clearing of sites for construction purpose of the site and its components ✓ Construction of sites and its components ✓ Diversion of river for room to build ✓ Disposal of wastewater generated during construction	● Ensure recommended water quality standards in the tail water are adhered to as per the provisions of NEMA water quality regulation. ● Ensure no observable aquatic organism is destroyed during construction. ● KWS in consultations with the local people to gazette conservation areas where need be, ● Key stakeholders to enhance public awareness and participation in conservation activities, ● Enforcement of wildlife Act 2013 and EMCA (wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009.	Proponent/contractor, NEMA, WRA and Farmers Groups	During construction phase	2,000,000
2.	Loss of vegetation.	● Site facilities, energy component, irrigation channels and water supply components.	● The proponent and Farmers to Practice Agro-forestry on at least 10% of their farms. ● Introduce vegetation strips to unproductive land to compensate	Proponent/Contractor, GoK Contractor. Farmers groups.	During construction	2,500,000

		✓ Clearing of vegetation for construction purpose	for what will be cleared, ● Identify endangered species of trees to be planted in other places where they will not be affected. ● consider re-vegetation around the upstream points and along the rivers ● Plant more trees in the site reserve areas to increase vegetation ● Encourage local people in catchment areas to plant more vegetation.			
3.	Loss of aesthetic value	● All the project components. ✓ Excavations ✓ Construction of buildings ✓ Installation of machinery ✓ Generation of spoils ✓ Cutting of trees ✓ Construction of access roads	● Reinstate the site after construction and rehabilitation activities. ● Planting of more trees within the project areas to improve aesthetic value of the area	GoK. Contractor Supervising consultant	Construction phase.	Part of construction cost.

.	Loss of habitat.	● All the project components ✓ Cutting of trees ✓ Destroying habitats to wildlife	● NEMA in collaboration with WRA to gazette wetlands that may exist within the area ● KWS in consultations with the local people to gazette conservation areas where need be, ● Key stakeholders to enhance public awareness and participation in conservation activities, ● Enforcement of wildlife Act and EMCA 1999 (wetlands conservation) Act. ● Planting of similar trees lost in other areas of the project to create more habitat that is vital for the project.	GoK WRA. NEMA. Farmers, Proponent	Construction phase	2,000,000
Pollution						
.	Water pollution	● Site components, contractor's camp, irrigation channels ✓ Effluents from camps ✓ Sediments from excavations that will pollute water ✓ Maintenance of construction vehicles	● The contractor to prepare an integrated waste management plan during construction and operation period of the schemes, ● Ensure all repairs and maintenance work are done at the contractors‟ yard to avoid spillages, ● Compact loose material/soils and ● Ensure recommended water quality standards in the tail water are adhered to as per the provisions of NEMA water quality regulation. ● Prevention of non-point source of	Contractor	During construction	2,500,00

			pollution to the water for irrigation. ● Regular water sampling of boreholes and water downstream to detect water pollution that will be handled immediately.			
7.	Excessive Noise and Vibrations.	● Site components, irrigation canals, water supply, and energy plant ✓ Noise from the operating machines ✓ Rock blasting	● workers using drilling equipment to be provided with specialized anti-vibrating gloves, ● switching off vehicles and machines when not in use, ● Machines and equipment to be fitted with silencer devices where possible, ● The site for construction should be hoarded off ● An improvised rock breaking system should be adopted by use of Ammonium Nitrate ● avoiding unnecessary hooting, ● workers to be provided with personal protection equipment, ● machines to be serviced to reduce generation of noise and vibrations, ● warnings to be issued to the locals in case of any unusual noise, ● the noisy activities should be restricted to daytime ● Ensure that NEMA noise and Vibration standards are observed	Contractors, supervising consultant and Farmers groups Workers a	During construction.	1,000,000

			in all project activities.			
8.	Dust emission.	● Site components, Irrigation components, access roads ✓ Dust emission due to construction activities	● The access roads to be watered during the construction period, ● Plant more vegetation for carbon sequestration, ● limit the speed on dusty roads, ● Workers to use masks when working in dusty conditions.	Contractor.	During construction.	2,000,000.
9.	Water borne Diseases.	● Site and irrigation channels ✓ Loss of sources of water due to submergence of the site 	● public awareness and campaigns on hygiene behaviour change, ● Promotion of household water treatment methods ● provision of safe water for domestic use to the local people ● Provision of alternative water sources to those who use water from wells being affected by the project ● Building of hospitals in the project area and equipping them to treat the illnesses when they occur.	Farmers groups to work with the County governments, and other relevant institutions.	During project construction	2,000,000
10	Changes in Hydraulics of the river.	● Site ✓ Interference of the river for construction	● Provision of water harvesting and storage facilities during wet seasons to supplement abstracted water. ● Plant more water loving trees in the project area to increase flows in the river ● Diverting the river to ensure	Contractor/GoK	During construction	5,000,000

			continued flow downstream during construction.			
11	Exhaust fumes	● All the project components ✓ Operation of construction vehicles	● Construction vehicles to have catalytic devices to ensure complete burning of waste gases, ● use of clean petroleum that is low in sulphur, lead or other pollutants, ● proper servicing of vehicles and Construction machines according to manufacturer's specifications ● Plant more vegetation for carbon sequestration.	Contractor and GoK	During construction	Part of construction cost.
Soil.						
12	Soil erosion.	● Site and irrigation channels ✓ Clearing of vegetation for construction purpose	● Planting of trees in the project catchment areas to minimize soil erosion ● Where there is intense soil erosion, gabions should be built as a measure to reduce soil erosion ● There should be intensive re-vegetation on bare grounds after construction. ● Compaction of loose soils after excavations and reuse of materials for refill. ● The canal design to adopt sub critical flow velocity to avoid	Contractor, County governments and farmers.	During construction	800,000

			erosion. ●			
13	Siltation, eutrophication and sedimentation.	● Site and irrigation command area ✓ Loose materials on sites due to construction ✓ Spoils as a result of excavations	● Re-using of excavated materials as fill or for other works, ● Compacting of loose soil and planting of grass to hold the soil	Contactor.	Construction phase.	No direct cost estimates.
Wastes.						
14	Waste water and effluents.	● Site sites, Contractor's camp, water supply and energy plant ✓ Waste water from the construction Activities	● The grey water runoff from the working areas should be contained and properly treated before being released to the river ● Where possible wastewater need to be treated to meet the effluent standards before releasing it the receiving water. ● Water containing pollutants such as cement, concrete, lime, chemicals and fuels should be discharged into a conservancy tank for removal from the site. ● Potential pollutants should be stored, kept and used in such a manner that any escape can be contained to avoid degrading the water table.	Contractor, County Government of Tana River,	During construction,	Part of construction cost.

			● Any pollution incidents on site should be resolved speedily. ● The construction should have sanitation facilities that will not pollute water			
15	Increase in waste.	● Site, Irrigation, Energy and access roads ✓ Different wastes resulting from contractor construction activities.	● promote the reuse, recycling and reduction of wastes generated, ● Provision of adequate litter collection facilities, ● Approval of waste disposal sites by NEMA in accordance with the waste management regulations, ● The chemical and hazardous wastes should not be burnt or dumped in open pits ● Debris should be utilized in filling up of quarries within the project area	Contractor	During construction,	700,000
Social issues.						
16	Increased communicable diseases.	All the project components ✓ Spread of communicable diseases among workers and local communities	● Hospitals should be built in the project area for to treat the locals for all the illnesses. ● Carry out public awareness campaigns against HIV/AIDS, STIs, Tuberculosis and other communicable diseases present in the area, ● Accessible health care services to be provided to the local populace, ● Free VCT centres to be provided	Contractor, Ministry of health and County government	Construction phase	3,000,000

			in the project area as well as sex education and awareness among the youth.			
17	Downstream Water use conflicts.	● Site and irrigation canals ✓ Use of water from the river for construction purpose	● Harvesting of rain water for use during the dry season and ● The need to provide piped water supply for domestic users. ● Base flow should be always released into the river to flow downstream	IWUAs WRUAs, County Governments, Operation team and Farmers groups.	During project Operation.	No direct cost estimates.
18	Involuntary resettlement	▪ Site ✓ Resettlement of people	▪ The farmers groups to spear head the way leave acquisition and registration process in the areas of canals. ▪ The WB OP 4.12 should be invoked and RAP prepared to include appropriate compensation and an alternative resettlement location in case of such requirement. ▪ The affected persons to be adequately involved in the preparation of RAP and its implementation, ▪ All the affected people need to be provided with an economic safe landing, ▪ Compensation for lost economic activities to be adequately addressed under RAP in case of any. ▪ Adherence on the prevention, protection and assistance to internally displaced persons and	Proponent	Before project Implementation	The cost to be determined by the RAP report

			affected communities Act, 2012.			
Public Health and safety Plan.						
19	Occupational Health and Safety (OHS).	▪ Site, Irrigation channels and contractors camps ✓ Working conditions for workers ✓ Securing of working areas ✓ Construction of crossings ✓ Daily works of the contractor ✓ Noisy machines ✓ Explosion of materials/rocks	▪ Ensure safety of the construction workers by putting first aid area and injury reporting mechanism ▪ The contractor to have his workable health and safety rules to apply always at work places ▪ Securing of sites to prevent any accident at sites ▪ Ensure safety of residents by providing safety signs at strategic places around the access roads. ▪ Ensure compliance to Occupational Safety and Health Act Cap. 514 and its Subsidiary Legislations. ▪ Provide adequate crossings where canals will pass ▪ Provide personal protective equipment to workers. ▪ There should be adequate provision of the requisite sanitation facilities for human waste disposal ▪ The workers should receive the requisite training especially on the operation of the machinery and equipment. ▪ Preparation of a working site	Contractor, supervising consultant Farmers groups	Construction phase	Part of construction cost.

			safety plan ▪ Provide clean drinking water for the employees. ▪ Develop a site safety action plan detailing safety equipment to be used, emergency procedures, restriction on site, frequency and personnel responsible for safety inspections and controls. ▪ Recording of all injuries that occur on site in the incident register, corrective actions for their prevention are instigated as appropriate. ▪ Provision of prevention tools such as condoms at the health center and construction site availed to all ▪ The contractor to register workplace and ensure fire and safety gears are in order and to be regularly maintained during operation			
Cost of ESMP at Construction Stage						**22,000,000**

Table 7-2: Environmental and Social Management Plan-Operation Phase

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
Biodiversity.						
No.	**Potential Impacts**	**Project component and Activities**	**Mitigation measures**	**Responsibility**	**Time frame**	**Cost Ksh.**
1.	Loss of Aquatic organisms.	● Irrigation command area ✓ Polluted water quality from the command area	● Ensure recommended water quality standards in the tail water are adhered to as per the provisions of NEMA water quality regulation. ● KWS in consultations with the local people to gazette conservation areas where need be, ● Key stakeholders to enhance public awareness and participation in conservation activities, ● Enforcement of wildlife Act 2013 and EMCA (wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009.	Proponent, NEMA, WRA and Farmers Groups	During operation phase	2,000,000

2.	Loss of vegetation.	● Irrigation ✓ Clearing of vegetation for irrigation purpose	● Farmers to Practice Agro-forestry on at least 10% of their farms. ● Introduce vegetation strips to unproductive land to compensate for what will be cleared, ● Identify endangered species of trees to be planted in other places where they will not be affected. ● consider re-vegetation around the upstream points and along the rivers ● Plant more trees in the site reserve areas to increase vegetation ● Encourage local people in catchment areas to plant more vegetation.	Proponent, GoK. Farmers groups.	During construction	2,500,000

.	Occurrence of invasive species.	● Irrigation ✓ Emergence of invasive species in the project area	● Improve in soil fertility ● Use of seeds coated with pesticides. ● Practice crop rotation, Inter cropping and Strip cropping. ● Before planting any new plant or crops in the area, it should be approved by relevant institutions ● Equipment required for the construction works should be clean and free from any alien plants and mud which may contain seeds of alien species. ● Raw materials to be used for construction such as sand and rocks should be sourced in areas where there are no alien/ invasive species. ● Enforce the crops Act 2013 where possible ● Where invasive crop occurs, it should be reported to relevant institutions to handle the issue before it spreads to other areas	Proponent, Farmers groups, contractor County government and seed company	During project Operation.	2,000,000

4.	Increased pests and diseases.	● Irrigation ✓ Emergency of new pests and diseases due to different crops	● Use of crop varieties resistant to pest and diseases ● Practice good agricultural practices like crop rotation. ● Use of integrated pest management concept. ● Minimise diseases vector breeding areas. ● Use of certified seeds. ● Controlled use of agrochemicals. ● Provision of post-harvest produce storage facilities. ● Provision of food banks. ● Sanitation in the field should be adequately maintained. ● Training programs should be developed especially on integrated pest management. ● Enforce the crops Act 2013 ● Incase of new pests, early reporting to relevant authority before it spreads out.	Proponent, Farmers groups, Agricultural extension officers, County governments and seed company	During project Operation.	2,000,000

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
5.	Loss of habitat.	● Irrigation ✓ Changing of habitat to other uses like irrigation	● NEMA in collaboration with WRA to gazette wetlands that may exist within the area ● KWS in consultations with the local people to gazette conservation areas where need be, ● Key stakeholders to enhance public awareness and participation in conservation activities, ● Enforcement of wildlife Act and EMCA 1999 (wetlands conservation) Act. ● Planting of similar trees lost in other areas of the project to create more habitat that is vital for the project.	Proponent, GoK WRA. NEMA. Farmers.	operation phase	2,000,000
6.	Water loss	● Site and irrigation components ✓ Evaporation and evapotranspiration ✓ Seepage from canals	● Planting of low water requirement crop varieties for example highland rice, ● Irrigating at cool times of the day for instance morning and at night hours, ● use of efficient irrigation methods, ● Practice of Agro-forestry for wind breaks and ● Lining of canals and drains	Proponent, Farmers groups, Agriculture, Fisheries and Food Authority (AFFA) and County governments).	Operation phase	5,000,000

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
			where seepage is anticipated. ● Provide provision for roof catchment in the area to compensate on water loss			
7.	Water logging	● Irrigation command area ✓ Poor drainage of soils ✓ Over irrigation of fields ✓ Excessive rainfall in the fields	● Ensuring efficient functioning of drain canals, ● Proper maintenance of canals to avoid seepage and leakages, ● Adopt agricultural practices that reduce hardpans, ● Installation of appropriate drainage channels to drain any excess water from the farms, ● Regular de-silting of canals and the rivers and ● Regular maintenance and operation of the irrigation infrastructure. ● During time of rain season, water should not be allowed to be supplied to the irrigation areas or into the firms	IWUA to be formed, Proponent, Farmers groups in cooperation with NWCPC. Site Operating team.	Operation phase.	5,000,000
Pollution.						

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
8.	Water pollution.	● Irrigation and energy plant ✓ Use of agrochemicals in farming ✓ Wastes from operation ✓ Waste water from irrigation areas	● Controlled use of agrochemicals to prevent deposition in water courses, ● The contractor and Farmers groups to prepare an integrated waste management plan during construction and operation period of the schemes, ● maintain a vegetated strip of 6m along riverbanks, ● Ensure recommended water quality standards in the tail water are adhered to as per the provisions of NEMA water quality regulation. ● Prevention of non-point source of pollution to the water for irrigation. ● Regular water sampling of boreholes and water downstream to detect water pollution that will be handled immediately.	Proponent, Farmers groups.	During operation.	5,000,000
9.	Excessive Noise and Vibrations.	● Irrigation and power plant ✓ Machines operation ✓ Rock blasting	● Switching off machines that are not in use ● avoiding unnecessary hooting, ● workers to be provided with personal protection	Proponent, Farmers groups	During Operation	1,500,00

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
			equipment, ● machines to be serviced to reduce generation of noise and vibrations, ● the noisy activities should be restricted to daytime ● Ensure that NEMA noise and Vibration standards are observed in all project activities.			
10	Water borne Diseases.	● Irrigation ✓ Weeding in flooded areas ✓ Using of water from the canals for domestic uses	● public awareness and campaigns on hygiene behaviour change, ● Promotion of household water treatment methods ● provision of safe water for domestic use to the local people ● Provision of alternative water sources to those who use water from wells being affected by the project ● Use of protection gears such as gumboots by farmers. ● Building of hospitals in the project area and equipping them to treat the illnesses when they occur.	Proponent, Farmers groups to work with the County government and other relevant institutions.	During project operation.	5,000,000

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
11	Changes in Hydraulics of the river.	●	● Use high water conservation agricultural practices to reduce amount of water used (Planting of high land rice variety). ● Provision of water harvesting and storage facilities during wet seasons to supplement abstracted water. ● Plant more water loving trees in the project area to increase flows in the river	Proponent,IWUA/ WRUA. WRA. Farmers groups and County government.	Operation phase.	2,000,000
12	Exhaust fumes	● Power house, and irrigation components ● Operation of the power house ● Machine operation during ploughing releasing carbon-monoxides	● use of clean petroleum that is low in sulphur, lead or other pollutants in operation vehicles, ● proper servicing of vehicles and Construction machines according to manufacturer's specifications ● Plant more vegetation for carbon sequestration.	Proponent, Farmers groups	During decommissioning.	2,000,000.

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
13	Agrochemical Pollution	● Irrigation ✓ Spraying of chemicals ✓ Applying of fertilizers during planting	● Use of personal protection gears during spraying, ● adoption of integrated pest management practices, ● Planting of wind break vegetation, ● spraying of crops should be done on a calm day ● Adoption of sustainable agricultural practices to reduce the impacts of agrochemical pollution. ● Strict following of manufacturers conditions when using chemicals ● Adequate capacity building of farmers on agro-chemical use.	Proponent, Farmers groups, County governments	During operation	5,000,000
14	Greenhouse gases (Methane)	● Irrigation ✓ Water logging as a result of poor drainage ✓ Burning of biomass by farmers	● Reduce water logging to allow aeration of the soils particularly after harvesting paddy crops. It can be done by draining paddies once or several times during the growing seasons. ● Avoiding biomass burning but instead use it for composed organic manure ● Crop residues or organic	Proponent, Farmers groups.	Operation phase.	2,000,000

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
			manure to be applied on dry fields to increase aerobic decomposition of the matter. ● Practicing agroforestry by planting plants with high primary productivity for carbon sequestration.			
Soil.						
15	Soil erosion.	● Irrigation components and catchment management component ✓ Clearing of vegetation for irrigation purpose ✓ Planting of trees ✓ Building of gabions ✓ Canal water flow rate	● Planting of trees in the project catchment areas to minimize soil erosion ● Where there is intense soil erosion, gabions should be built as a measure to reduce soil erosion ● There should be intensive re-vegetation on bare grounds after construction. ● Compaction of loose soils after excavations and reuse of materials for refill. ● The canal design to adopt sub critical flow velocity to avoid erosion. ● Practice of conservation agriculture. ● Enforce the crops Act 2013	Proponent, County governments and farmers.	During construction operation and decommissioning.	5,000,000

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
16	Siltation, eutrophication and sedimentation.	● Irrigation components ✓ Cutting trees next to the river ✓ River bank cultivation by farmers ✓ Planting trees for agroforestry	● Dredging canals on a regular basis and delivering the sediments to surrounding plots, ● Planting of buffer strips within the schemes, along the primary canals and the rivers, ● Re-using of excavated materials as fill or for other works, ● Adopting good agricultural and soil management practices and ● Controlled use of inorganic fertilizers. ● Planting of water friendly trees in the project area to hold soils ● Compacting of loose soil and planting of grass to hold the soil	Proponent, Famers. County Government	During operation phase.	5,000,000
17	Leaching	● Irrigation command area ✓ Accumulation of salts into the soil due to poor farming practice	● Adoption of cover cropping where necessary ● Minimizing tillage through adoption of conservation Agriculture. ● Controlled application and application of fertilizer	Proponent, Farmers groups and County governments.	During operation phase.	500,000

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
			according to crop requirement.			
Wastes.						
18	Wastewater and effluents.	● Site, water supply, energy plant and irrigation command area ✓ Pollution of water as a result of project implementation	● Any pollution incidents on site should be resolved speedily. ● Frequent measurement on efluents from project area to rectify mitigation measures if pollution is taking place.	Proponent, County Government	During operation a	3,000,000
19	Increase in agricultural waste.	● Irrigation ✓ Wastes generated from harvesting	● Preparation of waste management plan in all schemes in Giritucounty irrigation areas ● promote the reuse, recycling and reduction of wastes generated, ● Provision of adequate litter collection facilities, ● Approval of waste disposal sites by NEMA in accordance with the waste management regulations, ● The chemical and hazardous wastes should not be burnt or dumped in open pits	Proponent, farmers groups and County Government.	During operation of the project.	2,000,000

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
			• Re-use of agricultural waste			
Social issues.						
20	Increased child labour / workload for women.	• Irrigation component ✓ Child labour in agricultural farms	• Enforcement of the Government policy on compulsory primary and secondary education, • Hiring people with national Identification Cards and • Promoting public awareness on gender roles.	Proponent, Farmers groups.	Construction phase.	200,000
21	Increased communicable diseases.	• Site, energy component and access roads and irrigation component ✓ Spread of HIV/AIDS to workers and locals	• Hospitals should be built in the project area for to treat the locals for all the illnesses. • Carry out public awareness campaigns against HIV/AIDS, STIs, Tuberculosis and other communicable diseases	Proponent, workers farmers groups. Ministry of health and County government	Operation phase.	5,000,000

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
			present in the area, ● Accessible health care services to be provided to the local populace, ● Free VCT centres to be provided in the project area as well as sex education and awareness among the youth.			
22	Increase in vector borne diseases	● Site and irrigation component ✓ Spread of malaria spreading mosquitoes ✓ Working barefoot in flooded fields leading to vector borne diseases	● Stagnant water should be regularly drained off to prevent potential breeding grounds for mosquitoes. ● Regular spraying within trees ● Public awareness and sensitization on management and prevention of vector breeding for Malaria, Bilharzias, Filariasis, Dracontiasis or Trypanosomiasis, ● Provision of sanitation services in the project area, provision and equipping of medical facilities in the project area, ● Use of preventive measures such as protective clothing and controlling of flooding water in the project area through storage facilities will	Proponent, County Government. Ministry of Health. Farmers groups.	During project operation.	5,000,000

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
			reduce impacts of vector borne diseases. ● Adequate provision of health facilities by building of hospitals in the project area. ● Regular spraying of homes to control presence of mosquitoes. ● Adequate provision of mosquito nets at subsidized prices. ● Adequate information should be disseminated regularly on the need to treat drinking water.			
23	Human wildlife conflicts.	●	● The locals should not kill wild animals but instead call KWS to take them to conservation areas ● KWS in consultations with the local people to gazette conservation areas where need be, ● Key stakeholders to enhance public awareness and participation in conservation activities, ● Enforcement of wildlife Act and EMCA 1999 (wetlands conservation) Act.	Proponent, NEMA, WRA, KWS and local communities.	During project Implementation and Operation	1,000,000

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
24	Downstream Water use conflicts.	● Site and irrigation ✓ Conflicts due to overdraw of water upstream in the canal ✓ Less water going downstream along the river channel during dry season	● Formation of community irrigation water users associations for water conflicts resolution and management, ● Enforcement and adhering to the water management rules by all key stakeholders, ● Rationing irrigation water supply during dry seasons, ● Harvesting of rain water for use during the dry season and ● The need to provide piped water supply for domestic users. ● Base flow should be always released into the river to flow downstream	Proponent, IWUAs WRUAs, County Governments, Operation team and Farmers groups.	During project Operation.	4,000,000
25	Social cultural changes	● Irrigation ✓ Change of culture for the locals due to development	● Preserve vegetative areas of cultural heritage. ● Local people to adopt appropriate technology for crop and animal production. ● The locals to adapt to social cultural changes through capacity building accepting change.. ● Improve local varieties	Proponent, County government and farmers groups.	During project operation	No direct cost estimates.

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
			through research. ● Synchronized celebration of cultural festive and agricultural production work related activities.			
Public Health and safety Plan.						
26	Occupational Health and Safety (OHS).	▪ Site and irrigation components ✓ Crossing of canals on roads ✓ Safety of downstream people and properties when the site is in breach ✓ Safety of workers working in irrigation areas	▪ Ensure safety of the farm workers by putting first aid area and injury reporting mechanism ▪ Establish the appropriate safety measures in the O & M manual for the operation phases. ▪ Ensure compliance to Occupational Safety and Health Act Cap. 514 and its Subsidiary Legislations. ▪ Provide adequate crossings where canals will pass ▪ Provide personal protective equipment to workers. ▪ There should be adequate provision of the requisite sanitation facilities for human waste disposal ▪ The workers should receive the requisite training especially on the operation	Proponent, Farmers groups	Operation phase.	Part of construction cost.

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
			of the machinery and equipment. ▪ Preparation of a working site safety plan is attached in the report ▪ Provision of prevention tools such as condoms at the health center and construction site availed to all			
Cost of ESMP at Operation Stage						**53,500,00**
ESM During Decommissioning Phase						
1.	Increased waste generation	▪ All the project Components ✓ Renovation of dilapidated components ✓ Demolition of them when necessary ✓ Transportation of wastes ✓ Disposal of wastes	▪ promote the reuse, recycling and reduction of wastes generated, ▪ Provision of adequate litter collection facilities, ▪ Approval of waste disposal sites by NEMA in accordance with the waste management regulations, ▪ The chemical and hazardous wastes should not be burnt or dumped in open pits ▪ Debris should be utilized in filling up of quarries within the project area	Demolition contractor	Decommissioning phase	2,000,000

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
2.	Dust pollution	▪ All components ✓ Renovation of dilapidated components ✓ Demolition of them when necessary	▪ The access roads to be watered during the construction period, ▪ Plant more vegetation for carbon sequestration, ▪ limit the speed on dusty roads, ▪ Workers to use masks when working in dusty conditions.	Demolition contractor	Decommissioning	2,000,000
3.	Noise Pollution	▪ All components ✓ Renovation of dilapidated components ✓ Demolition of them when necessary	▪ Switching off machines that are not in use ▪ avoiding unnecessary hooting, ▪ workers to be provided with personal protection equipment, ▪ machines to be serviced to reduce generation of noise and vibrations, ▪ the noisy activities should be restricted to daytime ▪ Ensure that NEMA noise and Vibration standards are observed in all project activities.	Decommissioning Contractor	Decommissioning phase	2,000,000
4.	Occupation health and Safety	▪ All components of the project ✓ Renovation of	▪ Ensure safety of the farm workers by putting first aid area and injury reporting mechanism	Decommissioning Contractor	Decommissioning phase	3,000,000

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
		dilapidated components ✓ Demolition of them when necessary	▪ Establish the appropriate safety measures in the O & M manual for the operation phases. ▪ Ensure compliance to Occupational Safety and Health Act Cap. 514 and its Subsidiary Legislations. ▪ Provide adequate crossings where canals will pass ▪ Provide personal protective equipment to workers. ▪ There should be adequate provision of the requisite sanitation facilities for human waste disposal ▪ The workers should receive the requisite training especially on the operation of the machinery and equipment. ▪ Preparation of a working site safety plan is attached in the report ▪ Provision of prevention tools such as condoms at the health center and construction site availed to all ▪			

No.	Potential Impacts	Project component and Activities	Mitigation measures	Responsibility	Time frame	Cost Ksh.
5.	Aesthetic value	▪ All components of the project ✓ Renovating project components ✓ Demolishing of components	▪ Restoring sites back to their original state of make them better ▪ Planting of trees ▪ Planting of grass in	Decommissioning contractor and the Government of Kenya	Decommissioning phase	5,000,000
6.	Exhaust fumes	● Power house, and irrigation components ● Operation of the power house ● Machine operation during decommissioning releasing carbon-monoxides	● use of clean petroleum that is low in sulphur, lead or other pollutants in operation vehicles, ● proper servicing of vehicles and Construction machines according to manufacturer's specifications ● Plant more vegetation for carbon sequestration.	Decommissioning contractor	During decommissioning.	2,000,000.
Cost of ESMP at Decommissioning Stage						16,000,000
Total COST of ESMP						**91,500,000**

7.2 Pest Management Plan

One of the outcomes of Giritu Sugar project is to ensure that 5280 ha of land be under irrigation. It is expected that there will be an increase of incidences of crop pests which will call for management practices to control them. It is therefore important that management plan for controlling pests should be developed. We have listed the pests that are currently available in Garsen area. With knowledge of the Pest Management Expert and consultations with communities and experts in Kenya, we were able to identify pests that are likely to immigrate to the area due to increased crop production. The task of developing Integrated Pest Management Plan IPMP was coordinated by Pest management Specialist and it form an integral part of the ESMP. The IPMP was developed using the following procedures:

7.3. Pest management approaches

We collected baseline information on agriculture to identify current pest issues and pesticides management practices in the Project area as well as upstream and downstream areas. We looked at the promotion of Integrated Pest Management (IPM) and Integrated Vector Management (IVM), and lay down according to international standards, the criteria and procedures for pesticides selection. This will include elements such as toxicity range, bio-degradable, etc. We developed guidelines for development of appropriate methods to promote an Integrated Pest Management (IPM) approach that will minimize the need for chemical pesticides during project interventions.

7.3.1. Pesticide use and management

We looked into laid down plans for safe handling, storage, transport and disposal of pesticides (i.e. containers/emballage, expired products, etc.) and emergency plans to handle accidents, spillage, and theft. We analysed potential impacts of the project and propose mitigation and enhancement measures.

7.3.2. Policy, regulatory Framework and institutional capacity

We assessed current capacities in management of pest and identify gaps. The capacity building plan was developed to respond to the identified gaps. We also determined procedures for revision in chemicals and pesticide use in the event that crop mix changes and new pest issues emerge. This also looked at provision of technical assistance to farmers in the proposed areas. We developed screening procedures (including checklists) that will be used for screening potential environmental and social impacts due to the project.

7.3.3. Monitoring and evaluation

Along with annual audits of the ESMP, annual reports will be expected on pesticide use, quantity in storage, and those reaching expiry dates. Also, as part of the overall monitoring plan, monitoring of pesticides (and other

agrochemicals) at selected points in the proposed area, including entry and exit points, and in relevant streams have been included. We have prepared the IPMP covering all aspects related to the pest management. ***The Pest management Plan is attached in this report .***

8. ENVIRONMENTAL AND SOCIAL MONITORING PLAN (EMoP)

8.1. Overview

The implementation of Giritu Sugar Factory and irrigation project is likely to result into varying level of environmental and social impacts that would require supervision and monitoring. The environmental and social monitoring and supervision will be undertaken to:

- Provide information on the actual nature and extent of key impacts and the effectiveness of mitigation measures which, through a feedback mechanism, can improve the planning and execution of future similar projects.
- Ensure that mitigation measures proposed have actually been adopted
- Provide a means whereby any impacts which were subject to uncertainty at the time of preparation of this environmental impact assessment report, or which were unforeseen, can be identified, and to provide a basis for formulating appropriate additional impact control measures

The environmental team proposes fifteen (15) impact items as significant for monitoring by the various stakeholders. The expert team could not determine the realistic cost of some of the proposed monitoring activities due to the associated hidden costs. However, additional measures have been proposed to come up with a more accurate cost during implementation stage. It is upon the project proponent and the environmental enforcement agencies to ensure that the proposals are adhered to. The table 8-1 below brings out the table on monitoring plan.

Table 8-1*: Environmental Monitoring Plan*

No.	Impacts	Monitoring Action	Target Area	Phase of implementation	Responsibility	Frequency	Budget(KSH)
1.	Waterborne related diseases	Recording incidents of waterborne related diseases and how they were handled Indicators: number of patients, type of diseases, number of mosquitoes nets given out in the project area; number of safe water connections to the communities.	The entire project area	Implementation phase and Operation phase	Ministry of health	always	700,000
2.	Ground water table	WRA to identify boreholes within the project area for monitoring of ground water levels. **Indicators:** Level of water table	Sample boreholes around the project area.	Operation Phase	IWUA in Collaboration with WRA	Twice annually during the wet and dry seasons	3,000,000
3.	Changes in river Hydraulics	Changes in the volume of water flowing down stream of the site should be determined. **Indicators:** river capacity in m^3/s	Downstream of river tana site	Construction and Operation phase	IWUA in collaboration with WRA	Twice annually during the wet and dry seasons	400,000
4.	Ground water Quality	The boreholes sunk within the project area will also be used to monitor ground water quality. **Indicators:** pH, N-NH"	Sample boreholes within the project area	Operation phase	WRA in collaboration with IWUA	Once after 3-5 years as will be advisable by WRA	2,500,000

No.	Impacts	Monitoring Action	Target Area	Phase of implementation	Responsibility	Frequency	Budget(KSH)
		nitrate, nitrite, volatile phenol, cyanide, arsenic, mercury, chromium (hexavalent), total hardness, lead, fluorine, cadmium, iron, manganese, total dissolved solids, permanganate index, sulphate, chloride, fecal coliform bacteria or as will be determined by WRA.					
5.	Drainage/Tail water quality	Water quality before the site and that of tail water in Tana river after the site will be monitored to determine on impacts of town activities and water leaving the site. **Indicators:** Suggested parameters for agrochemicals include Organochlorine, Organophosphates, Pyrethroids and Polychlorinated Biphenyls, Suggested parameters for NEMA's water quality standards (3rd Schedule: Discharge to Environment) discharged to environment consist of Ammonia, BOD, COD, E. Coli, Organo- phosphorous compounds, pH, TSS, Temperature, Total coliforms, TDS, colour	Drain water discharge points after the bridge at the end of command area	Operation Phase	IWUA (examination of agrochemicals to be subcontracted to a NEMA accredited laboratory in Tana River or Mombasa)	Twice annually during rainy season and during dry season	2,500,000

No.	Impacts	Monitoring Action	Target Area	Phase of implementation	Responsibility	Frequency	Budget(KSH)
6.	Water quality of receiving river after the irrigation area	Water quality monitoring will be done on the river downstream of the discharge point to monitor the impact of irrigation water on the quality of water downstream. **Indicators:** The water rules by WRA and Water quality regulations 2006 by NEMA to guide on parameters to be monitored.	About 100m Downstream of irrigation area last drain water discharge point	Operation Phase	IWUA in collaboration with WRA	Twice annually, when water from the irrigation schemes is discharged during the two planting seasons.	1,500,000
7.	Air Quality	Determine quality of air by formulating air quality management Strategy **Indicators:** To agree on the air quality management parameters based on the activities and the type of hazardous materials to be used or released. Dust level, Nitrates, Sulphates, carbonmonoxides, among others.	Construction sites and crop fields	Construction and operation phase	The contractor in collaboration with GoK	Daily during construction and operation	5,000,000

No.	Impacts	Monitoring Action	Target Area	Phase of implementation	Responsibility	Frequency	Budget(KSH)
8.	Excessive Noise and Vibration	To determine the noise and vibration levels to ensure Compliance to the Environmental Management and Coordination Act (EMCA), Occupational Safety and Health Act Cap. 514, its Subsidiary Legislations and the Building by-laws of Kenya **Indicators:** Levels of Noise and Vibrations in decibels dBA	Construction sites	Construction and operation phase	Construction Supervisor and the contractor	quarterly	500,000
9.	Soil quality	To determine soil quality by taking soil augers in the schemes. NBI to determine additional indicators where necessary. **Indicators:** pH ECe Exchangeable sodium percentage (ESP) Sodium adsorption ratio (SAR) Organic matter Cation exchange capacity (CEC) Nitrates P, K, Ca status Micro-nutrients if indicated	Schemes	Operation phase	Farmers Groups	Twice annually before cropping season	2,000,000
10.	Changes in Water Demand	To determine different users of the canals and determine a water balance based on demand and supply. **Indicators:** No. of users and	All canals serving the schemes	Operation Phase	WRA in collaboration with IWUA	Annually	700,000.

No.	Impacts	Monitoring Action	Target Area	Phase of implementation	Responsibility	Frequency	Budget(KSH)
		their demand and Amount of supply.					
11.	Changes in Riparian Vegetation and vegetation in site area and command area	To determine riparian vegetation coverage area and dominant species. **Indicator:** area of riparian vegetation and the number of plant species in the area, number of farmers practicing agro-forestry, number of trees given to farmers and they are existing.	All riparian vegetation within the schemes; site reserve areas, irrigation command areas and entire Sio river catchment	During operation phase	WRA and NEMA	After two years	1,200,000
13.	Changes in Aquatic Flora and Fauna	Determine aquatic organisms along the river, site area, upstream and downstream of the entire project area. **Indicators:** Diversity and count of Aquatic organism along the river stretch	Entire Sio catchment	During operation	Farmers groups to coordinate with GoK and KMFRI	After two years	500,000

14.	Changes in Sediment Loads, Levels of Eutrophication and siltation before the factory and after the irrigation command area	To determine Sediment Loads, Levels of Eutrophication and siltation. This to be done through preparation of an action plan **Indicators:** Stakeholders to agree on the parameters to monitor through formulating an action plan. Some will include Total dissolved solid, Total suspended solids, turbidity among others.	Before the site and after the irrigation command area	During construction and operation phase	Farmers groups, IWUA, WRUA to coordinate with WRA and Giritu Sugar Limited	Twice Annually during the rainy season and dry season	1,000,000
15.	Safety issues on the project	The number of accidents happening on site and during operation to be recorded and their mitigation and preventive measures taken. Indicators: number of accidents	Entire project area	During construction and operation phases	Contractor and WRUAs	Daily	500,000
16.	Aesthetic value	To monitor site restoration programme for the entire project Indicator: number of trees planted and size of land planted with grass.	Entire project ate	During construction	Contractor and supervising consultant	monthly	1,000,000
17.	Noise pollution	Measure noise to make sure it does not go beyond the NEMA limits Indicators: noise levels in Decibels.	Within the project area sites	During construction	Contractor/Client	Annually	1,000,000

18.	Dust pollution	Measure the dust content in the neighboring areas so that it cannot affect community. Indicators: dust level in parts per million	Within the project area	During construction and operation	Contractor	Annually	1,000,000
19.	Agrochemical pollution	Record any form of pollution from use of agricultural chemicals Indicators: recorded number of pollution How agricultural chemicals are used.	Irrigation areas	operation	Farmers, proponent	monthly	1,000,000
20.	Waste generation	Record all wastes generated and be disposed of well Indicators: type of wastes, approved site for disposal, reuse of waste where possible	Project area	All the phases	Contractor/farmers organizations, NEMA	daily	3,000,000
21.	Downstream conflicts	Record all cases of downstream water conflicts along the project area Indicators: number of conflicts recorded and how they were solved	Project area	Construction and operation	Farmers groups/County Governments	weekly	2,000,000

22.	Diseases	Record all the diseases as a result of the project. Indicators: number of patients treated with diseases related to the project	Project area	Construction and operation	Ministry of health and farmers associations	monthly	2,000,000
23.	Soil erosion	To monitor sites prone to soil erosion in the project for corrective action. Indicators: name of sites and their GPS points prone to irrigation, number of mitigation measures administered. Number of trees planted in the project area.	Entire project area	Construction and operation	Contractor	Quarterly	3,000,000
24.	Occurrence of invasive Species	Monitor any new invasive species coming the project area. Indicators: Invasive species identified and how it was rectified	Irrigation area	operation	Farmers organization, County governments, Agricultural extension officers.	quarterly	3,000,000
Total Amount for monitoring							**43,600,000**

9. CONSIDERATION OF PROJECT ALTERNATIVES

9.1. Introduction

The Environmental and Social Impact Assessment study identifies and assesses alternatives to the proposed development/project. The best alternative will be selected based on less negative impacts and cost benefit analysis. Listed below are the alternatives considered.

9.2. "No" project Alternative/ the "Yes" Project Alternatives

This is an important analysis as it helps the proponent measure impacts from the project visa versa the impacts without the proposed project.

The "NO" project Alternative Option

The „No' project alternative option in respect to the proposed project implies that the status quo is maintained. This implies that the environmental situation will neither improve nor deteriorate and the project area will remain as it is before project implementation i.e. there will be no pollution and at the same time no positive impacts to the surrounding community. On the other hand, the project will provide water for domestic, livestock and irrigation, and hydropower generation. This will improve food security, increase household incomes, and provide employment as well as upgrading the regional economy. The No alternative option will imply that;

1. The local community will continue to live without employment, water for irrigation, power generation and social amenities.
2. The productivity will be low and reduced ability to create wealth.

The yes Project Alternatives

This alternative brings out the idea that the project is implemented according to the final designs. This means the site will be built at the best axis that maximizes storage and also the irrigation areas will be under the chosen areas. With the development of the project it will lead to the following benefits if all the negative impacts are mitigated against as shown in table 9-1 below;

Table 9-1: Comparison of yes project alternative and No project alternative

Project Alternatives	Advantages	Constraints
YES	✓ Improving water availability through the created storage, ✓ Food security through increased agricultural production, ✓ Energy security through increased renewable power generation, ✓ Reduction of environmental degradation and adaptation to climate change, ✓ Improve livelihoods of the communities in the project area, ✓ Reduce poverty and boost local and regional economic development, and ✓ Contribute to climate resilient (green) growth.	✓ Disturbance of ecosystem ✓ Displacement of people ✓ Increased use of pesticides that will lead to pollution.
NO	✓ No disturbance of the ecosystem	✓ The local community will continue to live without water for irrigation, hydropower generation and also improved Catchment area. ✓ The productivity will be low and reduced ability to create wealth.

Yes/No project alternative conclusion

Since the project is geared towards improving the livelihood of the surrounding communities, the NO project alternative is the least preferred.

With these benefits at hand of the „yes" project alternative, it is the best option for this project.

9.3. Location Alternative

Location alternative were based on 2 sites namely:

1. Giritu Ranch
2. Mumias TARDA Integrated Sugar Project .

Location 1 was chosen by the proponent because they wanted a place with a title deed to lease and a place without existing infrastructure.

9.4. Catchment alternatives

There was no alternative to this because the only source of water available was River Tana

The hydrological report is attached in the annex

9.5. Alternatives to Access Roads

Construction and improvement of the access roads to gravel standards, may be a possible design alternative than upgrading them to a tarmacked road. Maintenance of gravel roads in good motorable condition in Garsen area will require frequent re-gravelling and reconstruction may also be prompted since some parts of the road will be washed away whenever it rains. It would also mean that the road would be impassable during the rainy season. This will result in frequent use of good quality gravel resulting in removal of vegetation, borrowing and hauling materials besides the regular financial expenditure. Gravel roads are also a source of dust pollution to the surrounding environment. The roads can also be of concrete standards but concrete roads are expensive to build as compared to tarmacked roads. Hence, the proposed design of tarmacked surface dressed road is the most cost effective and environmentally sustainable since it not require much attention getting quarry materials for rehabilitation.

9.6. Water Supply Options

The water supply design gets its water from the Tana River to be built. This has an advantage of adequate water to the site into the treatment systems that can adequately supply water to the required demand.

The second option of water source can also be utilized inform of rainfall collected off roof into the tanks. This second option has the advantage of providing good quality water, and no water license is required. However, the option is limited since it cannot work well in dry areas and also the current climate variability can fail the option. This option also will need fittings and valves to be regularly maintained to reduce leakage apart from the option offering little water that cannot meet the water demands in the project area.

The third option of water supply is by use of ground water whose advantage is that it may be less influenced by seasonal variations than surface water. However, this option is limited by a lot of initial researches which need to be undertaken into the ground water availability and quality. This option will also still need storage tanks or back up pumps. The option

will not supply enough water to meet the domestic and irrigation water demand under consideration.

9.7. Project Alternatives for Irrigation Development

With the increasingly greater demand on a limited water supply in many parts of the country, there is an urgent need for its efficient utilization by reducing losses at various points in the irrigation system. Within the farm area, water losses can be greatly reduced by having proper system for distribution of irrigation water. A pipeline distribution system offers such a possibility. Generally, the system is buried underground and fixed permanently.

For surface irrigation where high heads are not required, the pipeline distribution system merit consideration since it is essentially a low pressure one, also known as 'open or semi - closed system', which is open to the atmosphere and where the operating pressure seldom exceed 5-6 m. Pressure irrigation systems, such as sprinklers and drips, operate on much higher pressures, generally greater than 25 m. and therefore, it is necessary to have a high pressure pipeline distribution system for them. In this case pumping would be required.

If the water distribution system is well operated, many other important management objectives can be satisfactorily realized and high returns obtained. In the case of conventional irrigation methods i.e., open channel distribution system, the evaporation losses, seepage losses and malpractices cannot be eliminated even with full control and efficient management of the system. However, with pipe distribution system, these parameters can be substantially controlled and minimized to reduce the adverse effect on irrigation efficiency.

Some of the advantages of a piped system to be considered include;

- Little loss of farm land, as almost the entire system is buried - as a result, no significant amount of productive farm area is lost to crop production, as is the case in an open channel network. (Some of the main canal sections have top width of 2.3m. Such excavations are substantial with large land loss. The need for wayleave agreements must be discussed if the option of canal system for the main conveyance is adopted)
- Virtually no water loss - a pipeline system is essentially water tight, with no evaporation and seepage losses during transmission as a result there are water savings. Reduction in water loss saving more than 30% compared with canal system. Irrigation efficiency in open canal distribution networks, the water losses are estimated at up to 40 percent in unlined ditches and up to 25 percent in lined canals. In piped systems, no such losses occur. As a result, water losses can be minimized and an irrigation efficiency of 75–80 percent can be achieved. In open canals, the irrigation application efficiency ranges from 45 percent to a maximum of 60 percent.
- Better and easier control of the flow of water means that more efficient irrigation is possible.
- No hindrance to equipment - there are few obstacles to hinder the movement of agricultural equipment and farm transport. This is an important feature where fields are small.
- Full and effective control of irrigation water resulting into taking up of crop diversification such as horticulture,

vegetables and other cash crops such as groundnut etc.

- No culverts or other structures such as falls are required. Buried pipelines are taken in straight line so considerable saving in length results in considerable economy.
- Excavation limited to one meter plus diameter of the pipe, hence fewer earthworks.
- Scheduling of irrigation based on crop water requirement can be .efficiently implemented.

9.8. Concluding Remarks on Project Alternative

From the above alternatives the "Yes" project alternative was adopted due to most positive benefits with reduced negative impacts mitigation measures. Site 1 option was selected as the most ideal site environmentally, socio-economically and the fact the proponent already owned the land. Catchment site, River Tana was chosen due to its geotechnical advantages and water availability throughout the year. On the part of access roads, tarmacked roads were chosen because they are environmentally friendly in terms of dust generation. Finally, the site water supply to the treatment plant was chosen due to meeting the current domestic and irrigation water demand.

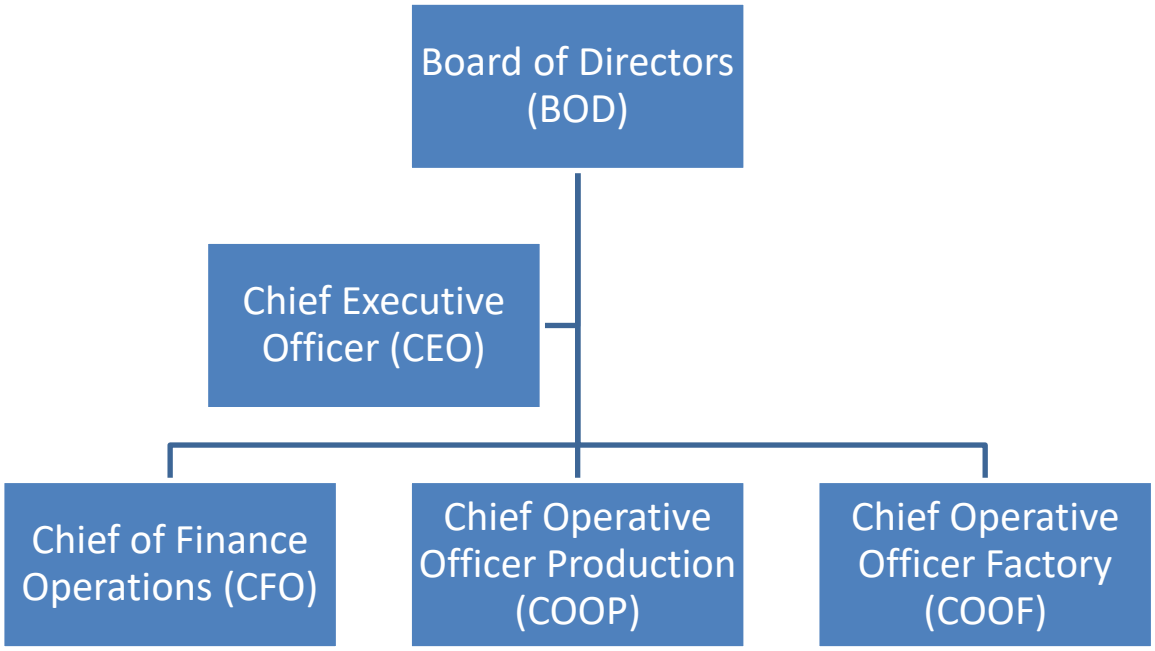
10. PROJECT ORGANIZATION AND MANAGEMENT

10.1. Staff

The key to any profitable organization is the staff. The management will ensure that the staff are always motivated, supervised and inspired to ensure job satisfaction and well above average levels of productivity. The Giritu Sugar Company Limited will employ management with African experience of mentoring and training staff at all levels in efficient methods of crop production and employ specific Operator Trainers with wide experience in particular fields to ensure the efficient operation of the operating company.

The Management of the project and operations will be run through three departments:

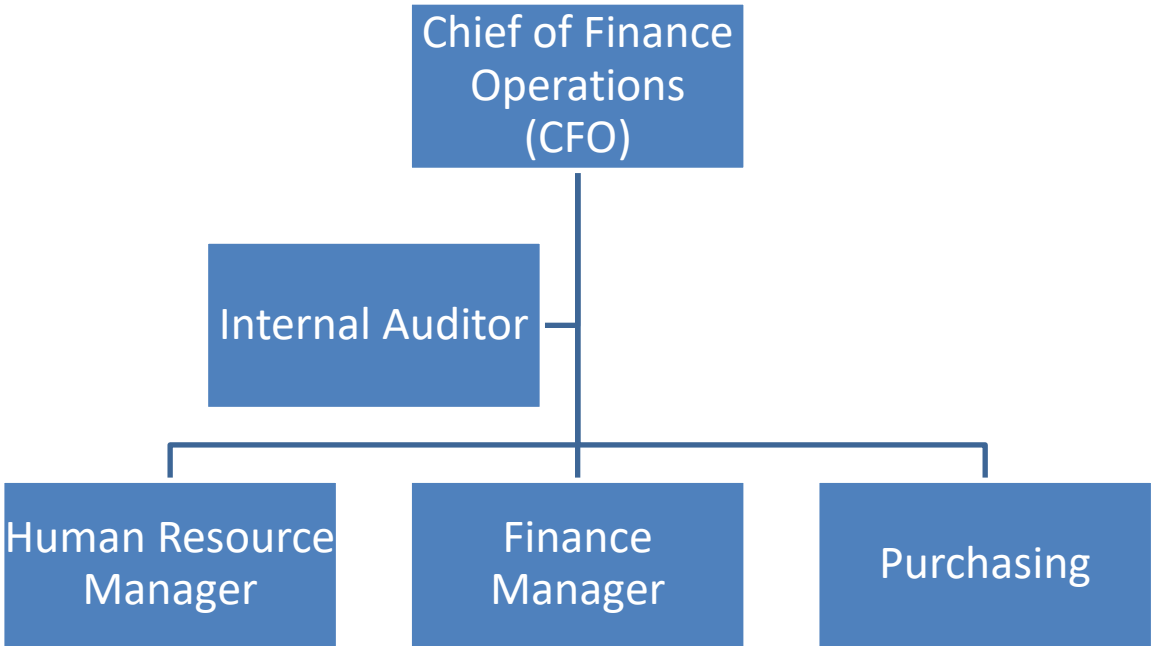
Head Office



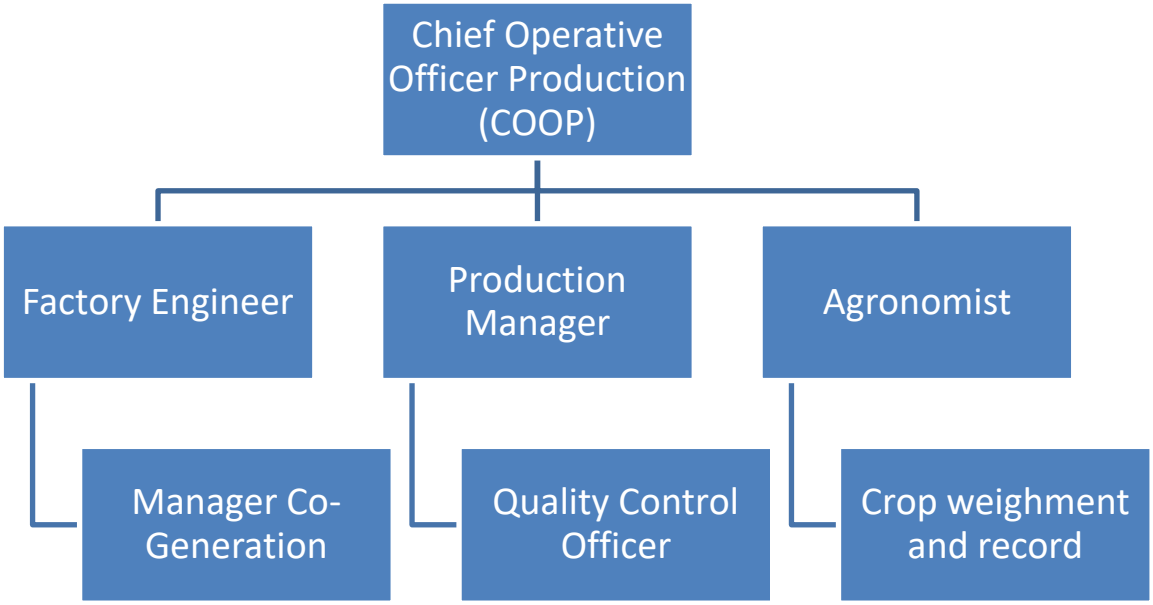
At the Head office, the Chief Executive will be reporting to the Board and Heads of Divisions. That is, CFO, COO Production and COO Factory. Heads of Division will be responsible for preparation of budgets, operations and delivery of targets of their respective divisions and will all report to the CEO.

Finance and Administration Division

This department will be headed by the CFO reporting to the CEO of the Company and will be supported by Head of HR, Head of Administration, Head of Internal Audit and Head of Finance.

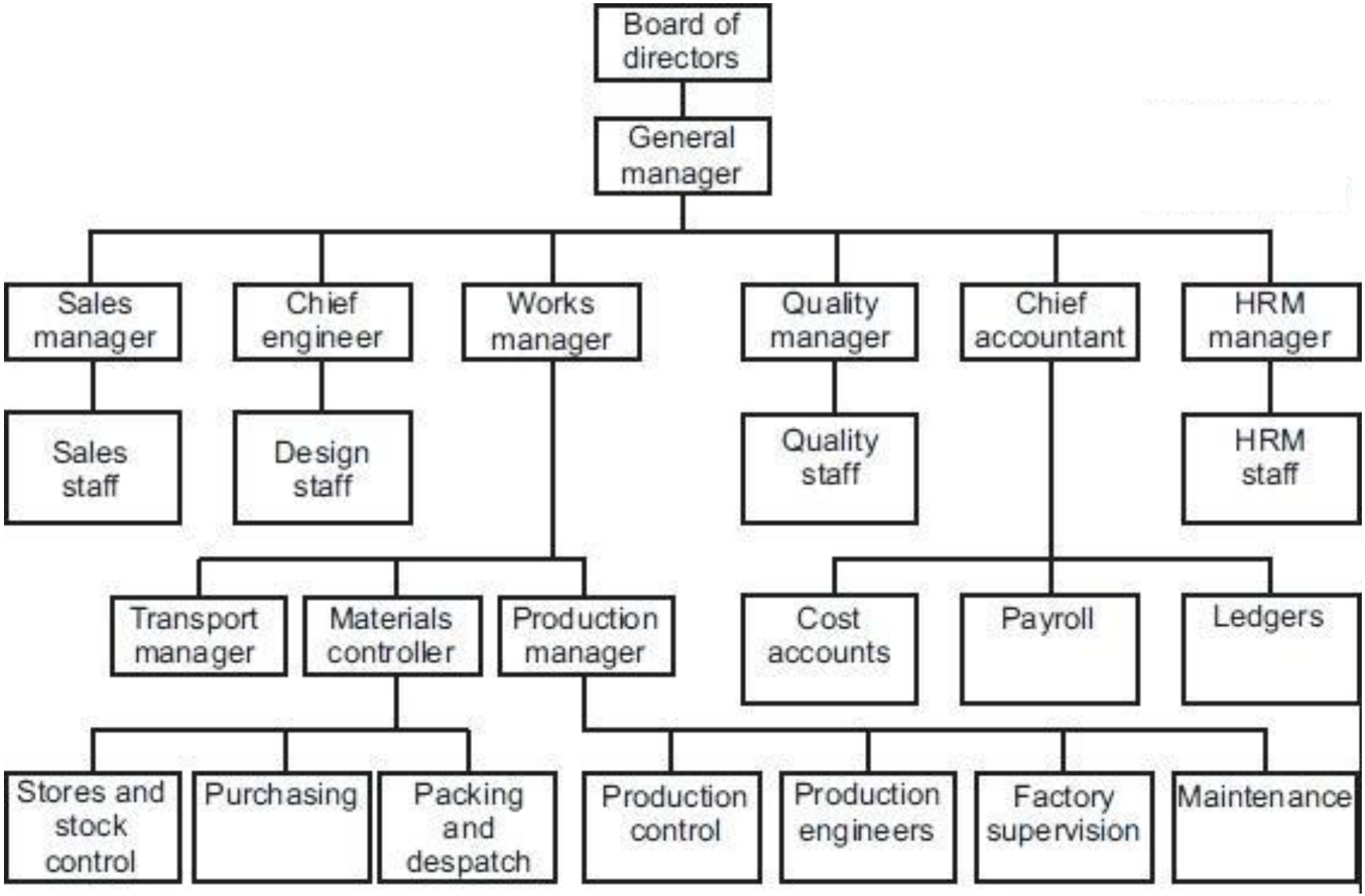


Production



Chief operative Officer Production will be in charge of the Factory and all the related operations which will include day to day running of the factory. This position reports to the CEO.

Organization Chart



11. CONCLUSION AND RECOMMENDATIONS

11.1. Conclusion

With regard to the Giritu Sugar Factory and irrigation project, the following conclusions have been arrived at;

From the report, it is evident that the project is environmentally and socially acceptable with all the mitigation measures taken into consideration;

Based on the positive side of the project, it will lead to job creation to locals improving their financial capability, improved sugarcane production, improved animal husbandry, power generation and will create avenue for value addition projects. Based on these preliminary figures, and taking into account a budget of 4 billion as proposed by the project financiers, it can be concluded that the project is financially viable as the preoperational costs does not affect the project implementation budget. Further, it can be concluded that the project does not affect so many people while the benefits spread across larger community segments. Environmentally and socially, it can be concluded that the project is viable as the proposed project area has no recorded or known fragile ecosystem: the plants and animals identified in the study are spread across the Tana River region and not unique to this ecosystem alone.

The local community has indicated their desire to have the factory and irrigation project to be implemented without delay. Tana River County Government has welcomed the project and they wish for quick implementation to improve people's livelihood. The site is acceptable to a majority of the local residents, most of whom appreciates the value it will have on the social and economic wellbeing of the area.

With implementation of the project following the ESMP provided, negative impacts shall be reduced to the minimum maximizing on positive impacts;

The Site safety Plan provided will cover the safety of property and people living downstream river Tana;

The IPMP prepared shall provide guidance to the proponent and farmers on pest management and control maximizing on their produce;

- ✓ Monitoring of parameters prepared should be carried out to determine the impacts of the project to the community;
- ✓ The total cost for ESMP together with Monitoring stands at **Ksh 139,100,000.**

11.2. Recommendation

The study on Giritu Sugar Factory and irrigation management project recommends the following;

1. There is need to undertake capacity building for the local communities so as to enable them to competitively exploit opportunities that arise from construction of the project (employment, supplies, etc.) as well as utilization of their resources;
2. ESMP measures should be effectively implemented during construction and operation phase of the project

under the strict supervision of the proponent and supervising consultant to achieve maximum project acceptability;

3. Initiatives on the conservation and protection of the immediate catchment should also be formulated and integrated into the site operations guidelines,
4. Monitoring of the parameters detailed in the monitoring plan should be effected as required;
5. The proponent will seek for a permit from Water Resources Authority to work on the river channel before project implementation.
6. The proponent will obtain permit for abstraction of water from the river.
7. The proponent to conduct annual environmental audits upon commencement of the project.
8. Since all the negative impacts have been addressed, the consultant recommends that NEMA should approve the project to be implemented and benefit the communities and Tana River County at large.

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13. APPENDICES

LIST OF APPENDICES