Report Prepared by: Earth Environmental Consultants Ltd
Plot 106
Kantanta Street
Nkana East
Kitwe, Zambia

Client: Kaleya Smallholders Company Ltd (KASCOL)
Plot No. 233a/234a/235a along Livingstone Road
P.O. Box 670371
Mazabuka, Zambia

TITLE: ENVIRONMENTAL SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED CONVERSION OF 2,164 HA OF SUGAR CANE IRRIGATION SYSTEM FROM **"FURROW FLOOD"** TO **"SUB-SURFACE DRIP"** AT KALEYA SMALLHOLDERS COMPANY LIMITED ESTATE IN MAZABUKA DISTRICT OF SOUTHERN PROVINCE LOCATED AT Plot No. 233a/234a/235a ALONG LIVINGSTONE ROAD

Report No: 01

Issue No: 01

Date of First Issue: 2022
Date of Second Issue: 0000

EXECUTIVE SUMMARY

PROJECT BACKGROUND

KASCOL intends to implement the sub surface drip irrigation project. Its aim is to improve crop production and reduce on water wastage through this system as it migrates from the flood irrigation of sugarcane fields. In improving crop production one of the intervention is to improve irrigation infrastructures. A total hector of 150 of land was selected as a pilot scheme for improvement of water management and use efficiency activities for increased improved flow of water into the field.

Hence KASCOL came up with intervention of subsurface drip irrigation scheme which will minimize water losses through improvement of irrigation infrastructure and crop production. The main activities will include conversion of 2,164 hectors of land from flood irrigation system to sub surface drip irrigation, field levelling, installation of water, measuring instruments and alteration in water use.

The Environmental and Social Management Plan (ESMP) for the sub surface drip irrigation scheme has been prepared to provide a base for prevention, controlling and minimizing environmental and social impacts that may arise during rehabilitation/improvement and operational activities of KASCOL irrigation scheme. The ESMP forms part of the tender document to be advertised for Contractors to bid. The ESMP has been prepared by the Earth Environmental Consulting Limited in order to comply with the environmental and social safeguards requirement as stated in the Environmental and Social Management Framework of the Zambia Environmental Management Agency (ZEMA).

Two drivers triggered the establishment of the KASCOL model. One was the need of the Zambia Sugar Company, at the time the sole sugar milling company in the country, to expand the area of sugarcane fields after it had expanded its plant processing capacity in the Mazabuka district. The other was the interest of the Zambian Government to have local inclusion in Sugar Cane Growing through Smallholder Farmers participation to uplift living standards and improve the incomes of the poor by involving them in the sugar industry.

The Commonwealth Development Corporation (CDC) was engaged to suggest an organizational model based on its experience with similar projects in Africa. The model suggested by CDC would create a sugarcane production and farming services company (KASCOL) which would:

a) Own the 4,179 hectares of land given by the Zambian Government for the development of this project
b) Lease part of the 2,500 hectares of arable land to smallholders for the production of sugarcane
c) Plant its own sugarcane on the remaining area to cover its overhead costs
d) Provide agricultural services and advice to the smallholders; and
e) Manage relationships between the smallholders and the Zambia Sugar Company who would provide irrigation water and buy the sugarcane. The smallholders would assume the responsibility of activities such as ridging, smut rouging, chemical application, weeding, and irrigating their cane fields. KASCOL would facilitate for cane-harvesting; supervising the farmers' field activities; replanting the cane; fertilizer applications; input procurements; water management; providing the technical, financial, and managerial skills; grading community roads; and providing other social amenities such as domestic water and recreational facilities to smallholders. In 1980, the company was formed.

KASCOL irrigation scheme include 2,164 ha of potential land that has been developed for smallholders utilizing the water resource from Kafue River that discharge its water into seven dams and Kaleya downstream. The existing irrigation practice at the scheme is a gravity conveyance system. The scheme have modern irrigation infrastructure which include irrigation and drainage system and farm access roads networks. The scheme has a water use permit to be able to extract water of 13.5m3/sec from the Kafue River at peak period.

The main crop at the scheme is Sugarcane grown as cash crop. KASCOL irrigation scheme benefiting communities are from Benny Mwiinga ward, with a total of 12 villages. During the process of wider consultations with different key stakeholders within the district such as Zambia Sugar Company, Government Officials in the district, Mazabuka Municipal Council, Ward Executive Officer, villages beneficiaries, and farmers. The Stakeholder ESMP for KASCOL irrigation scheme report raised different issues and proposed mitigation measures too. Main issues rose during various consultations was on reduced /no water supply downstream for farmers and livestock, loss of employment for already engaged work force. Possible water contamination with pesticides, however the ESMP has identified potential negative and positive impacts and also external impacts that don't relate to irrigation intervention but if they are not minimized they have potential impacts to KASCOL intervention. Positive impacts include;

POSITIVE IMPACTS

i. Increase water use efficiency;
ii. Improve irrigation infrastructure to reduce water losses;
iii. Increase crop production;
iv. Increased area under irrigation of about 2,164 ha through land levelling of highlands within the scheme;
v. No water rights will be changed.
vi. No economic displacement of local communities.
vii. Reduced water losses

Potential Negative Impacts

i. soil and water pollution through pesticides use
ii. Impact on Air quality
iii. Sourcing of construction materials
iv. Impact of waste generation
v. Community concern and stress
vi. Health and safety
vii. Loss of employment

In order to achieve the objective of Sub Surface drip irrigation project on efficient water use for increased controlled flow of water to field crops the ESMP recommends implementation of interventions involving a combination of software and hardware investments. The software interventions include the human factor in irrigation water management which is crucial to make the necessary changes happen. The human factor for water management in KASCOL irrigation scheme include, water extraction and allocations, water use permits, and operation and maintenance of irrigation infrastructure. The hard ware parts in water management include installation of water measuring instruments. Laying down of drip irrigation pipes others include protection drip irrigation pipes from rodent. The role and responsibilities for implementation of

the ESMP is vested under different actors, the Contractor, KASCOL Management Monitoring of water flows has been also emphasized in this ESMP.

OBJECTIVES

a) To convert 2,164ha under furrow irrigation system to sub surface irrigation system at Kaleya estates in Mazabuka District.
b) To facilitate optimal use of water resource in the project area
c) To help reduce on the incidence of water wastage by the use of the most efficient irrigation system.

LOCATION

The Project site is located to the south-east of Mazabuka town approximately 7km from Mazabuka CBD Central Business District (CBD) and can be accessed via the Mazabuka to Livingstone Kaleya junction at Plot No. 233a/234a/235a.The proposed project site location is shown in Figure 3.1

DIRECTORS AND SHAREHOLDERS

THE SHAREHOLDERS FOR KASCOL ARE AS FOLLOWS:

Institution Name	%SHAREHOLDING	NO OF SHARES
Development. Bank of Zambia	25.00%	250,000
Mazabuka Sugar Cane Growers Trust	25.00%	250,000
Growers Investment Holdings Limited	30.50%	305,000
Kaleya Smallholders Framers Trust	19.50%	195,000

INVESTMENT COST

The total investment is estimated at USD10million.

PROJECT DESCRIPTION

Kaleya Small Holders Company Ltd (KASCOL) has at its Mazabuka estate about 2,500ha of arable land whose current irrigation methods is as follows

a) Furrow - 2,164 ha,
b) Sprinkler - 8 ha,
c) Pivot - 328 ha

With funding from **DFCD and WWF for developmental Impacts evaluation, it intends to put some of this money for the preparation of an Environmental Social Impact Assessment (ESIA) for the proposed *conversion of the 2,164ha under furrow irrigation to sub-surface drip irrigation***

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In September 2021, Kaleya Smallholders Company Ltd (KASCOL) entered into a contract with Earth Environmental Consultants to conduct an environmental social impact assessment for the development and conversion of the said 2,164ha of land under furrow irrigation to sub surface in Mazabuka Districts of southern Province.

TECHNOLOGY

The proposed project comprises the conversion of sugar cane irrigation system from furrow to sub-surface drip in the Kaleya cane fields in Mazabuka Districts of Southern Province. The Project site is located to the south of the plantation.

Subsurface drip irrigation (SDI) is an irrigation system through buried plastic tubes containing embedded emitters located at regular spacing's. There are a wide variety of configurations and equipment used, however drip tubes are typically located 38" to 84" (134 to 213 cm) apart, and 6 to 10" (15 to 25 cm) below the soil surface.

PROJECT ALTERNATIVES,

The following alternatives were considered during the study

a) Process and Technology
b) Site alternative
c) Water and sewerage alternative
d) Energy/electricity
e) The no project option

ENVIRONMENTAL BASELINE STUDIES

The assessment of baseline conditions undertaken by Earth Environmental Consultants includes the following:

a) Landscape and topography
b) Geology
c) Soils
d) Land use and land classification
e) Local hazards
f) Climate
g) Air quality
h) Hydrology
i) Terrestrial flora and fauna
j) Aquatic flora and fauna
k) Archaeological and cultural environment
l) Social and economic environment

ENVIRONMENTAL AND SOCIAL IMPACTS

The following significant negative environmental and social impacts will be experienced in the project and surrounding areas:

Contamination of surface water could occur as a result of surface run-off from the sugar plantation or workshop and fuel storage areas; spillage or accidental release of fuel or oil; or release of water containing elevated levels of chemical from fertilizer and pesticide application. Control and treatment of direct runoff from in the estate will reduce the impact of the project on local watercourses.

Project development is bringing beneficial multiplier effects in the regional economy. The project is promoting the business of local suppliers and contractors in Southern Province and beyond, providing goods and services to the company. A direct favourable economic impact of the project in the Project area is the additional employment earnings generated in the local economy.

From a socio-cultural perspective, the project has and continues to attract people from the surrounding areas and beyond seeking employment. This places the local population in direct competition with outsiders. Depending on ability and the availability of jobs, KASCOL is committed to employ local inhabitants from Mazabuka area in preference to outsiders.

Noise and air pollution impacts arising from construction equipment and vehicles during the field operation;

Accidental spills of vehicles lubricants which may inadvertently contaminate surface water, groundwater and/or soil;

Once smelting ceases the natural profile of the area will be altered significantly and the aquatic flora and fauna habitats removed.

ENVIRONMENTAL MANAGEMENT PLANS

In order to ensure successful implementation of proposed mitigation measures, parameter monitoring and subsequent audits, Environmental and Social Management Plan (ESMP) and Environmental and Social Monitoring Plan (ESMP) were prepared in the detailed Environmental and Social Impact Assessment (ESIA), under chapter 8 in this report. The environmental and Social Management Plan summarizes mitigation measures to be taken with respect to the different environmental issues raised during the scoping phase in addition to those identified by the EIA team of experts during the detailed EA and the responsibilities of key stakeholders at the various project phases are clarified in detail in the ESMP. Overall, the project is environmentally feasible and sound with few potential negative impacts, which can be minimized or completely mitigated through incorporation of corrective, rehabilitation, restoration and instituting of appropriate mitigation measures. These have been integrated into the project decision-making level so as to ensure that the project designs take into consideration all the highlighted aspects of this study. The information presented in this environmental project report where approved will form basis for the final design stage of the project. Key parameters to monitor during operation of the project are also included in this ESIA report submitted to the client, however, the following aspects are part of the issues to monitor during project implementation phase:

- Noise levels emitted from different machines at plant and community
- Solid Waste management during the all phases of project implementation.
- Transmission of Infectious diseases, HIV/AIDS, STIs

- Workers Health and Safety
- Air quality
- Biodiversity and ecological stability in the project area.
- Fauna and Flora
- Water pollution due to application of pesticides and fertilizers during the operation stage of the project.

EXPERT WORKING GROUP

This report is prepared by a working group of experts of the Earth Environment Consulting Limited (EECL). The group comprises expertise in the following disciplines: Natural resource management, environmental geohydrology, social sciences and ESIA and SEA application. The composition of the working group and the background of the individual experts is presented in the table below. Note that the working group does not express an opinion on the feasibility or acceptability of the project itself, but comments on the quality and completeness of the ESIA report, in line with the Zambian and international regulations. The working group members also used their own practical experience in relation to reviewing ESIAs for comparable projects. In the case of shortcomings, the consequences for decision making are assessed and recommendations are given for supplementary information needed to address these shortcomings.

MEMBER	PROFESSION	POSITION
Lovemore M. Kapeya	Environmentalist Technician	Principal Consultant
Montgomery Mulengeshi	Partner Consultant - Social Economist	Agriculture Business Advisor
Charles M. Phiri	Flora & Fauna Biologist	Specialist Environmental Management
Vincent Kapundu	Field Studies, Recommendations	Specialist Social & Economic
Timothy Sakala	Agriculturist	Specialist Agricultural Economic
George Mumbi	Partner consultant - Public Health/ Social Sciences.	Social Safety Guard Specialist
Mutale Muma	Field Researcher And Data Analyst	Economics And Finance –Minor In Land Survey
Cassidy Mulengeshi	Research And Data Analyst	Social Political Development

RECOMMENDATIONS

Even though the project focuses on agricultural production, it is a multi-sectoral and a multi-disciplinary project. As such, it is important that during the implementation, relevant line ministries and other stakeholders are effectively involved to address some of the cross cutting issues such as environmental management and trade in agricultural produce. The multi-disciplinary approach will ensure that emerging issues and challenges are not only adequately addressed but the addressing is done timely and appropriately. The contractors and the project proponents should take into consideration all the legislative measures put in place so as to ensure the due process is followed. The mitigation measures provided are based on the recommendations of this ESMP and they

should be followed so as to address the environmental issues that may arise in the course of the implementation of this project.

CONCLUSION

This ESIA report has been prepared based on environmental and social assessments conducted to equip the relevant authorities of the Government of the republic of Zambia and especially the Ministry of Agriculture and the Directorate Zambia Environmental Management Agency at the Ministry of Land, Water and Environment as well as several other interested agencies, local administrative agencies plus all stakeholders with relevant and sufficient environmental information about the proposed conversion of 2,164 hectors of land from furrow irrigation to sub surface drip irrigation project . It is hoped that the KASCOL and the Zambian government authorities will use this information to evaluate the environmental viability and sustainability of the proposed project. The project has environmental impacts but which do not have long term and cumulative nor significant impacts. The proposed development project explains the various economic and social benefits not only to the local communities within the project area, but to the entire nation as a whole, particularly in improving crop production, trade and foreign exchange as well as national food and nutritional security. The negative environmental impacts that have been identified and are associated with the implementation of this project are minimal and could be addressed by implementing the mitigation measures proposed to ensure that they pose no threat to the environment and to the communities. These measures are part of the projects' component and will bring no added cost in the implementation process.

NON-TECHNICAL LOCAL LANGUAGE TONGA
TOOTU TWAAMBO MUBUFWAAFI TWA MULIMO OOYU MU MULAKA WA CITONGA.

I. MAKANI AA MULIMO OOYU (PROJECT)

Mulimo uzumbaizigwa ujatikizya ikucinca kwa kutilila misale kuzwa mukubelesya imufolo kuya mukubelesya kutilila kwa atala antela 'Subsurface Drip' kwa myuunda ya misale iliku kaleya kucilikiti ca Mazabuka kucooko caku musanza. Ikutilila misale atala caamba kuzika tupila tujisi tupulo tutanteene bweelede tugwisya meenda.

Ikucinca ooku kwa kuleka kubelesya imifolo kuya mukubelesya tupila tujisi tupulo tuzikkidwe ansi mu myuunda ya misale ciyakukuleta bulimi bubotu akubona kuti meenda alabelesegwa kabotu ,alimwi ciyakuyungizya mali muciyobwedo cesu. Masimpe, lusumpuko lwakutilila misale munzila eyi luyakupa bulumbu nkaambo ka bunji bwa meenda ajanwa. Aboobo, ba kascol balalalangilwa kuyocikonzya kuyobwedele meenda amali alo akonzya kubelesyegwa ku milimo imbi yandeene andeene. Alimwi cibeela cabantu bajanika mubusena oobu balakonzya kusumpuka kwiinda mukujana milimo yabulimi bwandeene-andene.

Ba KASCOL baya kuzumana kwendelezya bulongwe a kaati ka balimi bamisale aba Zambia Sugar balo batupa meenda aakutila misale a kuula misale yesu. Balimi ba misale ku Kascol baya kuzumana kubeleka milimo yabo iya kufokola, kugwisya mpakalwa, kulimina, a kutitila misale yabo. Mpoona ba mbunga ya Kascol bayakuzumana kulanganya butebuzi, kulanganya milimo ya balimi aba, kuba syangila misale mu myuunda yabo, kubikka camutuzya, kuula zyiyandika mu myuunda, kulanganya kuti meenda abelesegwa kabotu, kulanganya kuti balimi bamisale aba baisyigwa mbobelede kwendelezya bulimi bwa misale yabo, kubamba migwagwa yamubusena oobu a kubapa zyintu zimwi zyiyandika mu bukkale mbuli meenda akunwa, amisobano akati ka balimi aba.

II. ABUSENA MPOTUJANWA. (LOCATION)

Mulimo ooyu uyakutolabusena kujwe akumusanza mudolopo lya Mazabuka, ma maile aali ciloba (7km) kuzwa mu dolopo lya Mazabuka mpoili akati. Ngamwasika abusena obu kwiinda mukubelesya nzila ya Mazabuka kuya ku libingi abusena bwa mweele 233a/234a/235a. Mulimo ooyu uyakutolabusena kumusanza mudolopo lya Mazabuka,. Ngamwasika abusena obu kwiinda mukubelesya mugwagwa wa Mazabuka nkwiya ku libingi mpona mwanyona ampulazi ya 233a/234a/235a.

III. MALI AYANDIKA KUMULIMO OYU. (INVESTMENT COST)

Kwiilikizya kwa mali aa mulimo oyu kunootolabusena amwaka-amwaka, kwendelanya a mali ajanika; imali ayandika kumulimo oyu oonse wa mehekele asika ku 2,164 asika ku $10,000,000. Mali ayandika kumulimo oyu wamwaaka-amwaaka akasyoomezegwa kwiinda mu kubelekela antomwe aba mbunga iigwasilizya bantu ya DFCD/WWF baku Netherlands.

IV. BULANGIZI BUPATI BWAMULIMO OYU (MAJOR POTENTIAL IMPACTS)

BULANGIZI BUBOTU (POSITIVE)

- Eyi nzila ya kutilila misale kubelesya tupila tujisi tupulo tuntanteene kulaletele lubono mucooko coonse. Mulimo oyu ulaletela ikusumpuka kwa mulimo wa makwebo kuba sambazyi ba mucooko cakumusanza antoomwe aba kunze. Bubotu bugamidwe mulimo uyu mbwa kuletela lusumpuko kwiinda mukuyungizya milimo amaili ajanwa kumulimo oyu mucooko. Mucibela cabukkale bwa bantu, mulimo oyu uyazumanana kukwelelwezya bantu mucooko alimwi aba sikule.

BULANGIZI BUBI BWA MULIMO OYU (NEGATIVE)

- Bulangizi bubi bwamulimo oyu mbwakuti meenda abalika atala alabija nkaambo kakusanga ameenda azwa mumyuunda yamisale aasangene amisamu, mafuta-futa azwa mumasena abambilwa myootokala, misamu izwa ku camutuzya amisamu isnsailwa mu myuunda yamisale.

INZILA YAKUYUNGIZYA BUBOTU BWA BULANGIZYI BWA MULIMO OYU.(MITIGATION)

KUBAMBULULA BUBI BWA MULIMO OYU.

- Kubambulula alimwi akulanganya kuti meenda aazwa mumyuunda ya misale a bikkwa musamu weelede mu meenda aakubelesya mu maanda cilakonzya kucesya bulangizi bubi kuzyikala zya meenda.

KUYUNGIZYA BUBOTU BWA MULIMO OYU.

- Kweendelana amilimo iiliko aciindi eeco, ba kascol balilyabide ikunjizya milimo bantu bakkala mu Mazabuka antoomwe abaabo bazwa kule.

ABBREVIATIONS AND ACRONYMS

Acronym	Description
AIDS	Acquired Immune Deficiency Syndrome
BSAP	Biodiversity Strategy Action Plan
CBD	Central Business District
CBD	Convention on Biological Diversity
CHS	Community Health Safety
CITES	Convention on International Trade and Endangered Species
CO_2	Carbon Dioxide
SWSC	Southern Water and Sewerage Company
ECZ	Environmental Council Of Zambia
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMA	Environmental Management Act
EPPCA	Environmental Protection and Pollution Control Act
EPRP	Emergency Preparedness and Response Plan
ESIA	Environmental and Social Impact Assessment
ESIS	Environmental and Social Impact Statement
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management Systems
GDP	Gross Domestic Production
GIIP	Good International Industry Practice
GMO	Genetically Modified Organism
Ha	Hectare
HIV	Human Immune-deficiency Virus
IAP	Interested and Affected Persons
IDPs	Internally Displaced Persons
IFC	International Finance Corporation
ILO	International Labour Organization
KASCOL	Kaleya Smallholders Company Ltd
NBSAP	National Biodiversity Strategy Action Plan
NCC	National Council for Construction
NCS	National Conservation Strategy
NEAP	National Environmental Action Plan
NEP	National Energy Policy
NGO	Non-Governmental Organization
NHCC	National Heritage Conservation Commission
NPS	National Pension Scheme
NPS	National Pension Scheme
NSDI	National Spatial Data Infrastructure
OHS	Occupational Health and Safety
PS	Performance Standards
R-NASF	Revised National HIV and Aids Strategic Framework
RTSA	Road, Transport and Safety Agency
TOR	Terms of Reference

UNFCCC	United Nations Framework Convention on Climate Change
ZEMA	Zambia Environmental Management Agency
ZESCO	Zambia Electrical Supply Corporation Limited
ZICTA	Zambia Information and Communication Technology Authority

Contents

1 INTRODUCTION

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In September 2021, Kaleya Smallholders Company Ltd (KASCOL) entered into a contract with Earth Environmental Consultants to conduct an environmental assessment for the development and conversion of 2,164ha of land under furrow irrigation to sub surface in Mazabuka Districts of southern Province.

This Environmental Social Impact Assessment Study was prepared and conducted by Earth Environmental Consulting team a Limited Company registered within Zambia. The works were supervised by the lead environmentalist Mr. Lovemore Muma. The ESIA report was prepared in accordance with the requirements of the Environmental Impact Assessment Regulations No 28. Amended) of 1997 Pursuant to the Environmental Management Act (EMA), No. 12 of 2011 The Environmental Impact Assessment (EIA) Study Report is submitted to Zambia Environmental Management Agency (ZEMA) in conformity with the requirements of the Environmental Management Act (EMA), No. 12 of 2011. The study is of sub surface drip irrigation project by Kaleya Small Holder Company

1.1 OBJECTIVE OF THE STUDY

The objective of the study is to carry out an environmental impact study of the proposed development to determine whether or not the project activities will have any adverse impacts on the environment, taking into account environmental, social, cultural, economic and legal considerations.

The specific objectives include:

(i) To establish the baseline environment of the proposed irrigation project,
(ii) Identifying the impacts of the project and project activities on the environment,
(iii) Proposing mitigation measures for the significant negative impacts on the environment,
(iv) Generating the baseline data for monitoring and evaluating impacts, including mitigation and
(v) Measures during the project cycle.

1.2 ESIA STUDY TEAM

The ESIA team for subsurface drip irrigation study is shown in table 1.1 below

Table 1.1: showing the composition of the ESIA team

MEMBER	POSITION
LOVEMORE M. KAPEYA	ENVIROMENTALIST
MONTGOMERY MULENGESHI	AGRICULTURE BUSINESS ADVISOR
CHARLES M. PHIRI	SPECIALIST ENVIRONMENTAL MANAGEMENT
VINCENT KAPUNDU	SPECIALIST SOCIAL & ECONOMIC
TIMOTHY SAKALA	SPECIALIST AGRICULTURAL ECONOMIC
GEORGE MUMBI	SOCIAL SAFETY GUARD SPECIALIST
MUTALE MUMA	ECONOMICS AND FINANCE -MINOR IN LAND SURVEY
CASSIDY MULENGESHI	SOCIAL POLITICAL DEVELOPMENT

1.3 BACKGROUND OF THE PROJECT

Two drivers triggered the establishment of the KASCOL model. One was the need of the Zambia Sugar Company, at the time the sole sugar milling company in the country, to expand the area of sugarcane after it had expanded its plant processing capacity in the Mazabuka district. The other was the interest of the Zambian Government to improve the incomes of the poor by involving them in the sugar industry.

The Commonwealth Development Corporation (CDC) was asked to suggest an organizational model based on its experience with similar projects in Africa. The model suggested by CDC would create a sugarcane production and farming services company (KASCOL) which would,

a) Own the 4,179 hectares of land given by the Zambian Government for the development of this project
b) Would lease part of the 2,500 hectares of arable land to smallholders for the production of sugarcane
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e) Would facilitate relationships between the smallholders and the Zambia Sugar Company who would provide irrigation water and buy the sugarcane. The smallholders would assume the responsibility of activities such as ridging, smut rouging, chemical application, weeding, and irrigating their cane fields. KASCOL would be responsible for cane-harvesting; supervising the farmers' field activities; replanting the cane; water management; providing the technical, financial, and managerial skills; grading community roads; and providing other social amenities such as domestic water and recreational facilities to smallholders. In 1980, the company was formed.

1.4 SUMMARY DESCRIPTION OF THE PROJECT

The proposed project comprises the conversion of sugar cane irrigation system from furrow to sub-surface drip in the Kaleya cane fields in Mazabuka Districts of Southern Province located to the south of the plantation.

Subsurface drip irrigation (SDI) is an irrigation system through buried plastic tubes containing embedded emitters located at regular spacing's. There are a wide variety of configurations and equipment used, however drip tubes are typically located 38" to 84" (134 to 213 cm) apart, and 6 to 10" (15 to 25 cm) below the soil surface.

The migration from the current furrow irrigation to sub surface drip irrigation infrastructure will enhance agricultural productivity and contribute more efficient use of water and increased institution revenue base. Indeed, the development of this type of irrigation infrastructure by KASCOL is considered very beneficial and cost effective given the vast water resources present. As a result, the company is expected to serve on water and finances which would lead investment in other agricultural enterprises. Equally, a significant segment of community in the project areas will benefit from resulting jobs created through agriculture production diversification.

Subsurface drip irrigation provides the ultimate in water use efficiency for open-field agriculture, often resulting in water savings of 25-50% compared to flood irrigation. The use of SDI offers many other advantages for crop production, including less nitrate leaching compared to surface irrigation, higher yields, a dry soil surface for improved weed control and crop health, the ability to apply water and nutrients to the most active part of the root zone, protection of drip lines from damage due to cultivation and other operations, and the ability to safely irrigate with wastewater while preventing human contact.

All things considered, SDI is a highly efficient system which can help improve management of irrigation water and crop nutrients.

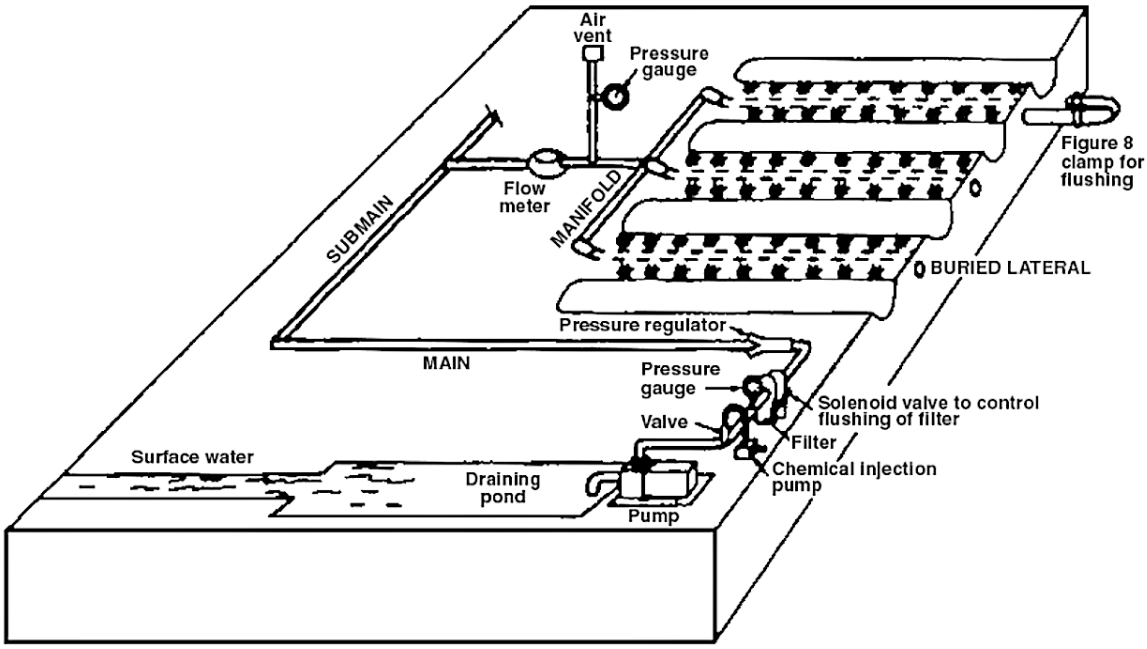

Figure 1.1 showing typical subsurface drip irrigation field layout

1.5 OBJECTIVES OF THE PROJECT

The main objectives of the project area:

- To convert the existing furrow irrigation to sub surface drip irrigation system
- To facilitate optimal use of the water resource.

1.6 PROJECT DEVELOPER

The Project developer is Kaleya Smallholders Company Ltd (a statutory body) with its registered address at:

Address:
Kaleya Smallholders Company Ltd (KASCOL)
Plot No. 233a/234a/235a along Livingstone Road
P.O. Box 670371
Mazabuka, Zambia

KASCOL Contact person details:

Name:	M. Mufana
Designation:	Estate Manager
Phone number:	0978240240
Email Address:	mmufana@KASCOL.co.zm

Table 1.2: Details of Directors

NAME	CONTACT DETAILS	ADDRESS	NAME OF SHAREHOLDER
COSTAIN CHILALA	Mobile: 0966778888 Email: cdchilala@gmail.com	CHIMSORO MILLING CO. LTD P.O. BOX 810012 KAPIRI MPOSHI	GROWERS INVESTMENT
MR SAMUEL BWALYA	Mobile: 0971021036 Email: smbwalyas@dbz.co.zm	DEVELOPMENT BANK OF ZAMBIA DEVELOPMENT HOUSE KATONDO ROAD PO BOX 33955	DEVELOPMENT BANK OF ZAMBIA
MR. M. HANTUBA	Mobile: 0977770833 Email: hantuba@aflife.co.zm	AFRICAN LIFE INSURANCE MPILE OFFICE PARK 74TH INDEPENDENCE AVENUE P.O. BOX 51331LUSAKA	GROWERS INVESTMENTS HOLDINGS LIMITED
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1.7 TOTAL PROJECT COST

The investment cost of the project is estimated at USD10million

1.8 PROPOSED PROJECT IMPLEMENTATION DATE & LIFE SPAN

Activity /Phase	2022				2023				2083
	1	2	3	4	1	2	3	4	
Site Preparation									
Construction									
Operation									
Decommissioning									

1.9 DIRECTORS AND SHAREHOLDERS

THE SHAREHOLDERS FOR KASCOL ARE AS FOLLOWS:

Institution Name	%SHAREHOLDING	NO OF SHARES
Development. Bank of Zambia	25.00%	250,000
Mazabuka Sugar Cane Growers Trust	25.00%	250,000
Growers Investment Holdings Limited	30.50%	305,000
Kaleya Smallholders Framers Trust	19.50%	195,000

10 PROJECT LIFESPAN

The project is under preparation stage and the project implementation period is 42 months

2 POLICY, INSTITUTIONAL AND ORGANISATIONAL FRAMEWORK

2.1 POLICY FRAMEWORK

The National Conservation Strategy (NCS) is the forerunner to environmental legislation in Zambia. The NCS was adopted by the Government of Zambia in 1985 and led to the enactment of the Environmental Protection and Pollution Control Act in 1990 and provided for the establishment of the Environmental Council of Zambia (ECZ) which became operational in 1991. The NCS provided guidance for the sustainable development of Zambia through the use and conservation of natural resources within a centrally planned and controlled economy. However in 1992, the National Environmental Action Plan process was established to update the NCS, to meet the demands of an economy undergoing liberalisation and to update technical information.

The following policies are relevant to the proposed housing Project.

1. Zambia Vision 2030

The developmental vision of Zambia, to become a prosperous middle-income country by 2030, is elaborated in a document entitled Vision 2030. The Vision 2030 is founded on seven key basic principles. These principles are: (i)sustainable development; (ii) upholding democratic principles; (iii) respect for human rights;(iv) fostering family values; (v) a positive attitude to work; (vi) peaceful coexistence; and (vii) upholding good traditional values. The characteristics of the nation that Zambia is building can be described as follows:

a. A common and shared destiny, united in diversity, equitably integrated and democratic in governance, promoting patriotism and ethnic integration;
b. Devolved political systems and structures while retaining the roots and positive aspects of their own mould of social, cultural and moral values;
c. A continuous path of ever refining, ever advancing and ever consolidating democratic dispensation and progressive adaptation from global best practices;
d. Economically, socially and politically integrated within the sub-region, Africa and the rest of the world;
e. Diversified and balanced and strong industrial sector, a modern agricultural sector and an efficient and productive services sector;
f. Technologically proficient, fully able to adapt, innovate and invest using its human and natural resources;
g. Strong and cohesive industrial linkages in the primary, secondary and tertiary sectors;
h. Sustained high and increasing productivity levels with regard to every factor of production;
i. Well developed and maintained socio-economic infrastructure;
j. A robust and competitive transport and communications network that services the region;
k. Strong entrepreneurial capabilities, self-reliant, outward looking and enterprising, where nationals take advantage of potential and available opportunities;
l. Exemplary work ethics, honesty, high human and ethical values, quality consciousness and the quest for excellence;
m. A macroeconomic environment conducive for growth;
n. Development policies consistent with sustainable environment and natural resource management principles;

o. Access for all to good quality basic human necessities such as shelter, titled land, health and education facilities and clothing;
p. Diversified education curricula that are responsive to the knowledge, values, attitudes and practical skill needs of individuals and society at large;
q. Regional centre of excellence in health and education;
r. Decent work opportunities that ensure respect for fundamental human rights and principles;
s. Opportunities for all citizens to become resourceful and prosperous nationals;
t. Decentralized governance systems; and,
u. Safe and secure social environment.

***Relevance**: This project addresses both the provision of the provision of decent work opportunities*

2. Seventh National Development Plan

The Seventh National development Plan is the vehicle that will deliver the broad objectives of Vision 2030 during the period 2017 -2021. The integrated approach recognises the multi-faceted and interlinked nature of sustainable development which calls for interventions to be tackled simultaneously through a coordinated approach to implementing development programmes. The key development outcomes envisioned by this plan include economic diversification and job creation; poverty and vulnerability reduction; reduced developmental inequalities; enhanced human development; and an enhanced governance environment for a diversified and inclusive economy.

***Relevance**: This project reduces inequalities through providing access to for middle-income groups.*

3. National Resettlement Policy - 2015

The policy aims to protect the resettlement land and provide for the welfare of persons resettled in order to achieve stability and sustained development and improved livelihoods. The policy has the following guiding principles:

- The Government shall ensure that guidelines and procedures regarding settler selection criteria are clearly spelt out.
- The size of the land allocated shall be commensurate to the ability of the settler to develop the land and/or be adequate to support an average family with basic subsistence food and reasonable surplus.
- Two (2) types of settlement patterns shall be promoted by the Government. The first is the dispersed type of settlement pattern where each settler has his own dwelling house and family on his farm. The second type is the concentrated settlement pattern where settlers' dwelling houses are clustered next to each other in communal /village setup.
- There is need to provide basic public services in resettlement schemes if settlers are to be attracted and encouraged to settle there.
- The Government will as much as practicable, encourage the use of the already existing ministries/institutions to carry out activities relevant to their respective mandates in the resettlement schemes. This also includes forging partnerships with all interested stakeholders including Cooperating Partners, the private sector and NGOs.
- Involuntary resettlement should be in line with the international human rights and humanitarian law as set out in the 1998 United Nations Guiding Principles on Internal

Displacement, which are recognised as an important international framework for the protection of internally displaced persons.

- Humanitarian and development aid to Internally Displaced Persons (IDPs) and other vulnerable populations should not place them in greater danger or empower those responsible for the violence, exploitation or abuse suffered by IDPs. External aid should not produce inequalities or dependencies, nor should it exacerbate local tensions.
- Involuntary resettlement should be avoided where feasible. Where population displacement is unavoidable, it should be minimised by exploring all viable project options.
- People unavoidably displaced should be compensated and assisted, so that their economic and social future would be generally as favourable as it would have been in the absence of the project or better.

Involuntary resettlement should be conceived and executed as part of the project. The full cost of resettlement and compensation should be included in the presentation of project costs and benefits.

***Relevance**: Any displacement that might be triggered by the project will be guided by this policy.*

4. Agricultural Policy

The aim of the Agriculture Policy is to facilitate and support the development of a sustainable and competitive agricultural sector that assures food security at national and household levels, and maximises the sector's contribution to Gross Domestic Product (GDP).

The policy has the following specific objectives:

- To ensure national and household food security through an all-year round production and post-harvest management of adequate supplies of basic foodstuffs at competitive costs;
- To contribute to sustainable industrial development by providing locally produced agro-based raw materials;
- To increase agricultural exports thereby enhancing the sector's contribution to the National Balance of Payments;
- To generate income and employment through increased agriculture production and productivity; and
- To ensure that the existing agricultural resource base is maintained and improved upon.

***Relevance**: Impacts of the project on any agricultural areas will be governed by this policy.*

5. National Energy Policy - 2008

The aim of the 2007 NEP is to create conditions that will ensure the availability of adequate supply of energy from various sources, which are dependable, at the lowest economic, financial, social and environmental cost consistent with national development goals. This policy seeks to ensure environmentally sustainable exploitation of the biomass resource, to expand generation and transmission capacity and also increase accessibility to electricity and private sector participation. The policy seeks to ensure an adequate, reliable and affordable supply of petroleum products. On sources of energy, the policy aims to increase the contribution of coal, to promote the exploitation of Uranium and to increase the deployment of renewable energy sources. The energy policy seeks

to reduce dependence on wood fuel and ensure sustainable provision of affordable, reliable modern energy services to rural and urban households as a means of raising productivity and standards of living.

***Relevance**: Supply of energy to housing structures will be governed by this policy.*

6. National Policy on Environment - 2007

The National Policy on Environment was developed in 2007 to safeguard the environment and ensure the sustainable use of natural resources. The purpose of the policy is "to create an umbrella policy for the welfare of the Nation's environment so that socio-economic development will be achieved effectively without damaging the integrity of the environment or its resources".

The National Policy on Environment aims to achieve increased economic growth that is not damaging to the environment and natural resources. The policy recognises the need to develop and promote alternative energy sources to fuel-wood and technologies to reduce the use of fuel-wood and enhance carbon-sinks. It offers strategic guidance on key economic sectors related to the environment.

***Relevance**: This policy guides the planning for sustainability in development activities such as the proposed project.*

7. National Water Policy - 2010

The National Water Policy is the main policy framework for the water and sanitation sector in Zambia. The Policy was developed and adopted by the Government of the Republic of Zambia in 1994, and updated in 2010. The National Water Policy envisions "to optimally harnessing water resources for the efficient and sustainable utilization of this natural resource to enhance economic productivity and reduce poverty". In order to achieve the national goal of increasing accessibility to reliable safe water by all sectors of the economy the policy addresses two broad categories of water resources management and development. The major outcome of the policy is to improve the management of water resources, institutional coordination and defined roles and responsibilities. The policy encourages the use of water resources in an efficient and equitable manner consistent with the social, economic and environmental needs of present and future generations.

***Relevance**: The provision of water supply to the project is guided by this policy.*

8. National Industrial Policy - 2018

This policy aims to ensure the growth of industrial activity in the country especially for Micro, Small and Medium Enterprises. In addition, it serves as a framework for collaboration between the Government, private sector stakeholders and cooperating partners in the development of the Zambian Industrial Sectors. The policy aims to foster new industrial capacity, promote the diversification of production, facilitate the creation of inter-sectoral and inter-industry linkages, promote the establishment of cooperatives across value chains, promote the development of industry specific skills and facilitate the shifting of economic activity towards higher value-added activities to spur sustainable economic growth. This Policy focuses on eight (8) Manufacturing sub-sectors as priority drivers of Industrialisation. The priority sub-sectors are as follows:

- Processed Foods;
- Textiles and Garments;

- Engineering Products;
- Wood and Wood products;
- Leather and Leather Products;
- Mineral (metallic and non-metallic) processing and products (beneficiation);
- Pharmaceuticals; and
- Blue Economy

In addition to the eight priority sub-sectors, Construction, Agriculture, Tourism, Education, Energy, ICT and Health, will be the key supportive sectors.

***Relevance**: The purchasing of engineering products for the construction phase will be guided by this policy.*

9. National Social Protection Policy - 2014

The overall objective of this policy is to contribute to the well-being of all Zambians by ensuring that vulnerable people have sufficient income security to meet basic needs and protection from worst impacts of risks and shocks. Specific objectives are to:

- Reduce extreme poverty and destitution among vulnerable and poor households;
- Enhance food and nutrition security for vulnerable populations;
- Build the human capital of extreme poor households;
- Attain an all-inclusive and comprehensive Social Security System;
- Achieve Universal Health Coverage through Social Health Insurance for all, with a special emphasis on the Vulnerable and the marginalised population groups;
- Enhance access by poor and vulnerable populations to productive resources and skills;
- Promote employment opportunities and income generating activities for the unemployed and other vulnerable groups;
- Increase livelihood potential among vulnerable populations;
- Protect vulnerable populations from all forms of abuse, violence, discrimination, denial and neglect;
- Enhance the social status and progressive realization of the socio -economic and cultural rights of the excluded and marginalised;
- Safeguard and promote the realisation of the right to an adequate standard of living for people living with disabilities; and
- Ensure equitable access to opportunities by persons living with disabilities.

***Relevance**: This policy ensures the consideration and protection of all social groups that will be impacted by the project, as well as the promotion of employment opportunities through the construction phase.*

10. National Policy on Disability – 2012

An Act to continue the existence of the Zambia Agency for Persons with Disabilities and define its functions and powers; promote the participation of persons with disabilities with equal opportunities in the civil, political, economic, social and cultural spheres; provide for mainstreaming of disability issues as an integral part of national policies and strategies of sustainable development; incorporate a gender perspective in the promotion of the full enjoyment of human rights and fundamental freedoms by persons with disabilities; ensure accessibility by persons with disabilities to the physical, social, economic and cultural environment, and to health, education, information, communication and technology; provide for the regulation and registration of institutions that provide services to persons with disabilities and organizations of,

and for, persons with disabilities; continue the existence of the National Trust Fund for Persons with Disabilities; provide for the domestication of the Convention on the Rights of Persons with Disabilities and its Optional Protocol and other international instruments on persons with disabilities to which Zambia is party, in order to promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by persons with disabilities and to promote respect for their inherent dignity; repeal and replace the Persons with Disabilities Act, 1996; and provide for matters connected with, or incidental to, the foregoing.

***Relevance**: This policy will guide the design and access points to ensure persons with disabilities have suitable access to all public facilities*

11. National Employment and Labour Market Policy – 2004

The main objective of the Employment and Labour Market Policy is to create adequate and quality jobs under conditions that ensure adequate income, protection of workers' and basic human rights.

The National Employment and Labour Market Policy is directed by the following principles:

- Equity: facilitation of equitable and freely chosen productive employment for all;
- Equality: remunerations that are equal for work of equal value;
- Responsiveness: a free and responsive labour market environment where players have no undue leverage against one another;
- Social Protection: a comprehensive social protection system for people of all walks of life to avoid all forms of destitution;
- Productivity: a productive work culture among the workforce;
- Social Dialogue: facilitation of continuous social dialogue among players on the Labour Market; and
- Sustainability: sustainable development through effective implementation of the National Employment and Labour Market Policy

***Relevance**: This policy will guide the terms of reference for the contractor to ensure fair employment conditions during construction.*

12. National Policy on Wetlands – 2018

The aim of the policy is to ensure the wise use of wetlands and their resources, and to create a comprehensive, stakeholder-based institutional and legal framework for their management.

The specific objectives are:

- To promote the integrity and natural productivity of wetland ecosystems and the maintenance of their functions and values to conserve their biodiversity;
- To promote their socio-economic development potential and contribution to the local and national economy;
- To strengthen the legal and institutional framework for their management;
- To promote a multi-sectorial approach to planning and management;
- To develop public education and awareness;
- To promote research, inventorying and monitoring of wetland resources;
- To conserve wetlands;
- To promote international action of national interest for the conservation of wetlands;

- To restore degraded wetlands;
- To promote community participation and ensure equitable sharing of benefits;
- To provide training and strengthen the capacity of wetland conservation institutions;
- To promote "new" and created wetlands.

***Relevance**: This project does not impact any wetlands directly; however this policy will guide treatment of any impacts to wetlands as a result of expansion to utility lines and facilities in the future due to development.*

13. Draft National Fisheries Policy – 2009

The aim of the policy is to provide an overall national vision for the development of the sector. The National Fisheries Policy seeks to give substance to the national fisheries vision. The policy prescribes the institutional arrangements for the management of the fisheries sector and identifies relevant stakeholder institutions that will support implementation to address current concerns. The objectives of the policy are:

- To increase the quality and quantity of aquaculture production at both small-scale and industrial levels.
- To ensure and increase the production of a diversified range of fish products including finfish and crustaceans from aquaculture.
- To identify fishery areas with potential for live ornamental fish production and encourage development of aquarium fisheries;
- To increase fish production in small water bodies.

***Relevance**: This Project does not impact any aquaculture as there is a robust water monitoring system of discharge of waste to natural bodies close to the project site.*

14. Draft Livestock Development Policy – 2012

The overall objective of the Livestock Development Policy is to promote increased and sustainable livestock production, productivity and management in order to ensure food security, income generation, creation of employment opportunities and a reduction in poverty levels. The following are some of the principles:

- The endeavour to create an economic environment which encourages individual initiative and self-reliance among the people and promote private investment.
- Inclusiveness in the formulation of development plans and programmes.
- The stimulation of agriculture, industry and technological development.
- The eradication of poverty and illiteracy.
- The institution of measures for disaster management and preparedness.
- Development and preservation of local languages.
- Protection to privacy.
- Protection of consumer rights.
- Protection of health, safety and economic interest.
- Access to information.
- Rights of the citizen to food, water, sanitation and a safe environment.
- Sustainable and productive management of land resources.
- Sound conservation and protection of ecologically sensitive areas.

- The respect of the integrity of natural processes and ecological communities including conservation of habitats and species.
- The sustainable exploitation, utilization, management and conservation of the environment and natural resources for the present and future generations.
- Protection of genetic resources and biological diversity.

***Relevance**: This policy will be considered with respect to potential impacts to livestock which may graze close to the project area, specifically during construction phase.*

15. Draft National Land Policy - 2015

The objectives of the Draft National Land Policy are as follows:

- Ensure that boundaries are clearly marked in order to minimise border disputes.
- Prepare and update internal boundaries in order to promote national identity, fiscal, electoral administration and good governance frameworks.
- To address the land tenure constraints that impact social and economic development through the implementation of a comprehensive land policy.
- To implement measures that will ensure that leasehold land managed in an effective and sustainable manner.
- To strengthen customary land administration in order to guarantee security of tenure.
- To institutionalise public land tenure in policy and law.
- To protect and conserve commons lands, which are essential for the livelihood support, economic growth and for the overall well-being of a community.
- To regulate access to land by non-Zambians with a view to providing for access and use rights on land to non-Zambians while restricting ownership of land, both state and customary to Zambians only.
- To ensure accountability, transparency, monitoring and compliance to lease conditions to protect land rights and safeguard against environmental damage.
- To review the compulsory acquisition of land and other property.
- To improve security of leasehold tenure
- To achieve a gender sensitive, and a youth friendly land sector which is inclusive of persons living with disabilities and other socially marginalised groups.
- To strengthen the administration and management of land services.
- To clarify institutional mandates
- To create and maintain a professional, accountable, transparent and timely land registration system.
- To enhance efficiency and cost effectiveness of survey and mapping functions through commercialisation, notwithstanding the public need to provide all basic and control services.
- To prepare basic topographic maps at scales which conform to policy needs and technological advances and regulate the preparation of Atlases and Tourist maps according to the law.
- To fix and record property boundaries through a variety of techniques, accuracies and costs.
- Implement a National Spatial Data Infrastructure (NSDI) framework.
- To maintain an accurate, gender-disaggregated and up-to-date land information for regional and urban land management.
- To implement an easy, equitable, transparent and cost effective land allocation system.

- To simplify taxes, improve collections and strengthen valuation capacity at all levels.
- Formalise land ownership in the country to create an asset base for the poor, promote a property market, expand financial intermediation and widen the municipal tax base.
- Strengthen valuation capacity at all levels of land administration and improve valuation systems and regulatory compliance.
- Prepare and update a national planning framework to guide national development planning proposals.
- To harmonise local land allocation policies and draw up plans for major urban expansions to provide land for housing in large tracts with plot layouts and trunk services (major roads and primary water supply and sanitation services) provided ahead of demand.
- To guide the identification of most suitable areas for location of various activities in rural areas in order to provide for orderly provision of essential services.
- To regulate with a view to eliminating the growth of unplanned areas through timely provision of shelter or serviced building plots.
- To institute forward planning of land for housing and publicise its availability.
- Enhance collaboration with Chiefs and Government to continually avail adequate land for resettlement purposes in all districts of the country.
- To improve smallholder access to secure ownership of agriculture land.
- Ensure optimal utilisation of the land resources through formulation of provincial, district and local land use policies that incorporate area-specific concerns and priorities.
- To manage land with a view to improving carbon storage by protecting grasslands, rangelands and forests to meet the food needs of a growing population and exports.
- To ensure that mining developers adopt principles of Free, Prior and Informed Consent of local people for decisions that may affect them.
- To ensure the preservation of land for future use.

***Relevance**: This policy will be given due consideration in the design of the concept plan, the land use plan, as well as the detailed design for the development.*

16. National Forestry Policy 2014

The current vision and policy on Forestry in Zambia is to attain the sustainable forestry management of all types of forests so as to enhance the contribution of forest products and services to the mitigation of climate, income generation, poverty reduction, job creation and to the protection and maintenance of biodiversity. The forest policy aims to reduce deforestation and forest degradation by focusing on increasing forest cover and enhance carbon stocks through integrated participatory forest management, improved law enforcement and private sector investment. It also provides for the domestication of international environmental agreements on the premise that forests play a key role in improving the global environment and sustainability. These include the United Nations Framework Convention on Climate Change (UNFCCC), Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the Convention on Wetlands of International Importance, the Convention on Biological Diversity (CBD), the Convention to Combat Desertification and other relevant international agreements to which Zambia is a party

***Relevance**: This policy will be considered in the positive and negative impacts of the site development, that is, positive with respect to improving access to electrical power thereby minimising need to tree cutting and charcoal usage, and negative in terms of any potential impacts to tree life impacted during construction works in the Project site.*

17. Decentralisation Policy

The National Decentralization Policy was developed in 2002 and launched in 2004. The policy aimed at decentralizing government responsibilities and functions to lower levels of government through 'devolution'. It reaffirms the local authorities as the institutions responsible for water supply and sanitation.

***Relevance**: This policy will be considered when reviewing the impact of providing affordable housing opportunities to employees of local authorities, thereby encouraging resource decentralisation.*

18. National Solid Waste Management Strategy

The overall goal of the National Waste Management Strategy is to improve the environmental quality of the Zambian environs through the development and implementation of an efficient and sustainable waste management system.

The objectives of the national waste management strategy are to:

- Minimise generation of waste;
- Maximise the collection efficiency of waste;
- Reduce the volume of waste requiring disposal and maximise the economic value of waste; and
- Develop and adopt environmentally sound treatment and disposal methods and practices.

***Relevance**: This policy will be considered when reviewing the impact of solid waste management of the development.*

19. National Conservation Strategy

The National Conservation Strategy (NCS), adopted by the Government of Zambia in 1985 has been the main policy document on the environment. The NCS led to the establishment of environmental legislation and institutions. The NCS was developed to manage natural resources and the environment in the context of a centrally planned and controlled economy.

The goal of the strategy is to "satisfy the basic needs of all the people of Zambia, both present and future generations, through the wise management of natural resources".

The objectives of the NCS are:

- To ensure the sustainable use of Zambia's renewable natural resources;
- To maintain Zambia's biological diversity; and
- To maintain essential ecological processes and life-support systems.

The NCS triggered the enactment in 1990 of the Environmental Protection and Pollution Control Act (EPPCA) which is a regulatory instrument that cuts across sectors; and the creation in 1991, of the Environmental Council of Zambia (now Zambia Environmental Management Agency) to regulate environmental matters and deal with related issues

***Relevance**: This policy will be considered when reviewing the impact of development on the natural environment.*

20. National Environmental Action Plan

The overall objective of the National Environmental Action Plan is to integrate environmental concerns into Zambia's social and economic development planning process. The NEAP was prepared as a comprehensive plan to contain the increasing environmental degradation in Zambia.

The NEAP is founded on three fundamental principles:

- The right of citizens to a clean and healthy environment;
- Local community and private sector participation in natural resources management; and
- Obligatory Environmental Impact Assessment is made compulsory for major development projects in all sectors.

***Relevance**: This policy will be considered when reviewing the impact of development on improving the quality and standard of living of the local population by providing affordable access to housing.*

21. National Biological Diversity Strategy and Action Plan

In May 1993 Zambia ratified the Convention on Biological Diversity. By ratifying the Convention on Biological Diversity, Zambia has committed herself to fulfilling its objectives and recognises that a Biodiversity Strategy and Action Plan (BSAP) is necessary in order to guide the country's future activities intended to achieve the objectives of the CBD in line with biodiversity conservation and usage. As part of the commitment to fulfil its objectives, Zambia developed the National Biological Diversity Strategy and Action Plan (NBSAP), which was finalised in 1998.

The goals of the NBSAP are to:

- Ensure the conservation of the full range of Zambia's natural ecosystems through a network of protected areas;
- Conserve the genetic diversity of Zambia's crops and livestock;
- Improve the legal and institutional framework and human resources to implement the strategies for conservation, sustainable use and equitable sharing of benefits from biodiversity management;
- Sustainably manage and use Zambia's biological resources;
- Develop an appropriate legal framework and the needed human resources to minimise the risks of the use of Genetically Modified Organisms (GMO's).

***Relevance**: This policy will be considered when reviewing the impact of development on the natural environment.*

22. National HIV and AIDS Strategic Framework

The Revised National HIV and AIDS Strategic Framework (R-NASF) covers the period 2014 - 2016. It is a framework to guide implementation of the National HIV Multi-sectorial Response in Zambia.

The purpose of the framework is to:

i. Provide an overall strategy for the planning, coordination and implementation of the multi sectorial national response based on available evidence;
ii. Articulate national priorities, expected outcomes and targets that all stakeholders should work towards, based on their respective mandates, resources and comparative advantage;
iii. Articulate an agreed framework for the implementation of the multi-sectorial response developed in partnership with civil society, private sector, public sector and development

partner inputs that is in line with the three-ones principle (one strategy, one coordinating body and one M&E system); and

iv. Provide a transparent framework to form the basis for reaching agreement with development partners on their technical and financial support and the management and coordination of the response.

The six themes of the NASF represent the cooperating partners' priority action areas and include:

- Intensifying efforts for prevention of HIV;
- Expanding treatment, care and support for people affected by HIV and AIDS;
- Mitigating the socioeconomic impact of HIV and AIDS;
- Strengthening the decentralised response and mainstreaming HIV and AIDS;
- Improving the monitoring of the multi-sectorial response; and
- Integrating advocacy and coordination of the multi-sectoral response.

***Relevance**: This policy will be considered when preparing the Project health and safety plan to be utilised by the contractor to ensure mitigation of the spread of viruses from external contractors to the local population and vice versa.*

2.2 INSTITUTIONAL FRAMEWORK RELEVANT TO THE ESIA

The Zambia Environmental Management Agency (ZEMA) is the umbrella environmental institution in Zambia and the lead agency on matters pertaining to environmental impact assessments (EIA). It is empowered by the Environmental Management Act (No. 12 of 2011) (EMA) to identify Projects, plans and policies for which an EIA is necessary.

The services provided by ZEMA specifically in relation to EIA studies include:

- Assisting the developer to determine the scope of EIA studies;
- Reviewing project briefs, terms of reference, and environmental impact statements (EIS) and decision-making;
- Disclosure of the EIS to the public through the media;
- Holding public hearing meetings to discuss the EIS with stakeholders;
- Conducting verification surveys of the affected environment;
- Monitoring the Project once implemented;
- Conducting compliance audits of the project between 12 and 36 months after implementation; and
- General administration of all the Regulations under the EMA.

The proposed Project will be required to submit an ESIA to ZEMA and approval from the agency will be required to undertake the proposed Project.

Other competent authorities potentially relevant to the Project include:

- Ministry of Lands and Natural Resources
- Ministry of Water Development, Sanitation and Environmental Protection
- Ministry of Housing and Infrastructure Development
- Ministry of Local Government
- Ministry of Agriculture and Livestock

- Ministry of Labour and Social Security
- Ministry of Health
- Ministry of Education
- Ministry of Community Development and Social Services
- Ministry of Chiefs and Traditional Affairs
- Ministry of Tourism and Arts
- Ministry of Transport and Communications
- Ministry of Works and Supply
- Ministry of Mines and Minerals Development
- Water Resources Management Authority
- Forestry Department
- National Heritage Conservation Commission (NHCC)
- ZESCO Limited
- Department of Water Affairs
- Department of National Parks and Wildlife
- Mazabuka Town Council

2.3 Legal Framework relevant to ESIA

Title	Summary of relevant contents	Relevance	Compliance
The Environmental Management Act (EMA), No. 12 of 2011	This Act is the principal environmental law in Zambia and provides for integrated environmental management, the protection and conservation of the environment and the sustainable management and use of natural resources among others. The Zambia Environmental Management Agency (ZEMA), established under the EMA, is responsible for EIA review and approval, and for monitoring the implementation of the Project Proponent's Environmental Management Plan. The Act also provides specific regulations for discharge, collection, storage, transportation and disposal of gaseous, liquid and solid waste, and makes the Project Proponent responsible for meeting them. The ZEMA is responsible for enforcing environmental regulations and coordinating of government agencies involved in environmental management in their sectors.	The EMA ensures that environmental issues are considered during the project planning and management as it is the principal law to be followed whenever projects are implemented.	The Project Proponent shall ensure that all contractors engaged comply with requirements of this Act and obtain all approvals and permits stipulated in the Act. During the detailed study, the ESIA team will not only review the EMA but will also identify the positive and negative environmental and social impacts likely to result from the project. The ESIA team will further develop mitigation measures for the negative impacts and advise the Project Proponent on how best to implement the mitigation measures in order to minimize the impacts in line with these requirements.
Environmental Impact Assessment Regulations No. 28 of 1997	The Environmental Impact Assessment is undertaken in accordance with the requirements of the EMA. They provide the framework for conducting and reviewing environmental impact assessment for any Project. Further, it provides regulations for auditing project implementation. The regulation requires Project Proponents undertaking projects that may have an effect on the environment to conduct environmental and social impact assessment prior to obtaining written approval of the Project from ZEMA. The Project falls within the Second Schedule of the EIA regulations and as such requires an EIA.	The proposed Project is likely to cause environmental and social impacts during implementation and thereby falls under the Second Schedule of these Regulations.	This Scoping report along with the Terms of Reference is the first step towards fulfilling the requirements of these Regulations. The TORs and Scoping Report will be submitted to ZEMA for scrutiny. Once ZEMA approves this Scoping report and the TORs, the ESIA team shall proceed to carryout detailed studies and consequently submit an Environmental and Social Impact Statement (ESIS) which shall include an Environmental and Social Management Plan (ESMP).

Title	Summary of relevant contents	Relevance	Compliance
Environmental Management (Licensing) Regulations, 2013 Part 3 (Waste Management)	These regulations provide for licensing of solid non-hazardous waste transportation and operating or owning of a non-hazardous waste disposal site.	The Environmental Management (Licensing) Waste Regulations are relevant to the proposed project because during construction, the contractor will generate solid and hazardous waste which will need to be disposed of.	The ESIA Team will propose measures of how the Project Proponent shall comply with requirements under these regulations and this will apply to the project area in total. In addition, the ESIA Team will propose measures that the Project Proponent, through the risk assessment, environmental, health, and safety guidelines, shall use to manage all wastes generated during Project implementation.
Environmental Management (Licensing) Regulations, 2013 Part 2 (Air & Water)	These regulations provide for licensing of emissions and liquid waste discharge to the environment and provide for statutory discharge limits for respective parameters.	This Act regulates the way waste water produced during Project implementation should be managed and discharged into the environment. This Act is also relevant due to the increase in vehicular emissions during construction and operation of the Project.	The ESIA Team will propose measures of how the Project Proponent shall comply with requirements of these regulations as well as to manage all liquid wastes generated during Project implementation.
Local Government Act of 2019	This legislation provides for an integrated local government system; gives effect to the decentralisation of functions, responsibilities and services at all levels of local government; ensures democratic participation in, and control of, decision making by the people at the local level; revises the functions of local authorities; provides for the review of tariffs, charges and fees within the area of a local authority; provides for the proceedings of the council and committees; provides for the role of traditional leadership in democratic governance; repeals and replaces the Local Government Act, 1991; and provides for matters connected with, or incidental to, the foregoing.	The Project falls under Mazabuka Town Council and the Project Proponent will be required to obtain all relevant permits from the council regarding the Project.	The Project Proponent will seek and comply with any relevant approvals from the Town Council.

Title	Summary of relevant contents	Relevance	Compliance
Water Resources Management Act No. 21 of 2011	This legislation establishes the Water Resources Management Authority and defines its functions and powers; provides for the management, development, conservation, protection and preservation of the water resource and its ecosystems; provides for the equitable, reasonable and sustainable utilisation of the water resource; ensures the right to draw or take water for domestic and non-commercial purposes, and that the poor and vulnerable members of the society have an adequate and sustainable source of water free from any charges; creates an enabling environment for adaptation to climate change; provides for the constitution, functions and composition of catchment councils, sub-catchment councils and water users associations; provides for international and regional co-operation in, and equitable and sustainable utilisation of, shared water resources; provides for the domestication and implementation of the basic principles and rules of international law relating to the environment and shared water resources as specified in the treaties, conventions and agreements to which Zambia is a State Party; repeals and replaces the Water Act, 1949; and provides for matters connected with, or incidental to, the foregoing.	The Project Proponent of the Drip irrigation project will have to develop groundwater resources and manage surface runoff.	Protection measures, particularly for the discharge of any effluents or control of run-off, are required to avoid any potential impacts to water resources and will be included in the ESMP. The Project Proponent and any contractor will comply with all the regulations under this Act.
Zambia Wildlife Act of 2015:	This legislation provides for governing the affairs of the Zambia Wildlife Authority; establishes the Department of National Parks and Wildlife in the Ministry responsible for tourism; provides for the establishment, control and management of National Parks, bird and wildlife sanctuaries and for the conservation and enhancement of wildlife eco-systems, biological diversity and objects of aesthetic, pre-historic, historical, geological, archaeological and scientific interest in National Parks; provides for the promotion of opportunities for the equitable and sustainable use of the special qualities of public wildlife estates; provides for the establishment, control and co-management of Community Partnership Parks for the conservation and restoration of ecological structures for non-consumptive forms of recreation and environmental education; provides for the sustainable use of wildlife and the effective management of the wildlife habitat in Game	This Act is relevant to ensure that only those areas necessary for the Project activities are cleared.	During the detailed study, the Project Proponent shall make recommendations in the ESMP to ensure that there is adherence to the principles highlighted in this Act during implementation of the proposed project.

Title	Summary of relevant contents	Relevance	Compliance
	Management Areas; enhances the benefits of Game Management Areas to local communities and wildlife; involve local communities in the management of Game Management Areas; provides for the development and implementation of management plans; provides for the regulation of game ranching; provides for the licensing of hunting and control of the processing, sale, import and export of wild animals and trophies; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Convention on Wetlands of International Importance especially as Waterfowl Habitat, the Convention on Biological Diversity, the Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora and other international instruments to which Zambia is party; repeals the Zambia Wildlife Act, 1998; and provides for matters connected with, or incidental to, the foregoing.		
Forest Act No. 4 of 2015	This legislation provides for the establishment and declaration of National Forests, Local Forests, joint forest management areas, botanical reserves, private forests and community forests; provide for the conservation and use of forests and trees for the sustainable management of forests ecosystems and biological diversity; establishes the implementation of the United Nations Framework Convention on Climate Change, Convention on International Trade in Endangered Species of Wild Flora and Fauna, the Convention on Wetlands of International Importance, especially as Water Fowl Habitat, the Convention on Biological Diversity, the Convention to Combat Desertification in those Countries experiencing Serious Drought and/or Desertification, particularly in Africa and any other relevant international agreement to which Zambia is a party; repeals and replaces the Forests Act of 1999; and provides for matters connected with, or incidental to, the foregoing.	This Act requires the Project Proponent to develop mitigation measures for possible impacts on terrestrial flora	The ESIA will be developed in line with this legislation and will be managed by the Project Proponent via the ESMP.
Fisheries Act of 2011	This legislation promotes the sustainable development of fisheries and a precautionary approach in fisheries management, conservation, utilisation and development; establishes fisheries management areas	This Act ensures consideration be given with respect to discharge of	The Project Proponent shall ensure that all contractors engaged comply with regulations under this Act.

Title	Summary of relevant contents	Relevance	Compliance
	and fisheries management committees; provides for the regulation of commercial fishing and aquaculture; establishes the Fisheries and Aquaculture Development Fund; repeals and replaces the Fisheries Act, 1974; and provides for matters connected with, or incidental to, the foregoing.	treated wastewater into drainage facilities which may eventually lead to water bodies with fish presence.	
National Heritage Conservation Commission Act No. 23 of 1989, and National Heritage Conservation Commission Amendment Act No. 13 of 1994	This legislation repeals and replaces the Natural and Historical Monuments and Relics Act; establishes the National Heritage Conservation Commission; defines the functions and powers of the Commission who are responsible for the conservation, restoration, rehabilitation, reconstruction, adaptive use and good management of heritage conservation; provides for the conservation of ancient, cultural and natural heritage, relics and other objects of aesthetic, historical, prehistorical, archaeological or scientific interest; provides for the regulation of archaeological excavations and export of relics; and provides for matters connected with or incidental to the foregoing.	During project implementation, activities will be undertaken that may lead to the discovery of artefacts or objects of archaeological significance. This Act will provide guidance on reporting channels and procedures should such items be discovered.	During the detailed ESIA study, the ESIA team will pay particular attention to establish the presence of any artefacts or objects of archaeological significance in the project area.
Petroleum Act No. 8 of 1995	This legislation provides for the conveyance and storage of petroleum, inflammable oil and liquids.	This act will regulate the handling and usage of petroleum, inflammable oils and liquids required for construction equipment.	The ESIA will be developed in line with this legislation and will be managed by the Project Proponent via the ESMP.
Explosives Act No. 10 of 1974	This legislation provides for the handling, storage and general management of explosives used for blasting in the mining industry.	The use of explosives during project implementation will be guided by this act	If explosives are used during construction activities, measures will be included in the ESMP to ensure compliance with this Act.
Electricity Act, Cap 433	Regulates the transmission, distribution and supply of electricity.	This act will regulate the handling and usage of electricity during project implementation.	The Project Proponent and all contractors engaged will comply with regulations under this Act.
Mines and Minerals Development Act of 2015	This legislation regulates activities relating to mines and minerals operations including quarrying; provides for safety, health and environmental protection in mining operations; repeals and replaces the Mines and Minerals Development Act of 2008; and provides for matters connected with, or incidental to, the foregoing.	Construction activities will involve the use of resources such as sand and aggregates from borrow areas.	During the detailed study, the ESIA team will make recommendations so the Project Proponent and contractors can implement project activities in compliance with this Act.

Title	Summary of relevant contents	Relevance	Compliance
Occupational Safety and Health Act No. 36 of 2010	This legislation provides for preventing work- related injuries, illnesses, and death by issuing and enforcing workplace health and safety standards; provide for the establishment of health and safety committees at workplaces and for the health, safety and welfare of persons at work; provide for the duties of manufacturers, importers and suppliers of articles, devices, items and substances for use at work; provide for the protection of persons, other than persons at work, against risks to health or safety arising from, or in connection with, the activities of persons at work; and provide for matters connected with, or incidental to, the foregoing.	This Act provides for the dissemination of information on occupational health and safety at the work place.	The Project Proponent will comply with all provisions of this Act to protect workers and the public near the site. Measures will be proposed in the ESMP to ensure compliance.
Workers Compensation Act No. 10 of 1999	This legislation provides for the establishment and administration of a Fund for the compensation of workers disabled by accidents to, or diseases contracted by, such workers in the course of their employment, and for the payment of compensation to dependants of workers who die as a result of such accidents or diseases.	The nature of the work means workers will be exposed to accident risks or risks of contracting disease, this Act provides for compensation of workers in case of accidents.	Accident prevention and mitigation measures will be developed and managed as part of the Project ESMP. The Project Proponent will ensure that all employees are registered, and contributions are submitted accordingly.
Water Supply and Sanitation Act No. 28, 1997	This legislation establishes the National Water Supply and Sanitation Council and defines its functions; provides for the establishment, by local authorities, of water supply and sanitation utilities; provides for the efficient and sustainable supply of water and sanitation services under the general regulation of the National Water Supply and Sanitation Council; and provides for matters connected with or incidental to the foregoing.	Workers and the residents will require suitable water and sanitation services during the construction and operations phases of the Project.	Water used during project implementation will be monitored frequently and stored appropriately. Applicable permits will be obtained from the relevant authority.
Public Health Act, 1995	This legislation provides for the prevention and suppression of diseases and generally regulates all matters connected with public health in Zambia. The Public Health Act. Chapter This Act prohibits any person or institution from causing nuisance or conditions liable to be injurious or dangerous to human health. It further forbids discharge of any noxious matter or wastewater flowing or discharged from any premises into a public street or into the gutter or side channel or watercourse, irrigation channel or bed not approved for discharge.	Workers and the residents may interact with disease agents and/or environmental media. Project activities have the potential to spread pollutants and increase the risk of contamination to the environment, hence the	During the ESIA study, measures to prevent diseases and pollution dangerous to human health will be considered and included in the ESMP.

Title	Summary of relevant contents	Relevance	Compliance
		relevance of this Act to the proposed project.	
Factories Act of 1994	This legislation makes further and better provision for the regulation of the conditions of employment in factories and other places as regards the safety, health and welfare of persons employed therein; provides for the safety, examination and inspection of certain plant and machinery; and provides for purposes incidental to or connected with the matters aforesaid.	Implementation of Project activities will employ the use of various machines for construction works. The use of machinery in terms of safety and welfare of employed persons is regulated under this Act.	Measures to ensure the safety of persons operating machinery will be included in the ESMP and supporting occupational health and safety (OHS) documentation.
Road Traffic Act of 2002	This legislation establishes the Road Transport and Safety Agency (RTSA) and defines its functions; provides for a system of road safety and traffic management; provides for licensing of drivers and motor vehicles; provides for registration of motor vehicles and trailers; provides for compulsory third party insurance of motor vehicles; provides for licensing and control of public service vehicles; provides for promotion of road safety; provide for the regulation of road transport between Zambia and other countries with which Zambia has concluded cross – border road transport agreements; provides for the implementation of the SADC protocol on Transport, Communication and Meteorology, the protocol on the third party motor vehicle insurance scheme adopted by the member states of COMESA and Protocols on transit trade and transit facilities, and repeals the National Roads Safety Council Act of 1995.	This Act ensures traffic control measures are taken to avoid accidents as a result of construction activities.	The ESIA will be developed in line with this legislation and will be managed by the Project Proponent via the ESMP.
Public Roads Act, 2002	An Act to establish the Road Development Agency and to define its functions; to provide for the care, maintenance and construction of public roads in Zambia; to regulate maximum weights permissible for transmission on roads; and to provide for matters connected with and incidental to the foregoing.	This Act is relevant to the project because access roads to the project site will be constructed.	The ESIA will be developed in line with this legislation and will be managed by the Project Proponent via the ESMP.
Employment Code Act of 2019	This legislation regulates the employment of persons; prohibits discrimination at an undertaking; constitutes the Skills and Labour Advisory Committees and provides for their functions; provides for the engagement of persons on contracts of employment and provides	During construction activities, a number of individuals will be employed, and this Act is the principal	The Project Proponent and all contractors engaged will comply with all the provisions of this Act to guarantee labour rights. Measures will be proposed in the ESMP to ensure compliance.

Title	Summary of relevant contents	Relevance	Compliance
	for the form and enforcement of the contracts of employment; provides for employment entitlements and other benefits; provides for the protection of wages of employees; provides for the registration of employment agencies; regulates the employment of children and young persons; provides for the welfare of employees at an undertaking; provides for employment policies, procedures and codes in an undertaking; repeals and replaces the Employment Act,1965, the Employment (Special Provisions) Act,1966, the Employment of Young Persons and Children Act, 1933 and the Minimum Wages and Conditions of Employment Act, 1982; and provide for matters connected with, or incidental to, the foregoing.	piece of legislature governing employment rights in Zambia.	
Employment of Young Persons and Children Act of 2004	These regulations regulate the employment of young persons, and children; and provide for matters incidental thereto.	During construction activities, a number of individuals will be employed therefore making this Act relevant to the Project.	The Project Proponent and all contractors engaged will comply with all the provisions of this Act to prevent child and forced labour.
Gender Equity and Equality Act of 2015	These regulations establish the Gender Equity and Equality Commission and provide for its functions and powers; provide for the taking of measures and making of strategic decisions in all spheres of life in order to ensure gender equity, equality and integration of both sexes in society; promote gender equity and equality as a cross cutting issue in all spheres of life and stimulate productive resources and development opportunities for both sexes; prohibit harassment, victimisation and harmful social, cultural and religious practices; provide for public awareness and training on issues of gender.	This Act will ensure that the Project Proponent provides equal employment opportunities to males and females during project implementation.	The Project Proponent and all contractors engaged will comply with all the provisions of this Act to ensure inclusion of Gender issues.
Anti-Gender- Based Violence Act of 2010	These regulations provide for the protection of victims of gender-based violence; constitute the Anti-Gender-Based Violence Committee; establish the Anti- Gender-Based Violence Fund; and provide for matters connected with, or incidental to, the foregoing.	During construction activities, a number of social dynamics may be impacted and conflicts may arise resulting in gender-based violence, therefore making this Act relevant to the current project.	The Project Proponent and all contractors engaged will comply with all the provisions of this Act and engage the relevant authorities to ensure protection of victims of gender-based violence.

Title	Summary of relevant contents	Relevance	Compliance
Human Rights Commission Act of 1996	These regulations provide for the functions and powers of the Human Rights Commission; to provide for its composition and to provide for matters connected with or incidental to the foregoing.	The nature of the project is such that many individuals will be involved with or affected by the project to different capacities and therefore this Act provides for the rights of those individuals.	The Project Proponent and any contractor will comply with all the provisions of this Act to ensure protection of human rights.
Non- Governmental Organisations Act of 2009	This Act provides for the co-ordination and registration of non-governmental organisations; establishes the Non-Governmental Organisations' Registration Board and the Zambia Congress of Non-Governmental Organisations; constitutes the Council of Non-Governmental Organisations; enhances the transparency, accountability and performance of non- governmental organisations; and provides for matters connected with or incidental to the foregoing.	The nature of the project is such that many individuals will be involved with or affected by the project to different capacities and therefore this Act provides for the rights of those individuals.	The Project Proponent and all contractors engaged will comply with all the provisions of this Act to ensure collaboration with NGOs in the Project area.
Lands Act of 1995	This legislation provides for the continuation of Leaseholds and leasehold tenure; provides for the continued vesting of land in the President and alienation of land by the President; provides for the statutory recognition and continuation of customary tenure; provides for the conversion of customary tenure into leasehold tenure; establishes a Land Development Fund and a Lands Tribunal; repeals the Land (Conversion of Titles) Act; repeals the Zambia (State Lands and Reserves) Orders, 1928 to 1964, the Zambia (Trust Land) Orders, 1947 to 1964, the Zambia (Gwembe District) Orders, 1959 to 1964, and the Western Province (Land and Miscellaneous Provisions) Act, 1970; and provides for matters connected with or incidental to the foregoing.	The Project affects land that is under Local Authority and as such due consideration will be given to the provisions of this Act in managing land issues.	The Project Proponent and all contractors engaged will comply with all the regulations under this Act.
Urban & Regional Planning Act No. 3 of 2015	This legislation provides for development, planning and administration principles, standards and requirements for urban and regional planning processes and systems; provides for a framework for administering and managing urban and regional planning; provides for a planning framework, guidelines, systems and processes for urban	The development cannot proceed without approval from the local authority.	The Project Proponent and all contractors engaged will comply with all the provisions of this Act.

Title	Summary of relevant contents	Relevance	Compliance
	and regional planning; establishes a democratic, accountable, transparent, participatory and inclusive process for urban and regional planning that allows for involvement of communities, private sector, interest groups and other stakeholders in the planning, implementation and operation of human settlement development; ensures functional efficiency and socio-economic integration by providing for integration of activities, uses and facilities; establishes procedures for integrated urban and regional planning in a devolved system of governance so as to ensure multi-sector cooperation, coordination and involvement of different levels of ministries, provincial administration, local authorities, traditional leaders and other stakeholders in urban and regional planning; ensures sustainable urban and rural development by promoting environmental, social and economic sustainability in development initiatives and controls at all levels of urban and regional planning; ensures uniformity of law and policy with respect to urban and regional planning; repeals the Town and Country Planning Act of 1962, and the Housing (Statutory and Improvement Areas) Act of 1975; and provides for matters connected with, or incidental to, the foregoing.		
National Council for Construction Act	This legislation provides for the establishment of the National Council for Construction (NCC) and to defines its functions; the promotion and development of the construction industry in Zambia; the registration of contractors; the affiliation to the Council of professional bodies or organisations whose members are engaged in activities related to the construction industry; the regulation of the construction industry; the establishment of the Construction School; the training of persons engaged in construction or in activities related to construction; and matters connected with or incidental to the foregoing.	The proposed Project involves the installation of a drip irrigation	The Project Proponent and all contractors engaged will comply with all the regulations under this Act.
Solid Waste Regulations and Management Act, 2018	This legislation provides for the sustainable regulation and management of solid waste; general and self-service solid waste services; the incorporation of solid waste management companies and defines their statutory functions; the licensing and functions of solid	The construction and operation of the proposed project will result in the generation of solid waste	The Project Proponent and all contractors engaged will comply with all the regulations under this Act.

Title	Summary of relevant contents	Relevance	Compliance
	waste service providers, operators and self-service solid waste providers and provides for their functions; the regulation, operation, maintenance and construction of landfills and other disposal facilities; the setting and approval of tariffs for management of solid waste and provision of solid waste services; and matters connected with, or incidental to, the foregoing.		
Zambia Revenue Authority Act No. 28 of 1993 and all amendments	The Acts provide for the taxation system in Zambia for various goods and services.	All goods and services will have to be taxed	The Project Proponent will comply with all the regulations under this Act.
Investment Act of 1998	Provides a legal framework for investment in Zambia, the Act relates to the environment by encouraging investment that is not detrimental to the environment.	Due consideration will be given to this act to ensure the investment does not have an adverse effect on the local environment	The Project Proponent will comply with all the regulations under this Act.

2.4 INTERNATIONAL AND REGIONAL CONVENTIONS

The following list summarises the international conventions to which Zambia is a signatory and that are relevant to the Project.

- African Convention on the Conservation of Nature and Natural Resources, signed in Maputo (2003)
- Kyoto Protocol Paris Climate Agreement (2015)
- Convention on Wetlands of International Importance especially as waterfowl habitat, known as Ramsar Convention (1975)
- Convention on the Conservation of Migratory Species of Wild Animals, known as the Bonn Convention (1983)
- Convention on Biological Diversity (1992)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora, known as CITES (1975)
- Convention concerning the Protection of the World Cultural and National Heritage (1972)
- United Nations Framework Convention on Climate Change (1992)
- United Nations Convention to Combat Desertification, UNCCD (1994)
- The Vienna Convention for the Protection of the Ozone Layer (1985)
- The Montreal Protocol on Substances that Deplete the Ozone Layer (1987)
- The Stockholm Convention on Persistent Organic Pollutants (2001)
- The Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes and Their Disposal (1989)
- The Universal Declaration of Human Rights (1949)
- International Covenant on Economic, Social and Cultural Rights, ICESCR (1966)
- Convention on the Elimination of All Forms of Discrimination against Women (1981)
- Convention on the Rights of the Child (1990)
- Convention on the Rights of Persons with Disabilities (2008)
- African Charter on Human and People's Rights (1987)
- Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa (2003)
- African Charter on the Rights and Welfare of the Child (2001)
- ILO Declaration on Fundamental Principles and Rights at Work (1998)

2.5 International Framework

2.5.1 International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability

The Performance Standards (PSs) are directed towards clients providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to Project-level activities. The International Finance Corporation Performance Standards (IFC PSs) on Environmental and Social Sustainability has eight performance standards which include the following:

- IFC PS1: Assessment and Management of Environmental and Social Risks and Impacts
- IFC PS2: Labour and Working Conditions.
- IFC PS3: Resource Efficiency and Pollution Prevention
- IFC PS4: Community Health, Safety and Security
- IFC PS5: Land Acquisition and Involuntary Resettlement
- IFC PS6: Biodiversity Conversion and Sustainable Management of Living Natural Resources
- IFC PS7: Indigenous Peoples
- IFC PS8: Cultural Heritage

Performance Standard 1 establishes the importance of (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of Projects; (ii) effective community engagement through disclosure of Project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of environmental and social performance throughout the life of the Project.

Performance Standards 2 through 8 establish objectives and requirements to avoid, minimise, and where residual impacts remain, to compensate/offset for risks and impacts to workers, Affected Communities, and the environment. While all relevant environmental and social risks and potential impacts should be considered as part of the assessment, Performance Standards 2 through 8 describe potential environmental and social risks and impacts that require particular attention. Where environmental or social risks and impacts are identified, the client is required to manage them through its Environmental and Social Management System (ESMS) consistent with Performance Standard 1.

The World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) are technical reference documents with general and industry-specific examples of good international industry practice (GIIP). The General EHS Guideline contains information on cross-cutting environmental, health, and safety issues potentially applicable to all industry sectors, including construction Projects. They provide guidance on performance levels and measurements considered to be achievable at reasonable cost by new or existing Projects with the use of existing technologies and practices. Projects are expected to comply with the levels and measures identified in the General EHS Guidelines where host country requirements are less stringent or do not exist.

World Bank Group EHS Guidelines applicable to the Project ESIA are the EHS General Guidelines (April 2007).

The General EHS Guidelines cover 4 areas of GIIP:

- Environmental
- Occupational Health & Safety (OHS)
- Community Health & Safety (CHS)
- Construction and Decommissioning

The World Bank Group EHS Guidelines with respect to emergency preparedness and response state that Projects should have an Emergency Preparedness and Response Plan (EPRP) that is

commensurate with specific risks. This includes the requirement to assess the risk posed to the Project by geological hazards, natural disasters, blade throw, etc. and formulate appropriate strategies that effectively reduce any potential impact associated with these hazards on the Project.

IFC Performance Standard 2 requires compliance with specific International Labour Organization (ILO) and United Nations (UN) conventions. Zambia has ratified all of the 8 core (fundamental) ILO conventions, namely:

- ILO Conventions 29 and 105 on elimination of forced and compulsory labour
- ILO Convention 87 and 98 on collective bargaining and freedom of association
- ILO Conventions 100 and 111 on elimination of discrimination in respect of employment and occupation
- ILO Conventions 138 and 182 on abolition of child labour

Zambia has ratified all 4 of the ILO governance (priority) conventions.

2.6 Corporate Standards and Guidelines

The initial Board of Directors of KASCOL consisted of representatives of CDC, the Zambia Sugar Plc and of the two commercial banks. In addition, the Zambian Government appointed a high ranking official from the Ministry of Agriculture, who had a strong inclination to serving the interest of the smallholders

Zambia Sugar Co. and KASCOL signed a renewable three years sugarcane supply and irrigation contract. Under this contract KASCOL would only supply its cane to the Zambia Sugar Co. and in turn would receive irrigation water. On the other hand, KASCOL and the smallholders signed an agreement by which the smallholders would lease land from KASCOL for a renewable 14 years period, would grow cane following the stipulated agronomic practices, and would receive agronomic services and irrigation

In 1985 the smallholders formed an association called the Kaleya Smallholder Farmers Association (KASFA). This initiative was in response to advice given by KASCOL. The initial farmer association executive was composed mostly by the first eight smallholders to join the project. The primary role of KASFA was to represent the smallholders in negotiations with KASCOL. The chairperson of the farmer association also attended the KASCOL board meetings.

*S*mallholder sugar out grower scheme is managed by Kaleya Smallholder Company Limited (KASCOL), which was set up in 1980 to incorporate smallholder farmers into production and marketing of sugar cane. The scheme was started as a community outreach by the Zambia Sugar Company who also saw the scheme as an opportunity to expand cane area for their mill. The KASCOL is essentially the management company for the out grower scheme. It is responsible for production management, service provision, training, harvesting schedules and negotiations between the smallholder farmers and the market, Zambia Sugar Company Limited. Some 160 farmers are currently participating in the scheme. The average land area used by smallholders is between 6.2 to 7.5 hectares, which includes also land for homestead and food crop production, where they are encouraged to build a house with loan finance available from KASCOL. For food crop production, the scheme supports smallholders with land preparation and drainage water used to grow vegetables for their own consumption and for sale for extra income.

3 PROJECT DESCRIPTION

3.1 PROJECT OVERVIEW

KASCOL came up with intervention of subsurface drip irrigation scheme which will minimize water losses through improvement of irrigation infrastructure and crop production. The main activities will include conversion of 2,164 hectors of land from flood irrigation system to sub surface drip irrigation, field levelling, installation of water, measuring instruments and alteration in water use.

The Environmental and Social Management Plan (ESMP) for the sub surface drip irrigation scheme has been prepared to provide a base for prevention, controlling and minimizing environmental and social impacts that may arise during rehabilitation/improvement and operational activities for the irrigation scheme. The ESMP forms part of the tender document to be advertised for Contractors to bid. The ESMP has been prepared by Earth Environmental Consulting Limited in order to comply with the environmental and social safeguards requirement as stated in the Environmental and Social Management Framework of the Zambia Environmental Management Agency (ZEMA).

3.2 PROJECT DEVELOPER

The Project developer is Kaleya Smallholders Company Ltd (a statutory body) with its registered address at: Kaleya Smallholders Company Ltd (KASCOL) located at Plot No. 233a/234a/235a along Livingstone Road Mazabuka southern province.

- The developer proposes a project to converting sugar cane irrigation system from furrow to sub-surface drip in the Kaleya cane fields in Mazabuka Districts of Southern Province
- To facilitate optimal use of water resource in the project area
- To help reduce on the incidence of water wastage by the use of the most efficient irrigation system

3.3 PROPOSED PROJECT AREA

The proposed area is 2,164ha under furrow irrigation system to sub surface irrigation system at Kaleya estates in Mazabuka District.

3.4 PROPOSED PROJECT STRUCTURES

The scheme have modern irrigation infrastructure which include irrigation and drainage system and farm access roads networks.

3.5 PROJECT WATER SOURCE

The irrigation scheme include 2,164 ha of potential land that has been developed for smallholders utilizing the water resource from Kafue River that discharge its water into seven dams and Kaleya downstream. The existing irrigation practice at the scheme is a gravity conveyance system. The

scheme has a water use permit to be able to extract water of 13.5m3/sec from the Kafue River at peak period.

It is envisaged that a reduction in water intake will trigger the raise in good diversification of other agriculture projects. A total of 30 to 40% water reduction is expected during operational phase of the subsurface drip irrigation system.
KASCOL is exploring the possibility of additional boreholes to abstract groundwater for irrigation supply which appears to be a viable option. An estimated total of 14 additional boreholes would be required to provide enough water for irrigation during the dry season peak demand. This would leave KASCOL less dependent on the sometimes erratic and insufficient water supply from Zambia Sugar.

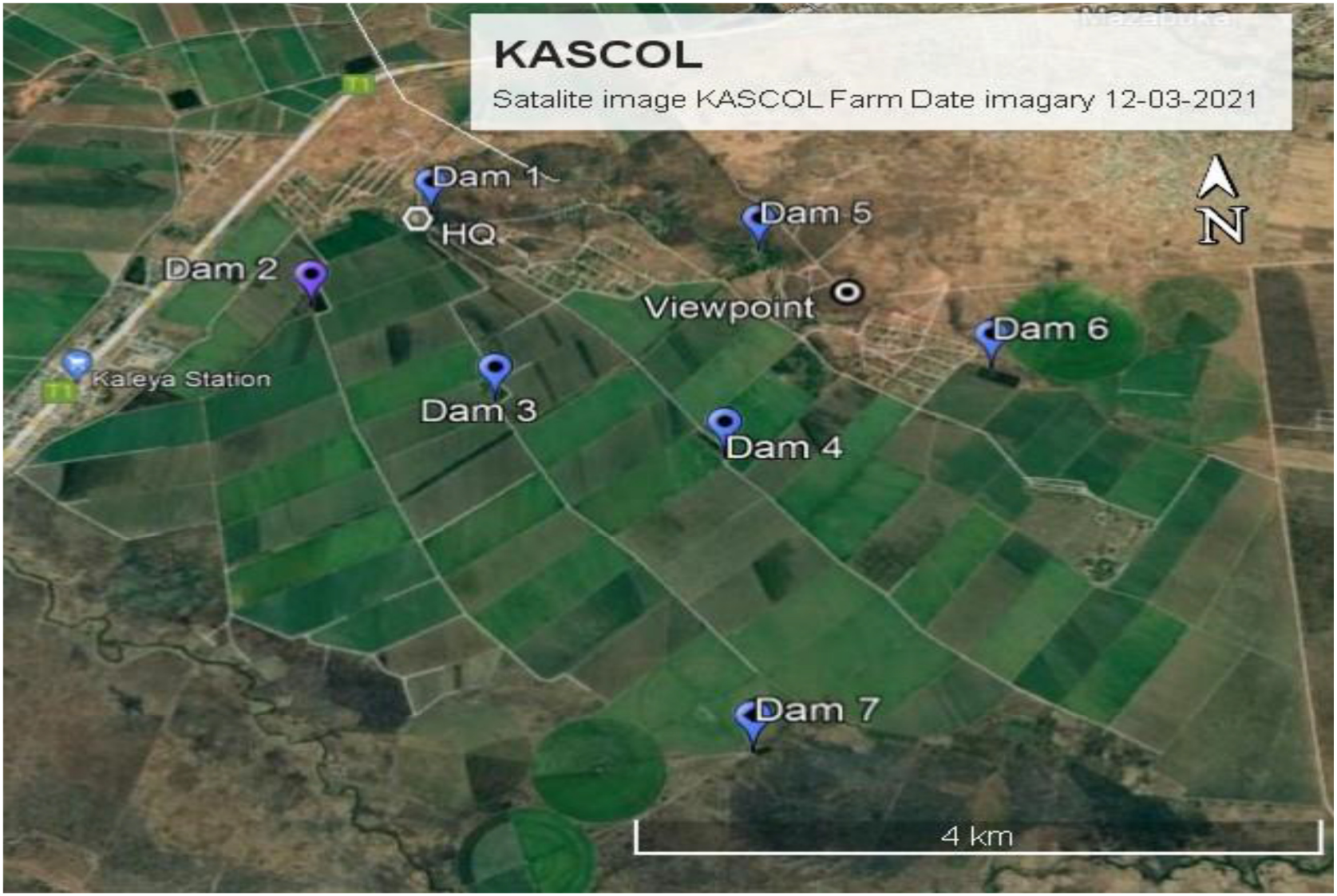
3.6 LOCATION

The proposed project comprises the *Conversion of sugar cane irrigation system at Kaleya Smallholders sugar cane estate from furrow to sub-surface drip* irrigation in Mazabuka Districts of Southern Province. The Project site is located at Plot number 233a/234a/235a to the south-east of Mazabuka along the Mazabuka to Livingston road approximately 7km from the Central Business District (CBD) and can be accessed via the T1 road. The proposed site covers a total area of 2500. Table 3.1 shows the corner coordinates of the Project site.

Table 3.1: Project site Corner Coordinates

A. 35L 580496.14 m E 8243616.67 m S
B. 35L 580525.47 m E 8238748.59 m S
C. 35L 572125.71 m E 8241393.59 m S
D. 35L 573370.93 m E 8242908.59 m S
E. 35L 573125.24 m E 8243102.57 m S
F. 35L 574562.27 m E 8245375.00 m S
G. 35L 576403.67 m E 8245798.69 m S
H. 35L 577896.92 m E 8243359.04 m S

The location of the proposed Project site is shown in Figure 1.1 below while Figure 1.2 shows the general layout of the proposed site.


KASCOL
Satalite image KASCOL Farm Date imagary 12-03-2021
Dam 1
HQ
Dam 5
N
Dam 2
Viewpoint
Dam 6
Kaleya Station
Dam 3
Dam 4
Dam 7
4 km

3.7 NATURE OF THE PROJECT

- Raw materials (including hazardous materials and their storage on site)
- Process and technology (including flow diagrams)
- Products and by-products
- Production capacity
- Schedule and life time of the project

3.8 MAIN ACTIVITIES

3.8.1 Site preparation phase

This phase will involve carrying out surveys of the proposed site. Surveys in this case refer to land investigations, drilling, measurements and pre-works examination of the site. This will facilitate the development of a conceptual design of the site structures, especially the road network. The output from this phase is an environmentally friendly-engineered final design for the drip irrigation facilities to be implemented in the construction phase.

3.8.2 Construction phase

The actual development of the proposed Project will take place in the construction phase.

Project activities during construction will include the following:

- Creation of service tracks to site
- Excavation, filling, levelling,
- Construction of foundations involving excavations and concrete works
- Transportation of construction materials
- Construction of Project components and supporting infrastructure

3.8.3 Operation phase

Project activities during operation phase will include the following:

- Water requirements for irrigation (2.7 million cubic meters/year), water for domestic use will be sourced from the bulky supply from Nakambala Estates.
- Field operations such as irrigation, weeding, pest control, e.t.c
- Conversion of 2,164 hectors from furrow irrigation to drip irrigation system
- Recruitment of workers.
- Irrigation of sugarcane fields.
- Application of pesticides and fertilizers

Initial Management Activities

The initial activities during this phase relating to construction management will include:

- Establishment of the construction Project Management Team (PMT);
- Establishment of a professional Site Inspection Team;

- Establishment a management, inspection, and reporting procedure.

There will be no labour camp on the Project site, although security personnel will be accommodated on the site. Unskilled labour will be sourced locally, and therefore will not require on site accommodation. Skilled labour will be accommodated in town to avoid the necessity for a costly site camp. Various plant and equipment to be mobilised to site for the execution of civil works and will include:

- Graders
- Bulldozers
- TLB- Tractor-Loader-Backhoe)
- Generator Set 125 KVA
- Excavators
- Water Pumps
- Mechanical Tool Boxes
- Tipper Trucks
- 10 Ton Trucks

Site Preparation, Levelling and Clearing

Initial site preparation will entail removal of the existing vegetation, scarifying of topsoil and earthworks to establish the required levels. The project will be constructed on the existing level requiring minimal basic earthworks, which will minimise the need for filling of areas with topsoil. Earthworks will for the most part involve the use of heavy machinery such as bulldozers and graders.

Materials Mobilisation, Handling and Storage

This refers to the acquisition, delivery, and storage of materials required for construction works. Gravel, laterite, and stone aggregates, if necessary, will be acquired and transported to the site from Zambia Environmental Management Agency (ZEMA) approved quarry sites within the district. Provision will be made for bulk storage of materials such as sand, aggregate and laterite. Petroleum products, such as fuels (petrol/diesel), lubricating oils, and hydraulic fluids will also be sourced. Only limited amounts of these materials will be stored on site as reliable supply sources will be in close proximity within the district. Other materials that will be transported and stored on site include sand, cement and blocks.

Movement of Construction Traffic and Heavy Machinery

Transportation of construction materials and waste to and from the site will involve the movement of heavy vehicles on access roads to the Project site as well as within the site. Construction activities such as clearing, excavation, earth moving and mixing of concrete will involve the movement and operation of heavy machinery and equipment on and around the site.

Construction Workers Activities

Although no labour camp is planned on the Project site, social interaction activities will undoubtedly result between Project workers and local communities. The Project will as much as is possible hire labour from within local communities. The presence of construction workers will require the provision of water for food preparation and domestic purposes as well as the provision of sanitation and health services on site or easily accessible.

Waste Management

Waste management during the construction phase will include:

- Provision of workers sanitation.
- Collection and disposal of domestic waste at ZEMA approved disposal sites.

Access Road Construction

The proposed site is situated along the Mazabuka to Livingstone about 7km from the CBD so there will be no need for the construction of the access routes. Therefore, no foreign materials will be brought during tract construction, and the tracts will only be clear and compacted paths. No laterite or any other materials will be used.

4 PROJECT ALTERNATIVES

4.1 IDENTIFICATION OF ALTERNATIVES

The study team together with stakeholders analysed various project alternatives available that would achieve this project's objectives with few adverse environmental consequences. The identified project alternatives were evaluated based on their environmental impacts and associated costs. The project alternatives assessed during this process included;

4.2 THE 'NO PROJECT" ALTERNATIVE

This is an important analysis as it help the proponent measure impacts from the project visa a vis the impacts without the proposed project. 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. On the other hand the project will improve food security, increase household incomes and provide employment as well as upgrading the regional economy. The No alternative will lead to major negative and long term impacts to the region, these will include:

a) KASCOL will continue to suffer due to water loss through flood irrigation,
b) The productivity will be low and reduced ability to increase institution revenue base.
c) The NO project alternative is the least preferred from the social economic and environmental aspects.

4.3 LOCATION OF THE PROJECT

There is no alternative project site for the proposed sub- surface drip irrigation system project as the area can generally be characterized to be the same, therefore an alternative would mean complete re—location of the project to a different site.

4.4 IRRIGATION METHODS

The type of irrigation methods development greatly depends on the nature of the water sources, topography and relative location to the command area .Various methods can be applied at different levels of an irrigation project in order to achieve the required objective. A combination of techniques can be selected in order to achieve optimum irrigation project. The various irrigation options includes-;

4.4.1 Gravity fed irrigation;

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

4.4.2 Lift irrigation;

Water is lifted to the area by use of pumps or manual methods from the source or distribution system and discharging into a higher canal system, a storage reservoir or directly onto the fields. It is the topography that dictates the use of pump fed irrigation system. Normally water source is lower than the irrigation field. The use of pump-fed irrigation system is governed by the maximum suction lift. Pumps used are normally low head, high discharge. It is a more expensive method than the gravity method due to higher long term running costs of pumping water (fuel, lubricants, repair/operation and maintenance).

4.4.3 Wetland irrigation;

Wetland irrigation Is more common in areas of permanent/seasonally water logged valleys or depressions, due to water inflow from outside. They cover water sheds and head waters of river systems and have a fluctuating water table related to seasonal ground water and surface water flow regimes.

4.4.4 Flood irrigation

Flood irrigation: Is a form of gravity irrigation from a river without the need for an intake structure to divert the water. Seasonal rains raise the streams and rivers courses and the flow waters can be used by the farmers to irrigate their fields. Bunds and channels can be constructed to maintain the water in the fields for as long as possible, and as the flood recede the residual moisture, is used by the crop. Once the floods and residual moisture have been exhausted the farmer can make use of the shallow water table and construct shallow wells to lift the water by bucket for watering/ irrigating the crops.

4.4.5 Sub Surface and Drip irrigation.

Drip irrigation is a method of crop irrigation that involves a controlled delivery of water to plants through system of pipes, valves, tubing and emitters. The water is delivered from a source directly to the root zone of individual plants or to the surface of the soil. Water drips constantly onto plants to keep them well watered. Drip irrigation is also called trickle irrigation.

This method of irrigation is used to automate aspects of plant care and to save water by reducing water wastage by directing it to the plant's roots, as opposed to spraying water and having water miss the area where it is most required, thus wasting it. Drip irrigation is effective for certain types of farming, but it does have drawbacks and limitations. It cannot be used for a lawn, for example. It also requires maintenance and flush outs.

Therefore due to merits of the sub surface drip irrigation method, the stakeholders and partners preferred this method.

4.4.6 Alternative Water Source

The main water source for KASCOL irrigation scheme is Kafue river with mean total annual flow of over 13m3 /s, with 80% dry year flows of 5.82m3 /s. Base flows from August to December are low, ranging between 0.5m3/s and 3.0m3/s depending on the preceding rains. Flows begin to rise in late November when they reach 1-3m3 /s. Mean peak flows of up to 40m3/s are experienced in March/ April period, with a maximum recorded flood of approximately 300m3 /s (Mayes, 2000). In Mid-May flows fall to between 6 and 11m3 /s.

For irrigation purposes a total flow of 7.5m3 /s is allowed to flow through the intake, to irrigate more than 2,164 ha during the rainy season and a continuous flow of 0.5m3 /s during dry season downstream drain to carter for livestock and human use outside the scheme area. Therefore, there was no alternative water source that was suggested during the stakeholders consultative meeting for the infrastructure is controlled by the Zambia Sugar Company.

4.4.7 Sewage and solid waste management alternatives

Design a method of medical waste disposal suitable for home base care activities. The system should consider the pattern and distribution of home base care patients in the project area. Enforce health education on sanitation and solid waste management within the community. Ensure adequate onsite solid waste management to prevent environmental pollution. Training of farmers on sound environmental management: Each farmer irrigation scheme to have an environmental management plan that would include management of various solid waste streams.

4.5 SITE

4.5.1 Kaleya Smallholders Sugar Plantation

Kaleya sugar plantation is the only feasible site in the area, as it is integral to the Councils Development Plan. The Kaleya sugar plantation site is owned by the developer and the proposed Project was identified as being a suitable developmental opportunity for the land given its size, situation and nature, as such, no alternative sites were considered for the Project.

The following factors were also considered:

- The District Council has a master plan for the area, and has zoned and allocated this land to KASCOL as part of its district development plan, therefore this would be the most suitable location as identified by the local and district stakeholders.
- The total extent of the site is large enough to provide enough space for the proposed Project
- The site is ideally located for structured planning and the type of development intended.
- The facilities that the development intends to provide are essential around the proposed development site area. This is according to stakeholder consultation.
- The site is within reasonable distance of the power lines, making it possible for the construction of permanent connections to these services without difficulty.
- The site has good ground water potential.

4.5.2 Design

Although recent advancements in sugar can irrigation has other options like Pivots and Sprinkler the developer settled for sub surface drip irrigation for the plantation. The proposed design was selected as the most cost effective in terms of construction raw materials demand, compatibility to surrounding structures, and market demand.

4.5.3 Technology

The following irrigation system / technology alternatives are available for this Project in order of preference:

- Furrow irrigation
- Sub surface irrigation system

It should be noted that concrete for some works like the foundation for the pump house and walls will have no alternative.

4.5.4 Power alternative

The principal source of electricity both during construction and operational phase of the Project is expected to be hydro-power energy to be sourced from a nearby ZESCO main substation which is found within Project site. The ZESCO main substation was picked as a major source of power as it provides the clean and less costly power alternative which is also environmentally friendly. Thermal or solar generated electricity may also be required for back-up during periods of supply disruption. This will be in the form of on-site generator sets or solar panels.

4.5.5 Raw materials

The developer will acquire raw materials such as laterite and building/river sand locally from licensed suppliers within the Project location. However, if the raw materials will not be available within the area, they will be sourced from other towns as well as other parts of the country.

4.6 Analysis of each of the identified alternatives

The alternatives considered for the implementation of the Project are limited and have been analysed to determine how feasible they are in terms of helping to achieve the Project objectives.

The best alternatives will be adopted for implementation.

- *Site alternative*- Kaleya sugar plantation is the only feasible site in the area, as it is integral to the Councils Development Plan.
- *Design alternative* - The adopted design for the proposed Project is a standard sub surface irrigation system. An appropriate design is vital to the effectiveness of the Project in terms of cost, material and market suitability.
- *Power alternative* - The proposed energy source for the Project site is hydro-power connected through the ZESCO mains. The alternative power source considered was the use of on-site generators or solar panels but this was not adopted due to the continuous supply of power required at the facility, and the cost of implementation for a Medium Cost facility.
- *Water supply and sewer disposal* - The adopted water supply alternative is the connection to the existing on site water and sewerage system the other alternatives considered for water supply was the use of boreholes which will be used as back up water source.
- *Raw material alternative*- The raw material for the construction of the proposed Project will be laterite, building/river sand, steel and aluminium which will be acquired locally, and only when they are not available locally will they be acquired outside the district area.
- The No-Project alternative in respect to the proposed sub surface drip irrigation Project implies that the status quo is maintained. Under the no-Project alternative, the existing furrow irrigation system use will not change; the plantation owner will continue to make an efficient furrow irrigation system. The proposed irrigation system would not be implemented and the expectations attached to the Project would not be met. The no-project construction

alternative is the least preferred from the socio-economic perspective due to the following factors:

- The existing irrigation system is not efficient and most profitable;
- Little or no additional employment opportunities will be created if the project does not go ahead

From the analysis above, it becomes apparent that the "no Project alternative" is not a viable alternative to the Project Proponent.

5 ENVIRONMENTAL BASELINE

5.1 PHYSICAL ENVIRONMENT

5.2 Location and access

The Project site is located at plot number 233a/234a/235a to the south-east of Mazabuka along the Mazabuka to Livingston road approximately 7km from the Central Business District (CBD) and can be accessed via the T1 road. The proposed site covers a total area of 2500.

5.3 About the District

According to the 2010 Census of Population and Housing, Mazabuka has a population of 71,700 inhabitants. The average annual population growth rate for the district, based on the 2010 statistics, is 3.3% (3.2% for males and 3.5% for females). The population of Mazabuka, like is the general trend in Zambia, has been rising, and the last census recorded a higher growth rate. One would attribute the recent growth in population to the following factors:

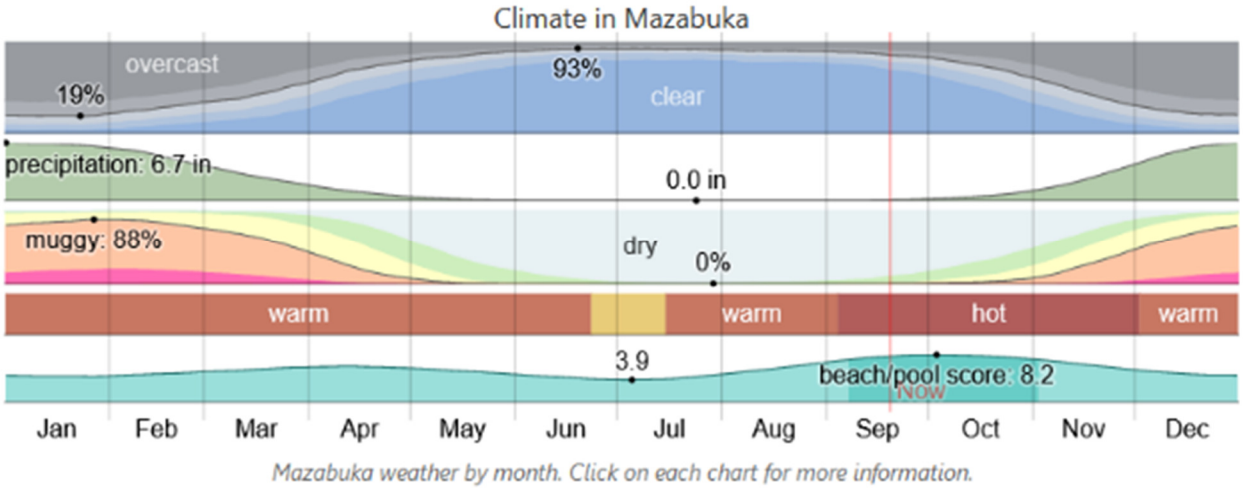
- Increase in urbanisation.
- The establishment of non-traditional businesses and entrepreneurship like the new international chain stores/malls along the highways, which have created more employment opportunities
- The Government decentralization policy implementation that has created more opportunities of employment

The reduction in mortality from killer infections like HIV/AIDS related diseases such as tuberculosis and diarrhoea, which could have led to high mortality

5.4 Climatic Conditions

The Sothern province, like any other province in Zambia has a tropical climate with three seasons the *hot season* lasts for *2.1 months*, from *September 16* to *November 20*, with an average daily high temperature above *88°F*. The hottest day of the year is *October 21*, with an average temp being high of *91°F* and low of *68°F*. The *cool season* lasts for *2.2 months*, from *May 28* to *August 3*, with an average daily high temperature below *78°F*. The coldest day of the year is *July 5*, with an average low of *49°F* and high of *75°F*.

Table 4.1: Seasons and associated temperatures



5.4.1 Rainfall

The *rainy* period of the year in Mazabuka lasts for *6.4 months*, from *October 16* to *April 29*, with a sliding 31-day rainfall of at least *0.5 inches*. The *most rain* falls during the 31 days centred on around *January 1*, with an average total accumulation of *6.7 inches*.

The *rainless* period of the year lasts for *5.6 months*, from *April 29* to *October 16*. The *least rain* falls around *July 24*, with an average total accumulation of *0.0 inches*.
Rainfall is at its Heaviest between December and March of each year. In October there is an average of 10.84 hours of sunshine a day and a total of 335.92 hours of sunshine throughout October, while January records lesser hours of sunshine with an average of 9.01 hours per day and a total of 279.22 throughout the month. Around 3398.35 hours of sunshine are counted in Mazabuka throughout the year. On average there are 111.66 hours of sunshine per month.

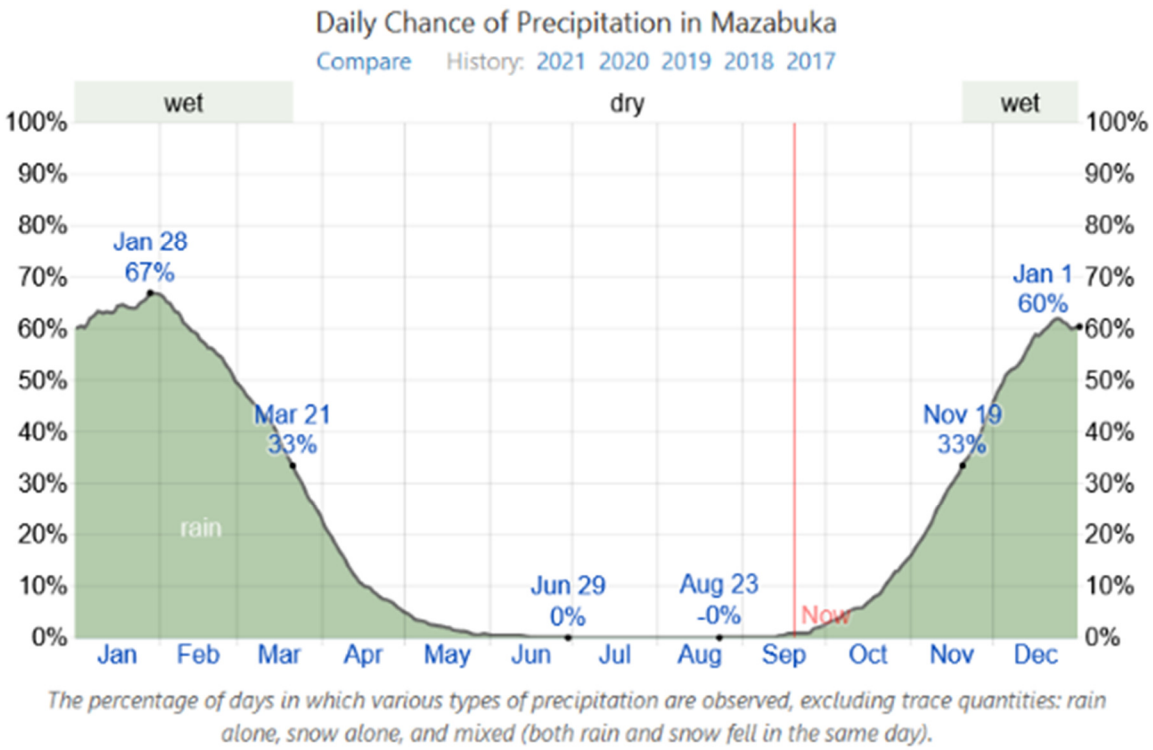


Figure 5.2: Precipitation of Mazabuka

5.4.2 Relative Humidity

Relative humidity varies throughout the year, reaching peak in the wet season. Wet season humidity levels are about 83%, dry season humidity levels are 41%, with mean relative humidity of the area recorded as an average of 65.0%. The relative humidity of the project area is typical of the Mazabuka climatic conditions. The annual relative humidity of the area is 65%, while the average monthly relative humidity ranges from 40.9% in September to 83% in February. The table below shows the summary of relative humidity of the project area.

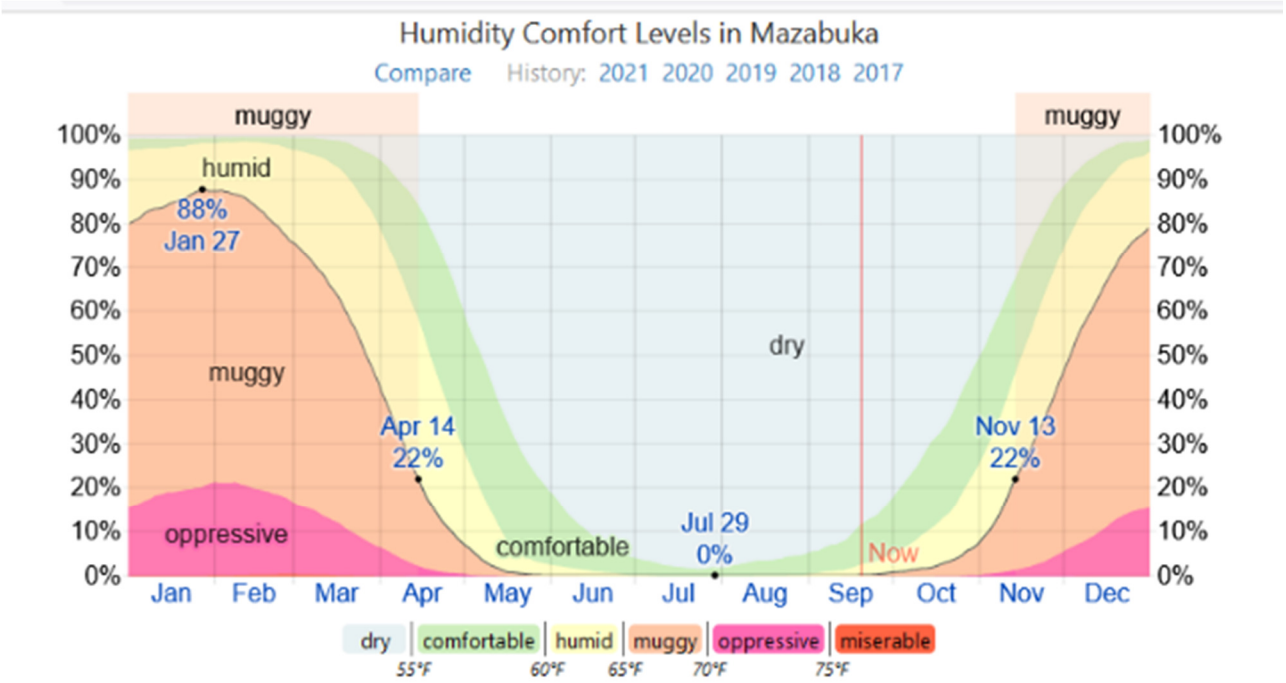


Figure 5.3: Relative humidity

5.5 AIR QUALITY

The ambient air can be described as moderately clean. However, the increase in the volume of traffic on around the project area has contributed to a worsening of the air quality along the newly constructed roads especially at peak times.

The burning of sugar cane fields before harvest results in the emission of smoke and ash particles into the air with a corresponding deterioration in air quality. Dry and windy conditions, brought about by land preparation for farming, also increase the amount of dust that rise which intermittently reduce air quality in the area. This may be due to the fact that agriculture is the main economic activity hence the absence of any polluting industrial activities (factories, power plants or any other emission producing activities) within Kaleya helps keep the area clean of any potential air pollutants. However, the air quality within the project area may be polluted to a minimal extent by the application of pesticides hence the chemicals used at the estate such as pesticides do not last any longer than 60 days. Manual removal of weeds is also preferred by the employees to the use of chemicals.

5.6 NOISE AND VIBRATIONS

The source of noise in the project is limited to domestic vehicles and movement of light vehicles using the local roads and agriculture equipment gusts. There is low level of noise and vibration during the development and implementation of the project

The source of noise in the project area are utility vehicles, farm vehicle (tractors), two pump station (1 station has 6 electric powered irrigation pumps, 3 pumps supply to the drip irrigation and 3 to center pivots). The other pump station has 4 pumps and supply to the center pivots.

The types of pumps have 3 phase motors with a mass of 361 kg, 400/600 volts,95.8/55.5 amps, HMIT 250 SM-2B3. These pumps have less output of noise and are located far from the residential

These could be mitigated against by: (i) ensuring that all vehicles transporting raw materials especially soil should be covered or avoid overloading to reduce dust emissions; (ii) the workers in dusty areas should be provided with requisite protective equipment (ii) the movement and speed of the construction machineries and vehicles should be controlled and properly managed; (v) most noisy machinery should be fitted with proper silencers to minimise noise emissions; (vi) where necessary, ensure good and appropriate selection of construction machinery and equipment,(vii) ensure the noise levels are kept at the minimum acceptable levels and the construction activities are confined to the working time limits.

5.7 LANDSCAPE AND TOPOGRAPHY

The project site forms part of the Kafue flats which is a vast floodplain with an altitude between 970 and 1000 metres. The flats cover an area of up to 60 km wide and 250 km long. The average gradient is as low as 10cm per km.

The project site is generally flat and low-lying gradually sloping downwards towards the old sugar cane field to the south. The area of land between the project site and the Livingstone Road to the north is generally raised resulting in a gentle slope towards the east southern boundary of the estate on the road network.

5.8 BUILT ENVIRONMENT

No major infrastructure exists on the proposed project site. At the time of carrying out field surveys, the only identifiable infrastructure within the Expansion Project site were concrete water canals and block of offices that will not be affected by the project development.

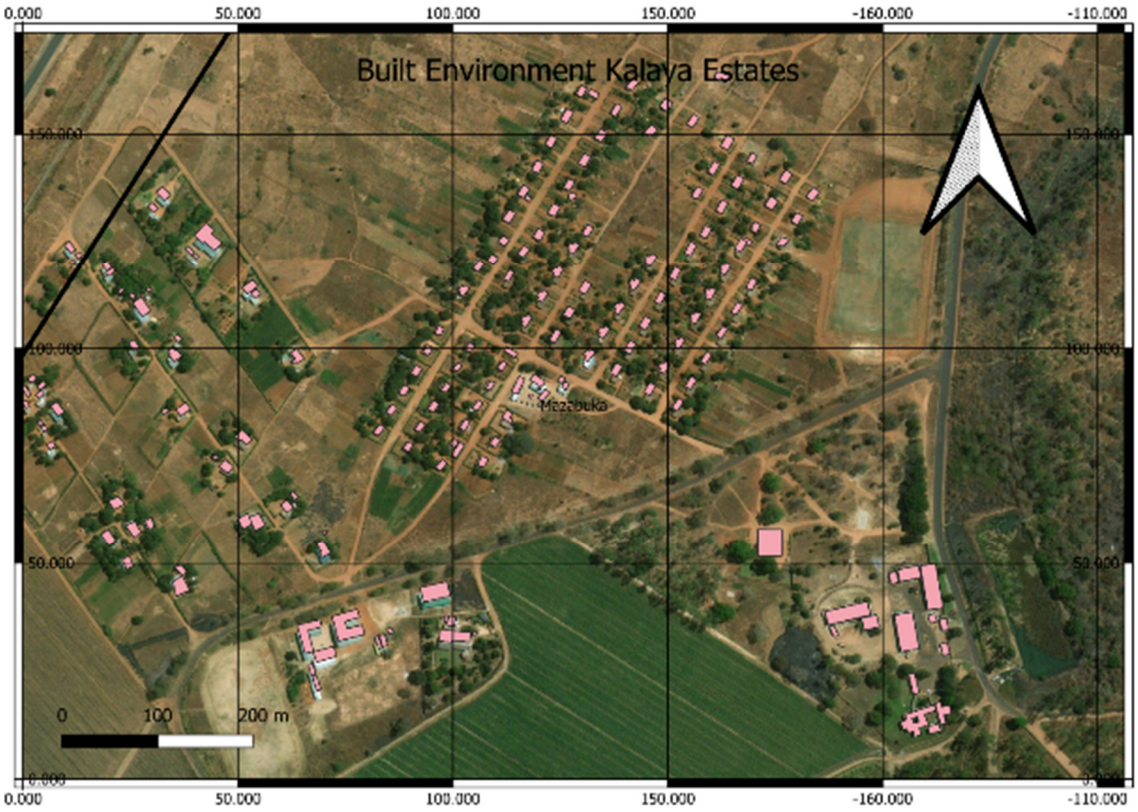


Figure 4.4: Built environment of the proposed site

Fig 4.5 Sugar cane fields

Fig 4.6 channels of water system for the furrow irrigation

Fig 4.7 current Sugar cane fields

Fig 4.8 Office blocks for the developer

5.9 GEOLOGY AND SOILS

5.9.1 Soils

The dominant soil types found in Mazabuka are *luvisols* and *vertisols*. Figure 2.6 shows the soils in Southern Province according to soil units. The soil units found in Mazabuka are 28, 12, 9 and 2 as described in the text here.

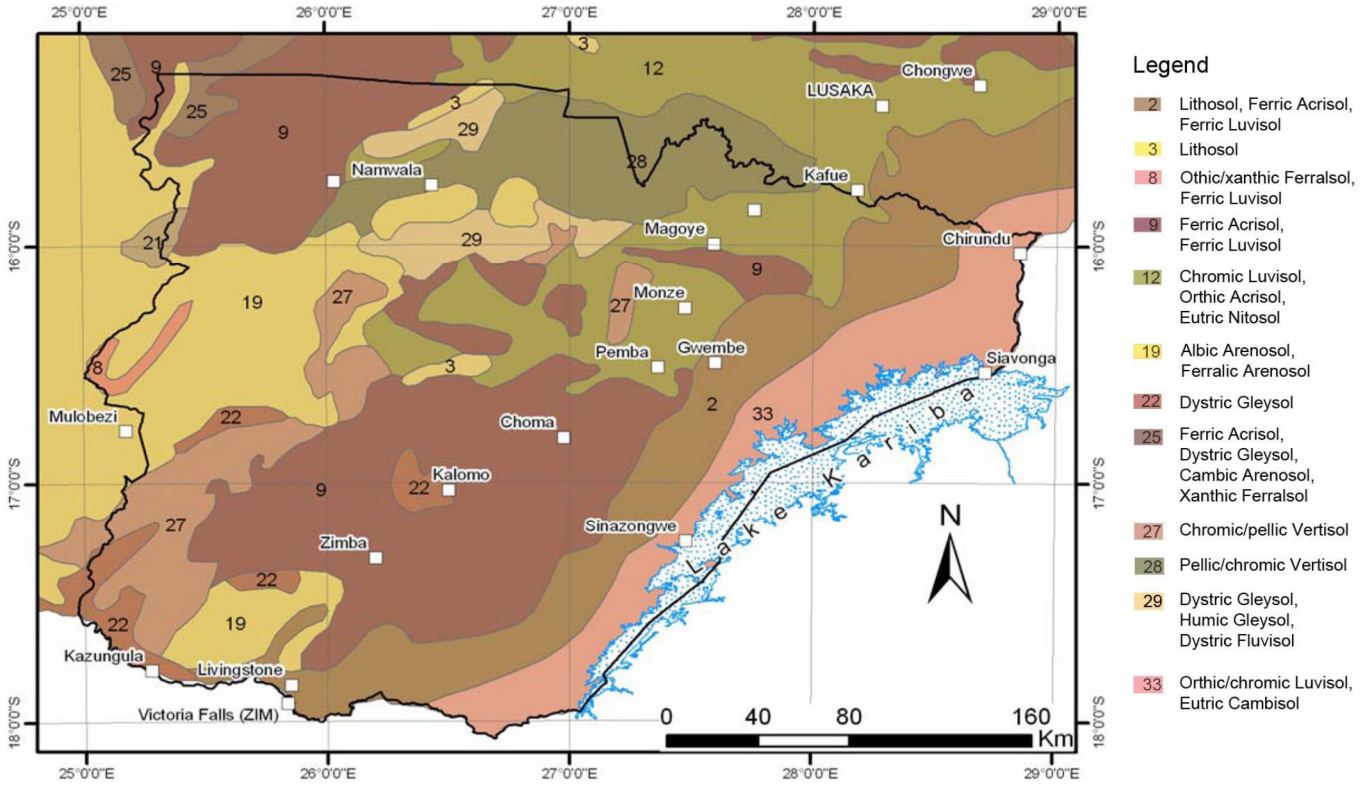


Figure 4.9: Soils of the Southern Province and adjacent Areas, Source: FAO 1988 in Baumle et al, 2007

The available soil units (according to FAO 1988 classification in Baumle et al 2007) are:

(**28**) *Pellic/chromic vertisol.* These are the Kafue Flats clay soils supporting the grassland.

(**12**) *Chromic Luvisol Orthic Acrisol. Eutric Nitosol.* These cover the biggest part of the district. They form a boundary with the Kafue Flats area on the western side and reach the boundary with Kafue district at the Kafue River in the north. They cover much of the north eastern part of the district, Chikankata area, and continue in the southern part but circumventing Magoye-Ngwezi area. These soils are moderately leached reddish clayey soils derived from basic rocks, often associated with Munga type of vegetation. This is the belt where commercial farms are located. They are the common soils of the Katanga Supergroup. These soils cover 15.6 per cent of the province (Baumle et al 2007).

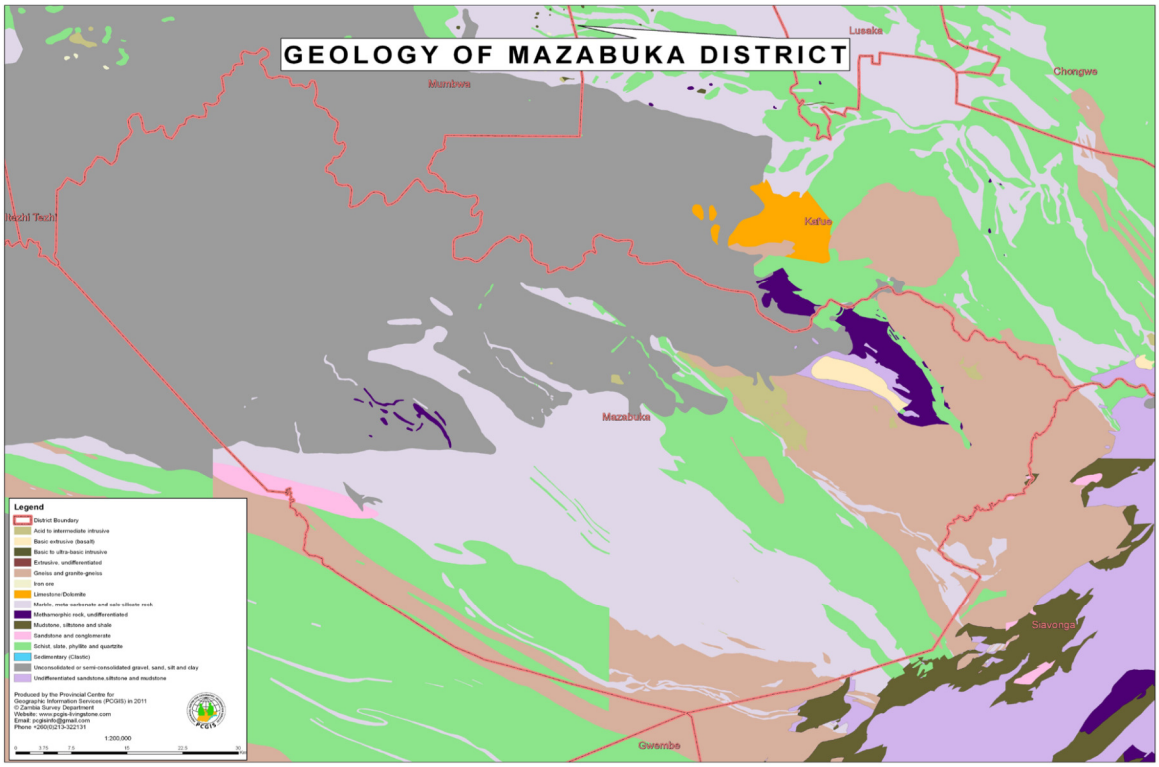
(**9**) *Ferric Acrisol, Ferric Luvisol.* These are found around Magoye-Ngwezi area. They are moderately leached reddish to brownish clayey to loamy soils, derived from acid rocks. They are associated with the Miombo type of vegetation. The area is also covered by farms mostly settlements where small to medium farmers are found. Some commercial farms are found here too.

(**2**) *Lithosol, Ferric Acrisol, Ferric Luvisol.* These are shallow and gravelly soils derived from acid rocks, occurring in rolling to hilly areas including escarpment. They are also associated with the Miombo vegetation. These are found mainly in the north eastern and south eastern parts of the district close to the Zambezi escarpment.

A field reconnaissance was conducted and transect walk through the project site revealed that the soils are generally sandy roams to sandy clay loams. The soil colour is brown to brown yellow where they are poorly drained while the riverine alluvial soils are pale sandy loams.

5.9.2 Geology

The project site lies within Mazabuka area that is underlain by strongly folded Meta-sedimentary rocks which have been assigned to the Katanga super group (1200-465Ma). These Meta-sedimentary rock unconformable overly a crystalline basement complex comprising of gneisses, schists, migmatites, granites and meta-carbonates



Source: PCGIS, Survey Department Livingstone, 2011

Figure 5.10: Geological layers in the Project region

5.10 HYDROLOGY AND HYDROGEOLOGY

The major river system in the district is the lower Kafue, a tributary of the Zambezi River. The lower Kafue catchment includes the Kafue Flats, a part of which is found in the district. The area floods in the rainy season but dries sufficiently in the dry season to provide pasture land for cattle. This behavior of the flood plains to inundate and subside at different times has led to transhumance which is a practice of moving out of the pasture land by the local cattle keepers in the wet season.

The lower Kafue River has two tributaries, the Kaleya and Magoye. There are many other smaller streams that either drains into the Kaleya and Magoye or directly into the Kafue and Zambezi rivers. The Ngwezi stream drains into the Magoye while the Kasengo stream drains directly into the Kafue. Apart from the Kafue itself, the only other perennial stream in the district is the Kaleya. Most of the Kafue River system discharge is from the upper catchment. In the lower part, the inflow from tributaries equals the evaporative losses from the flood plains and reservoirs (Baumle et al, 2007). North eastern part of the district is drained by the Lusitu stream which discharges water into the Zambezi.

There are seven dams on the project area. Water for irrigation purposes is bought from Zambia sugar and pumped into six dams on the estate. The seventh dam is used for excess water. This excess water later flow down-stream into Kaleya River through two drains. The excess water is used by farmers downstream for domestic use, gardening and livestock. With the introduction of sub-surface drip irrigation system, they will be no excess water flowing into the Kaleya River. Therefore, the KASCOL under its community social responsibility policy should provide alternate source of water supply for the community such as boreholes.

There are also constructed water reservoirs in the district. The Kafue Gorge reservoir was constructed in 1972 for generation of hydropower at Namalundu Power Station. There are a number of earth dams and dambos dotted in and around the district. The dams are built on streams or dambos and are used to provide water for livestock, irrigation and domestic water supply. Figure 4.11 is a hydrological map of the district depicting it rivers and dams.

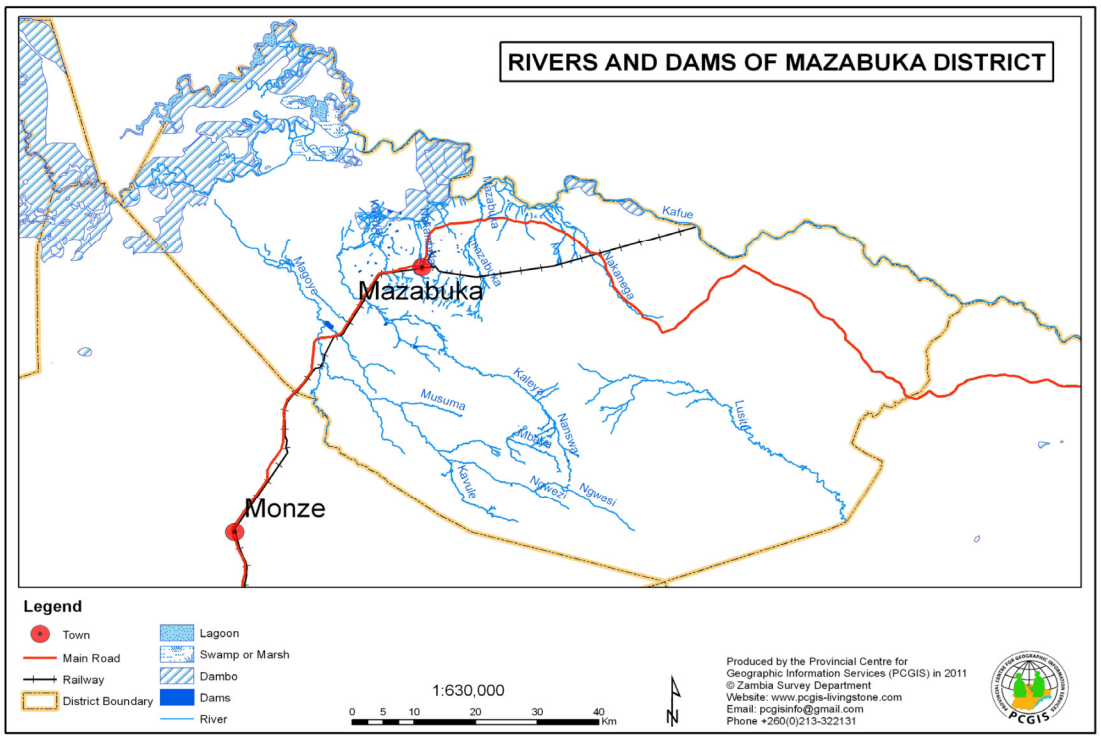


Figure 4.11: Mazabuka Hydrology

Source: PCGIS, Survey Department, Livingstone, 2011

5.11 GROUNDWATER QUALITY

Mazabuka has a renewable groundwater potential of 0.31 km3 per year (DWA/JICA, 1995). Ground water is considered the most reliable for domestic and rural water supply due to the comparatively small amounts of water that are needed. The rural part of the district is dependent on underground water. Table 5.4 gives the types water points that are used in rural areas for abstraction of water from underground.

Groundwater quality in Kaleya settlement area at the moment is in conformity with ZABS and WHO drinking water standards with a few exceptions that can be a result of underlying aquifer and agricultural practices involving the use of chemical fertilizers. There would be potential of groundwater pollution arising from both human activities and the underlying geology hence, chemicals used at the estate such as pesticides do not last any longer than 60 days. There is also a need for periodic testing of water samples from the project area and beyond so as to reduce negative impacts on public health therefore, water samples are collected every month and taken to a laboratory at The University of Zambia for testing to ensure it is safe. In terms of boreholes, there are thirteen boreholes on the estate. All these are only used for domestic purposes.

Groundwater samples from the existing boreholes are collected every month. This is aimed at establishing and ensuring that the water that is consumed by the residents meets the NWASCO and World Bank drinking water standards. The data collected by KASCOL on the water quality forms part of the baseline water quality data for the groundwater within the project area. The parameters analysed are reflected in the appendix, from the results, all physical chemical parameters including

bacteriological were found to be below the maximum allowable limits for drinking water in accordance with WHO guidelines. Caution though must be taken in considering that these results are merely baseline values, Firm conclusion can only be made after long term monitoring.

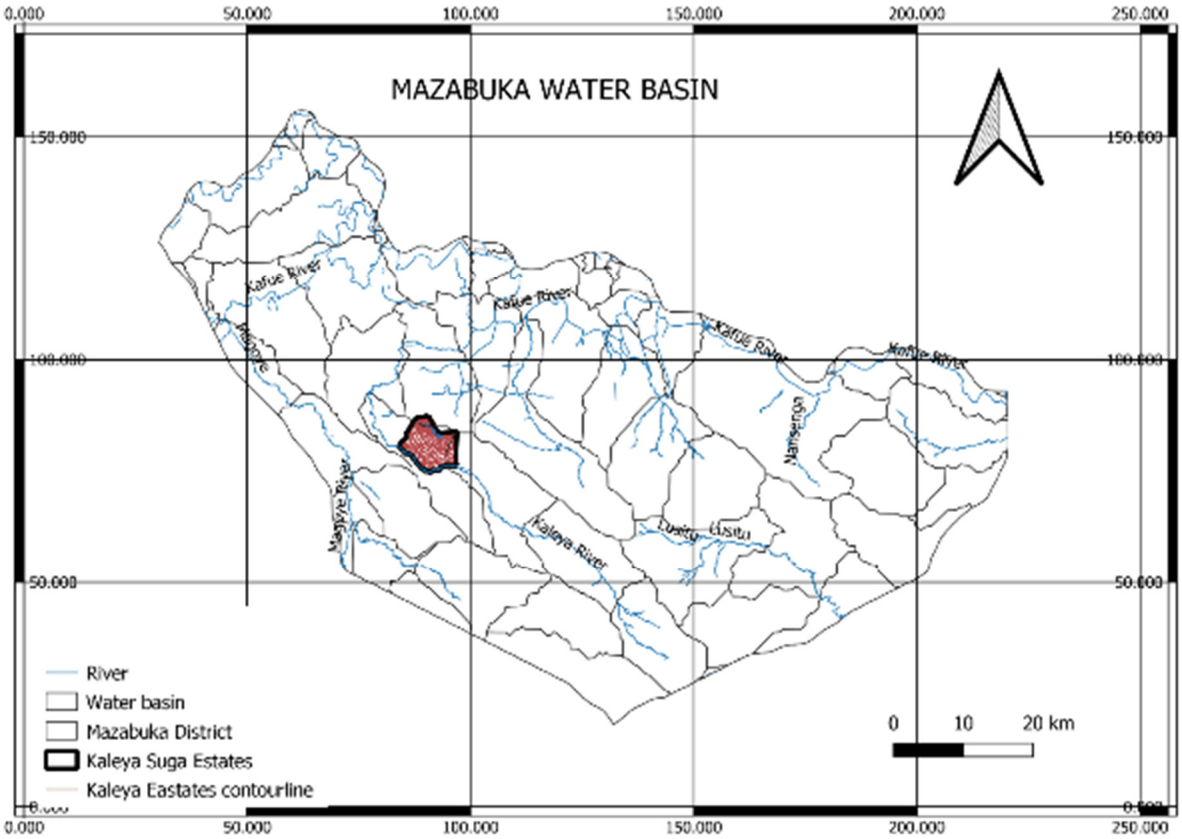


Figure 5.12: Water Catchment area of Mazabuka

5.12 BIOLOGICAL ENVIRONMENT

5.12.1 FLORA

5.12.1.1 Methodology of assessment

Literature Review

The Ecological study on the proposed project plantation site and adjacent areas included review of the relevant local and international legislation and guidelines that concern the proposed project and ecological conditions of the study area to determine flora and fauna species diversity and ascertain the habitat value and sensitive and ecological significance of the site. The literature review included Government and private sector reports, herbarium floras and specimens, internet, vegetation and land use maps and geospatial data review as well as other relevant environmental reports related to sugarcane production.

Field Surveys

The field survey included flora studies and fauna searches and identification of habitat types/quality on the proposed site and immediate surrounding areas. The survey was designed to create a foundation for assessing and ascertaining the proposed project's impact on the exiting ecological components of

the proposed site (both terrestrial and aquatic). Based on the results of the surveys, flora and fauna groups were characterized and listed followed by their diversity estimation.

The details of the plants and grass identified during the survey and literature review are given below. The below table also provides the details of avifauna species with respect to status in Zambia Environmental Act, 2015 and IUCN red list.

S/N0	Species	Protected under ZEPM Act, 2011	IUCN Classification	Survey Field/ Public Consultation	Literature Review
1	Phylum (*Basidiomycota*)		Least concern		x
2	Amaranthus hybridas		Least concern	x	
3	Bluegrass(*Poa*)	Protected	Least concern	x	x
4	Nut sedge (*C.Rotundus*)	Protected		x	x
5	Rhodes grass (Gayana)	Protected	Least concern	x	x
6	Oxgrass (*O.Abyssinica*)	-	Least concern	x	
7	Guinea grass (M.Maximus)	-	Least concern	x	x
8	Star grass (*Aethiopiscus*)	Protected	Least concern	x	x
9	Acacia (*Acacia polyantha*)	Protected	Least concern	x	x
	Acacia giraffe	Protected	Least concern	x	x
	Acacia Girardi	Protected	Least concern	x	x
	,Bauhinia thonningii,	-	Least concern	x	x
	Brachystegia longfolia Dichrostanchys cinerea	-	Least concern		x
	Combretum species	-	Least concern		x

5.12.1.2Vegetation types and ecosystems

A large part of the district is characterized by Munga woodland on heavy soils. This is mainly covering the plateau region of the district. It is dominated by various species of acacia, dry forests and open woodlands. This region however, has lost most of its original vegetation due to agriculture, particularly commercial farming. The north east and south east of the district is covered by Miombo woodland. Figure 2.7 shows the vegetation types in the district.

5.12.2 TERRESTRIAL FAUNA

5.12.2.1Detailed Survey Findings

Mazabuka district does not have any game reserve. It has predominance of game ranches that have offered habitats for some of the wildlife. Eland, Buffalo, Hartbeast, Reed Buck, Common Duiker, Zebra, Bush Buck, Impala and Kudu can be found in game ranches within the district. The game however is threatened by poaching.

a. Extent and nature of human influence

The extent of impacts on the district's forest diversity could not be fully reported due to the lack of data. Physical evidence of deforestation, encroachment in gazetted areas is there on the ground. Effort is required to take stock of how much of the forests is still remaining so that integrated forest management plans can be put in place.

b. Biodiversity indicators

The forests in Mazabuka district play host to a wide range of tree, shrubs and animal species and they also provide important ecosystems services. The Convention on Biological Diversity defines refers to Forest biodiversity as a wealth of life in a forest, variability between living organisms from all sources including diversity within species and between species of ecosystems. Any loss of forest species reduces biodiversity and this has a devastating effect on the complex web of forest life supporting system.

c. IUCN Red List Categorisation

The mammals identified from the surrounding of the sub-project area are listed below. The identified spices are classified in accordance with the IUCN list and Zambia Wildlife protection, preservation, conservation and management Act, 2015. Animals which were physically seen include, spring hare, Common Duiker, Field rat, Bush pig, House Mouse and the Foxes. The spring hares, and Field rats were observed during the field project site assessment. African python (*Python sebae natalensis*), Bush pig (*Potamochoerus porcus)*, Foxes (*Vulpes*), were also cited during the field interviews.

#	Common Name	Scientific Name	IUCN Conservation status	Status in ZWL Act, 2015	Survey Field/ Public Consultation	Literature Review
1	Bush pig	*Potamochoerus porcus*	Vulnerable	Listed	**x**	**x**
2	Spring hares	*Pedetes capensis*	Least concern	Not listed	x	x
3	Warthog	*Phacochoerus Aethiopiscus*	Vulnerable	Listed	x	x
4	House Mouse	*Mus muscular*	Least concern	Not listed	x	x
6	Field rat	*Mus booduga*	Vulnerable	Not listed	x	
7	Foxes	*Vulpes*	Least concern	Not listed	x	x
8	Genet Cats	*Felis libyca*	Least concern	Listed	x	x
10	Duicker Yellow Backed	*Sylvicapra grimmia*	Vulnerable	Listed	x	x
11	African python	Python sebae natalensis	Vulnerable	Listed	x	x

5.13 SOCIO-ECONOMIC ENVIRONMENT

5.13.1 Methodology

Social research provides an understanding of the development and consequent social impacts of irrigation schemes. Changes in the attitudes and adaptations of local communities, subsequent livelihood changes, and consequent demographic changes, are of particular interest to the social impact assessment expert. Social research from a number of sources provides an understanding of the development and consequent social impacts of developments such as the proposed sub surface drip irrigation development. Changes in the attitudes and adaptations of farm families, and consequent demographic changes, are of particular interest to a social impact assessment framework for irrigation. The baseline survey was executed under the KASCOL sub surface drip Irrigation development Project. The project objectives are; to convert the existing furrow irrigation to sub surface drip irrigation system, to facilitate the optimal use of the water resource and to help reduce on the incidence of water wastage by the use of the most efficient irrigation system The objective of the baseline survey was to reveal typical farmers conditions and to set the baseline in the command area of the KASCOL irrigation development area as a part of project benefit to be monitored.

5.13.2 Project Area Description and Institutional Arrangements

The Project site is located at plot number 233a/234a/235A/235a to the south-east of Mazabuka along the Mazabuka to Livingston road approximately 7km from the Central Business District (CBD) and can be accessed via the T1 road. The proposed site covers a total area of 2500. The project of conversion the 2,164 hectors of land from furrow irrigation to sub surface drip irrigation is a proposed upcoming development project by Kaleya Small Holder Company Limited. The process of taking up

the EIA and ESIA through an engaged Consultant (Earth Consultants) was agreed by the board and Management as part of the legal process under Government Agency (ZEMA) through different Acts of law.

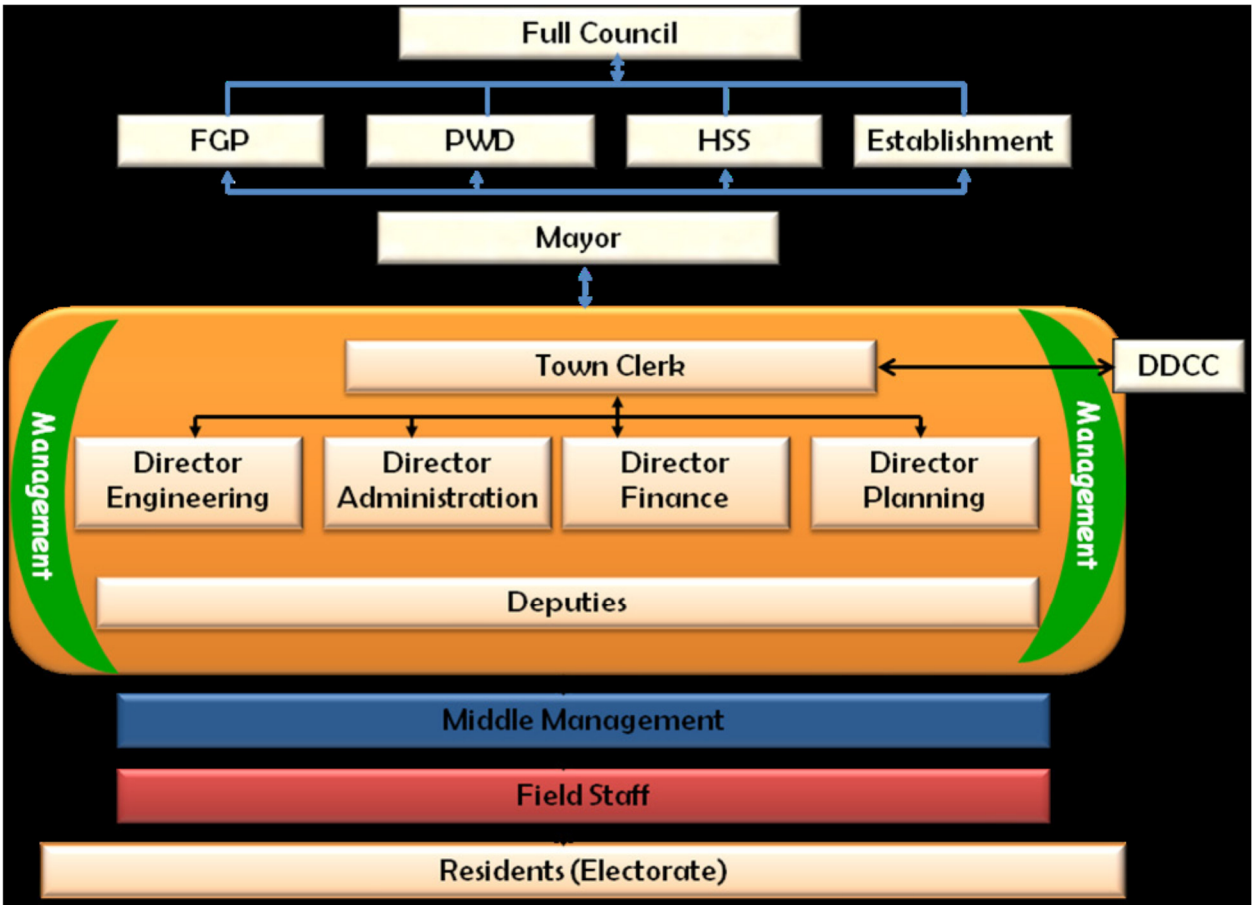
The population in the project area is estimated that 498 employees for KASCOL out which 420 are seasonal employees, 53 were on fixed contracts and 25 members of staff were on permanent basis[1].
The project area is zoned into four groups. Each group had its own occupants as follows: Group consisted of an average per household being 9 to 15 occupants.
Majority of the occupants are smallholder farmers, a few of them are in contractual employment with KASCOL, while a further 10% are not employed. Income levels range from K500 to per month to K1500 per month with the majority falling in K1500 range. There are a variety of small businesses owned by residents. 10% of businesses owned are selling vegetables and grocery shops; transport; and sugarcane farming.

5.13.3 Governance and Administration

Mazabuka district has a dual system of administration comprising Local and Central Government. The Council is accountable to the electorate while the line departments are accountable to provincial and national level line ministerial departments. The dual system poses a challenge in terms of development co-ordination, monitoring, reporting systems and mechanisms for ensuring responsiveness of government services. In order to address this challenge, a District Development Coordinating Committee (DDCC) was created by government through Cabinet Circular No. 1 of 1995, whose role was to improve responsiveness of government services through, coordination, monitoring and reporting.

The DDCC is intended to provide technical advice to the Council through relevant committees of the Council which is channeled through the Town Clerk. It comprises of all Heads of Government Departments, Non-Governmental Organizations (NGOs), Faith Based organizations (FBOs) and Private sector representatives. The DDCC is headed by the District Commissioner (DC) who is a representative of the Central Government at district level and supervises all functions of line departments.

[1] HR,KASCOL, 2021



The Local Government system is accountable to the electorate through elected representatives, the Councillors. The system has a management team which reports to the Council as illustrated in Figure 1.1. The MMC has 22 elected Councillors from the 22 Wards, two Chiefs' representatives, and three Members of Parliament (MPs). The Councillors are the link between the community and the district. To facilitate coordination each Ward is meant to have an Area Development Committee (ADC). Currently, MMC has 16 ADCs and is working towards establishing the remaining eight by 2012.

The district is headed by a Mayor who is elected at during the general elections. The Mayor, Councilors and the MPs comprise the Full Council. The Council is advised by the Town Clerk who is supported by Heads of Departments. Mazabuka district has three constituencies, each represented by an MP. These constituencies are Mazabuka Central, Chikankata and Magoye. Figure 5.2 provides an illustration of the three constituencies covering 22 wards each of which is represented by a Councilor whose term office is five years.

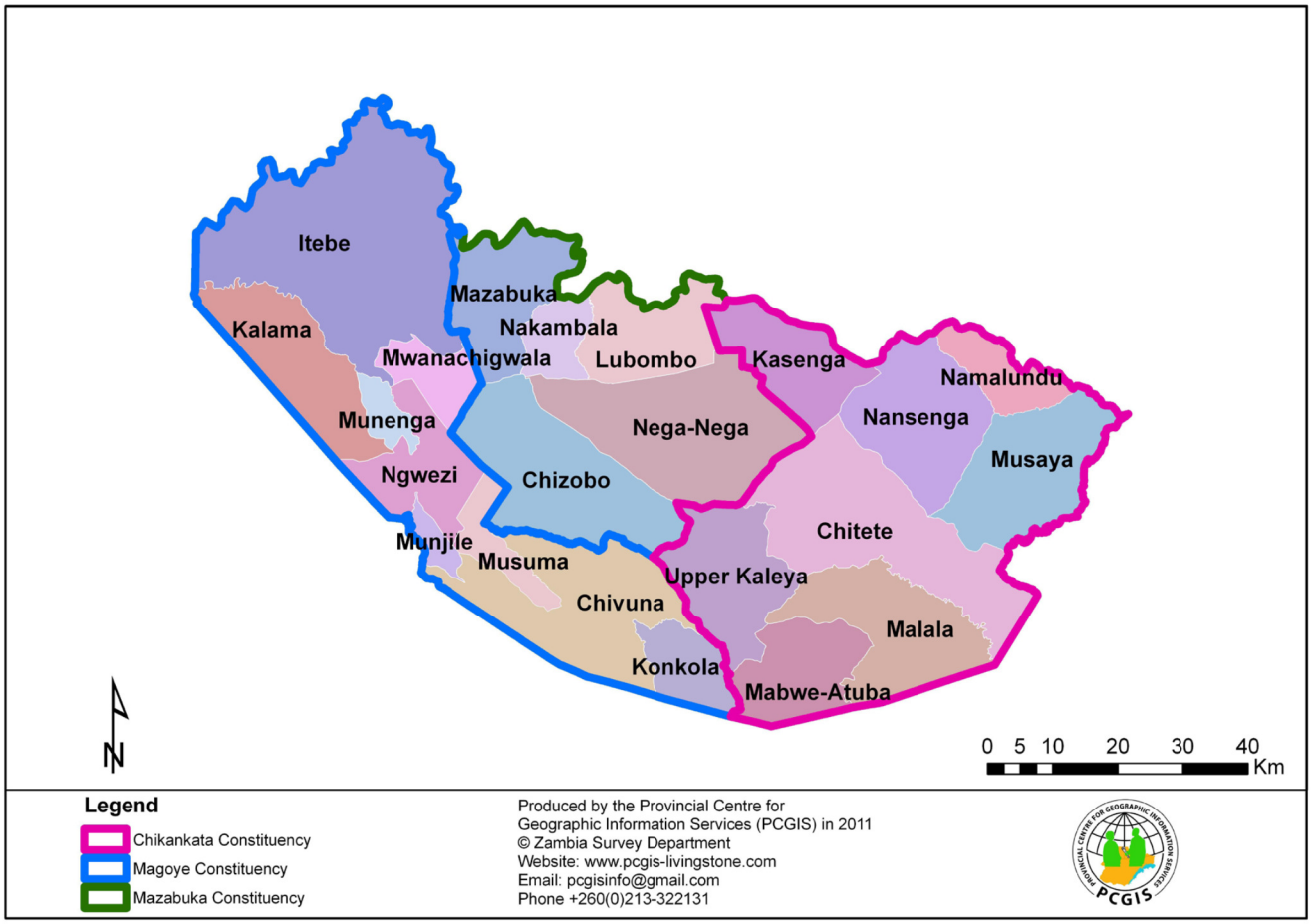


Figure 4.13: Organizational Structure of Mazabuka Municipal Council Source: MMC

5.13.4 Traditional Authority

The Province has a diverse mix of ethnic or tribal groupings from different parts of the country. Most (98.7 per cent) of Zambia's population comprises about 72 Bantu-speaking ethnic groups. Almost 90 per cent of Zambians belong to the eight main ethnolinguistic groups, which are the Bemba, Nyanja-Chewa, Tonga, Lunda, Luvale, Kaonde, Nkoya, and Lozi. Europeans make up 1.1 per cent, and others 0.2 per cent.. The major vernaculars is tonga while Bemba, Kaonda, Lozi, Lunda, Luvale, Nyanja and about 70 other indigenous languages.

The country is 85 per cent Christian, with Catholicism being in the majority. Anglicans, Methodists, Baptists, and Seventh Day Adventists all have established a presence as well. While Zambia is predominantly a Christian country, few have totally abandoned all aspects of their traditional beliefs. Zambia has a very small Jewish community, composed mostly of white Ashkenazi. Muslim, Hindu and Baha'i citizens together represent about two per cent of the population.

5.13.5 Cultural/historical sites

On awareness of any sites of special/particular cultural interests in the region such as sacred places, graveyards, cultural places, archaeological places, and recreational places among others that could

hinder successful implementation of the proposed project, majority of respondents had no knowledge of such sites.

5.13.6 Cropping Patterns and Yields

Agricultural production at KASCOL is low relative to its potential. Crop production is constrained by high operational costs in terms of labour and water wastage. From the survey conducted, Sugarcane is the main stay of KASCOL and smallholder farmers.

5.13.7 Involuntary resettlement

The Project does not anticipate any involuntary resettlement. The project site is kilometres away from duelling compounds. The project will not affect any areas protected by the laws of Zambia nor will it affect areas of cultural significance and is not anticipated to create any major changes in land use because the project site is already on developed land. No major extensive construction works are anticipated other than the installation of sub-surface drip irrigation.

5.14 LAND TENURE AND ACCESS TO LAND.

It was noted that KASCOL has inter generation land ownership system. In this case all the land is owned by the KASCAL and is given out to smallholder farmers on out grower basis where land is allocated to individuals for life. When he/she dies, the family appoints someone in the family to take over and administer land rights. This system of land ownership adopted by KASCOL allows small holder farmers to implement permanent development on the land there are allocated.

5.14.1 Land

Mazabuka district covers an area of 6,687km2 (IDP Status Quo Report, 2008). There are two major tenure systems; customary and state. The type of tenure may be related to how the land is used and managed. This chapter will focus on land tenure, use and land management in Mazabuka

5.14.2 Land Tenure System

Land tenure is defined as the relationship, whether legally or customarily among people, as individuals or groups, with respect to land. The rules of tenure or the relationship among people with respect to land vary from society to society. These rules could also be termed as land tenure systems. Rules of tenure define how property rights to land are allocated within societies. They define how access, rights, control, and transfer of land, as well as associated responsibilities and restraints are granted. In simple terms, land tenure systems determine who can use what resources for how long, and under what conditions (FAO, 2002).

In Zambia, there are two types of land tenure systems: leasehold and customary. According the Land Acquisition Statutory Instrument No.1 of 1985, Leasehold tenure is land held on behalf of the Zambian people by the President. The leasehold tenure runs for either 14 or 99 years and is renewable provided there is no breach of the conditions in the existing agreement. Customary tenure is land that is managed by traditional rulers on behalf of their subjects. Under the Land Acquisition Statutory

Instrument, land in the customary area can be converted to leasehold for security of tenure provided that there is written authority by the traditional leaders, and it is approved by the local authority. Figure 4.1 shows an approximate distribution of state land compared to customary land in Mazabuka.

The Project area has four housing compounds within the estate with 160 housing units and 160 small holder farmers homestead all these are on title as provided for by the Government provisions. Including one Government supported clinic and two schools Kaleya east school - Government headed and St clement basic school-supported by the Catholic Church

There will be no structures, farmland, residential and businesses earmarked for demolishing or relocations during the project development because the site is on the old fields that are going to be changed into new development

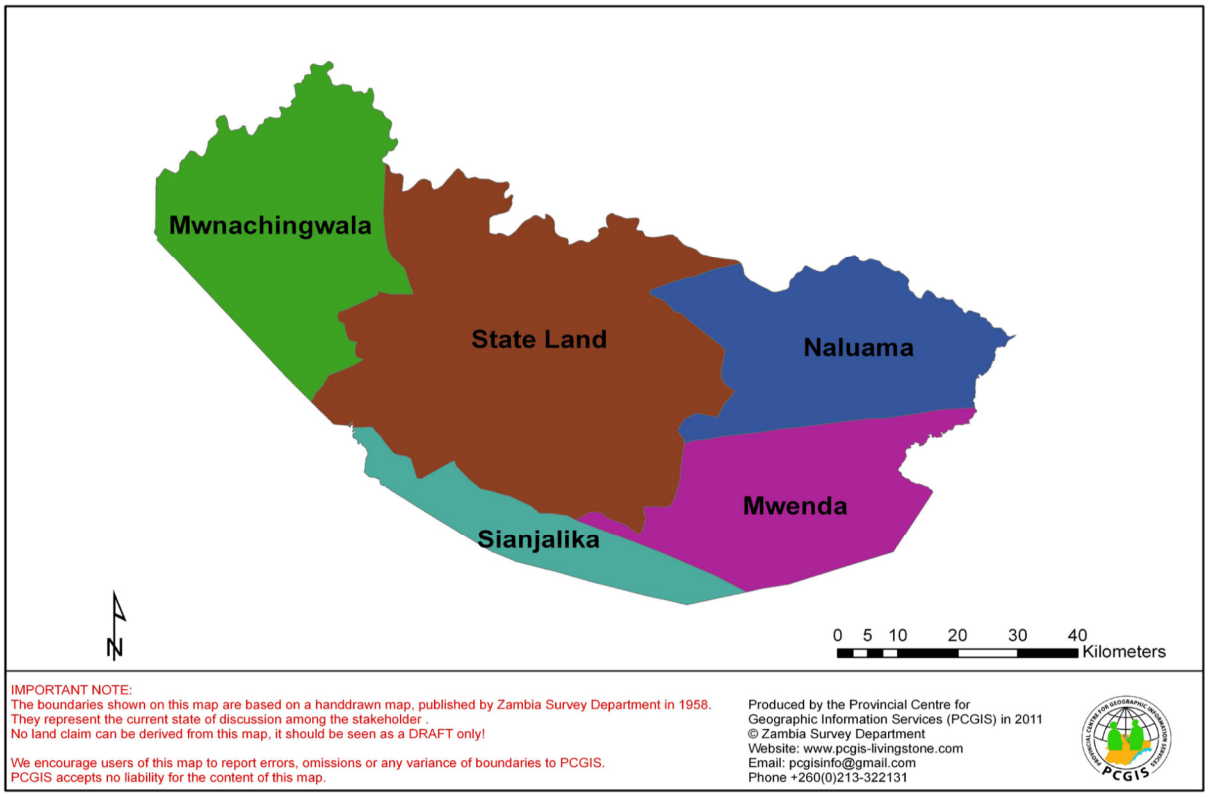


Figure 5.13: Distribution of Land Tenure, Zambia Survey Department, PGGIS, 2011

Figure 4.1 shows that the proportion of state to customary land is not even, most of the land in the district 44 is held under customary tenure while the rest is under leasehold. However, the trend in land tenure systems is such that leasehold tenure is on the increase while customary tenure is on the decrease.

5.14.3 Land Use

Land in Mazabuka is mainly used for residential, agriculture, commercial and mining purposes. Mazabuka has for a long time been an agricultural area. However, large scale mining gained recognition

in the period 2004-2007 with the opening of the Munali Nickel Mine. Prior to the Nickel Mine, areas like Kapona in Magoye and Nasenga in Chikankata had been growing as small scale sand mining sites.

Some of the large scale farms have plant and equipment on site for processing and packaging of farm produce. With the increase in the number of actors in, and size of the local agricultural sector since 2000, the district has been experiencing competing need for agricultural and residential land. The current land use distribution may differ with the findings in the Final Report of 1995 by the Ministry of Energy and Water Development (MEWD) where agricultural activities accounted for 43.72 per cent and 56.28 per cent for non-agricultural purposes. Table 4.1 gives an indication of land use in the district.

5.14.4 Settlements and Settlement Patterns

5.14.4.1Socio Economic Setting

The scenarios for socio-economic focus on population growth, economic growth and provision and investment in basic services such as education and health
The population of Mazabuka district is mainly as result of natural growth through birth, migration and mortality. Migration into the district has been a result of the high rate economic growth in agriculture sector as result of the expansion of the Zambia Sugar plc factory and the opening of the Munali nickel mine. Another factor contributing to the high population growth is the well-developed service infrastructure such as national training and research centres like Chikankata school of Biomedics, NIRS, Cotton Development Trust, Zambia Institute of Animal Health, and Magoye Research. The district has well developed schools and clinics.

5.14.5 Population Characteristics

As per the 2010 Zambian census, Southern Province had a population of 1,589,926 accounting to 12.08% of the total Zambian population of 13,092,666. There were 779,659 males and 810,267 females, making the sex ratio to 1,039 for every 1,000 males, compared to the national average of 1,028.[The literacy rate stood at 71.20% against a national average of 70.2%. The rural population constituted 75.33%, while the urban population was 24.67%. The total area of the province was 85,283 km^2 and the population density was 18.60 per km^2. The population density during 2000 Zambian census stood at 18.60. The decadal population growth of the province was 2.80%. The median age in the province at the time of marriage was 20.6. The average household size was 5.4, with the families headed by females being 4.6 and 5.7 for families headed by men. The total eligible voters in the province was 64.10%.[The unemployment rate of the province was 12.10%. The total fertility rate was 6.1, complete birth rate was 6.2, crude birth rate was 37.0, child women population at birth was 807, general fertility rate was 160, gross reproduction rate was 2.5 and net reproduction rate was 1.8. The total labour force constituted 55.00% of the total population. Out of the labour force, 64.1% were men and 46.7% women. The annual growth rate of labour force was 4.4%.[Tonga is the most spoken language with 74.70% speaking it. condition stood at 3,068. The life expectancy at birth stood at 56 compared to the national average of 51.

5.14.6 Economic Activities

Mazabuka is majorly a farming town. Most businesses thrive in the supply of farm products ready. Nonetheless, a number of economic activities have sprung up in the recent past in the following sectors Agriculture, education, Healthy, Private Sector, Faith organization and self-employment (Entrepreneur)

5.14.6.1 Livelihood Assets

Agricultural production in the Project area is relative high due to availability of water throughout the year. From the survey conducted, most of the respondents grow sugarcanes and vegetables. Livestock keeping (Cattle goats, chickens among others) is also common among the farmers.

5.14.6.2 Employment

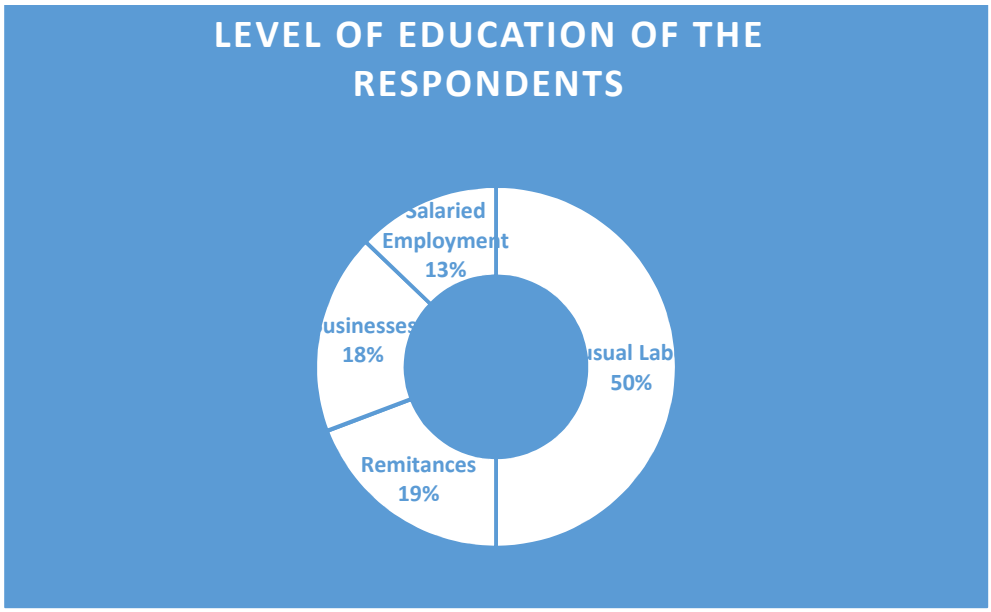
The major economic activity of the district is farming. The Agriculture sector as at 2010 recorded the highest employed labour force at 60% as illustrated in Figure 3.5. The district has many large and small scale farmers engaged mainly in the cultivation of sugarcane, maize, coffee and wheat. The trade and commerce sectors recorded a slight increase in 2009 from 2008 of 2 per cent and a 1 per cent decline in 2010. The increase in 2009 can be directly attributed to an increase in the number of suppliers of various products that had contracts with Zambia Sugar plc during their expansion project.

5.14.6.3 Vulnerability

Major sources of income are through sugarcane production and other farming related employment. Respondents interviewed indicated that they have other sources of income. 39 per cent drew their extra income from casual labour on farms and other forms, 14 per cent from businesses and 15 per cent enjoyed remittances. Only 3 present were in salaried employment.

5.14.6.4 Literacy Levels and Gender Equity

Education plays an important role in Human Development by empowering people, improving their well-being and enabling them to actively participate in nation building. Education strengthens people's abilities to meet their basic needs and those of their families by increasing their productivity and potential to achieve higher standards of welfare and thereby improving their quality of life. From the survey conducted, 47% had attained formal education up to primary school level, 31% had attained secondary school level education 10% of the household heads had no formal education, while only 9% had acquired tertiary level education. 3 had attained university education. Figure below gives a summary of level of education attained by household head within the KASCOL project area



5.14.7 Social Services and Infrastructure

5.14.7.1 Educational Facilities

The major economic activity of the district is farming. The Agriculture sector as at 2010 recorded the highest employed labour force at 60% as illustrated in Figure 3.5. The district has many large and small scale farmers engaged mainly in the cultivation of sugarcane, maize, coffee and wheat. The trade and commerce sectors recorded a slight increase in 2009 from 2008 of 2 per cent and a 1 per cent decline in 2010. The increase in 2009 can be directly attributed to an increase in the number of suppliers of various products that had contracts with Zambia Sugar plc during their expansion project.

Facility	Number
High School	4
Secondary School	4
Upper Basic School	61
Middle Basic School	17
Community School	33
Private Schools	13
Skills Training	1
Total	**133**

There is one primary school and one secondary school in the project area. Kaleya primary school only provides up to grade nine level. The dropout ratio in both boys and girls is very high after the primary section due to the non-availability of middle school and high schools. The population of the school was estimated to be 371 pupils both girls and boys.[2] The staffing levels reported was 17 staff (7 males and 10 females).It has staff housing challenges with only 3 houses against 17 teachers. Despite the low

[2] , Branco, Luiindi, Kaleya Primary School, 2021

dropout rate of pupils due to robust education awareness and fight against early marriage and teen pregnancies, several challenges faced by the school were reported such as inadequate and dilapidated infrastructure, the targeted communities reported that better quality and adequate educational facilities, children of all the communities travel to St. Clement Secondary School for higher education. St, Clement secondary school was reported to have 682 pupils though not desegregated by sex and age. It was the only secondary school in the project area at the time of conducting ESIA. The school is run by the Catholic Church and provides education for boys and girls up to grade twelve level[3]. The school recoded Grade 9 pass rate of 63% for 2020 intake this low pass rate was attributed to high poverty levels as most pupils come from outside KASCOL community.

The project would have minimum negative impact on the education in the project area as the schools are located 4-7 Kilometres away from the project site. There will be minimum noise pollution and vibration during the construction phase,.

The consultant recommended that KASCOL under its Cooperate social responsibility Policy to come to the aid of the school in addressing the challenges faced by Kaleya primary school.

5.14.7.2 Health Facilities

Mazabuka town has one general hospitals and some private. The main hospital is Mazabuka general, HIV prevalence rate for Mazabuka districts stands at 15.8 per cent. The national HIV prevalence rate is 17 per cent among adults ages 15 to 49. According to Ministry of Health information new infections have been increasing from an estimated 67,602 adults in 2006 and are projected to rise further to 72,019 in 2015. Only 15 per cent of Zambians access counseling despite the country recording a high HIV prevalence rate.

The proposed project is not expected to impact negatively or positively on the existence and operation of health institutions and service delivery in a big way owing to the limited number of staff expected to in-migrate as the majority of staff will be drawn from the local communities. However, the potential for increased respiratory diseases and injuries exist if occupational health and safety measures are not implemented effectively and this could put stress on existing facilities. Another potential source of stress on health services by the project relate to HIV/AIDS. The proposed project will generate employment and increase money circulation in the area. An increase in disposable income by employees and those transiting for business to the area has potential to increase social interaction and despondence especially with sexual workers naturally being attracted to areas of economic boom.

Main causes of transmission include unprotected casual sex, sexual abuse/defilements and sexual cleansing together with limited cases of mother to child transmission. Efforts in place to address the problem include education and sensitization programs as well as, Voluntary Counseling and Testing. Those involved in these programs include Government and Volunteer Health Care providers, Non-Governmental Organizations (NGOs).

There is one functional Basic Health unit (BHU) available for both KASCOL and the surrounding communities. The available health unit can only provide minor health treatments to patients and has

[3] Mazuba Elvis Fedelis,2021

very bad infrastructure and limited services.[4] The clinic is ready to handle the migrant worker who will come to work on the project. The clinic records 2 out of 10 positive cases in 6 months. Services provided at the clinic include supply of condoms, Social behaviour change and counselling services. The malaria fight has been successful because of health education and robust indoor spraying and distribution of insecticide treated mosquito nets. However, the clinic has neither dumpsite nor a sanitary Land fill. The consultant recommended the establishment of the damp site or Land fill in the project area for solid waste management.
Therefore, in case of emergency and better health treatment for serious health care needs, patients are either need to be referred to Mazabuka District Hospital or Monze General Hospital

5.14.7.3 Water Supply and Sanitation

Water supply in the district is centralized and water is supplied by Southern Water and Sewerage Company (SWSC). However, the supply of water is limited to areas surrounding the central business district. The outlying areas mostly comprise localized systems of water and sanitation. The key sources of water for domestic use mainly comprise shallow wells and boreholes in the unplanned settlements. Of these, the most preferred water source is borehole water. However, the distribution of boreholes is far apart with some households having to cover more than 300m to access borehole water and this status is an indicator that more needs to be done to improve safe water supply in the unplanned settlements. Most boreholes are sunk by the local authority using resources from the Constituency Development Fund, while individuals also hire private borehole drillers. The main source of water at the proposed project site is the borehole.

The estate has thirteen boreholes within the project area. As shown below

S/No	Borehole location	Capacity	Depth	Size of casing	Comments
1.	Main Borehole - 1	7.5 HP Pump	50 Meters	8”	Working
2.	Main Borehole - 2	6.5 HP Pump	50 Meters	8”	Working
3.	Main Borehole - 3	No Pump	60 Meters	8”	Less water
4.	Recreation Club	5 HP Pump	50 Meters	4”	Working
5.	Mizinga Compound	3 HP Pump	50 Meters	5”	Working
6.	A5 House Borehole	2 HP Pump	20 Meters	6”	Working
7.	Tuyake borehole	3 HP Pump	50 Meters	8”	Working
8.	Group 2 Borehole	5 HP Pump	50 Meters	8”	Working
9.	Group 2 Borehole	5 HP Pump	50 Meters	8”	Working
10.	Group 3 (b)	2 HP Pump	50 Meters	5”	Working
11.	Group 4 (a)	1 HP Pump	50 Meters	5”	Working
12.	Group 4 (b)	1 HP Pump	50 Meters	5"	Working
13.	Filtration Plant	20 HP Pump	Surface	Filtration plant	Working

5.14.7.4 Transport and Communication Infrastructure

Mazabuka has a number of road networks, the main roads that connect the town to different parts of

[4] *Source:* Earth Environmental Consulting Limited Team, 2021.

the country is the Kafue to Livingstone Road, Road. A number of gravel roads also exist within the townships leading to various parts of the district. Consequently, the majority of the travelling public use road transport mostly public buses and minibuses. It is also not uncommon to see pedestrians, cyclists, and motor riders in the district.

Radio and television reception from the Zambia National Broadcasting Corporation and private stations are also accessible in the area. Other digital networks are also available providing TV and other communication services. The area is equally serviced in terms of mobile phone communication with all the three mobile phone service providers namely Cell Z, MTN and Airtel present in the area making it easy for local people to easily communicate using mobile phones. This consequently enhances social interaction and business transactions. However, connectivity varies from place to place.

In terms of energy, Mazabuka is well connected to the national grid. Although the grid line passes through most areas of the district, the costs involved in installing transformers to step down power for consumption is a major limiting factor to electricity access. Consequently, only those with enough money to afford high connection costs have access and this comprise mostly of those educated and working and/or those who own some business. The main source of electricity at the site is ZESCO

5.14.7.5 Community Health, Safety and Security

Earthworks, loading and unloading materials, operation of construction machinery such as rippers, trucks, and concrete mixers all have potential accident risks or pollution affecting workers if there are no control measures. The storage and usage of fuels such as power, gas, and petrol contains accident risks to fire, explosion, leakage etc, and pollution which will affect the health and safety of workers. There is safety risks associated with working at construction sites with various types of materials and machines, equipment, and vehicles passing by. In addition, weather factors need to be taken into account during construction of the sub-surface drip irrigation drip irrigation such as high temperature in the dry season when the outdoor temperature may reach 38-40°C that can also cause health risks to the workers. Heavy rainfall during the rainy season from January to Mach is likely to complicate the work of construction in terms of soft soil, digging of furrow s where to lay PVC drip irrigation pipes. The weather impact can be mitigated by digging of the furrow s during the dry spell of the season. In conclusion, the risk level of these social impacts is assessed as medium and will be mitigated as indicated in the ESMP.

5.14.7.6 Cultural heritage resources

On awareness of any sites of special/particular cultural interests in the project area such as sacred places, graveyards, cultural places, archaeological places, and recreational places among others that could hinder successful implementation of the proposed project, majority of respondents had no knowledge of such sites that exist within the planned project area as confirmed by traditional and civic leaders

6 IMPACT ASSESSMENT

The project is likely to have a number of positive and negative environmental and socioeconomic impacts. This section identifies, assesses and discusses these impacts. Impacts were identified and assessed based on the significance and likelihood following the information gathered during the desk study and project site survey which included field visits that were undertaken in December 2021. The impacts are discussed according to whether positive or negative or both in section 6.1.1. The identified impacts are for all the project phases and i.e. site preparation and construction, operational and decommissioning and closure phases.

6.1 IDENTIFICATION OF IMPACTS

The ESIA has predicted and evaluated anticipated impacts using acceptable standard methods of impact prediction and evaluation. Constant reference to a checklist of project activities was made. The study team used several approaches such as brainstorming and use of checklists and matrices to identify the main sources and establish the potential impacts from the proposed main project activities. Public participation and consultation with some of the community and stakeholders were conducted to reduce uncertainty (Appendix 4).

6.1.1 Biophysical Environment

Positive Impacts on the Biophysical Environment

There will be improved protection of the vegetation in the area as much of the vegetation within the estate is under private hands.

Negative Impacts on the Biophysical Environmental

The project will generate a number of negative impacts on the biophysical environment of the area. These impacts are summarised in Table 6-1 overleaf**.**

6.1.2 Socio-Economic and Cultural Environment

Positive Impacts on the Socioeconomic Environment

The project will result in a lot of positive socioeconomic impacts. The positive socioeconomic impacts outweigh the negative impacts that will result from the project. These positive impacts are summarised in Table 6-2.

Negative Impacts on the Socioeconomic Environment

The commercial farming project will also generate negative impacts on the socioeconomic environment. The negative impacts on the socioeconomic environment are discussed in Table 6-3.

Table 6-1: Negative impacts on the biophysical environment

SN	Impact	Construction Phase	Phase Operation Phase
1	Stress on water resources	Apart from water requirements for construction purposes, workers and the site works will create additional demand for water. Water will be required for activities such as construction of various support infrastructures Impacts upon existing and potential use of water resource for any purpose: • Impact on availability and quantity of water used for drinking, agriculture or recreation. • Impact from use of water for construction taking water directly from rivers. • Minor impact only if the use of water for construction or at construction is in competition with other use. In reality the quantities of water to be used are small and in all probability there will be no impact.	Water requirements for irrigation (2.7 million cubic meters/year), water for domestic use will be sourced from the bulky supply from Nakambala Estates. Impacts upon existing and potential use of water resource for any purpose: Moderate impact on surface water because there will be no increase in volume of water pumped from Kafue River
2	Air pollution	Large exposed surface areas with loosened topsoil combined with the operation of plant and machinery such as bulldozers will increase dust raised from the site, especially during initial bulk earth works and levelling and during windy conditions. Emissions to the air in form of exhaust fumes from vehicles and machines may also impact on air quality. However, both exhaust fumes, and dust raised on site is likely to pose mainly a nuisance to construction workers and the immediate surrounding communities; impact of this is potentially significant although considered intermittent and localized.	No significant impact on air quality owing to exhaust fumes from vehicles and machines during operation. However, minor impacts may from spray of agricultural chemicals during operation Significant impact on air quality owing to fumes as a result of burning cane during harvest
3	Land and soil pollution	Soil disturbance will result from vegetation clearance, vehicle movements etc. These disturbances expose the soils to a very high risk of erosion especially during rainy and windy seasons. However, erosion problems will be minimal due to the flat topography of the area. Oil spills and leaks from the machine operations, poor handling of petroleum products such as oil and fuel spillage during dispensing as well as improper disposal of	During operation phase, there is a potential for surface water pollution occurring due to oil spillages from project vehicles. This impact if at all it arises will be very low during this phase. Another significant impact that may arise is contamination of nearby rivers. There is a possibility of agricultural chemicals

		used oils, hydraulic fluids, toxic and empty oil containers may potentially cause soil contamination.	contaminating the rivers.
4	Increased noise levels	During construction phase heavy machinery will be used for the excavation of soil. The machines are noisy and will cause a certain degree of nuisance to the surrounding environment. Noise can also result from blasting activities during construction should a hard rock be encountered which has not been anticipated. Some common impacts of noise nuisance include annoyance, sleep disturbance and interference with communication. Acceptable levels of noise are regarded to be 40 dB(A) during the night and 50 dB(A) during the day. Since construction will take place during the day only the 50 dB(A) level is of importance, and given the fact that the project area is already has no significant traversed by vehicles, noise from the site will pose little nuisance to the local communities.	Impacts will result during field cultivation though this impact will very insignificant
5	Water pollution	During the construction phase, there is a potential for ground water pollution occurring due to contaminants emanating from various waste products generated by construction activities entering the surface drainage regime and/or polluting the soil and infiltrating the underlying aquifer. Sources of contaminants include: • Increased water runoff and erosion (as discussed above) which could potentially result in siltation of downstream culverts and drainage systems; • Accidental oil and fuel leaks can occur from poorly maintained construction machinery operating around the site; • Oil and fuel spillages and leakages from transporting, storage, dispensing of petroleum products; • Wash-out water from the concrete batching plant or mixers is potentially an environmental issue if this is not contained properly and is discharged to the local drainage system; alkalinity levels of wash water can be as high as pH12; and	During operation phase, there is a potential for surface water pollution occurring due to oil spillages from project vehicles. This impact if at all it arises will be very low during this phase. Another significant impact that may arise is contamination of nearby rivers. There is a possibility of agricultural chemicals contaminating the rivers.

		• Other waste that will be produced on the construction site includes rubble from demolition of existing structures, building rubble and waste as well as worker's domestic sewage and garbage that can contaminate ground water during periods of rainfall. • Oils and greases contain hydrocarbons and/or heavy metals such as lead, chromium and cadmium, which are known drinking water pollutants. Negative impacts of this are potentially significant if specific measures are not taken for on-site waste management.	
6	Increased Erosion and sedimentation	Contractor activity carrying out site clearance, trench excavation and other earthwork as a component task for the works. • Exposed soil during construction vulnerable to erosion, significant impact if excavated surfaces are bare and unprotected from heavy rainfall.	Areas of poor soil which may not support effective vegetation. Development of sheet, rill and gully erosion on areas of bare ground exposed to water and wind erosion, potentially significant impact.
7	Increased Waste and Hazardous Materials	Numerous construction activities have potential to release waste and hazardous material: • Significant short or long-term impact from release of any hazardous materials into the environment. • Significant impact from hazards and accidents for workers not wearing PPE.	Impact will be localised or of short duration if contaminants get into a watercourse. Only a potential minor impact during operation. Hazards and accidents for maintenance workers not wearing PPE.
8	Destruction of Vegetation, Wildlife and Wildlife Habitat	As mentioned in Section 5, the proposed project activities will mainly take place in an already built up area and as such, it is devoid of significant wildlife and sensitive wildlife habitats. However, there is a presence of small mammals especially in areas that are newly opened up. Most of the pipe network will follow already existing public way leaves and as such very few ornamental trees will be affected. Thus, the impact of the proposed project on vegetation and wildlife is considered to be insignificant. During construction some vegetation will be permanently removed and areas covered by the work, other	No impact provided that flora and fauna disturbed during construction are restored

		areas will be disturbed but subsequently restored • Short term impact from areas cleared of vegetation due to construction activities but which will subsequently be revegetated. • Potential impact if tree has resident fauna habitat such as bird nests. • Potential impact on endangered or special status species.	
9	Disruption to ecology and biodiversity	Biodiversity and protected sites or proposed protected sites; rare, endangered, threatened or endemic species or their habitats. • There are no work sites affecting protected sites, rare, endangered, threatened or endemic species or their habitats. • Disturbance at work sites during construction from impacts on other receptors: air, water and land. • Transport of pollution and seeds by water during construction.	No operational impacts.
10	Archaeology and Cultural Resources	Construction activity is temporary change in land use for small areas of land taken temporarily for contractor work sites: • Minor short-term impact on air and water from work activities. • Minor short-term impact on land, wildlife and resources from clearing areas of natural vegetation especially in areas where vegetation is present. • Significant but short-term impact on community from workers, impaired access and traffic.	No operational impacts.
11		Construction activity is temporary change in land use for small areas of land taken temporarily for contractor work sites: • Minor short-term impact on air and water from work activities. • Minor short-term impact on land, wildlife and resources from clearing areas of natural vegetation especially in areas where vegetation is present.	Permanent clearance of vegetation for fields and other infrastructure: Permanent impact: land cannot be used for any other purpose

		• Significant but short-term impact on community from workers, impaired access and traffic.	

Table 6-2: Positive impacts on the socioeconomic environment

SN	Impact	Construction Phase	Phase Operation Phase
1	Improved local economy	A large sum of the Project money will be released into the local economy due to the construction activities. It is estimated that at least 30% of the Project funds shall be used up directly within the Project area. The project will provide a positive boost to the local and national economy through its multiplier effect on the construction sector, which the project intends to maximise. Specialized equipment and construction material such as structural steel components pipes, cement etc, will be procured within the country. Generation of business opportunities to local contractors	The project will provide a positive boost to the local and national economy as it will lead to the establishment of other businesses. The presence of safe clean water will contribute to local economic development
2	Increased employment opportunities	Construction will increase employment 0pportunities for skilled and unskilled residents in Mazabuka, especially youths. Skilled labour will include artisans such as plumbers, carpenters, masons while unskilled labour will include trench excavation. It is anticipated that the project will provide direct employment opportunities over the construction cycle to ensure its completion (with between 50-100 persons at any one time). The project will require skilled technicians and crafts people as well as un-skilled labour and will offer many employment opportunities for persons from within local communities, including women.	Many companies will thrive in the area due to the the presence of the estate. This will lead to increased employment opportunities for many people in the area
3	increased Public Revenue/ Taxes	The implementation of the project will increase revenue and taxes for both the central and local authorities. This includes scrutiny fees for the local planning authorities (Mazabuka District Council) and other indirect taxes resulting from the construction project such as VAT on materials and services, PAYE (construction workers and other formally employed persons will form by far the majority of created employment opportunities) as well as revenue to pension funds such as NAPSA	Same as during construction

4	Enhanced business opportunities	The presence of the project will increase business for most local products as workers will be able to buy goods and services from local people. This impact will be highly localised.	Presence of the project will lead to establishment of other businesses
5	income to Suppliers and Contractors	Minor impact on the economy of households whose members will be employed during construction	The presence of the estate will enhance household incomes through the provision of employment either permanent or temporal.

Table 6-3: Negative impacts on the socioeconomic environment

SN	Impact	Construction Phase	Phase Operation Phase
1	Stress on water resources	Apart from water requirements for construction purposes, workers and the site works will create additional demand for water. Water will be required for activities such as construction of various support infrastructures Impacts upon existing and potential use of water resource for any purpose: • Impact on availability and quantity of water used for drinking, agriculture or recreation. • Impact from use of water for construction taking water directly from rivers. • Minor impact only if the use of water for construction or at construction is in competition with other use. In reality the quantities of water to be used are small and in all probability there will be no impact	Water requirements for irrigation (2.7 million cubic meters/year), water for domestic use though these will be sourced from boreholes. Impacts upon existing and potential use of water resource for any purpose: Moderate impact on surface water because there will be an increase in volume of water pumped from Kafue River Water may not be available to downward users
2	Dust Nuisance and public health concerns	Dust generating from construction equipment may be a nuisance and may pose health risks to members of the public especially in communities where clearing and digging will be done.	No significant impacts during operational phase
3	Spread of sexually transmitted disease by migrant workforce	The project will lead to in-migration and consequently increase in local population. In terms of community health, the following concerns/impacts are likely to occur: Increased transmission of communicable diseases – due to in-migration of people Increased transmission of STIs including HIV/AIDS associated with improved livelihoods, higher levels of disposable incomes and changes to the population	This impact may not be significant during operation
4	Loss of access to forest areas	Local communities use the forest areas within the project area for various forest products. These products include firewood, mushrooms, and medicinal herbs among others. The presence of the project will mean loss of access to necessary forest products and services. The forest in area is quite homogenous	Same as during construction

5	Loss of access due to presence of farm – Site clearing and fencing	No significant impact	Because the local people access the project area for forest products, it is possible that the area is used to access other areas outside/beyond the project area. The impact is expected to be very minimal as there are many alternative routes
6	Impact on Labour and working conditions – Workers' rights and occupational health and safety for contractors and subcontractors and the entire supply chain	Workers' rights including occupational health and safety may be impacted through accidents and injuries, loss of man-hours, labour abuses and to ensure fair treatment, remuneration and working or living conditions	Same as during construction
7	Physical displacement of the people	No physical displacement will occur	No physical displacement will occur

6.2 IMPACT ASSESSMENT

6.2.1 Introduction

The impact assessment criteria, outlined in the following sub-sections, have been applied to the assessment of each of the proposed Project elements during construction and operation stages. Evaluations of environmental and social impacts within this ESIA are considered against the baseline (including its value/sensitivity). In addition to the Key Principles provided by ZEMA, and as a basis for assessing environmental impacts, the methodology applied to this ESIA has been developed using a combination of the criteria, methodology and guidance provided by international requirements/best practice. The ZEMA principles are as follows: Nature and magnitude of the intended activity and the existence of similar projects at the site or similar sites; Extent of the impact of the proposed project; Location of the project and the nature of the surrounding environment and nearby residential clusters The ESIA methodology has been adopted in combination with ZEMA requirements on ESIA content. The following factors were considered in classifying each potential impact generated by the Project as presented in Table 6-4:

- Frequency: Occurrence of activity producing the impact, e.g. continuous, intermittent or a single event/less than once per year;
- Likelihood: Probability of impact occurrence (e.g., 100%, 50%, 0%);
- Extent: Spatial extent of the impact (e.g. within 2km of site boundary, outside the Project site but within 20km, within 200km, within Zambia, outside Zambia;
- Duration: Extent in time of the impact. Short term impact (less than the life of the project), medium term impacts (equal to the lifetime of the Project) and long term impacts (greater than the lifetime of the Project);
- Magnitude: Impact magnitude defined in relation to the limit criterion specified by ZEMA or international standards where available;
- Type of impact: Positive or negative effect; direct or indirect action;
- Potential significance: A combination of all the factors described in the preceding bullet points is used to determine the type and significance of potential impact prior to mitigation. This is defined as low, medium or high.

Table 6-4 presents the terminology used throughout Section 6 to describe and rank environmental and social impacts according to the categories defined above. Figure 6-1 presents how these criteria are combined in order to assess the significance of the potential environmental and social impacts identified.

Table 6-4: Terminology used to describe environmental and social impacts

Category	Terminology	Definition
Scope of Impact		
Frequency	Frequent Infrequent Rare	Uninterrupted or on a daily basis Once or more per day Less than once per day Single event/less than once per yea
Likelihood	Certain Likely Unlikely No impact	Impact possibility estimated to be 100% Impact possibility estimated as between 50% and 99% Impact possibility estimated as < 50% Zero estimated possibility of impact
Extent	Local Provincial Regional National International	Within 2 km of the Project site Outside the Project site but <20 km away Outside the Project site but < 200 km away Within Zambia Outside Zambia
Duration	Short Medium Long	Less than the life of Project The life of project Greater than the life of Project
Magnitude(2	Very low Low Medium High Very high	Defined in relation to the limit criterion where available, e.g.: Very low: Parameter < 10% limit criterion Low: Parameter 10 to <50% limit criterion Medium: Parameter 50 – 100% limit criterion High: Parameter 100 – 200% limit criterion Very High: Parameter > 200% limit criterion. Or, for qualitative assessments: Very low: No degradation/adverse alteration to resource/receptor Low: Minor degradation/adverse alteration to resource/receptor Medium: Moderate degradation/adverse alteration to resource/receptor. High: Significant degradation/adverse alteration to resource/receptor. Very High: Permanent degradation/detrimental alteration to resource/receptor.
Type of Impact		
Effect	Positive Negative	Beneficial impact Adverse impact
Action	Direct Indirect	Impact caused solely by activities within scope of Project Impact which does not result directly from by activities within the scope of Project, but which has a connection with the Project's presence.
Potential Significance		
Significance	Low Medium High	Any low magnitude impact, or medium magnitude impact that is unlikely to occur or is of short duration. Any medium magnitude impact that is certain or likely to occur and of medium or long duration. Also, any high magnitude impact that is unlikely to occur, of short duration, or local in extent. Any high magnitude impact that is certain or likely to occur, of medium or long duration, and regional in extent
(1)	All terms are characteristics of the impact(s). For example, duration refers to duration of impact, not the activity causing it.	

(2)	As indicated, the impact magnitude for some environmental aspects can be defined in relation to the limit criterion specified by ZEMA or international regulations, or best practices when national standards are not available. However, in the absence of definitive quantitative criteria, a qualitative assessment of the magnitude is used relating to the impact type.

6.2.2 Impact Assessment Reporting

The findings of the assessment process for each environmental aspect are presented in Table 6–4 with the significance of any predicted environmental impacts being defined as Low, Medium or High. Impacts predicted as being of medium to high significance are then assessed against appropriate mitigation measures to predict the residual impact significance. Mitigation Measures and Reporting

Two types of mitigation measures are identified in this ESIA Report in order to alleviate or manage the potential impacts identified:

- Type 1: Measures to be taken to manage potential impacts considered to be of medium or high significance. Following application of these measures, residual impacts are expected to be lower.
- Type 2: Recommended measures that could be taken to manage impacts classified as low/insignificant. These measures can be considered as good management practices.

6.2.3 Evaluation of Impact Significance

The significance of the identified impacts was determined by combining the perceived frequency of occurrence of the source of impact; the duration of the impact; the severity of the impact; the spatial extent of the impact; and the sensitivity of the area being impacted upon. The sections below give a detailed description of how each of the aspects was assessed.

6.2.4 Ranking of the Significance of Impacts

The significance of the impacts was ranked by taking into consideration four main factors namely: -

- Duration of the Impact: Which defines whether the impact is temporal or permanent;
- Spatial extent of the impact: Which defines the area to be affected by the impact;
- Severity of the Impact: Which is the severity/beneficial or simply the state or extent of the badness of the impact. It takes into consideration among other things, sensitivity of the area being impacted upon; and
- The likelihood of occurrence: Which looks at the probability of the impact occurring and frequency of occurrence where it occurs.

The four criteria above were ranked with scores assigned to each as presented in Table 6-5. To come up with the overall significance of the impact, the scores for each impact were considered in two categories namely "effect" (which comprises duration, special extent and severity) and "likelihood of occurrence" (Table 6-6) The total scores recorded for the 'effect' and 'likelihood' were then read off from the matrix table presented in Table 6-7

Table 6-5: Description of overall significance ratings

SIGNIFICANCE RATING	DESCRIPTION	SCORE RANGE
LOW	This refers to an impact with acceptable effects for which mitigation is desirable but not essential. The impact by itself is insufficient to prevent programme approval. Effects from these impacts do not go beyond medium term	4 to 7
MODERATE	Impacts for which mitigation measures are required though impact cannot prevent programme approval. The impacts can extend up to long term	8 to 11
HIGH	This is a serious impact which, if not mitigated, may prevent programme approval (if negative). These impacts can result in major and usually long-term effects to the environment	12 to 15
VERY HIGH	This is a very serious impact which if negative may, by itself, be sufficient to prevent programme implantation. This type of impact results in permanent change and usually has no mitigation measures	16 to 20

Table 6-6: Ranking of evaluation criteria

EFFECT	**DURATION OF IMPACT**		SCALE
	Short Term	Confined to construction phase 1	1
	Medium Term Up to three years 2	Up to three years 2	2
	Long Term 3 to 20 years 3	3 to 20 years 3	3
	Permanent Above 20 years	Permanent Above 20 years	4
	SPACIAL EXTENT OF THE IMPACT		
	Localised	At localised scale covering a few hectares	1
	Study	Programme area including immediate environment	2
	Regional District or provincial	District or provincial level	3
	National Country level	Country level	4
	International	International Beyond national boundaries	5
	SEVERITY		
	Slight	Little impact	1
	Moderate	Moderate impact	2
	Severe	High impact	3
	Very severe	Very high impact	4
LIKELIHOOD	**LIKELIHOOD OF OCCURRENCE**		
	unlikely	Will not Occur	1
	May Occur	There is a small chance of this impact	2
	possible	The likelihood of this impact occurring is probable	3
	Certain	The likelihood is that this impact will definitely occur	4

Table 6-7: Ranking of evaluation criteria matrix

LIKELYHOOD		EFFECT													
		3	4	5	6	7	8	9	10	11	12	13	14	15	16
	1	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	2	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	3	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	4	7	8	9	10	11	12	13	14	15	16	17	18	19	20

6.3 SUMMARY OF IMPACT ASSESSMENT

The identified impacts are summarised in Table 6-8. The overall significance of impacts, based on the above evaluation criteria, is presented

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

Environmental and Social Management Plan (ESMP)

This Environmental and Social Management Plan (ESMP) (Table 7-1) represents KASCOL's commitment to address and manage the potential negative and positive impacts associated with the proposed commercial farming project, and defines the standards andguidelines to be achieved in terms of environmental legislation, policy and standards. TheESMP involves the protection, conservation and sustainable use of the various elementsor components of the environment. The ESMP for the proposed project provides all the details of project activities, impacts, mitigation measures, time schedules, costs, responsibilities and commitments proposed to minimize environmental impacts of activities, including, monitoring and evaluation and environmental audits during implementation and decommissioning phases of the project.

The ESMP is a very important output of an ESIA since it provides the framework or checklist for project monitoring and evaluation/audit. Mitigation measures provided in thissection are aimed at making changes in any of the following ways: project materials, rawmaterials, project sites to mention but a few. The main objectives of the ESMP are to:

- Ensure the project is compliant with applicable national environmental and social legal requirements;
- Identify the required mitigation measures that are needed in order to reducenegative impacts and enhance positive ones;
- Ensure that all mitigation measures and recommendations identified duringthe environmental impact assessment are incorporated into documents that are referenced and expanded if necessary during the various phases of the project;
- Outline the mitigating/enhancing, monitoring, consultative and institutionalmeasures required to prevent, minimize, mitigate or compensate for adverse environmental and social impacts and/or to enhance projectrelated beneficial impacts;
- Address human resource requirements to ensure implementation of the ESMP is possible.

To achieve the above, the ESMP ensures that:

1. ***During project planning and design***, all mitigation measures identified in the ESIA that can be incorporated into the planning and design of the project are considered during the detailed planning and design phase.
2. ***During construction*** all constraints, restrictions and actions required to minimize construction related impacts are implemented.
3. ***During commissioning and operation***, detailed operating procedures are developed so that all constraints, restrictions and actions required to minimize impacts caused by commissioning and operation are developed, implemented and monitored for all aspects of the project.
4. ***During the life of the project,*** continue to enhance positive impacts and ensuremitigation for negative impacts. An important component of this monitoring, evaluation and communication of findings, and adherence to the principle of continued improvement.
5. ***During decommissioning,*** detailed procedures are developed to ensure that the project area

is rehabilitated to an acceptable and previously agreed-to level.

The ESMP is an umbrella plan that describes the management of environmental, health and safety (EH&S) matters and that will be complemented and augmented by a number of sub plans as described in this report.

7.1.1 Implementation of Environmental and Social Measures

Ultimately, the Project Owner KASCOL is responsible for the implementation of all environmental and social mitigation measures identified and described in the ESIA. However, these measures can be grouped in two main categories as follows, for which responsibilities will be organized differently:

- Measures directly related to construction and the construction site: implementation of most if not all of these measures will be attributed directlyto the Contractor (and the Contractor will have to make sure, if the case arises, that' his sub-contractors will also comply with them). In these cases KASCOL's responsibility will mainly be the control and monitoring of the Contractor's performance. The relevant measures – and sub-plans to be prepared – for this category are described in Section 7.3.7
- Measures not related to construction activities and/or the construction site:Here, the Owner will be directly responsible for implementation, which willbe done either by the Project Implementation Unit (PIU), the Owner's Engineer or a third party (but usually not the contractor) specially appointedby the Owner for this purpose.

7.1.2 Summary of Main Impacts and Mitigation Measures

In this ESIA Report, environmental risks and impacts likely to emanate from Project elements or Project related activities were described. This Section takes up the synopsis of the impacts, with their importance, and lists the required or proposed mitigation measures, where such measures seem necessary for minimizing the impact as far as possible or reducing the risk to an acceptable level. The mitigation measures for impacts with 'medium' to 'high' significance have been summarised in Table 7-1.

7.1.3 Overall Impact Evaluation

The main conclusions of the analysis in this Report are the following:

- Most impacts are rather small and easily mitigated, if mitigation is required at all
- There is one area of important impacts, which need to be addressed in detail and where mitigation is required. These are:

- The possible famers that benefits from the runoff water from the channels that maybe decommissioned must adequately be taken into consideration.
- There is no impact of the category "strong negative, mitigation not possible", whichwould have to be considered as a no-go for the project.

7.1.3.1 Environmental and Social Monitoring Plan

Monitoring of all the environmental protection measures described in the ESMP has to be carried out in the way outlined. The aims of monitoring are the following:

- To check on compliance with the conditions set forth and standards to be met;
- To inform the relevant authorities on observed cases of non-compliance;
- To propose corrective measures for such cases;
- To check on the success of these measures.

The environmental and social monitoring plan is described in Table 7-1.

Table 7-1: Environmental and Social Management Plan (ESMP)

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring andManagement Plans (S-MP)
Digging foundations for pipe network and office buildings	Construction activities and transportation activities	Air pollution (pollution (dust, exhaust gases) mainly by nitrogen oxides (NOx) and Particulate Matter (PM10)	**high - negative** impact, localised to construction site, and limited to the duration of construction	• Appropriate warning shall be given to the general public and drillinglocations shall be appropriately secured before blasting. • All heavy equipment and machinery shall be fitted with air pollution control and noise dampening devices that are operating correctly and that can operate within the Zambian statutory requirements for the areas of operation (e.g. sensitive locations besides schools or open country). • Works contractor with PMC will conduct consultation with the community towarn of potential discomforts, contractor methods of reducing pollution anddiscuss additional methods households may wish to further reduce discomforts. • Use of a water bowser to reduce the amount of dust generated.	**Low negative** reduction of quantity of exhaust gas, dust; will be within legal limits	Environmental, Health and Safety Management and Monitoring of the Contractor Equipment Maintenance Management Plan Air Quality Management Plan
	Construction activities	Soil pollution	Negative	• The maintenance of machinery and equipment has to be done in workshops; liquids including cleaning water should be collected in tanks. • Storage of fuel and lubricants has to be in tight containers placed on sealedsurfaces underneath a roof. The storage has to be equipped with all safety measures to prevent oil spilling including firefighting equipment. The area needs to be marked. • Sufficient quantities of oil absorbent have to be stocked and have to be easily accessible in case of an oil spill. The contaminated absorbent has tobe disposed of properly. • Hazardous waste has to be stored in designated closed tanks or areas. • Solid waste generated during will be properly treated and safely disposed ofonly in demarcated waste disposal sites. • All activities which could contaminate the soil have to be carried out on sealed surfaces. If accidental spillage occurs, the contaminated soil has tobe excavated and disposed of properly (final treatment or disposal shall be done by a suitably qualified company and in accordance with the Zambian Hazardous Waste Management Regulations of 2001).	small negative reduced risk of soil contamination; unexpected spills and leakages will be treated properly and fast, the contamination of soil will be locally and due to clean-up mechanisms notspread into the surrounding or drained into the water and/or groundwater	Environmental, Health and Safety Management and Monitoring of the Contractor Equipment Maintenance Management Plan Waste Management Plan Hazardous Material Management Plan Pollutant Spill ContingencyPlan

	Construction activities, movement of vehicles and heavy machines	Increased noiselevels	Negative	• Use of mufflers, silencers, and screens to minimize noise from constructionactivities; • Vehicle movements and operation of loud machinery and equipment will berestricted to daylight hours	None	Occupational Health andSafety Plan Health and Safety Management Plan duringoperation

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring and Management Plans (S-MP)
Vegetation clearance	Constructio narea	Soil erosion Main risks: Soilerosion: • Creation of open and erosion-prone surfaces during construction phase (amongst others whilst levelling the ground of the project site). In the absence of vegetation cover the soil will become more susceptible to erosion. • Small negativeeffect (visibility, change in morphology). While a natural process, erosion can locally be accelerated by the project.	Medium - Negative	• Fill should be compacted properly in accordance with the Specification. • Unsuitable and surplus excavated materials shall not be disposed tolocations or in a way that it will subsequently be prone to erosion. • Protect slopes from erosion, where bare slopes are exposed as a consequence of the works limit the period of exposure to water or wind erosion and provide temporary or the designed slope protection at the earliest opportunity, measures shall include covering with sheeting, bioengineering (seeding and planting) geotextiles, gabion boxes and mattress, riprap and other physical measures that will hold unstable soil. • Minimise or protect areas of bare soil throughout the rainy season. • Precautions as necessary to prevent erosion of areas under construction throughout the rainy season including excavation/fill/etc. any areas that cannot be completed prior to the rains. • Planting with indigenous species. • Exposed areas shall be protected using conventional civil engineering structures in conjunction with bioengineering techniques similar to but notlimited to those recommended above for slope protection. • In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion. Measures shall be taken to preventponding of surface water and erosion of slopes. Newly eroded channels shall be backfilled and restored to natural contours. • Restoring all areas used temporarily for the works immediately these areasare no longer required including borrow areas and temporary lay down areas.	Low - negative The erosion prevention control measures during construction and operation will considerably reduce the soil erosion	Environmental, Health and Safety Management and Monitoring of the Contractor Erosion Control Plan Site Rehabilitation / Re-VegetationPlan Excavation Spoil / Fill Management Plan

	Constructio nactivities	Loss of wildlife habitat Especially in areaswhere there will beclearing of some regenerating trees	Medium – Negative Impact of minor importance since no critical natural habitats and area not of major importance for conservation of biodiversity	• Confine vegetation clearance to areas where structures will be built • Do not clear vegetation or damage vegetation outside of the worksite, do notcut trees, damage root system or lop branches without prior consent of localauthority and forest department • No tree cutting during the nesting season. • If identified, rare, endangered, threatened or endemic species or their habitats to be persevered or transferred as per ZEMA instructions. • Avoid stock piling of materials on vegetated areas. • Monitor stockpiling. • Plant appropriate seedlings, indigenous to the area to regenerate vegetationto pre-project state. • Use of soil reinforcement where necessary to promote establishment of vegetation cover, biodegradable soil reinforcements can be used. • Works contractor responsible for vegetation until established.	Very small -none	Site Rehabilitation / Re-Vegetation Plan

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring andManagement Plans (S-MP)
Generation of non and hazardous waste	Constructio n and some operation activities	Water pollution Contamination of soil, water, health risk; due to: • Domestic waste (mainly during construction). • Liquid waste (from maintenance of all Lorries and construction machinery). • Hazardous waste (e.g. from	Negative	• No solid waste, fuels or oils should be discharged into water flows. • Test water samples from dewatering operations for contaminants according to ZEMA, Zambia guidelines for discharge of effluents, which when exceeded, advice on appropriate discharge should be sought. • Hold and store sanitary and cleaning wastes in appropriate containers to bedisposed of at approved sites. • Park vehicles preferably on paved platforms. • Fuel storages should not leak, and should be periodically monitored, andrepaired or replaced when necessary. • Sites for cleaning, fueling and maintaining vehicles should be able toprevent leakage (e.g. paved). • Maintain fuel and clean vehicles and equipment at workshops/sites with adequate leakage prevention (e.g. impermeable surface, settlers and oilseparator). • Storing hydrocarbons and hazardous materials on impervious ground undercover and constructing the storage area as a spill tray to avoid spread of accidental spills.	**small negative / none** appropriate waste handling measures result in minimisation of contamination of the environment and in improved health protection	Waste Management Plan Hazardous Material Management Plan

		maintenance of machinery).				
	Operation activities	Odours generated and released to the surrounding area during the process ofchemical spray	Medium - Negative	• Ensure appropriate warning is given to the communities nearby • Apply when the wind is calm • The perimeter of the proposed site should be vegetated with trees and plants of varying heights thereby forming windbreaker and reduce dispersion of odour;	Low - Negative	Waste water managementplan
	Operation activities	Contamination of nearby streams/rivers. Thereis a possibility of agriculture chemicals flowing into nearby rivers or streams	Medium - Negative	• Regular monitoring and sampling of the water of the the receiving waterbodies;		Water pollution prevention plan, Monitoring plan

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring andManagement Plans (S-MP)
Handling, Storage and disposal of Hazardous Materials	Constructionphase	Impacts on workers'health	Negative	• Storing hydrocarbons and hazardous materials on impervious ground undercover and constructing the storage area as a spill tray to avoid spread of accidental spills. • Providing safe ventilation for storage of volatile chemicals. • Restricting and controlling access to areas containing hazardoussubstances. • Site all hot mix plant, crushing plant, workshops, depots, and temporary workers accommodation facilities in approved locations. • Using refrigerants and fire extinguishing agents in accordance with the'Montreal Protocol'. • PPE for operatives. • Document safe disposal of hazardous or contaminated waste; includingdisposal sites and volumes. • Identify, in coordination with ZEMA as required, potential safe disposal sites for hazardous or contaminated waste. Investigate the environmental conditions of the disposal sites and prepare a recommendation for most suitable and safest site(s). • Designate disposal sites to be used in the project.	Small/None Once mitigation measures are implemented, remaining impact will be very small if none	Waste Management Plan Hazardous Material Management Plan
Movement of heavy trucks,vehicles and machines	Constructionphase	Injuries to pedestrians, increased road trafficaccidents	Negative	• All motorists will be encouraged to move within the speed limit. Adequatesignage will be installed along the roads within the project area • Entry into the project area will be restricted to workers only • Contractor will ensure that alternative spaces in communities will be provided for public vehicles to stop and pick-up passengers safely	Small/None Once mitigation measures are implemented, remaining impact will be very small if none	Traffic management plan

Public consultation	Increased awareness about the project. All types of potential effects of the Project on the directly affected population. Knowledge about the Project by allinterested parties.	Impact will bemedium	Positive or negative	Providing good and timely information on the project: • information on ongoing and planned works • receiving of and dealing with complaints by affected or interested public • public disclosure of relevant documents	**mostly positive** adequate solving of any problems that might arise with any stakeholders	Public consultation and disclosure plan (public consultation and community relation management plan)

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring andManagement Plans (S-MP)
Occupational Health and Safety	Mainly Constructio nPhase and Operation Phase	Work accidents, occupational diseases (skin irritation, noise, etc.)	Negative	• Develop occupational health and safety procedures such as wearing ofprotective equipment, proper handling of hazardous substances, etc. • All workers have to use the relevant protective equipment (helmet, gloves,goggles, work boots, masks, ear plugs, etc.), provided free of charge. • All restricted plant facilities have to be labelled with caution signs, especiallythose with potential risk for workers. Label transmission line poles indicatingdanger, high voltage. • All construction areas shall be marked and fenced to avoid accidents involving unauthorized people. Fence off all areas such as excavation pits,quarries, etc. to prevent accidents. • First aid kits and facilities need to be available at the construction site for fast action if an accident occurs. Workers should be provided with First AidTraining. • Accessible consultation sheets for review in case of contingency or emergency situations. These should have phone numbers for police, fire fighters, Hospital, personnel supervisor or project leader.	none / small positive reduction of accidents, health protection, appropriate reaction in case an accident happens	Occupational Health andSafety Plan Health and Safety Management Plan duringoperation

				• Prepare a scheme of the evacuation routes and where the fire extinguishers are located within the plant and place them at conspicuous places. • Maintenance of machinery (preventive and corrective; during constructionand operation). • Assign a special area for food consumption during construction. • Workshops and camp site must have		
Presence of the project in the area	Construction and Operation phases	Increased employment opportunities	Small - positive	• Workers will be employed locally, where possible, without discrimination ofgender, race, religion, and for unskilled positions for low literate. • Avoiding conflicts with local communities by providing resources for worker requirements at works contractor's temporary operational sites. • Avoiding the potential spread of vector borne diseases and communicable diseases, such as STIs and HIV/AIDS by controlling the contact of workerswith awareness programmes, and regulation. • Achieve 30% minimum target employment for women (including equal remuneration for similar work) jobs are targeted for women in order to promote and increase opportunities and participation for women duringconstruction. • Opportunities will be for skilled, semi-skilled and unskilled positions	High - positive	Recruitment plan
	Construction and Operation phases	Enhanced business opportunities	Positive or negative	• Encourage workers to buy from locals	Mostly positive - impact will be high after enhancement measures	N/a

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring and Management Plans (S-MP)
	Construction and Operation phases	Income to Suppliers and Contractors	Medium - Positive	• Source local materials, skills and services. These include plant (pump sets, switch gear, instrumentation and chemicals) steel and plastic, cement, sand,etc • Earth materials needed for construction, for example, aggregate (stones andsand) are obtained from quarry operations. Conscious or unwitting purchase of these materials from unlicensed operations indirectly promotes environmental degradation at illegal quarry sites and can cause medium- to long-term negative impacts. It should therefore be a contractual obligation for contractors to procure construction materials from quarries legitimately licensed by Mazabuka District Council and duly approved by ZEMA.	Mostly positive - impact will be high after enhancement measures	Procurement and contractingplan
	Construct ionphase	Pressure on ExistingResources	Medium - Negative	• Through inductions and tool box meetings, KASCOL will ensure that contractors are conversant with resource conservation practices in all project activities. Conservation awareness will focus on water use. • The Contractor and KASCOL will acquire water abstraction permits with conditions to guide the amount of water to be abstracted as per WARMA requirement. • Earth materials will be sourced from ZEMA-approved sources in a manner that reduces environmental and social impacts. Approved sources are knownand easy to monitor and regulate by both the district local administration and ZEMA. • Catchment management plans are being developed with the aim of conserving and allowing recharge of water resources. • Water conservation measures will be encouraged: saving water is an efficientway of reducing the overuse of ground water resources. It is not only decreases the amount of the water withdrawn, but may also reduce the threatof pollution.	Small/None Once mitigation measures are implemented, remaining impact will be very small if none	None
	Construct ionphase	Creation of Wealth	Medium - Positive	• Encourage workers to support local business and services such as foodvendors	Mostly positive - impact will be high after enhancement measures	N/a

Influx of workers to the area	Construct ionphase	Increased market forlocal goods	Positive	• Encourage workers to buy from local people for goods and services thatarea available in the area	Medium – positive after enhancement	N/a

Aspect	Project Component	Impact and significance before mitigation/ enhancement	Importance	Mitigation/Enhancement Measure	Remaining impact after mitigation/ enhancement	Related Sub Monitoring andManagement Plans (S-MP)
	Construction phase	Increased conflict between workers and locals	Negative	• Preparing workers to avoid conflict situations through orientation and awareness programs. • Avoiding damage to utilities by ensuring that vehicles and equipment are operated by trained personnel, and that operations are adequately supervised.	None	Public consultation and disclosure plan (public consultation and community relation management plan)
	Construction phase	Stress on public health facilities as there will be an influx of people looking for jobs	Negative	• Give first priority to local members of the community when employing • Support government programs on health such as rehabilitation and construction of health facilities	None	Recruitment plan Public consultation and disclosure plan (public consultation and community relation management plan)
	Construction phase	Spread of communicable diseases	Medium - negative	• Health education on the dangers and prevention of communicable • Insert prevention intervention clauses in construction contracts. • Maximize employment of local labor for construction work. • Focus on behavior change for workforce, not just raising awareness • Tailor messages to the general workforce, as well as men and women • Provide male and female condoms for construction workers. • Educate construction workers on how to avoid STI, to recognize common STI symptoms, and to seek treatment via confidential referral systems. • Publicize to workers the existence of anonymous VCT service (testing, pre-test, and post-test counseling). • Educate construction workers on how to avoid Opportunistic Infections, to recognize common Opportunistic Infections symptoms, and to seek treatment • The Contractor in collaboration with Ministry of Health shall take measures to educate and sensitize the labor force on the risks of communicable diseases (malaria, TBC, STDs, including HIV/AIDS etc.). How infections are transmitted, how to recognise symptoms, what should be done and on prevention measures. Male and female condoms shall be distributed to workers by the Contractor free of charge. • Overall good housekeeping contributes to maintain hygienic and safe conditions on the construction site.	Small - negative	Recruitment plan Public consultation and disclosure plan (public consultation and community relation management plan)

Table 7-2: Environmental and Social Monitoring Plan

Aspect	Impact	Mitigation/Enhancement Measure	Frequency of Monitoring	Time-Frame	Performance Indicator	Responsible Person	Cost (US$)
Digging foundations for pipe network and office buildings	Air pollution (pollution (dust, exhaust gases) mainly by nitrogen oxides (NOx) and Particulate Matter (PM10)	• Appropriate warning shall be given to the general public and drilling locations shallbe appropriately secured before blasting. • All heavy equipment and machinery shall be fitted with air pollution control and noisedampening devices). • Works contractor will conduct consultation with the community to warn of potentialdiscomforts, contractor methods of reducing pollution and discuss additional methods households may wish to further reduce discomforts. • Use of a water bowser to reduce the amount of dust generated.	Weekly	Throughout construction phase	Digging and drilling done after appropriate warning is given	Contractor (Implement ation)	10,000
	Soil pollution	• Regular servicing and maintenance of equipment and vehicles. • Contaminated soil shall be removed/treated immediately	Whenever itoccurs	Throughout construction phase	Soil pollution within standard	Contractor (Implement ation)	10,000
	Generation ofnoise	• Use of mufflers, silencers, and screens to minimize noise from construction activities; • Vehicle movements and operation of loud machinery and equipment will be restrictedto daylight hours	Daily	Throughout construction phase	Noise level within standard	Contractor (Implement ation)	15,000
	Disturbance to Archaeology / Cultural Resources	• Close monitoring during construction to avoid accidental damage including damagefrom vibration. • Anything uncovered is reported to NHCC	Daily	Throughout construction phase		Contractor (Implement ation)	10,000

Aspect	Impact	Mitigation/Enhancement Measure	Frequency of Monitoring	Time-Frame	Performance Indicator	Responsible Person	Cost (US$)
Vegetation	Soil erosion	• Fill should be compacted properly in accordance with the Specification. • Unsuitable and surplus excavated materials shall not be disposed to locations or in away that it will subsequently be prone to erosion. • Protect slopes from erosion, where bare slopes are exposed as a consequence of the works limit the period of exposure to water or wind erosion and provide temporary or the designed slope protection at the earliest opportunity, measures shall include temporary or permanent drainage including check dams and may also include covering with sheeting, bioengineering (seeding and planting) geotextiles, gabion boxes and mattress, riprap and other physical measures that will hold unstable soil. • Minimise or protect areas of bare soil throughout the rainy season. • Precautions as necessary to prevent erosion of areas under construction throughout the rainy season including excavation/fill/etc. any areas that cannot be completed prior to the rains. • Planting with indigenous species. • Exposed areas shall be protected using conventional civil engineering structures inconjunction with bioengineering techniques similar to but not limited to those recommended above for slope protection. • In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion. Measures shall be taken to prevent ponding of surfacewater and erosion of slopes. Newly eroded channels shall be backfilled and restoredto natural contours. Check dams and/or drop structures with designed stilling basinswill be provided on steep slopes. • Restoring all areas used temporarily for the works immediately these areas are nolonger required including borrow areas and temporary lay down areas.	Weekly at active worksites and thereafter as necessary during the period of use but not less than quarterly.	Throughout constructionphase		Contractor (Implementation)	5,000
	Loss of wildlife habitat	• Minimise damage to trees. • Do not clear vegetation or damage vegetation outside of the worksite, do not cut trees, damage root system or lop branches without prior consent of local authorityand forest department • No tree cutting during the nesting season. • If identified, rare, endangered, threatened or endemic species or their habitats to bepersevered or transferred as per ZEMA instructions. • Avoid stock piling of materials on vegetated areas. • Monitor stockpiling. • Plant appropriate seedlings, indigenous to the area to regenerate vegetation to pre-project state. • Use of soil reinforcement where necessary to promote establishment of vegetationcover, biodegradable soil reinforcements can be used. • Works contractor responsible for vegetation until established.	Weekly at active worksites and thereafter as necessary during the period of use but not less than quarterly	Throughout constructionphase	Number of trees planted	Contractor (Implementation)	10,000

	Disruption to ecology and biodiversity	• Supporting re-vegetating and environmental programmes	Annually	Throughout operation phase	Number of environmental programs supported	KASCOL (Implementation)	15,000

Aspect	Impact	Mitigation/Enhancement Measure	Frequency of Monitoring	Time-Frame	Performance Indicator	Responsible Person	Cost (US$)
Generation of non and hazardous waste	Water pollution	• No solid waste, fuels or oils should be discharged into water flows. • Test water samples from dewatering operations for contaminants according to ZEMA,Zambia guidelines for discharge of effluents, which when exceeded, advice on appropriate discharge should be sought. • Hold and store sanitary and cleaning wastes in appropriate containers to be disposedof at approved sites. • Park vehicles preferably on paved platforms. • Fuel storages should not leak, and should be periodically monitored, and repaired orreplaced when necessary. • Sites for cleaning, fueling and maintaining vehicles should be able to prevent leakage(e.g. paved). • Maintain fuel and clean vehicles and equipment at workshops/sites with adequate leakage prevention (e.g. impermeable surface, settlers and oil separator). • Storing hydrocarbons and hazardous materials on impervious ground under cover and constructing the storage area as a spill tray to avoid spread of accidental spills.	Weekly	Throughout constructionphase	Pollution within acceptable limits	Contractor (Implementation) ZEMA (enforcement)	Constructioncost
Handling, Storage and disposal of Hazardous Materials	Impacts on workers' health	• Storing hydrocarbons and hazardous materials on impervious ground under cover and constructing the storage area as a spill tray to avoid spread of accidental spills. • Providing safe ventilation for storage of volatile chemicals. • Restricting and controlling access to areas containing hazardous substances. • Site all hot mix plant, crushing plant, workshops, depots, and temporary workersaccommodation facilities in approved locations. • Using refrigerants and fire extinguishing agents in accordance with the 'MontrealProtocol'. • PPE for operatives. • Document safe disposal of hazardous or contaminated waste; including disposalsites and volumes. • Identify, in coordination with ZEMA as required, potential safe disposal sites for hazardous or contaminated waste. Investigate the environmental conditions of thedisposal sites and prepare a recommendation for most suitable and safest site(s). • Designate disposal sites to be used in the project.	Daily	Throughout constructionphase	Number awareness programmesconducted	Contractor (Implementation) ZEMA (enforcement)	20,000
Abstraction of water	Stress on water resources	• Pump amount in accordance to the water permit from WARMA • Work closely with WARMA • Ensure that only permitted amounts of water is pumped • Monitor the pumping of the water from the lake so that it is within standard. □	Monthly	Throughout operation phase	Pump permitted amounts	KASCOL (Implementation)WARMA (Enforcement)	3000

Aspect	Impact	Mitigation/Enhancement Measure	Frequency of Monitoring	Time-Frame	Performance Indicator	Responsible Person	Cost (US$)
Movement of trucks, and heavy vehicles	Injuries to pedestrians, increased road traffic accidents	• All motorists will be encouraged to move within the speed limit. Adequate signage willbe installed along the roads within the project area • Entry into the project area will be restricted to workers only • Contractor will ensure that alternative spaces in communities will be provided for publicvehicles to stop and pick-up passengers safely	Daily	Throughout construction	Incidents of accidents	Contractor (Implementation)	5000
Public consultation	All types of potential effects of the Project on the directly affected population. Knowledge about the Project by allinterested parties.	Providing good and timely information on the project: • information on ongoing and planned works • receiving of and dealing with complaints by affected or interested public • public disclosure of relevant documents	Monthly andas when as the complaint occurs	Throughout construction	Number of consultation meetings held.	Contractor (Implementation)	8,000
Occupational Health and Safety	Work accidents, occupational diseases (skin irritation, noise,etc.)	• Develop occupational health and safety procedures such as wearing of protective equipment, proper handling of hazardous substances, etc. • All workers have to use the relevant protective equipment (helmet, gloves, goggles, work boots, masks, ear plugs, etc.), provided free of charge. • All restricted facilities have to be labeled with caution signs, especially those with potential risk for workers • All construction areas shall be marked and fenced to avoid accidents involving unauthorized people. Fence off all areas such as excavation pits, quarries, etc. to prevent accidents. • First aid kits and facilities need to be available at the construction site for fast action if an accident occurs. Workers should be provided with First Aid Training. • Accessible consultation sheets for review in case of contingency or emergency situations. These should have phone numbers for police, fire fighters, Red Cross, personnel supervisor or project leader. • Prepare a scheme of the evacuation routes and where the fire extinguishers are located within the plant and place them at conspicuous places. • Maintenance of machinery (preventive and corrective; during construction and operation). • Assign a special area for food consumption during construction. • Workshops and camp site must have	Daily	During construction and operation		Contractor (Implementation)	12,000

Aspect	Impact	Mitigation/Enhancement Measure	Frequency of Monitoring	Time-Frame	Performance Indicator	Responsible Person	Cost (US$)
	Risk of Accidents	• Contractor will adopt best transport safety practices (Journey Management Plans (JMPs)) with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public by: employing safe traffic control measures, including road signs and flagmen/traffic guides to warn of dangerous conditions and children crossings; and setting speed limits on all access roads in the project area willbe 40km/h for light vehicles and 30 km/h for heavy vehicles. Through the JMPs, optimum routes from material storage areas to the construction sites will be identifiedto avoid sensitive receptors such as schools and hospitals.		Throughout construction	Journey management document	Contractor (Implementation)	20,000
Presence of the project in the area	Increased employment opportunities	• Workers will be employed locally, where possible, without discrimination of gender, race, religion, and for unskilled positions for low literate. • Avoiding conflicts with local communities by providing resources for worker requirements at works contractor's temporary operational sites. • Avoiding the potential spread of vector borne diseases and communicable diseases, such as STIs and HIV/AIDS by controlling the contact of workers with awareness programs, and regulation. • Achieve 30% minimum target employment for women (including equal remuneration for similar work) jobs are targeted for women in order to promote and increase opportunities and participation for women during construction. • Opportunities will be for skilled, semi-skilled and unskilled positions	Monthly	Throughout construction	Number of locals employed	Contractor (Implementation)	Constructioncosts
	Enhanced business opportunities	• Encourage workers to buy from locals shops	N/a	N/a	N/a	N/a	N/a
	Changes in land use, i.e. from a natural area to tank sites in some areas. Establishment of new office	• For mitigation measures regarding areas to be occupied temporarily or permanently by project structures and/or related activities, see entries for Vegetation • New facilities should be designed to be integrated in the landscape to the extentpossible.	N/A	Throughout construction	Building within required standards	Throughout construction	10,000

	blocks						
Influx of workers to the area	Increased market for local goods	• Encourage workers to buy from local people for goods and services that area availablein the area	N/a	N/a	N/a	N/a	N/a
	Increased conflict between workers andlocals	• Preparing workers to avoid conflict situations through orientation and awarenessprograms. • Avoiding damage to utilities by ensuring that vehicles and equipment are operated bytrained personnel, and that operations are adequately supervised. • Informing the affected community of the schedule if utilities have to be moved orservices are interrupted.	Monthly	Throughout construction	N/a	Throughout construction	N/a

Aspect	Impact	Mitigation/Enhancement Measure	Frequency of Monitoring	Time-Frame	Performance Indicator	Responsible Person	Cost (US$)
	Stress on public health facilities as there will be an influx of people looking for jobs	• Give first priority to local members of the community when employing • Support government programs on health such as rehabilitation and construction ofhealth facilities	N/a	N/a	N/a	N/a	N/a
	Spread of communicable diseases	• Health education on the dangers and prevention of communicable • Insert prevention intervention clauses in construction contracts. • Maximize employment of local labour for construction work. • Focus on behavior change for workforce, not just raising awareness • Tailor messages to the general workforce, as well as men and women • Provide male and female condoms for construction workers. • Educate construction workers on how to avoid STI, to recognize common STI symptoms, and to seek treatment via confidential referral systems. • Publicize to workers the existence of anonymous VCT service (testing, pre-test, and post-test counseling). • Educate construction workers on how to avoid Opportunistic Infections, to recognize common Opportunistic Infections symptoms, and to seek treatment • The Construction Supervisor in collaboration with Ministry of Health shall take measures to educate and sensitize the labour force on the risks of communicable diseases (malaria, TBC, STDs, including HIV/AIDS etc.). How infections are transmitted, how to recognize symptoms, what should be done and on prevention measures. Male and female condoms shall be distributed to workers by the Contractorfree of charge. • Overall good housekeeping contributes to maintain hygienic and safe conditions on the construction site.	regular intervals	throughout the construction period	Reduction in the spread of communicable diseases	Contractor (Implementation)	10,000

7.1.3.2 Description of the ESMP

The Environmental and Social Management Plan (ESMP) provides an overall approach formanaging and monitoring environment and social issues during construction and operation. It describes the institutional framework and resource allocations required to implement theenvironmental and social management and monitoring plans for the Project.

This Section of the ESMP Report presents the framework that will be developed for the Project and under which the Contractor will be required to operate.

7.1.4 Legal Framework

Section 2 of the ESIA Report provides a list of the relevant laws on protection of the environment, occupational health and safety.

Among the international standards for the commercial farming project are the InternationalFinance Corporation (IFC) Policy, and Performance Standards on Social and Environmental Sustainability and the IFC EHS Guidelines (see Section 2 of this Report). The following Table lists the topics which are covered by the IFC EHS Guidelines and the relevant Management Plans which will have to be implemented for commercial farming project by the Owner and / or the Contractor(s).

Table 7-3: IFC EHS Guidelines

General EHS Guidelines IFC which have been applied for the ESMP	Management plans to be implemented (discrete plans for construction and operation periods)
1. Environmental	
1.1 Air Emissions and Ambient AirQuality	Air Quality Management Plan
1.2 Energy Conservation	
1.3 Wastewater and Ambient WaterQuality	WastewaterMonitoring Management Plan
1.4 Water Conservation	
1.5 Hazardous Materials Management	Hazardous Material Management Plan, Explosives Management Plan
1.6 Waste Management	Waste Management Plan
1.7 Noise	Noise and Vibration Management Plan, Equipment Maintenance Management Plan, Explosives Management Plan
1.8 Contaminated Land	Pollutant Spill Contingency Plan, Site RehabilitationPlan / Re-vegetation Plan
2. Occupational Health and Safety	Occupational Health and Safety Plan (OHSP)
2.1 General operation Facility and Design	Site Maintenance and Housekeeping Plan as part ofthe OHSP
2.2 Communication and Training	Skills Development Plan, included in OHSP and other plans
2.3 Physical Hazards	Site Emergency Preparedness and Response Plan (included in OHSP), Explosives Management Plan
2.4 Chemical Hazards	Hazardous Material Management Plan, part of OHSPof the Contractor
2.5 Biological Hazards	Not applicable
2.6 Radiological Hazards	Not applicable
2.7 Personal Protective Equipment(PPE)	OHSP
2.8 Special Hazard Environments	OHSP
2.9 Monitoring	OHSP
3. Community Health and Safety	
3.1 Water Quality and Availability	Public Health, Water Quality Monitoring, CommercialFarming Operation Plan
3.2 Structural Safety of ProjectInfrastructure	Included in OHSP and other plans
3.3 Life and Fire Safety (L&FS)	OHSP
3.4 Traffic Safety	Traffic Management Plan
3.5 Transport of Hazardous Materials	Hazardous Material Management Plan
3.6 Disease Prevention	OHSP
4. Construction and Decommissioning	
4.1 Environment	Additional Plans to the above mentioned are the:Erosion Control Plan Excavation Spoil / Fill Management Plan Site Rehabilitation Plan / Re-vegetation Plan
4.2 Occupational Health & Safety	See above
4.3 Community Health & Safety	See above

7.1.4.1 KASCOL (Project Owner)

KASCOL will be responsible for the following:

- Overall responsibility for environmental performance of the project;
- Decision-maker on applicable policies to the project;
- Oversight supervisory role during the construction phase;
- Overall responsibility for ESMP implementation during the operation phase;
- Review reports of independent environmental monitoring consultants;
- Approve changes to the ESMP, as necessary, as part of an adaptive approach to environmental and social management of the project;
- Shall appoint an Environmental Manager or Environmental Coordinator (ECO) to take care of environmental issues during Project implementation and a Safety Officer.
- Shall allow ZEMA Inspectors unrestricted entry to the project site at any reasonabletime without making prior notice throughout the Project cycle.

7.1.4.2 The Contractor

The Contractor, i.e. the company in charge of constructing, will be selected and contracted by KASCOL.

The Contractor will have the overall responsibility for carrying out all the work on site, and for implementing the ESMP as far as applicable to the construction site and construction activities.

Specifically with respect to ESMP implementation, the Contractor will have the following obligations:

- Preparation and implementation of the EH&S management and monitoring plans for construction site management;
- Responsible for training related to construction works and operating machinery/equipment;
- Design, construct, maintain and operate suitable temporary pollution control facilities, where appropriate, to prevent the discharge of polluting matter or visible suspended materials into private property, streams or existing drainage systems.
- Ensure that all construction personnel and subcontractors are informed of the intentof the ESMP and are made aware of the required measures for environmental and social compliance and performance;
- During construction, maintain traffic safety along access roads, with special emphasis on high trafficked areas;
- Preparation of a well-articulated Code of Conduct, accessible and understandable by every worker.
- Appoint officer(s) who will be responsible for the management of environmental issues on site. The Contractor's environmental officer(s) shall ensure the implementation of the ESMP guidelines, prepare Action Plans, maintain close liaison with the Employer's ECO and will have meetings regularly.
- Appoint safety officers who will be responsible for handling safety issues on site. The Contractor's Safety Officers shall ensure the preparation and implementation of the Occupational Health and Safety Plan (OHSP) and will maintain close liaisonwith the Employer's Safety Officer.

In order to be able to carry out these obligations, the Contractor will have its own EH&S Unit. This will, in addition to an experienced unit manager, have the required personnel andinfrastructure (such as offices, laboratory, health facility, vehicles, computers, etc.) for executing the tasks. It is important that this EH&S Unit responds directly to the ConstructionSite Manager of the Contractor (as emphasized in Figure 7-1, and is not e.g. just a subunitof an engineering department.

The Contractor will also be responsible for the performance of its subcontractors. These will have to follow the overall ESMP as well as all the Sub-ESMPs.

7.1.4.3 Other Parties Involved

A number of government agencies will be involved in the Project, mainly by carrying out some regulatory and monitoring functions. The most important ones are shortly described Mazabuka District Council, ZEMA, Forestry Department and Water Resource Management Authority (WARMA).

7.1.5 Monitoring

7.1.5.1 Internal Monitoring

For the EH&S measures to be implemented on site, the first level of monitoring has to be carried out directly by the Contractor. This is part of the duty of the personnel described inSection 0.

For an efficient monitoring of certain environmental parameters, e.g. for water quality, a number of measuring devices are required, which allow to make fast and precise measureson site at the required places and intervals. The Environmental Consultant proposes to usemodern hand-held equipment for this purpose.

The supervision and monitoring of the Contractor's activities on a second level is the duty of KASCOL, as the Project Owner. This monitoring will be done by checking the regular monitoring reports to be provided by the Contractor, and by carrying out regular (unannounced) site visits. In practice, this work will be done by personnel stationed on siteand/or by the Owner.

KASCOL will also be responsible for this type of monitoring for all mitigation measures not related to construction, and therefore not under the responsibility of the Contractor. This concerns, among some other points, the monitoring of the livelihood restoration plan implementation.

7.1.5.2 External Monitoring

External monitoring is usually required in such projects. This can be done e.g. by institutions(such as ZEMA) and/or external experts.

KASCOL and the Contractor respectively shall allow ZEMA inspectors unrestricted entry to theProject site at any reasonable time without making prior notice throughout the Project cycle.

7.1.6 Reporting

Reporting is essential. The following monitoring reports seem required for this project:

- "Standard" monthly, quarterly and yearly reports to be prepared by the contractor and the Owner's Engineer covering project advancement, but also containing information on implementation of all ESMP related activities, any problems encountered and corrective measures taken.
- All emergencies with potential to cause damage to the environment shall bereported to ZEMA within 24 hours.
- Any accident with serious consequences has to be reported to the site manager and by him to KASCOL, immediately.

7.1.7 Contractual Measures

Implementation of the mitigation measures required by the sub plans will generally be done by contractors.

In the pre-construction period the sub plans will be developed by KASCOL's EH&S Unit for implementation by the local contractors. KASCOL will review and approve any plans local contractors might have or develop during this period.

For the main construction periods, the sub plans will be developed by the main contractor/consortium. For this it is important that the measures as described here shall beincluded in the international (and local, in the case of subcontractors) tender documents, and that the potential contractor will have to prepare their proposals taking into account these measures. It will also have to be stated clearly in the tender documents that the evaluation of tenders will include consideration of EH&S management staff and plans, andof past EH&S performance, and that selection of the contractor will be based partly on thesefactors, including past EH&S performance. In particular, a poor performance record shouldbe a reason for disqualification.

Likewise, the contract with the successful bidder should contain these environmental management measures as firm conditions to be complied with.

7.1.8 Sub-ESMPs

The ESMP is an umbrella plan that describes the management of EH&S matters to mitigatethe impacts identified in the ESIA and that will be complemented and augmented by a number of subplans prepared by KASCOL's EH&S Unit, the main contractor/consortium, and/or subcontractors.

Subplans approved by the main contractor/consortium will be reviewed and approved by KASCOL's EH&S Unit and/or the Owner's representative, while those prepared by subcontractors will be reviewed and approved by the main contractor/consortium.

The main Sub-ESMPs and the responsibilities for preparing and implementing them are shown in a generic way in the following 7-2.

KASCOL will be committed to the creation and implementation of programs to reduce the probability of occurrence of deleterious environmental incidents. Contingency plans will bedeveloped for dealing with such adverse incidents, if they occur.

KASCOL will expect the same level of environmental performance from its contractors, sub-contractors and suppliers and needs to stipulate this in any legally binding agreements it enters with these parties (see Section 7.7.3.4)

KASCOL should include the following umbrella obligations into the contract of any main and sub-contractors:

"The Contractor shall take all responsible steps to protect the environment (both on and off the site) and to limit damage and nuisance to people and property resulting from pollution, noise and other results of his operation.

The Contractor shall ensure that emissions, surface discharge and effluents from thecontractor's activities shall not exceed the values indicated in the Employer's requirements, and shall not exceed the values prescribed by applicable laws and good international practice, including the IFC EHS Guidelines, whichever is more stringent.

The Contractor shall take all responsible steps to ensure the occupational health andsafety of its workforce as well as the security of the public (both on and off the site). The Contractor is obligated to equip its workforce with the required personal protective equipment, to supervise and to train its workforce related to international safety standards (ILO Standards, IFC Performance standards) and to report any incidents to the Client (KASCOL). In case of non-compliance it can be considered as breach of contract.

The Contractor will have to include these conditions in all the contracts with his subcontractors, and he will be responsible for the compliance of the subcontractors with these conditions. KASCOL may inspect and monitor contractor's and subcontractors' EH&S compliance and performance at any time.

This Clause shall take precedence over all environmental-related clauses elsewherein the Contract."

Furthermore, the Contractor will be under contractual obligation to KASCOL to implement theaspects of the ESMP and approved sub-plans that apply to it, and to ensure compliance byits own workers and its subcontractors. The Contractor will ensure that appropriate corporate resources, personnel and reporting and accountability systems are in place for the successful implementation of the ESMP and relevant sub-plans. They will, on acontinuing basis, review the objectives of the ESMP and sub-plans as well as the company'ssuccess in achieving them. Where objectives are not being achieved, corrective action willbe taken. Adjustment may be made to environmental mitigation measures as needed in order to reach compliance with ESMP objectives.

Each Sub-ESMP will have to include the following:

The purpose

Reference and relevant documents (Zambian legislation and other applicable international Standards and other documents

used)Roles and responsibilities

The management process

- Emission standards and requirements
- The project emission sources
- Prevention and control

Surveillance

- Inspections
- Monitoring (measurements)
- Reporting

Actions to be taken in case of non - Compliance

1. Awareness and training

2. Documentation and communication

Plans for construction, including both the pre-construction and main construction periods, will be similar, although responsibility for their development may be different. Similarly, plans for the initial operating period, which will be effective during the period before full operation, and the full operating period, will also be similar or identical.

7.1.8.1 Safety

Employers need to have a written safety policy for their enterprise setting out the safety andhealth standards that they aim to achieve. The policy should name the senior executive who is responsible for seeing that the standards are achieved, and who has authority to allocate responsibilities to management and supervisors at all levels and to see that they are carried out.

A risk assessment will have to be carried out to identify hazards and measures for the prevention of accidents. General principles have to be the conditioning and maintenance of the workplace (good housekeeping); the development of knowledge, experience and training of the work force at all levels, the coordination, organization and management of the work force, duties and responsibilities of supervisors and key workers, that facilities andequipment are appropriate for the work to be performed and that they meet the health andsafety standards. Furthermore the policy needs to contain the selection and control of subcontractors and the arrangements for setting up safety committees. The following procedures will have to be developed:

7.1.8.2 Training and Capability of the Workforce

One of the most important measures at a construction site is the implementation of continuous training of the workforce, to raise awareness that personnel at all levels have adegree of responsibility in relation to environmental, health and safety issues. Therefore it is necessary to implement induction training for each worker and a periodic repetition on general environmental, health and safety issues. In addition to the general EH&S training task, specific training modules need to be developed to train the workforce in relation to their specific activity. Documentation needs to be kept to verify that the workforce has beentrained adequately.

7.1.8.3 Investigation of Accidents

All accidents as well as near misses need to be reported and investigated to be able to takecorrective actions, to learn and finally to prevent future incidents.

7.1.8.4 Construction and Camp Site Management Plan

This plan will specify which facilities and installations need to be provided for the workers and on which level of standard, e.g. sufficient and well maintained sanitary facilities, child-care facilities on site, proper lighting wherever and whenever work takes place.

7.1.8.5 Site Maintenance and Upkeep

The objective is to promote an efficient housekeeping management in all working and livingplaces, in order to ensure fundamentally tidy conditions and the protection of all personnelhealth.

7.1.8.6 Safety procedures during construction works

These procedures should provide guidance in terms of excavation safety, fall protection (ladders, scaffolding), safe use of working tools and equipment (welding, cutting, working near water, etc.)

7.1.8.7 Personal Protective Equipment (PPE)

Standard PPE such as safety helmets, reflectors and appropriate footwear (safety shoes or boots) needs to be used on the whole construction site area, and by all persons on site.

The need for other PPE (such as goggles, hearing protection, overalls, dust coats, gloves and masks) will depend on the type of work done by the employee. Furthermore, proper work clothes will provide skin protection.

It is the Contractor's obligation to provide the required PPE free of charge, and to enforce its use.

All visitors entering the construction site will be required to wear appropriate protective clothing.

7.1.8.8 Hazardous Material Management Plan

A Hazardous Materials Management Program (see also appendix 3, Data Sheet No. 9) willbe prepared by the Contractor to comply with the relevant IFC EHS Guidelines. This will set out the methods for screening the characteristics and threshold quantities of hazardous materials, managing the risks associated with their transportation, storage, use and disposal, keeping safety data sheets at the place where hazardous material is used, storedand disposed of, specific training program for employees concerning H&S, and authorization for people working with hazardous substances, and for informing the potentially affected community (if relevant). Important categories are the following:

<u>Chemical Substances</u>

Many chemicals are hazardous, with a potential for fire and explosion, or toxic, with an inherent potential to cause poisoning. Toxic substances cause both acute effects, such asdizziness, vomiting and headaches, produced in a short time by exposure to solvents, andchronic effects resulting from exposure over a long period as in lung diseases such as asbestosis and silicosis. Contact dermatitis may result from the contact between the skin and some chemicals. Acids and alkalis are corrosive and can damage both

skin and eyes.

Cement

Cement mixes are a well-known cause of skin disease. Both irritant and allergic contact dermatitis can result from proximity to wet cement. Prolonged exposure to wet cement (forexample, by kneeling or standing in it) may cause cement burns or ulceration of the skin.

Asbestos

Breathing in asbestos dust can kill by causing irreversible lung damage and cancer. Thereis no known cure for asbestos-related diseases. The more asbestos dust breathed in, the greater the risk to health. There are control limits for the various types of asbestos.

Today, asbestos is normally no longer used, and it is assumed that this material will also not be used on the construction site. The main problem today is often the rehabilitation or decommissioning of old structures, where asbestos was applied sometimes in largequantities; in such cases, it needs to be taken out and disposed of, whereby strict protectionmeasures for workers have to be observed.

7.1.8.9 Fire Precautions

Fires on construction sites arise from the misuse of compressed gases and highly flammable liquids, from the ignition of waste material, wood shavings and plastic materials,and from the failure to recognize that adhesives and some floor and wall coatings are highlyflammable (especially in relation to smoking).

The use of fires should be monitored and should be restricted to residential camps.

Every individual on site should be aware of the fire risk, and should know the precautions to prevent a fire and the action to be taken if fire does break out. Firefighting material (suchas fire extinguishers, fire detectors, alarm systems) must be available on all sites for use whenever need arises.

7.1.8.10 Traffic Management Plan

The underlying cause of most site traffic accidents is the failure to plan a safe system of work and to train workers on how to follow it. However, the common immediate causes areone or a combination of the following factors:

- Bad driving techniques which include reversing blind;
- Poor maintenance of vehicles;
- Carelessness or ignorance of special hazards, e.g. overhead power lines orexcavations;
- Carrying unauthorised passengers;
- Overloading or bad loading;
- Site congestion,
- Poor traffic layout;
- Lack of proper roadways combined with uneven ground and debris.

The Contractor will produce a Traffic Management Plan (TMP, based on Data Sheet No. 03) which needs to contain appropriate strategies for moving materials and persons to, from and within the construction areas, including abnormal loads. It will also contain provisions for management of connection points between site access roads and the main public roads,and for any upgrading work to be carried out. Specific traffic management measures will include, but not be limited to the following procedures:

- Only licensed and authorised persons should drive project vehicles, carrying of unauthorised passengers and cargo shall be prohibited,

- Compliance with all relevant applicable laws / traffic regulations;
- All visitors coming to the project site are required to abide by the traffic guidelinesfor the project;
- Parking and on-site traffic movement, when possible switch off engines when not inuse;
- Safe driving procedures (training, enforce use of safety belts, backwards drivingsignals, etc.);
- Training and testing of heavy equipment operators and drivers, including vision tests,with records kept of all trainings;
- The use of any kind of drugs needs to be forbidden and sanctioning needs to beincluded;
- Use of buses to transport workers to reduce traffic;
- Enforcement of maximum load restrictions;
- Posting and enforcement of speed limits;

- Road signs to highlight exits, crossings, warnings, etc.;
- Vehicle safety classes in the affected settlements for residents/villagers, in particular pedestrians and bicyclists.

The Traffic Management Plan will also specify the procedures for the monitoring and reporting of the construction-generated traffic movements, and associated environmental problems.

All proposals, details, execution, maintenance, removal and necessary reinstatementassociated with safety and management, temporary decking, road crossings and other structures on public roads, shall be subject to the approval of the Roads Authority and as advised by the Site Manager or Safety Officer. The Contractor or his agent or supervisor shall supply all information required for consultation with appropriate authorities, including the Local Authority and the Police.

All traffic safety and management measures necessitated by the works shall be fully operational before the construction team commences work which affects a highway or gazette road.

All accidents, however big or small, should be reported to the Safety Officer immediately according to the reporting format to be provided by the Safety Office.

7.1.8.11 Environmental Management Plans

General principles are to involve the relevant stakeholders in environmental education andawareness, to verify the compliance with national and international environmental regulations and standards, to strengthen the environmental awareness of the workforce through training and to reduce possible negative impacts by applying proper environmentalprocedures and practices. Responsible supervisors are in charge of the proper conduct oftheir workers, equipment and facilities. A positive attitude shall be developed concerning environmental procedures.

For this a set of Procedures/Sub-management Plans is proposed and described to some extent in the subsections below.

7.1.8.12 Solid Waste Management

Proper waste management (e.g. collecting, reuse, recycling, and disposal) has short and long term benefits to community health, quality of life and environmental protection. It alsoenables anticipation of associated problems and their mitigation. It is therefore essential todevelop efficient management practices because of risks such as the following:

Uncontrolled burning of waste pollutes the atmosphere, produces poisonous gases and can cause injuries if e.g. pressurized empty cans explode.

Uncontrolled burying of waste can pollute the ground and surface water.

Uncollected piles of waste attract animals and insects which are harmful and can spread diseases. Sharp objects such as needles, broken glass and blades, and other dangerous (hazardous) waste might be present in waste piles and may harm human scavengers, in particular children, and animals. Piles of waste are unsightly, they emit odor and make people nearby feel uncomfortable generally reducing the aesthetic value of the environment.It also blocks drains, leading to flooding and blocked access routes.

Therefore, good practice in waste management is very important in order to avoid these risks to health and environment.

The objectives of a waste management system are to ensure a safe and clean living environment, protecting loss of life and property and ultimately mitigating adverse impacts on the natural environment. This is achieved through systematic planning, implementation and monitoring of minimizing, storing, collecting, recycling and disposal of refuse.

Solid waste can broadly be categorized into two groups namely hazardous waste and non-hazardous waste. On the other side, liquid waste can be categorized into two groups as domestic wastewater and industrial wastewater.

Hazardous waste which can be generated by industries (chemical/pharmaceutical, radioactive waste, heavy metals), hospitals/medical centers and other sources (e.g. sanitary waste incl. human excreta, pressurized containers) should be handled and disposed of by specialists who are specifically trained for that purpose. Normal waste collectors should however be trained to at least differentiate and/or identify hazardous waste and take steps to report them with urgency.

7.1.8.13 Management of Wastewater and Protection of Natural Streams

Wastewater means waste principally consisting of water, and includes wash-down water, cooling water, effluent, irrigation runoff and contaminated storm water.

Wastewater management system means a system designed and operated for the purposeof collecting and managing wastewater so as to minimize any adverse impacts of the wastewater on the environment. Wastewater can be classified into two categories namely:

Domestic wastewater means wastewater from residential settlements and services which originates predominantly from the human metabolism and from household activities;

Industrial wastewater means any wastewater which is discharged from premises used for carrying on any trade or industry, other than domestic wastewater and runoff rain water;

Any type of wastewater should be subject to a treatment process before it is discharged to the environment. The treatment process is identified according to the content of the wastewater. At the construction site, three main types of wastewater are generated. These are domestic wastewater, wastewater generated from concrete batching works and wastewater generated by aggregate washing. Besides that there are other sources of wastewater to be expected, e.g. water from maintenance (washing) of machines and vehicles.

Key elements of wastewater treatment:

Pre-treatment is the removal of sand and fat using mechanical processes such as screening,sedimentation or flotation

Primary treatment is the removal of suspended solids by passing wastewater through asettlement process in flotation tanks

Secondary treatment is a biological treatment.

Tertiary (more advanced treatment) involves removal of phosphorus and nitrogen.

7.1.8.14 Air Quality Management

The Contractor will produce an Air Quality Management Plan. Air quality and equipment maintenance are strongly related. Good equipment maintenance will prevent high emissions (see section "Equipment

Maintenance Management" below). Furthermore procedures such as road sprinkling, energy efficient driving training, good housekeeping, etc., need to be implemented. Daily inspections and instrumental monitoring outside of theconstruction site will have to be carried out.

Confined spaces (tunnels, workshops, caverns etc.) will need special attention and mechanisms will be implemented to guarantee good ventilation.

7.1.8.15 Noise and Vibration

Excessive exposure to loud noise can cause permanent damage to hearing. Hearing protection will be required for work in especially noisy places, e.g. crushing plants.Machines, including vehicles, will have to be maintained in order to stay within legal noise limits. This will have to be monitored.

7.1.8.16 Erosion Control

The Contractor will develop procedures to minimize erosion caused by constructionactivities. Sensitive areas need to be identified, and avoided if possible. If work has to be carried out in such sensitive places, state of the art techniques have to be used to reduce erosion were possible (implement drainage channels, slope properly, compact, if necessarytostart re-cultivation as soon as possible). Areas sensible to erosion should be monitored.

7.1.8.17 Pollutant Spill Contingency Plan

The Contractor's Pollutant Spill Contingency Plan will outline the procedures for proper handling of potential pollutants and procedures to be carried out in the event of a pollutantspill. It will also specify equipment procurement and training of construction personnel. The most important pollution mitigation measures are shown below:

Prohibition of dumping of any contaminating substances into the environment (including oil,waste oils)

Storage and routine handling of fuels, lubricants, and other contaminating substances in workshops with sealed floor and equipped with a drainage system with oil skimmer

Storage areas shall be designed such that they will contain 110% of the largest container/vessel stored in the storage area; suitable clean-up equipment and material needs to be on site.

All wastes recovered during cleanup operations to be collected and stored for subsequentdisposal.

Supply agreement will include responsibility for supplier to take waste oil,

The Contractor will verify that each supply/disposal subcontractor has adequate arrangements or facilities for proper disposal, treatment or recycling of these wastes.

Personnel will be educated on proper use and disposal of hazardous materials.

7.1.8.18 Equipment Maintenance Management

The Contractor will produce an Equipment Maintenance Management Plan which needs tocontain the processes for the maintenance of the different construction equipment used on-site and off-site, maintenance protocols should be developed for the different equipment, machine and vehicle types, the periodicity in which the maintenance inspections needs to be carried out for the different equipment, machines and vehicles types needs to be determined. Furthermore, the Contractor will set up procedures to take worn out or unsafeequipment out of operation until it has been repaired and is in compliance with safety and environmentally acceptable standards. All maintenance protocols need to be kept on the construction site.

As far as practicable, the Contractor shall bring to site, and employ on the works, plant andequipment

that is environmentally acceptable with safe and tolerable sound emission compatible with the safe and efficient undertaking of the works.

All plants shall be properly maintained and relevant service records kept. All plants shall beprovided with effective silencers and anti-vibration devices, and shall be operated accordingto the manufacturer's recommendations, in such a manner as to avoid causing excessive noise emissions or vibrations.

8 DECOMMISSIONING AND REHABILITATION PLAN

The goal of decommissioning is to ensure that the project sites are left in a condition that is safe and stable, long-term environmental impacts are minimized and any future liability to thecommunity and future land use restrictions are minimized. Several factors usually drive the process. The Decommissioning and Closure Plan shall be subjected to periodic review to update it with any possible change of business plans. The proposed closure cost estimates (stated in section 8.5) were based on the current market prices and costs of labour. These shall be updated with annual inflation and major economic changes.

8.1.1.1 Closure and Rehabilitation Objectives

Given the fact that the commercial farming project will be for a long time, the rehabilitationand closure objectives for this project will be as follows:

1. Compliance with relevant Zambian environmental legislation relating to close of suchprojects.
2. Identification of potential post closure uses of the land occupied by certaininfrastructure in consultation with government authorities and land users;
3. Rehabilitation of disturbed land to a state that is suitable for its agreed post closureuses;
4. Rehabilitation of disturbed lands where temporal structures will be build:

- Ensures that the area is physically stable and minimizes safety hazards;
- Minimizes the opportunities for soil erosion to occur;
- Facilitates compliance with applicable environmental quality objectives (airquality and water quality guidelines;
- Reduces visual impact of the disturbed land;
- Provides a self-sustaining solution with a minimum of post closure management.

5. Finding alternative livelihood strategies for workers whose jobs become redundant upon completion of construction and at closure;
6. Keeping relevant authorities informed of the progress of the decommissioningphase;
7. Submitting monitoring data to the relevant authorities as required;
8. Maintaining required pollution control facilities and rehabilitated land until and/orafter closure.

8.1.1.2 Post-Closure Land Use

The project will identify potential post closure uses of the land occupied by the project infrastructure in consultation with government authorities, the surrounding landowners, landusers and relevant traditional authorities. Generally, the contractor will ensure that the wholesite is also subjected to progressive rehabilitation so that all areas where construction is completed are rehabilitated.

8.1.1.3 Post - Closure Monitoring

Surface and groundwater monitoring will continue until such time as it can be demonstratedthat residual impacts have been reduced to an acceptable level. At least monitoring shall beconducted for whole period the project will be in operation. Following the completion of the rehabilitation program monthly inspections will be carried out for a certain period of time especially around the areas that were directly affected by the project.

8.1.1.4 Post - Closure Maintenance

Any flaws identified during the post closure monitoring phase will be addressed by the post closure maintenance program-by the project management;

Monitoring and maintenance will continue until a closure certificate has been issued by the authorities.

8.1.1.5 Cost of Decommissioning

The expected expenditure for the decommissioning and closure works is composed of costs for demolition and cleaning the site. It is expected that the cost of decommissioning will be about 20% of the project cost.

8.1.1.6 Validation of Decommissioning

At the completion of the decommission phase, KASCOL will produce a validation report to showthat the decommissioning plan has been successfully implemented by confirming that there is no risk of environmental pollution and negative social impacts. The report will include the following:

- Disposal of raw materials;
- Disposal of waste;
- Decommissioning of plant and equipment;
- Disposal of obsolete equipment;
- Results of monitoring and testing; and
- The need for ongoing monitoring or investigations.

Table 8-1 summarizes the decommissioning and closure impacts and their associated mitigation measures.

Table 8-1: Summary of Decommissioning and Closure Activities

Environmental. Comp.	Impact	Mitigation/Enhancement Measures	Frequency of monitoring	Performance Indicator	Responsible Person/ Entity
Biophysical Environment	Land degradation from disposal of decommissioning waste	Establish waste management priorities at the outset of activities based on an understanding of potential Environmental, Health, andSafety (EHS) risks and impacts and considering waste generation and its consequences	Weekly	Amount of accumulating waste Availability of a waste Management strategy	KASCOL
		Establish a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposalaccording to ZEMA guidelines			
		Preventing uncontrolled releases of hazardous materials to the environment or uncontrolled reactions that might result in fire orexplosion			
		Provide education to workforce on hygienic conditions and behaviors	Daily	Amounts of solid waste disposedof	
	Pollution of Water resources	All solid waste (screenings) shall be adequately dried beforedisposal at a disposal site			
		Apply measures on Land degradation from disposal ofdecommissioning waste	Daily	Air Quality	
	Air pollution	For open area sources, including storage piles, use control measuressuch as installing enclosures and covers, and increasing the moisturecontent	Daily		KASCOL
		Implement dust suppression techniques	Daily		
		Avoid open air burning of solid waste			
	Noise and vibration	Plan activities in consultation with local communities so that activitieswith the greatest potential to generate noise are planned during holidays and off-peak periods of the day	Weekly	Noise levels Vehicle and machinery Maintenance records	
		Use noise control devices, such as temporary noise barriers anddeflectors for impact and blasting activities, exhaust muffling devices for combustion engines includinggenerators	Daily	Records and verifications from communities	
		Avoid or minimize project transportation through community areas	Daily	Records of damages	
		All workers involved in noisy works will be provided with PersonalProtection Equipment (PPE)	Daily	Records of damages	

Environmental.Comp.	Impact	Mitigation/Enhancement Measures	Frequency of monitoring	Performance Indicator	Responsible Person/ Entity
		Where decommissioning activities result in damage, repairs/ restructure will be provided	Weekly	Records of repairs	
Socioeconomic Environment	Employment Creation	Prioritize employment opportunities to local community members and only outsourcing where labour is not locally available. This could be achieved if the contractor works with the local authorities	Weekly	No. of locals, women and vulnerable people employed on project	Contractor
		Women and the vulnerable groups like widows shouldbe given preference;	Weekly		
		Ensure expectations are well managed and avoid strikes	Weekly		
		Manage community relations well	Weekly		
	Damage and disruption to adjacent services	Obtain up-to-date information on the locations of services that can bedisturbed or damaged when works are being implemented	Weekly	Damages to infrastructure	
		Give notice to the owner of power and telecommunication cables, or other installations likely to be affected	Weekly	Notices to service providers	
		Exercise care not to damage or disrupt these services Daily	Daily	Communication impending disruptions	
		Where the above is not possible, the contractor shall liaise with the concerned authorities so that adequate measures to cushion theimpact are put in place Daily	Daily	Communication impending disruptions	
		Informing customers of impending disruptions through media	Daily		
		Where services are disrupted, service providers shall make sure such disruptions are for the shortest possible time. This will be throughadequate communication by the contractor with service providers	Daily	Communication impending disruptions	
	Economic displacement	All people to be affected by decommissioning will be informed about the planned activities in advance. They will also be informed about the plans for repairing the damages	Weekly	Records of meetings with PAPs; Records of Notices to PAPs	
		Where the project will result in economic displacement, repair /restructure of livelihood will be provided.	Weekly	Records of restructure / repair	
	Occupation Health and safety associated with the decommissioning of water supply facilities	Train workers in lifting and materials handling techniques and placement of weight	Monthly	Incidences of overexertion, injuries and illnesses Training reports	

Environmental. Comp.	Impact	Mitigation/Enhancement Measures	Frequencyof monitoring	Performance Indicator	Responsible Person/ Entity
		Plan work site layout to minimise the need for manual transfer ofheavy loads	Weekly	Appropriateness of site layout,tools and work stations	
		Implement administrative controls into work processes such as jobrotations, rest and stretch breaks	Daily	Record of administrative controls	Contractor
		Implement good house-keeping practices e.g., sorting and placing ofloose decommissioning materials in established areas away from foot paths	Daily	Slips and falls	
		Clean up excessive waste debris and liquid spills regularly	Daily	Records of good house-keeping	
		Plan and segregate the location of vehicle traffic, machine operation,and walking areas, use of one-way traffic routes, establishment of speed limits, and onsite trained flag-people wearing high-visibility vests or outer clothing covering	Weekly	Accidents Appropriateness of site layout and safety measures	
	Community health and Safety associated with the decommissioning of commercial farming facilities	Restrict access to the site, through a combination of institutional and administrative controls including fencing and signage	Weekly	Accidents involving community members	KASCOL
		Remove hazardous conditions on decommissioning sites that cannot be controlled affectively with site access restrictions	Daily	Evidence of access restriction and no hazardousconditions	
		Notice will be given, in writing, to the local authority of the works to be undertaken including the required time to complete the works	Weekly	Accidents Records of notice	Contractor
		Fence, guard and light, during the night, the works at all times while the street is opened or broken up or obstructed	Daily	Evidence of fencing, lighting, road restoration and no decommissioning waste	
		Where it is anticipated that decommissioning works will disrupt movement, the contractor in liaison with the District Council will inform the public through the media at least 24hours beforecommencement of such works	Daily	Records of early warning to public	
		In peri-urban areas, the contractors shall also coordinate with the WDCs so that announcements are conveyed by word-of-mouth (i.e.announcements in clubs, churches, mosques, schools and other public gatherings) and also through the use of megaphones	Daily	Displayed notices Evidence of alternative routes, warning signs, fencing, lighting, road restoration and no decommissioning	

Environmental. Comp.	Impact	Mitigation/Enhancement Measures	Frequencyof monitoring	Performance Indicator	Responsible Person/ Entity
				waste	
		Where trenches are to be excavated in busy areas, the contractor willensure such trenches remain open for very short periods of time. In these areas, the works shall also be scheduled during traffic off-peakperiods like Saturday afternoons, Sundays and public holidays	Daily	Evidence of alternative routes, warning signs, fencing, lighting, road restorationand no decommissioning waste	
		Excavations will be sufficiently fenced with adequate warning signsand reflective tapes warning passers-by about deep trenches	Daily		

9 CONCLUSION AND RECOMMENATIONS

9.1 CONCLUSION

This ESIA objectively assessed and evaluated impacts that may arise due to the proposed project. The drafting of this ESIA was based on the design information on the project which was provided by the design team who worked in conjunction with the ESIA team. The Mitigation measures and the Environmental Management and Monitoring Plan were formulated based on the level of detail and depth of the available information. In-depth analysis of the impacts revealed the following key findings:

- As all project activities will be confined within the boundary of the farm, no involuntary displacement and relocation of communities is envisaged;
- Most of the anticipated negative impacts are confined to the construction phase;
- For all major negative impacts like noise and air pollution, adequate mitigation
- Measures have been provided making the impacts manageable; and
- Most of the anticipated impacts in the operation phase are positive and bring out thedesired results.
- The positive impacts of this project are more sustainable and outweigh the negative impacts.
- Based on the level of detail and depth of the study, it is the view of the developer thatall envisaged environmental and socioeconomic impacts have been adequately addressed within the limits of the current state of knowledge and reasonable practice.

The environmental impact from the implementation of this project are minimal and can be addressed by putting in place mitigation measures to ensure that they pose no threat to the environment or any danger to the community. The advantages of placing the infrastructure are enormous and it will address a chronic problem that has affected the crop production for a long time. In summary the potential negative impacts of the project are low and easy to mitigate, therefore they should not prevent the project from proceeding. The positive impacts and the benefits to the community are immense and welcome. From the foregoing, it is evident that the construction of the proposed irrigation system project will be beneficial to KASCOL and also to the economy of the county and country at large. The positive impacts will include among others increased production and incomes, creation of employment opportunities, efficient and effective use of water for irrigation, reduced operation costs. There are also negative Socioeconomic and environmental impacts anticipated during the construction and operation phases but their significance is not major to warrant worry as they are well addressed in the EMP. The major environmental and health and safety concerns associated with the project have been adequately addressed in the Environmental Management Plan. It is concluded therefore that the project proceed as planned with the mitigation measures integrated in the implementation;

9.2 RECOMMENDATIONS

Occupational safety and Health: Ensure that worker's occupational health and safety standards are maintained through capacity building, proper training, providing Personal Protection Equipment (PPE), harmful and hazardous substances should be banned and avoided, in accordance with Zambian legislation and international standards;

Environmental audits and monitoring: Regular environmental audits should be carried out on the project in order to ensure compliance of the project with the mitigation measures outlined in the Environmental and Social Management Plan (ESMP).

Solid waste: Waste Management be carefully carried

Social conflicts between local and local workers: The contractor maximizes the utilization of the local labor for the project to ensure integration of the local people in the project and reduce cultural friction,

Environmentalist: The persons responsible for environmental issues relating to the project make site visits regularly to monitor the activities at the project site during all phases of the project.

Data: Monitoring data be analyzed and reviewed at regular intervals and compared with specified requirements so that any necessary corrective actions can be taken.

Records: Records of monitoring results be reported to the responsible authorities and relevant parties, as required.

10 DECLARATION OF AUTHENTICITY OF THE REPORT

I, Mufana Muimui on behalf of Kaleya Small Holders Limited, hereby submit this Environmental Social Impact Assessment (ESIA) for the proposed conversion of 2,164ha of land under furrow irrigation to sub surface in Mazabuka Districts of southern Province. I confirm that this report is the work of Earth Environmental Consultants Limited, other works referred to in this report have been acknowledged. This Environmental Impact Assessment has been prepared in accordance with the Environmental Management Act 2011 and the Environmental Impact Assessment Regulations S.I. No. 28 of 1997.

Signed at Mazabuka on ……, 2022

Signature:…….
(Mr. Mufana Muimui)

Estate manager
Kaleya Smallholder Company Ltd

11 BIBLIOGRAPHY

12 APPENDICES

12.1 TERMS OF REFERENCE FOR THE ESIA

12.2 SCOPING REPORT

12.3 ZEMA APPROVAL LETTER

12.4 SPECIALIST REPORTS

12.5 STAKEHOLDER ENGAGEMENT PLAN

12.6 TITLE DEEDS

12.7 MAPS