

SUMMARY PROJECT REPORT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE CONSTRUCTION WORKS FOR EXPANSION OF KOGONGA-KAYUNDI IRRIGATION PROJECT IN NORTH UYOMA WARD IN SIAYA COUNTY



**National Agriculture Value Chain
Development Project (NAVCDP)**

**Kogonga Kayundi Irrigation Water User
Association**

P.O. Box 30-400600 Ragengni

Latitude -0.258086, Longitude 34.391667

Prepared By:

Fredrick Aloo
Registration No: 9049,
P.O. Box, 34188-00100 Nairobi, Kenya
TEL 0726589117
Email: fredrick.aloo@gmail.com

FEBRUARY 2026

FACT SHEET

Project Name	Construction Works for Expansion of Kogonga-Kayundi Irrigation Project in North Uyoma Ward in Siaya County
Assignment Name	Environmental and Social Impact Assessment for the Construction Works for Expansion of Kogonga-Kayundi Irrigation Project in North Uyoma Ward In Siaya County
Location	Kogonga-Koyundi Beach in North Uyoma, Rarieda Sub-County, and Siaya County. The site can be located the project area Ndiru village by murram road from Kayundi to Ragengni. The Ragengni junction is connected to the Tarmac Luanda Kotieno – Ndori road the area is part of the larger Uyoma region, which is situated along the shores of Lake Victoria.
GPS Coordinates	Latitude -0.258056, Longitude 34.391667
Elevation	1135 m.a.s.l.
Project Description	The project seeks to enhance tomato production by implementing solar-powered irrigation, providing a cost-effective and environmentally sustainable solution to unreliable rainfall and expensive conventional irrigation methods. By ensuring a consistent water supply, the initiative aims to boost tomato yields, strengthen food security, and uplift the economic status of farming households in the region
Main source of water	It will be from the Lake Victoria
Proponent	Kogonga Kayundi Irrigation Water Users Association
Key Financer	World Bank National Agriculture Value Chain Development Project (NAVCDP).
Target beneficiaries,	Kogonga and Kayundi Beach (IWUA) Members
Contact of the Proponent	Kogonga Kayundi Irrigation Water Users Association P.O. Box 30. Ragengni
Date.	6 th February 2026

CERTIFICATION

For and on behalf of: Kogonga Kayundi Irrigation Water Users Association

This Environmental Social Impact Assessment (ESIA) Summary Project Report was prepared in accordance with the Environmental Management and Coordination Act (EMCA) 1999 and the Environmental Impact Assessment and Audit Regulations 2003 (revised 2015 & 2019) in order to meet the statutory requirements for the implementation of projects under schedule II.

I, the undersigned, confirm that the contents of this report are a true representation of the ESIA process for the expansion of the Kogonga Kayundi Irrigation Water Users Association

LEAD ESIA/ EA EXPERT

FREDRICK ALOO

NEMA REG. No. 9049

P. O. BOX 34188 -0000

NAIROBI, KENYA

Signature



Date. 6th -02-2026

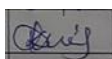
PROJECT PROPONENT:

Kogonga Kayundi Irrigation Water Users Association

P.O. Box 30. Ragengni

Name **Kennedy Ochieng**

Signature



Designation: **Chairperson**

Date 6th -02-2026

TABLE OF GENERAL INFORMATION

Project	Construction Works for Expansion of Kogonga-Kayundi Irrigation Project in North Uyoma Ward in Siaya County
Location	Kogonga-Kayundi beach in Ndiru village, North Uyoma ward, Rarieda subcounty
County	Siaya
Project objective	To increase the average household income of local farmers in Kogonga -Kayundi beach and beyond by 30% and reduce local food insecurity by 40% through the implementation of year-round irrigation infrastructure and climate-smart agricultural training
Project description	The project seeks to enhance tomato production by implementing solar-powered irrigation, providing a cost-effective and environmentally sustainable solution to unreliable rainfall and expensive conventional irrigation methods. By ensuring a consistent water supply, the initiative aims to boost tomato yields, strengthen food security, and uplift the economic status of farming households in the region
Project classification	Medium risk project
Public participation meeting date	5 th April 2025
Anticipated positive impacts	a) Economic and social benefits to the communities through improved crop production b) Enhanced food security and improved nutrition at the household level. c) Employment opportunities to youths and other community members d) The project would ensure that greenhouse gas emission is reduced by using solar energy to pump water e) Trees would also be planted in the project areas to act as carbon sink hence mitigating greenhouse gas effects to the environment f) Using solar powered energy will curb greenhouse gas emission.

Anticipated negative impacts	a. Solid Waste from products, materials used and post-harvest losses may increase emission and cause environmental degradation b. Lack of adequate knowledge and skills in irrigation. c. Clearing of vegetation during construction phase, this would be addressed through reforestation programs and sparing of indigenous trees during the expansion and clearing process

DISCLAIMER

This EIA Summary Project Report is strictly confidential to Kogonga-Kayundi Water Users Association and any use of the materials thereof should strictly be in accordance with the agreement between the proponent and the ESIA/EA Expert/s mentioned herein (Fredrick Aloo). It is subject to conditions spelt out in the Environmental (Impact Assessment and Audit) Regulations Amended in 2019 under the Kenya Gazette Supplement No. 62, Legislative Supplement No. 16, and Legal Notice No. 31 of 2019. It provides information on the proposed project as per the time of EIA in the year 2025

ACKNOWLEDGMENT

We, the ESIA study team Fredrick Aloo (Lead Expert), Elijah Lwevo (Lead Expert), County ESS team and Mr. Benard Ayagah (Associate) wish to acknowledge and express our profound gratitude to the Siaya National Agriculture Value Chain Development Project (NAVCDP). We thank the County Project Coordinating Unit especially the County Project Coordinator, Mr Vincent Okoth, Caroline Majuma Social safeguards (NAVCDP), Eng Kevin Obiero the NAVCDP County infrastructure Officer and Engineer Charles Olang County Irrigation Officer, Mrs Janet Owuor the Environmental for commissioning this Environmental Social Impact Assessment - Summary Project Report Study.

We appreciate the cooperation and contributions of all the stakeholders who we interacted with during this EIA report, without their support this study would not have been successful.

We would also like to affirm our appreciation to Mr David Olang from the Environment and Social Safeguards Specialist for, National Agriculture Value Chain Development Project, not forgetting the NEMA county office team for their guidance in the preparation of this SPR. Finally, we wish to appreciate the contributions made by the entire community for providing us with useful information and filling out questionnaires during the field visits and public participation forums.

EXECUTIVE SUMMARY

The Proposed Kogonga–Kayundi Irrigation Scheme is a strategic agricultural development initiative designed to enhance food security, increase household incomes, and promote climate-resilient farming systems within the project area. The project is spearheaded by the County Government in collaboration with relevant national institutions responsible for irrigation development and water resource management. It responds to persistent challenges facing local farmers, including unreliable rainfall patterns, declining agricultural productivity, and recurring seasonal crop failures associated with climate variability.

The scheme is designed to abstract water from a nearby surface water source and distribute it to beneficiary farms through a structured irrigation system comprising intake works, a pump house, rising mains, distribution pipelines, and associated on-farm infrastructure. By transitioning from rain-fed to controlled irrigation agriculture, the project seeks to stabilize crop production, encourage crop diversification, and support high-value agricultural enterprises.

The broad objective of the project is to increase agricultural productivity and strengthen local livelihoods through sustainable irrigation development. The specific objectives are to expand the area under irrigation; improve crop yields and promote diversification; enhance water use efficiency through modern irrigation technologies; build farmer capacity in agronomic, environmental, and water management practices; and strengthen farmer institutions to ensure sustainable operation and maintenance of the scheme.

The preparation of this Environmental and Social Impact Assessment (ESIA) Summary Project Report has been undertaken in compliance with the Environmental Management and Coordination Act and other applicable national legal and regulatory requirements. The ESIA integrates environmental and social considerations into project planning, design, construction, operation, and eventual decommissioning, ensuring that the project proceeds in a sustainable and responsible manner.

The primary objective of the ESIA is to identify, predict, and evaluate the potential environmental and social impacts associated with the construction, operation, and decommissioning of the Kogonga–Kayundi Irrigation Scheme, and to propose appropriate mitigation and enhancement measures. The scope of the assessment covered the review of project design and technical components; analysis of baseline environmental and socio-economic conditions; examination of the relevant policy, legal, and institutional framework; stakeholder consultations; assessment of project alternatives; identification of potential impacts; and development of an Environmental and Social Management and Monitoring Plan (ESMMP).

The ESIA study adopted a systematic and participatory approach. This included environmental screening and scoping to determine the level of assessment required; desktop review of relevant policies, legislation, and previous studies; field visits to collect baseline data; stakeholder mapping; structured public consultations; and key informant interviews. Data collection tools included questionnaires, focus group discussions, and direct observations. The information

gathered was analysed to identify potential impacts and inform the formulation of mitigation measures and management strategies.

The proposed irrigation scheme will cover a defined acreage of agricultural land within the Kogonga–Kayundi area. The selected irrigation method is a pressurized system, such as drip irrigation, designed to optimize water use efficiency, minimize losses through evaporation and seepage, and enhance uniform distribution of water across farms. Key project components include a water abstraction intake structure, pump house and pumping units, main conveyance pipelines, distribution network, on-farm irrigation infrastructure, and associated access roads and ancillary facilities.

Construction activities will involve site clearing, excavation for intake and pipeline alignment, laying of pipelines, construction of the intake and pump house structures, installation of pumps and electrical systems, and restoration of disturbed areas. Required inputs will include cement, sand, aggregates, pipes, fuel, machinery, and both skilled and unskilled labor. During the operational phase, activities will include water abstraction, irrigation scheduling, routine maintenance of mechanical and electrical systems, farmer training on efficient water use and agronomic practices, and environmental monitoring.

Waste generated during construction and operation will primarily consist of construction debris, packaging materials, used oil from machinery maintenance, and domestic waste from workers. Appropriate waste management measures will be implemented, including waste segregation, reuse and recycling where feasible, safe storage of hazardous materials, and disposal in accordance with environmental regulations. The project design incorporates sustainability considerations such as efficient irrigation technologies, climate-smart agricultural practices, institutional strengthening of water user associations, and farmer capacity building to ensure long-term viability.

The project aligns with key national development frameworks and legal provisions. It upholds the environmental rights enshrined in the Constitution of Kenya, which guarantees every person the right to a clean and healthy environment. It also supports the agricultural transformation and food security objectives articulated in Kenya Vision 2030. The project is further guided by the National Irrigation Policy, which promotes the expansion and modernization of irrigated agriculture.

Other relevant legal instruments include the Water Act, which regulates water resource management and abstraction permits; the Occupational Safety and Health Act, which safeguards worker health and safety; the Public Health Act, which addresses public health concerns; and the Climate Change Act, which promotes climate resilience and low-carbon development. Institutional oversight will involve the National Environmental Management Authority for environmental licensing and compliance monitoring, and the Water Resources Authority for water use permitting and regulation. The project also aligns with international commitments, including the United Nations Framework Convention on Climate Change and the Sustainable Development Goals, particularly those related to zero hunger, clean water and sanitation, and climate action.

Baseline assessment indicates that the project area is characterized by gently undulating terrain, predominantly smallholder agricultural land use, and a semi-humid to sub-humid climate. Agriculture is the primary economic activity, largely dependent on rain-fed cropping and livestock keeping. The socio-economic profile reveals moderate population density, limited access to reliable irrigation water, and vulnerability to climatic shocks. Basic infrastructure such as access roads, electricity, health facilities, and markets exists, though some improvements may be required to fully support the irrigation scheme. No critical ecologically sensitive habitats were identified within the immediate project footprint; however, measures will be taken to protect riparian zones and ensure sustainable abstraction levels to prevent adverse impacts on downstream users and aquatic ecosystems.

Public participation was undertaken in compliance with legal requirements and best practice standards. Stakeholders consulted included farmers, community leaders, women and youth groups, water resource users, and government representatives. Key concerns raised included equitable water distribution, land ownership and wayleave arrangements, protection of the water source, local employment opportunities, and mechanisms for resolving disputes. Overall, stakeholders expressed strong support for the project, recognizing its potential to improve agricultural productivity, household incomes, and food security. A structured Grievance Redress Mechanism (GRM) has been proposed to address concerns related to land, water use, labor issues, and Gender-Based Violence (GBV) or Sexual Exploitation and Abuse (SEA), ensuring timely and transparent resolution of complaints.

The ESIA evaluated project alternatives, including the “No-Action” option, which would maintain reliance on rain-fed agriculture and continued vulnerability to climate shocks. This alternative was considered undesirable due to persistent low productivity and socio-economic vulnerability. Alternative design and technology options, such as gravity-fed systems and solar-powered pumping, were assessed. The selected design represents the most technically feasible, cost-effective, and environmentally sustainable option with minimal ecological disturbance.

The project is expected to generate significant positive impacts, including increased agricultural productivity, higher household incomes, employment creation during construction and operation, improved food security and nutrition, strengthened farmer institutions, and enhanced resilience to climate variability. However, potential negative impacts during construction may include soil erosion, vegetation disturbance, dust and noise generation, waste production, occupational health and safety risks, and temporary disruption of access routes. During operation, risks may include over-abstraction of water, waterlogging and salinization, conflicts over water allocation, and agrochemical runoff.

Mitigation measures have been proposed to address these risks. They include erosion control measures, proper waste management, provision of Personal Protective Equipment (PPE), traffic management plans, rehabilitation of disturbed areas, regulated water abstraction in line with approved permits, efficient irrigation scheduling, soil and water quality monitoring, promotion of integrated pest management, and continuous farmer training.

An Environmental and Social Management and Monitoring Plan (ESMMP) has been developed to guide implementation of mitigation measures. The ESMMP outlines specific

actions, responsible parties, timelines, performance indicators, and monitoring frequency. It provides a structured framework to ensure compliance with environmental regulations and safeguard community welfare. The plan includes provisions for environmental monitoring of water and soil quality, occupational health and safety management, community health and safety, gender inclusion and GBV prevention, and ongoing stakeholder engagement and grievance management.

In conclusion, the ESIA finds that the Proposed Kogonga–Kayundi Irrigation Scheme is environmentally and socially viable, provided that the recommended mitigation measures and management plans are effectively implemented. The project will significantly contribute to improved agricultural productivity, poverty reduction, and climate resilience within the project area while aligning with national development priorities and environmental sustainability principles. It is recommended that the project be approved subject to strict adherence to the ESMMP; that all necessary permits and licenses be secured prior to commencement; that stakeholder engagement be sustained throughout the project lifecycle; that adequate budgetary resources be allocated for environmental and social safeguards; and that periodic monitoring and reporting be undertaken to ensure compliance and adaptive management. With these measures in place, the Kogonga–Kayundi Irrigation Scheme will deliver lasting socio-economic benefits while safeguarding environmental integrity

LIST OF ACRONYMS AND ABBREVIATIONS

AEZ	Agro Ecological Zone
AIDs	Acquired Immunodeficiency Syndrome
CIDP	County Integrated Development Plan
CIGs	Common Interest Groups
CMS	Convention on Migratory Species
CRW	Crop Water Requirement
EAs	Environmental Audit
EHS	Environmental Health and Safety
EMCA	Environmental Management and Coordination Act, 1999 Revised, 2015
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESS	Environment and Social Safeguards
ESMMP	Environmental and Social Management and Monitoring Plan
FGD	Focused Group Discussion
GBV	Gender Based Violence
GDP	Gross Domestic Product
GRM	Grievance Redress Mechanism
GoK	Government of Kenya
GHG	Greenhouse Gases
GPS	Global Positioning System
HIV	Human Immunodeficiency Virus
Km ²	Square Kilometers
MEA	Multilateral Environmental Agreements
MOA&LD	Ministry of Agriculture and Livestock Development
NAVCDP	National Agriculture Value Chain Development Project
NEMA	National Environment Management Authority\
NIDP	National Irrigation Development Programme
NIA	National Irrigation Authority
OSHA	Occupational Health Safety Act
PAPs	Project Affected Persons
PPE	Personal Protective Equipment
SEA	Sexual Exploitation and Abuse
SECAP	Social Environment and Climate Assessment Procedures
SPR	Summary Project Report
STDs	Sexually Transmitted Diseases
SH	Sexual Harassment
TOR	Terms of Reference

DEFINITION OF TERMS

Agroecological zones. Geographical mapping units based on climatic conditions and land forms that determine relatively homogeneous crop growing environments

Afforestation: Planting of new forests on lands that historically have not contained forests

Biological insect control. A method of pest control that relies on beneficial enemies to reduce pest populations to tolerable levels. It involves human manipulation of natural enemies of insects.

Basin irrigation: Irrigation by flooding areas of level land surrounded by dikes. Used interchangeably with level border irrigation but usually refers to smaller areas. (ASAE, 1998)

Climate Change: Climate change refers to any significant change in the measures of climate lasting for an extended period. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer.

Ecological restoration refers to enhancing the recovery of an ecosystem that has been degraded, damaged, or destroyed.

Furrow irrigation: Method of surface irrigation where the water is supplied to small ditches or furrows for guiding across the field. (ASAE, 1998)

Alternate set irrigation: Method of managing irrigation whereby, at every other irrigation, alternate furrows are irrigated, or sprinklers are placed midway between their locations during the previous irrigation. (ASAE, 1998)

Alternate side irrigation: Practice of furrow irrigating one side of a crop row (for row crops or orchards) and then, at about half the irrigation time, irrigating the other side.

Cutback irrigation: Reduction of the furrow or border inflow stream after water has advanced partially or completely through the field in order to reduce runoff. (ASAE, 1998)

Surge: Surface irrigation technique wherein flow is applied to furrows (or less commonly, borders) intermittently during a single irrigation set. (ASAE, 1998)

Pesticide: Chemical agent used to control specific organisms. Includes insecticides, herbicides, and fungicides.

Irrigation system: Physical components (pumps, pipelines, valves, nozzles, ditches, gates, siphon tubes, turnout structures) and management used to apply irrigation water by an irrigation method. All equipment required to convey water to or within the design area.

Lateral: Secondary or side channel, ditch or conduit. Also call branch drain or spur. Water delivery pipeline that supplies irrigation water from the main line to sprinklers or emitters.

"Threatened ecosystem" means an ecosystem of high biodiversity value or habitat of endangered or endemic species that is under threat of degradation;

"Wildlife" means any wild and indigenous animal, plant or microorganism or parts species that have been introduced into or established in Kenya;

“Gender based violence”- any harmful act directed at an individual based on their gender, sex, gender identity, or perceived gender roles

TABLE OF CONTENTS

FACT SHEET	i
CERTIFICATION	ii
TABLE OF GENERAL INFORMATION.....	iii
DISCLAIMER	iv
ACKNOWLEDGMENT	v
EXECUTIVE SUMMARY	vi
LIST OF ACRONYMS AND ABBREVIATIONS.....	x
DEFINITION OF TERMS	xi
TABLE OF CONTENTS.....	xiii
LIST OF TABLES	xix
LIST OF FIGURES	xix
LIST OF PLATES	xix
1 INTRODUCTION	1
1.1 Background information.....	1
1.1.1 Project Proponent.....	2
1.2 Project Objective.....	2
1.2.1 Broad objective	2
1.2.2 Specific objectives.....	2
1.3 Project justification.....	2
1.3.1 Rationale for the ESIA	3
1.4 Objectives of the ESIA- SPR.....	3
1.5 Terms of reference.....	4
1.6 Scope of the study	5
1.7 ESIA Approach and methodology	5
1.7.1 Environmental Screening and scoping	5
1.7.2 Environmental Scoping.....	6
1.7.3 Desktop study.....	6

1.7.4	Public consultation.....	6
1.7.5	Reporting.....	8
1.8	ESIA Team.....	8
1.9	Project Implementing agency/structure	8
1.10	Structure of the Report	8
1.11	Study Methodology	9
2	PROJECT DESCRIPTION	10
2.1	Introduction	10
2.2	Project Location.....	10
2.3	Project Design.....	10
2.3.1	Size of the Proposed Irrigation Area	10
2.3.2	Proposed Irrigation Method.....	11
2.3.3	Design of the proposed project	13
5.1.3	Intake work and pump house.....	13
2.3.4	Construction activities.....	14
	Required inputs.....	15
2.3.5	Materials used for construction	16
2.3.6	Proposed Project Activities during operation phase	17
	Project management activities.....	18
2.3.7	Waste to be generated and method of disposal.....	19
2.3.8	Project sustainability.....	24
2.4	Project Cost	25
3	POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK.....	26
3.1	Introduction	26
3.2	Relevant Policies	26
3.2.1	Kenya Constitution 2010	26
3.2.2	Vision 2030	26
3.2.3	National Irrigation policy 2017	27
3.2.4	National Gender and Development Policy, 2000	27
3.2.5	Policy on Gender and Sexual Based Violence 2017.....	27
3.2.6	Kenya National Youth Policy 2006	28
3.2.7	Wetlands policy	28

3.3	Institutional framework	28
3.3.1	National Environmental Management Authority.....	28
3.3.2	Environmental liaison units in other institutions with environmental management mandates in Kenya	29
3.3.3	Water Resources Authority (WRA).....	29
3.3.4	Irrigation Water Resource Users Association (IWRUA)	30
3.4	The Legal Framework.....	30
3.4.1	Environmental Regulatory Framework.....	30
3.4.2	<i>The Water Act, NO. 43 of 2016</i>	33
3.4.3	<i>Wildlife Conservation and Management (Amendment) Act, 2023</i>	34
3.4.4	<i>The Public Health Act (Cap. 242)</i>	34
3.4.5	<i>Physical Planning and Land Use Planning Act, 2019</i>	34
3.4.6	<i>The Occupational Health and Safety Act, 2007</i>	35
3.4.7	<i>Employment Act, 2007</i>	35
3.4.8	<i>Work injury benefits Act, 2007</i>	36
3.4.9	<i>National Construction Authority (2011)</i>	36
3.4.10	<i>Climate Change Act, 2016</i>	36
3.4.11	<i>Malaria Prevention Act (CAP 246)</i>	37
3.4.12	<i>The Energy Act, 2019</i>	37
3.4.13	<i>National legal provisions on Gender, HIV/AIDS and Gender Based Violence</i> 37	
3.4.14	<i>The National Museums and Heritage Act 2006</i>	38
3.5	Environmental and Social Standards	38
3.6	International Conventions and Treaties	43
3.6.1	Ramsar Convention 1971	43
3.6.2	The United Nations Framework Convention on Climate Change (UNFCCC).....	44
3.6.3	Sustainable Development Goals	44
4	CHARACTERISTICS OF THE PROJECT AREA.....	45
4.1	Background information.....	45
4.2	Overview of Tomato Value Chain(Nationally, regionally and local.....	45
4.3	Project location	46
4.3.1	Proof of Land Ownership	48

4.4	Demographic and population profile	48
4.4.1	Population.....	48
4.4.2	Population by Ward & Gender	49
4.4.3	Demographics by Age Group	49
4.5	Physical Environment	49
4.5.1	Topography.....	49
4.5.2	Ecological and Climatic conditions	50
4.6	Socio economic characteristics of the area.....	52
4.6.1	Land and Land use/Zonation.....	52
4.6.2	<i>Land use and economic activities</i>	52
4.6.3	<i>Flora and Fauna</i>	53
4.6.4	<i>Ecologically sensitive areas</i>	53
4.7	Physical infrastructure	53
4.7.1	Environmental Management Supportive Infrastructure	53
4.7.2	Infrastructure and Access Road.....	53
4.7.3	Roads.....	54
4.7.4	Communication.....	54
4.7.5	Electricity Coverage and use of Solar	54
4.7.6	Marketing Centres	54
4.7.7	Housing	54
4.7.8	Health and Environment	55
4.7.9	Water Access and Sanitation	55
5	PUBLIC PARTICIPATION AND STAKEHOLDER CONSULTATIONS. .	56
5.1	Public Participation.....	56
5.2	Purpose for the public and stakeholder consultation.....	56
5.3	Public Consultation process	57
5.3.1	Stakeholder mapping	57
5.3.2	Public consultation questionnaires.....	58
5.3.3	Public consultation meetings	58
5.4	Issue raised during the Consultation.....	60
5.5	Anticipated impacts.....	61
5.5.1	Positive Impacts	61

5.5.2	Anticipated negative impacts.....	62
5.5.3	Suggestions and comments from public consultations	63
5.5.4	Grievance Redress Mechanism (GRM)	64
5.5.5	Communication & Stakeholder Engagement Plan	66
5.6	Conclusion	67
6	ANALYSIS OF PROJECT ALTERNATIVES.....	68
6.1	Introduction	68
6.2	“No-action” alternative	68
6.3	Relocation Alternative.....	68
6.4	Alternative design and technology (Include wastes disposals)	69
6.4.1	The project alternative.....	70
7	ANALYSIS OF POTENTIAL IMPACTS AND MITIGATION MEASURES	71
7.1	Introduction	71
7.2	Positive Environmental and Social Impacts during construction phase	71
7.2.1	Positive environmental impacts.....	71
7.2.2	Positive social impacts.....	72
7.2.3	Negative environmental impacts during construction phase	73
7.2.4	Negative Social impacts during construction phase.....	77
7.3	Environmental and Social Impacts and Mitigation Measures during Operational Phase	85
7.3.1	Positive environmental impacts during operational phase.....	85
7.3.2	Negative environmental impacts during operation phase	85
7.3.3	Negative social impacts during operational phase.....	89
7.4	Anticipated Environmental and Social Impacts during Decommissioning Phase and Mitigation Measures.....	93
7.4.1	Positive Decommissioning Impacts	94
7.4.2	Negative Environmental Impacts during Decommissioning phase	94
7.4.3	Negative Social Impacts during decommissioning phase	94
8	ENVIRONMENTAL SOCIAL MANAGEMENT AND MONITORING PLAN (ESM&MP).....	97
8.1	Introduction	97
8.1.1	Environmental Social Management& Monitoring Plan	97

9	CONCLUSION AND RECOMMENDATION	114
9.1	Conclusions.....	114
9.2	Recommendations.....	114
10	REFERENCES.....	116
11	APPENDICES.....	118
i)	Copies of filled questionnaires.....	118
ii)	Minutes of public consultation meeting	123
iii)	Public participation attendace list	128
iv)	Title Deed	131
v)	Land Use Agreement letter Kogonga- Kayundi Beach Irrigation Water User 134	
vi)	Screening Checklist.....	135
vii)	ESIA Practicing License.....	145
viii)	BQ of the Kogonga Kayundi Irrigation scheme	146
ix)	Photo of participants raising their concerns	148
x)	Invitation for Stakeholder Engagement.....	149
xi)	Structural drawing.....	151
xii)	Design Layout.....	152
xiii)	Profile drawing.....	153
xiv)	WRA Permit.....	154
xv)	WRA permit payments	155
xvi)	list of land owners and farmers/beneficiaries.....	156
xvii)	Chance Find Procedures	159
xviii)	Hydrological survey report.....	162

LIST OF TABLES

Table 3-1 Analysis of potential triggers to ESS Standards	39
Table 4-1: Population characteristics Rarieda sub county ward	49
Table 4-2 Population by Ward & Gender	49
Table 4-3 : Agro -Ecological Zonation Of Siaya County.....	52
Table 4-4 ACCESS Ownership and communication.....	54
Table 4-5: Housing type in the Project Area	54
Table 5-1: Stakeholder Consultative meeting key concerns raised.....	60
Table 7-1: Summary of expected impacts, rating and development stage	71
Table 8-1: Environmental and Social Managment and Monitoring Plan(EM&MP) ...	98
Table 8-2: Integrated Pest Management Plan (IPMP)	112

LIST OF FIGURES

Figure 2-1 Proposed project site plan.....	Error! Bookmark not defined.
Figure 4-1: Administrative location of the project site	47
Figure 4-2: Proposed project site (Kogonga Kayundi Beach) Courstesy og Google Earth	48
Figure 11-1Topographical design of the proposed site .	Error! Bookmark not defined.

LIST OF PLATES

Plate 1-1: Proposed irrigation scheme site	7
Plate 5-1Associate Expert Benard Ayagah addressing participants.....	56
Plate 5-2 Community sensitization meetings.....	58
Plate 5-3:County Community Ivestment Development Officer	58
Plate 5-4: Participants filling individual questionnaire	59
Plate 5-5: Participants at Uasi village raising hands in accapetance of the proposed project	60
Plate 6-1 Current state (No action.....	68
Plate 11-1 Participants filling questionanire and raising their concerns.....	148

1 INTRODUCTION

1.1 Background information

The National Value Chain Development Programme (NAVCDP) is a five -year project that is jointly funded by World Bank and the Government of Kenya (GOK). in 34 Counties. The project is implemented by Ministry of Agriculture and Livestock Development, State department of Crops. The aim is to increase market participation and value addition for targeted farmers in 16 prioritized value chains. Siaya County is one of the 34 counties under the NAVCDP. Component 2 of the project (Climate smart value chain ecosystem investments) has four (4) sub-components, of which two (2), namely Farmer-Led Irrigation Development (FLID) and Market Access and Infrastructure Development (MA&ID), are infrastructure based. FLID aims to contribute towards increasing the production and productivity of priority agricultural value chains to ensure adequate volumes for markets and for value addition/processing.

Kogonga and Kayundi Beach Irrigation Water Users Association aligns with Component 2.0 (Climate Smart Value Chain Ecosystem Investments) and Sub-Component 2.1 (Increase area under irrigation) of the National Agricultural Value Chain Development Project (NAVCDP).

The Kogonga and Kayundi Beach (IWUA) is a registered community-led irrigation scheme undertaking horticultural crops (tomato, kale, onion) production within North Uyoma Ward, Rarieda Sub-County in Siaya County. The IWUA has 312 (104F,208M) members with 105 acres under irrigated agricultural production .There is potential 500 acres that can be put under irrigation. To support the rapidly increasing population and ensure sustainable economic growth in the reducing landholdings, use of irrigation technologies will ensure the intensification of production in the available land.

The proposed project is an expansion of the Kogonga Kayundi irrigation scheme. The project was identified through am PICD process and is in tandem with Siaya County CIDP 2023-2027. It is committed to adhering to environmental guidelines which includes formulating plans for climate risk analysis, environmental management, pesticide usage and engagement with local communities

The Environmental and Social Impact Assessment (ESIA) report seeks to promote sustainable development in the project area by integrating environmental costs and benefits into proposed development activities through identifying likely impacts, their significance, and propose

mitigation measures for identified impacts. The study entailed scooping, screening, back and forth community engagement and was conducted for on 15 days from 31st of March to 18th of April, 2025. The assessment considered all the impacts of the proposed project from feasibility study design construction, operation and decommissioning.

1.1.1 Project Proponent

The Kogonga- Kayundi beach Irrigation Water User Association is the main proponent of the project. Kogonga Kayundi is a settlement located within Kogonga Beach in North Uyoma, Rarieda Sub-County, and Siaya County, Kenya.

1.2 Project Objective

To increase the average household income of local farmers in Kogonga -Kayundi beach and beyond by 30% and reduce local food insecurity by 40% through the implementation of year-round irrigation infrastructure and climate-smart agricultural training.

1.2.1 Broad objective

The main objective is to install a solar powered irrigation system and accessories i.e conveyance systems to support all year round irrigated horticultural production in Kogonga-Kayundi irrigation scheme for improved livelihood.

1.2.2 Specific objectives

To provide water access to farmers in Kogonga-Kayundi beach and the neighbouring villages to irrigate 12 Ha of land for increased horticultural production and incomes. The irrigatable land area is expected to increase by 40%

1.3 Project justification

Many smallholder farmers in Kogonga Kayundi Irrigation Scheme and the entire community struggle with inconsistent rainfall patterns, leading to unreliable crop production and food insecurity. Moreover, traditional irrigation methods, which often rely on diesel-powered pumps, are costly and environmentally unsustainable. The proposed project provides a sustainable alternative by utilizing solar energy to power irrigation systems, significantly lowering production costs and reducing the carbon footprint of agricultural activities.

The project also contributes to poverty reduction, job creation, and overall economic growth within the community. By improving tomato yields, farmers can increase their household

incomes, enabling them to invest in education, healthcare, and other essential services. Additionally, the adoption of modern irrigation methods enhances climate resilience, ensuring that farmers can sustain their agricultural activities despite changing weather patterns. The initiative aligns with national and international development goals, including the promotion of renewable energy, sustainable agriculture, and climate adaptation strategies.

1.3.1 Rationale for the ESIA

The main purpose for which ESIA is conducted and report prepared is to assist the project proponent, the Environment Management Authority (NEMA) and all other stakeholders in understanding the project and thus provide a basis for making informed decisions on whether direct or indirect and particularly environmental, social and economic impacts are fully examined and addressed. In the long term ESIA ensures that the proposed development is sustainably implemented.

The World Bank Environmental and Social Standards which comprises of 10 ESSs also requires the project proponents to conduct Environment and Social Impact Assessment (ESIA) for projects that have the potential to have significant environmental and social impacts ESIA helps in identifying potential negative impacts and proposing mitigation measures

The recommendation was in line with NEMA Public Notice on ESIA and Legal Notice No. 31 which identifies the proposed project as Low risk, thus requiring only a Summary Project Report (SPR). Besides, the ESIA was prepared as per the provisions of The World Bank ESS that provides broad coverage on transparency, non-discrimination, social inclusion, public participation, accountability, among others

1.4 Objectives of the ESIA- SPR

The objective of this study was to undertake Environmental and Social Impact Assessment for The Construction Works for Expansion of Kogonga-Kayundi Irrigation Project and identify potential impacts of the project's activities on the environment including social concerns and to identify mitigation measures.

The specific objectives include: -

- To ensure compliance with environmental laws, regulations and standards
- To identify the impacts of the proposed project's activities on the environment and social aspects

- To propose mitigation measures for the significant negative environmental and social impacts
- To develop an Environmental and Social Management and Monitoring Plan (ESMMP)

1.5 Terms of reference

The terms of reference on task and scope of the assessment will include but not limited to:

- Provide in depth description of the proposed development project site
- Describe key components of works such as construction, operation and decommissioning.
- Identify for each component sources of adverse environmental impacts.
- Review policy, legal and administrative framework that should be addressed for the proposed development project to proceed without negatively affecting the environment.
- Provide analysis of alternatives to the proposed development project.
- Record all public consultations and other records that will indicate participation of interested and project affected parties (PAPs) throughout the ESIA study process, including: surveys used to seek views of affected stakeholders; date and location of consultation meetings; a list of attendees, their affiliation, contact addresses and a summary.
- Record of consultations with VMGs, youth, female beneficiaries and communities meeting the requirement of ESS7. This section needs to present an approach to ongoing stakeholder engagement. In addition, a Grievance Mechanism will be described in this section.
- Attaching all the requisite documents and records e.g Topographical, architectural and structural drawings, land ownership among others as shall be guided by the project
- Develop mitigation measures for identified negative impacts within an elaborate Environmental Social Management and Monitoring Plan (ESMMP).
- Prepare the Summary Project Report.
- Submit the draft SPR to NAVCDP for review and incorporate comments
- Submit the required hard copies and soft copy of the SPR report to NEMA to allow review and approval of the proposed project.

1.6 Scope of the study

The Kenya Government and the World Bank policy on all proposed facilities, activities and programmes requires that an environmental and social impact assessment study be done to provide baseline information upon which subsequent environmental control audit studies and world bank environmental and social monitoring shall be based. This ensures that significant impacts on the environment and the surrounding communities are taken into consideration at all times during the operations of the respective project. The scope of this SPR, therefore, covered description of the project

- Determination of how far the operation of the Kogonga Kayundi irrigation scheme will impact on the environment.
- The study and description of the irrigation activities during construction and operation phase and identification of all the impacts it has on both human and natural environment.
- The review of the project operating activities to ensure that the intended mitigation measures have been properly implemented.
- The description of the health and safety issues of the organization members, the local community and other potentially affected groups.
- The description of monitoring programs, parameters and procedures in place for control and corrective actions in case of emergencies.
- The provision of evidence of public consultations
- The design of an environmental management plan which the organization management group will use to implement the proposed mitigation measures in order to improve the environmental quality.

1.7 ESIA Approach and methodology

1.7.1 Environmental Screening and scoping

The Consultant first undertook environmental screening and scoping to identify pertinent issues for coverage in line with the TOR and to complement the World Bank ESS screening checklist findings. ESS Standards that NAVCDP are aligned to include: ESS1 Assessment and Management of Environmental and Social risks and Impact, ESS 2 Labour and Working Conditions, ESS 3 Resource Efficiency and Pollution Prevention Management: on Labour and working conditions. ESS 4 Community Health and Safety, ESS 5 Land Acquisition,

Restrictions on Land Use and Involuntary Resettlement, ESS 6 Biodiversity Conservation and Management of Living Natural Resources, ESS7 Indigenous Peoples/ Sub Saharan African Historically Underserved Traditional Local Communities, ESS 8 Cultural Heritage (IPs/ SSAHUTLC) and ESS 10 Stakeholder Engagement and Information disclosure. According to the World Bank Environmental Social framework risks are categorized as High, Substantial, Medium & Low. The magnitude of the investments is small - medium, temporary, site specific, predictable but reversible. The project is found to be medium risk.

An Environmental and Social Safeguards screening checklist was applied resulting in the classification of the project as a 'B' category project (see annex 3) in line with considerations of NEMA Legal Notice No 31 on the Amendment of the Second Schedule of EMCA 1999. The County Director Environment Siaya recommended a summary project report to be prepared for the proposed project

1.7.2 Environmental Scoping

The purpose of the scoping was to determine the intensity of the expected environmental impacts and the people likely to be affected. In the study, environmental scoping involved evaluating the expected environmental impacts and discussing them with relevant stakeholders to determine their views on the same

1.7.3 Desktop study

Desktop study included documents review on the nature of the proposed activities, project documents including designs, policy and legislative framework as well as the environmental setting of the area among others. Key documents reviewed included the following: Kenya policies, strategies and guidelines; National and County Laws and regulations; applicable Multilateral Environmental Agreements (MEAs), World Bank policies on ESS, PICD report, (CIDP)-2023-2028, hydrological assessment report among others. The ESIA team also held discussions with design engineers, County agriculture staff, Quantity surveyors and interviews with the local community.

1.7.4 Public consultation

a) Physical inspection of the site and surrounding

Physical inspection of the proposed site which included field investigation at site and surrounding areas was done on 2nd April 2025. At the visited sites, documentation on geology, soil characteristics and landscape were recorded. Photographs at selected sites were taken for

inclusion in the report to further emphasis these observations. The field investigations were meant for physical inspections of the site characteristics and the environmental status of the surrounding areas to determine the anticipated impacts from the project. It also included further interviews with the community and key stakeholders.



Plate 1-1: Proposed irrigation scheme site

b) Consultation and Public Participation

The ESIA experts, in consultation with NAVCDP, Siaya team sought the views of persons who may be affected by the proposed project. The public consultations were preceded by the identification of stakeholders and project affected persons (PAPs- annex III) and plates 2, 3&4. Public meetings were undertaken at the proposed site and the project area, evidence photos attached (annex VI Public baraza attendance). During the meeting held 2nd April, 2025, there was attendance of about 49 participants of which 29 were men and 20 were women. The record of minutes is provided in annex II. To ensure adequate public participation in the ESIA process, at least 15 questionnaires were administered. The information gathered was subsequently synthesized and incorporated into the ESIA summary project report. This was done in order to incorporate the concerns and views of all persons and individuals in the project neighbourhood.

c) Observation Methods

This was to asses and quantify environmental risks posed by the proposed project. The application of this technique was based on the exoperts long term knowledge and experinece in environmental impact assessment and environmental management

d) Photography

The EIA/EA expert took photos of the site to document the local environment including vegetation cover existing structures area topography, and infrastructure

1.7.5 Reporting

The Environmental Impacts Assessment report was compiled from the findings in accordance with the EIA guidelines issued by NEMA for Summary Project Report. The Consultant ensured constant briefing of the proponent during the exercise. The exercise culminated with the production and documentation of the summary project report which will be submitted to NEMA for review and approval.

1.8 ESIA Team

The ESIA team comprised of a team of experts from the various related fields among them being the County as indicated in the table below:

NEMA Lead Experts	Fredrick Aloo Lead Expert No 9049
Agricultural Economic	Elijah Lwevo
Environmental science	George Omondi
Sociologist	Diana Awuor
County Irrigation Engineer	Engineer Kevin Obiero
Irrigation Engineer	Engineer Charles Olang

1.9 Project Implementing agency/structure

The implementing agency is National Agriculture Value Chain Development Project (NAVCDP). The project is a Farmer-Led Irrigation Development (FLID) under the Ministry of Agriculture and Livestock Development, State Department of crops. NAVCDP is being implemented in 34 Counties, and Siaya County is among them.

1.10 Structure of the Report

The report structure is organized in 9 chapters. Chapter 1 covers the general introduction of the project and its relation to the NAVCDP project. In chapter 2, a description of the nature of the project is given covering what the project entails. Chapter 3 describes the location of the project and its surrounding. Chapter 4 addresses the legal framework and how it is linked to the project activities. Public participation and stakeholder engagement description and methods used to

reach them is described in chapter 5. Project Alternatives is described in Chapter 6 and a description of potential impacts and mitigation measures foreseen in the project is provided in chapter 7. Chapter 8 gives a table that describes the Environmental and Social Management & Monitoring Plan (ESM&MP) that will be implemented by the project. Chapter 9 sums up the conclusion and recommendations for the whole assessment. References and Annexes have been included respectively.

1.11 Study Methodology

This assessment was carried out in March and April 2025 in accordance with the procedure outlined in the Environmental (Impact Assessment and Audit) Regulations, 2003 (Revised 2019) and involved:

a) **Screening:** screening checklist used assess the site and project area. This was followed by Site visits to physically inspect and document existing facilities at the site and natural and socio-economic features of importance.

c) **Scoping:** A reconnaissance survey was done at the site in order to narrow down to the most critical environmental and social issues requiring detailed evaluation.

d) **Public participation:** A total of 49 people attended the public participation meeting; questionnaire interviews were conducted from 20 households. (annex 111) The lists of attendance and the minutes of the public meeting are also attached (Appendices IV and Appendix VI) respectively.

e) **Desktop studies:** The experts also reviewed relevant policies and legislation, PICD report, (CIDP)-2023-2028, hydrological assessment report, literature on the environmental setting of the area and case studies of similar projects.

f) **Observation** was done in the areas visited during the data collection exercise, unstructured observations were made such as cultural materials, economic, livelihoods and production systems, land use and settlement patterns.

g) **Data Analysis and Report writing** Quantitative data was entered into excel spreadsheet and run to obtain basic frequencies and information regarding the key variables of concern to the social assessment study. The qualitative data Key Informant Interview(KII) was transcribed and audited. It was then analysed using content analysis and category building and grouping which enabled the developing of themes in line with the objectives of the social assessment.

2 PROJECT DESCRIPTION

2.1 Introduction

The Kogonga Kayundi Irrigation Water User Association(IWUA) project objective is to enhance tomato production by implementing solar-powered irrigation, providing a cost-effective and environmentally sustainable solution to unreliable rainfall and expensive conventional irrigation methods.

Project Location

The proposed site for the expansion of Kogonga Kayundi Irrigation project is in Ndiru Village North Uyoma Ward Rarieda Sub County .It is found in Kogonga-Kayundi Beach . The area lies in GPS Coordinates Latitude -0.258056, Longitude 34.391667.The project is community led and targets to transform the rural livelihoods of the IWUA . The irrigated farms are individually owned totalling approximately 40ha whereas the proposed development of infrastructures will be installed in farms and agreements have been made as per the attached (Annex v). The proposed site is about 2.5 km away from the Kisumu-Luanda Kotieno tarmac road.It is located in Ndiru village and connected by a murram road from Ragegni junction.

The major facilities near the site are Matera dispensary which is 1.5 km away and Madiany Sub county hospital about 5 Km away. The nearest primary school, Nyamasore primary school is less than 1 km from the project site while the office of the chief is about 2Km away from the proposed site

2.2 Project Design

This section presents the proposed agricultural development plan for the Kogonga Kayundi Irrigation Water Users Association. The design entails construction, installation, piping, area of land to be irrigated, fencing, sanitation facilities etc detailing the planned irrigation area, selected crops and their allocation, as well as the cropping pattern and rotation schedule.

2.2.1 Size of the Proposed Irrigation Area

The proposed irrigation area for this development plan covers a total of **40 hectares**. This area has been carefully selected based on its soil suitability, water availability, and accessibility to farmers within the Kogonga Kayundi Irrigation Water Users Association. The irrigation system

will be designed to efficiently distribute water across all designated plots, ensuring optimal crop growth and productivity.

Selected Crops and Area Allocation

The selection of crops is based on factors such as climate adaptability, market demand, water requirements, and the potential for income generation. The IWUA has proposed to put the entire scheme under tomato production (for which the scheme has been designed)

Cropping Pattern and Rotation

A well-structured cropping pattern and rotation schedule will be implemented to maintain soil fertility, control pests and diseases, and maximize land productivity. The cropping pattern will be as follows:

Seasonal Cropping Plan

Rainy Season (April -November): Maize and green beans

Dry Season (October - March): Tomatoes, onions, and kales

Crop Rotation Schedule

To prevent soil depletion and minimize pest outbreaks, a rotational system will be practiced over a three-year cycle:

- **Year 1:** Kales → Tomatoes.
- **Year 2:** Onions → Tomatoes.
- **Year 3:** Kales → Tomatoes

Note: The Crop Water Requirement for Tomato suits the alternative crops i.e Onions and Kales (CWR for Onions and Kales are lower than that of Tomato)

This rotation will enhance soil nutrient retention, reduce soil-borne diseases, and improve overall land productivity.

2.2.2 Proposed Irrigation Method

a) Crop Water Requirement for Tomatoes in Kogonga Kayundi Irrigation scheme

The crop water requirement (CWR) refers to the total amount of water needed for a crop to grow optimally, taking into account evapo-transpiration losses. For this analysis, the FAO CROPWAT model was used to estimate the CWR for tomatoes under the Kogonga Kayundi Irrigation Scheme. The calculation considers local climate data, crop coefficients, soil conditions, and the irrigation system.

b) Data Used for CWR Calculation

Climate Data for Siaya County

Reference Evapotranspiration (ET_0) was estimated using the FAO Penman-Monteith equation.

Monthly average ET_0 values (mm/day) are as follows:

Jan: 5.4, Feb: 5.6, Mar: 5.2, Apr: 4.8, May: 4.5, Jun: 4.2, Jul: 4.1, Aug: 4.3, Sep: 4.7, Oct: 5.0,
Nov: 5.2, Dec: 5.3

Tomato Crop Coefficients (K_c) Based on Growth Stages

Initial Stage (0-20 days): 0.6

Development Stage (21-50 days): 1.05

Mid-Season Stage (51-90 days): 1.15

Late-Season Stage (91-120 days): 0.8

Soil and Irrigation Data

Soil Texture: Loamy-Clay

Root Depth: 0.6–1.5 m

Irrigation Method: Drip irrigation

c) Crop Water Requirement Calculation

The crop water requirement (ET_c) is determined using the formula:

$$ET_c = K_c \times ET_0$$

Where:

ET_c = Crop water requirement (mm/day)

K_c = Crop coefficient

ET_0 = Reference evapotranspiration (mm/day)

Total Crop Water Requirement (ET_c) for Tomatoes = **579.6 mm (or 5796 m³/ha per season).**

d) Total Scheme Water Requirement

The irrigation scheme is to cover 12 hectares of tomato farming. The total seasonal water demand is: 69,552 m³ per season

e) Daily and Weekly Irrigation Demand

Average Daily Water Requirement: 579.6 m³/day

Weekly Water Requirement: 4,057.2 m³/week

The Kogonga Kayundi Irrigation Scheme requires approximately 69,552 cubic meters of water per season to support 12 hectares of tomato farming. The daily irrigation demand is 579.6 cubic meters, with a weekly demand of 4,057.2 cubic meters. These figures are essential for

designing the irrigation system, determining pumping capacity, and planning efficient water distribution

2.2.3 Design of the proposed project

The proposed irrigation scheme is designed to efficiently manage and distribute water across the designated **40-hectare** agricultural area while minimizing losses and ensuring sustainability. The layout incorporates modern irrigation infrastructure, including reservoirs, pipelines, and intake works, to optimize water usage and enhance crop production. With a well-planned network of rising mains, sub-mains, and laterals, the system aims to provide uniform water distribution, reducing water stress and maximizing yield potential. Key components include:

Pipeline Network

The water conveyance system consists of a structured pipeline network to ensure uniform water distribution

- Rising Main: 200mm HDPE (PN8) pipes to transport water from the pump station to the reservoir
- Main lines: DN160mm, DN 110mm mainline pipes.
- Sub-Main: DN90mm, DN 75mm and DN 63mm to distribute water from the reservoir to field plots
- Laterals (Drip lines): 16mm polyethylene drip tapes material with emitter spacing of 15cm, 20cm and 30cm application ensuring precise water application to crops,

Reservoir System

To ensure consistent water supply, the scheme will have a low level 518,000-liter pressed steel/IGRP/FRP reservoir c/w dwarf walls positioned at the highest elevation, allowing gravity-fed water distribution.

5.1.3 Intake work and pump house

- Sump/well, Power House, Pump and Accessories
- The sump/well will be constructed to a depth of 10m and lined with pre-cast concrete rings of DN 900mm.
- The power house will have masonry walls and corrugated iron sheet roof. It shall house the pump controller and other essential electrical. Solar support Structure.

- The steel solar support frame shall support the solar panels
- In-let Pipe.

The in-let pipe line shall consist of HDPE PN16 DN 250mm diameter line, 100m long running from the lake to the sump

- Fence

It shall comprise of chain link mounted on barbed wire mounted on concrete posts for the entire perimeter of the head works and storage tank.

2.2.4 Construction activities

Planning Phase Activities

The main activities considered during this phase are: community mobilization, tendering services as required by procurement regulations, site hand over, hand over of drawing and building plans and site layout.

Mobilization and construction works

Site mobilization includes the stepping up of a camp for construction works and transportation of machinery to the site for excavation works. This stage of the project will also involve selective clearing of vegetation i.e trees and shrubs to allow for excavation of the foundation

Earthworks

After clearing any existing vegetation in selected areas, the soil will then be excavated to allow construction of various infrastructure. Excavators will be sought to the site to remove the soil. The contractors will recycle the excavated soil as much as possible due to the topography of the proposed site. Since the area under irrigation is about 100 acres the soils will be spread out in the farm fields and layed along the contours if possible terraces will be constructed along the slopes to minimise soil erosion. For construction of the main reservoir, earthworks will involve excavation of soils for the foundation; this will be done with an aim of achieving the desired foundation in order to be able to hold a 720,000m³ water tank

Construction works

Construction works will majorly involve construction of auxiliary structures

Installation of Solar infrastructure

Pumping of water from the intake will be by use of solar which is green energy. This therefore means that there should be installation of solar infrastructure at site. Solar will also be used to light to boost security and deter wildlife from the irrigation fields

Required inputs

The project inputs include the following:

- 1 Construction raw materials i.e sand, cement, stones, clay materials among others. All these should be obtained from the surroundings.
- 2 Construction machines including machinery such as trucks, concrete mixers, and tools and other relevant construction equipment. The equipment will be used for transportation of materials clearing of the site and construction debris. Most of machinery will use petroleum products to provide energy
- 3 A construction labour force of both skilled and non-skilled workers
- 4 Solar technology infrastructure

Construction activities

Head works: The head works serve as the foundation of the irrigation system, ensuring a steady and reliable supply of water from the source to the distribution network. The head works consist of essential infrastructure required to abstract and regulate water for the irrigation scheme.

The key components include:

An Intake Works: well-structured intake system consisting of a sump-well at Lake Victoria that ensures efficient water abstraction, minimizing sedimentation and debris infiltration.

Power House and Pumps: The power house is a reinforced concrete structure with a corrugated iron sheet roof. It houses two high-efficiency solar controllers. The pumps are located within the sump wells at a depth of 8m below ground level.

Solar Power System: A solar energy system powers the pumps, ensuring sustainable and cost-effective operation while reducing dependency on fossil fuels.

Water Meter: A centralized metering devices ensures accurate measurement of water usage and operational efficiency.

Water conveyance

The water conveyance system is designed to efficiently transport water from the intake point to the irrigation fields. The system includes:

- Rising Main: DN200mm HDPE pipes transporting water from the pump station to the reservoir.
- Main-lines: DN160mm, DN110mm mainlines

- Sub-Main Pipelines: DN90mm, DN 75, DN 63 HDPE pipes distributing water from the reservoir to various field blocks.
- In-let Line: A DN 250mm HDPE PN 16 pipe (100m long) connects the sump to the lake intake point, ensuring smooth water abstraction with minimal losses.

Water Distribution System

The water distribution system is designed to ensure even and efficient water application across the irrigation fields. The major components include:

Reservoir Storage: 518,000-liter pressed steel tank is installed at the highest elevation to allow gravity-fed water distribution.

Drip Irrigation Laterals: 16mm polyethylene drip tapes with emitters spaced at 15cm, 20cm, and 30cm intervals ensure precise water delivery to plant roots

Main and Sub-Main Pipelines: These pipes form a structured distribution network, minimizing losses and improving irrigation efficiency.

Water application method

Flood Irrigation – This method involves channeling water directly to the fields and allowing it to spread over the surface. While it is inexpensive and simple to implement, it results in high water wastage due to evaporation and runoff. It is also unsuitable for tomato farming due to excessive moisture exposure, which can lead to root diseases.

Sprinkler Irrigation – Sprinkler systems distribute water through overhead spray mechanisms, simulating natural rainfall. Although efficient in terms of water distribution, they require high energy inputs and are not ideal for crops like tomatoes, which are prone to fungal infections due to prolonged leaf wetness

Drip Irrigation (Selected Method) – Drip irrigation was chosen as the preferred technology for the scheme due to its high-water efficiency and suitability for tomato farming. This method delivers water directly to the root zone through a network of pipes and emitters, reducing water loss through evaporation and runoff.

2.2.5 Materials used for construction

a) Head Works

The head works are critical components of the irrigation system, responsible for water abstraction and initial distribution. Key features include:

Intake Works: A structured intake system to regulate and filter incoming water, preventing debris and sediment infiltration

Pumping Station: Houses energy-efficient pumps, powered by solar, ensuring continuous water supply

Reservoir Storage: A high-capacity reservoir for water storage, ensuring steady supply during dry spells

Control Valves: Includes specialized valves used to regulate the flow of water to different sections of the field.

b) Main Pipeline

The main pipeline serve as primary water transport channels from the head works to different irrigation sections. Features include:

Material: Constructed using HDPE pipes for durability and efficiency.

Capacity: Designed to handle peak flow rates ensuring uninterrupted water supply.

Flow Regulation: Equipped with control Valves for efficient water distribution.

c) Sub-Main Pipelines

These secondary conveyance structures distribute water from the main pipeline to the laterals. Features include;

Intermediate Flow Management: Equipped with check control valves to regulate water pressure

Branching System: Designed to distribute water evenly across various farm plots.

Leak Prevention: Built with sealed joints and anti-leak technologies to minimize losses.

Accessibility: Strategically placed for ease of maintenance and operational efficiency.

d) In-Field System

The in-field irrigation system ensures water reaches individual crops effectively. Features include:

Drip Irrigation System: Comprising polyethylene pipes with precisely spaced emitters, minimizing water wastage.

2.2.6 Proposed Project Activities during operation phase

Crop agronomic activities

A well-structured cropping pattern and rotation schedule will be implemented to maintain soil fertility, control pests and diseases, and maximize land productivity. The cropping pattern will be as follows.

Seasonal Cropping Plan

- ✓ Rainy Season (April - November): Maize and green beans
- ✓ Dry Season (October - March): Tomatoes, onions and kales.

Crop Rotation Schedule

To prevent soil depletion and minimize pest outbreaks, a rotational system will be practiced over a three-year cycle:

- ✓ Year 1: Kales → Tomatoes.
- ✓ Year 2: Onions → Tomatoes.
- ✓ Year 3: Kales → Tomatoes

Note: the crop water requirement for tomato suits the other alternative crops i.e. onion and kales (CWR for onions and kales are lower than that for tomato)

This rotation will enhance soil nutrient retention, reduce soil-borne diseases, and improve overall land productivity.

Maintenance of system activities

Maintenance of Reservoir

- ✓ Maintenance of Intake channel
- ✓ Maintenance of Power House, Pump and Accessories
- ✓ Maintenance of solar panels and the wiring systems installation of lightening arrestors
- ✓ Maintenance of In-let Pipe and the entire piping system into the irrigation fields
- ✓ Maintenance of Fence
- ✓ It shall comprise of chain link mounted on barbed wire mounted on concrete posts for the entire perimeter of the head works and storage tank.

Project management activities

The members of the Kogonga Kayundi Irrigation Water User Association in collaboration with the agronomy experts and irrigation engineers from the county government will manage the irrigation system. There will be a committee responsible for coordinating overall operation and maintenance of the irrigation scheme

This involves managing conflicts that may arise from the project operations carrying out repairs and maintenance among other duties

2.2.7 Waste to be generated and method of disposal

2.2.7.1 Effluent Waste

Effluent waste will emanate from construction works (mixing of aggregate, cleaning) mobile toilet facilities that will be used by workers while at work among others. Wastewater will also emanate from activities related to washing/cleaning of equipment and vehicles. During operation effluent waste is going to emanate from the crop agronomic activities use of fertilizers hence leading to releasing of nitrogen in the ground water and washing of nitrogen to the Lake Victoria.

The leached nitrogen may lead to eutrophication and affect fish in the lake. Application of pesticides and fungicides to control pests and diseases may also lead to washing away of the chemicals in the soils or to the Lake Victoria. Wastes from leaking pipelines may also result to soil erosion

Method of Disposal

1. Construction & Equipment Wastewater

Sedimentation Ponds/Silt Traps: Direct construction runoff into temporary lined ponds. This allows heavy particles to settle at the bottom before the clarified water is reused or discharged. Washing and cleaning of vehicles

Oil-Water Separators: For vehicle washing areas, use a separator to trap grease and hydrocarbons. The captured oil should be disposed of via a licensed hazardous waste contractor.

Containment & Reuse: Designate a "washout" area for concrete mixers lined with geomembranes to prevent leaching into the soil. Once dried, the hardened slurry can be disposed of as inert construction debris.

2. Sanitary Waste (Mobile Toilets)

Since these are temporary facilities for workers, the management focuses on containment and off-site treatment.

Exhauster Services: Mobile toilets must be regularly emptied by licensed vacuum trucks (exhausters).

Approved Treatment Plants: The waste must be transported to a municipal wastewater treatment plant (WWTP) or a designated lagoon system that meets national environmental standards.

Buffer Zones: Ensure mobile units are placed at least 30–50 meters away from any water bodies or drainage channels to prevent accidental spills from reaching the lake.

3. Agricultural Runoff (Nitrogen & Phosphorus)

Nitrogen leaching is a major driver of eutrophication. Management here will focus on source control rather than "disposal."

Vegetative Buffer Strips (Riparian Zones): Maintain a thick "green belt" of native vegetation between the cropland and Lake Victoria. These plants act as biological filters, absorbing excess nitrogen and phosphorus before they reach the water.

Precision Application: Use soil testing to apply only the exact amount of fertilizer needed (4R nutrient stewardship: Right source, Right rate, Right time, Right place) to minimize leaching.

Bio-swales and Retention Basins: Construct shallow, vegetated channels to slow down runoff, allowing microbes and plants to process the nutrients.

4. Pesticides and Fungicides

Because these chemicals are toxic to aquatic life, the goal is to prevent them from entering the hydrological cycle.

Integrated Pest Management (IPM): Reduce chemical reliance by using biological controls and crop rotation.

Safe Rinsing Zones: Never wash spray equipment in or near the lake. Use a "biobed"—a lined pit filled with a mixture of peat, straw, and soil that biologically breaks down pesticide residues.

Weather-Syncing: Avoid application during high winds or immediately before heavy rains to prevent "wash-off" into the lake.

5. Pipeline Leaks and Erosion

Leaking pipelines can saturate soil, leading to instability and heavy sedimentation.

Containment Berms: Construct earthen or concrete bunds around high-risk pipeline sections to catch leaks. Automatic Shut-off Valves: Install pressure-sensitive valves that stop the flow immediately if a leak is detected.

Gabions and Terracing: To prevent soil erosion caused by water force, install gabions (wire baskets filled with stones) in areas where runoff is concentrated to dissipate energy and stabilize the soil.

2.2.7.2 Solid Waste

Construction solid waste will comprise of waste from excavation and reinforcement of the 720,000m³ water tank. Construction waste will include among others construction packaging materials (cement bags, packaging waste, sand, ballast HDPE material pipes and plastic pipes for drip irrigation). Wastes consist of gravel packs and other packets of materials and equipment metal cuttings, rejected materials, surplus materials, surplus spoil, and excavated materials, paper bags, empty cartons, empty paint and solvent containers, broken glass among others Wastes from lubricating oils during laying of pipes and construction works. Human waste will also emanate from the construction workers on site (will require mobile toilets).

During operation, the most likely waste will arise from application of farm inputs i.e fertilizers, pesticides fungicides and containers of the same, repairs of pipes and metals, waste due to post-harvest losses and materials from maintenance of solar electrical works and pipelines water system conveyance

Method of disposal

1. Construction Phase: Solid & Hazardous Waste

Earthworks and Inert Waste

Surplus Spoil & Excavated Material: Use excavated soil for backfilling, landscaping, or creating embankments. Excess material must be transported to pre-approved sites (e.g., exhausted quarries) for land reclamation.

Aggregates (Sand/Ballast): Surplus or rejected gravel and ballast should be used for site road stabilization or sold to local contractors for secondary use.

- **General Construction Debris**

Packaging (Cement bags, Cartons, Paper): These should be flattened and baled. Establish a "Waste Transfer Station" on-site where a licensed waste recycler collects paper and cardboard. Burning on-site must be strictly prohibited.

HDPE & Plastic Pipes: Off-cuts and scraps from drip irrigation and conveyance pipes should be collected and returned to the manufacturer for recycling or sold to plastic recycling plants.

Metal Cuttings: Scrap metal has high value; it should be stored in designated skips and sold to foundry industries for smelting.

- **Hazardous Waste (Chemicals & Oils)**

Lubricating Oils & Solvents: Used oils from pipe laying and machinery maintenance must be stored in leak-proof, labeled drums placed on a concrete bunded floor. Disposal must be done via a licensed hazardous waste handler for refining or incineration.

Paint & Solvent Containers: Empty tins should be triple-rinsed (with rinsate treated as wastewater) and punctured to prevent reuse before being disposed of at a hazardous waste facility.

2. Operational Phase: Agricultural & Maintenance Waste

- **Pesticide & Fertilizer Containers:** Follow the "Triple Rinse" protocol. The rinsed containers should be collected by the supplier (Extended Producer Responsibility) or taken to a designated hazardous waste collection point.
- **Post-Harvest Losses:** Organic crop waste should be composted on-site to create organic mulch, reducing the future need for synthetic fertilizers.
- **Solar & Electrical Components:** Maintenance of the solar water system will generate "e-waste" (broken panels, wiring, batteries). These contain heavy metals and must not be landfilled. They should be returned to the vendor or a licensed e-waste recycler.
- **Broken Glass:** Should be stored in puncture-resistant containers and sent to a glass recycling facility.
- **3. Sanitary Waste (Human Waste)**
- **Mobile Toilets:** These must be managed by a NEMA-licensed (or local equivalent) service provider. The waste is vacuum-pumped into exhauster trucks and treated at an approved Municipal Sewage Treatment Plant.

2.2.7.3 Gaseous Emissions

The use of motorized equipment during construction will generate gaseous emissions in the project area of influence. Motorized vehicles and equipment including trucks, excavators etc.

will generate exhaust fumes. Dust will also be generated by movement of motorised vehicles and construction works.

During the decommissioning phase, the primary waste will be from the motorized equipment and machinery. Trucks will be required to transport wastes generated through the decommissioning phase to appropriate waste disposal sites. These vehicles will consume diesel and produce air emissions as a waste. Secondly through servicing of these trucks, used oils will be generated which are hazardous wastes

Method of Disposal

1. Management of Gaseous Emissions & Exhaust

Exhaust fumes (CO, NO₂ SO₂, and Particulate Matter) from trucks and excavators cannot be collected, so they must be managed at the source.

- **Preventive Maintenance:** Implementation of a strict maintenance schedule for all motorized equipment. Well-tuned engines ensure complete combustion, significantly reducing "black smoke" (carbon soot).
- **Low-Sulphur Fuel:** Procuring high-quality diesel with low sulphur content to reduce emissions.
- **Catalytic Converters & Filters:** Fitting heavy machinery with Diesel Particulate Filters (DPF) to trap fine soot before it leaves the exhaust pipe.
- **Idle Reduction Policy:** Enforcing a rule that engines must be shut off if the vehicle is stationary for more than 5 minutes to prevent unnecessary emissions.

2. Dust Suppression (Particulate Matter)

Dust is a physical waste that can settle on nearby vegetation and the surface of Lake Victoria, affecting photosynthesis and water clarity.

- **Water Sprinkling:** Regular spraying of water on unpaved access roads and active excavation sites to bind dust particles.
- **Vehicle Speed Limits:** Restricting site speeds to **20–30 km/h** to minimize the mechanical lifting of dust.
- **Material Covering:** Ensuring all trucks transporting "surplus spoil" or sand are covered with tarpaulins to prevent wind-blown dust during transit.

3. Disposal of Used Oils and Lubricants

Use The "Zero-Ground" Policy: All servicing of trucks and excavators must occur on an **impermeable concrete apron** or a heavy-duty drip tray. Never service machinery on bare soil.

- **Storage in Bunded Areas:** Used oils must be stored in sealed, labeled 200-liter steel drums. These drums must sit within a "bund" (a secondary containment wall) capable of holding 110% of the total volume in case of a leak.
- **Licensed Hazardous Waste Handlers:** Used oil is often recyclable. It must be collected by a NEMA-approved (or equivalent authority) waste contractor for re-refining or used as fuel in high-temperature industrial kilns (co-processing).

2.2.7.4 Noise Emissions

The use of motorized equipment during construction will generate noise emissions in the project area of influence. Motorized vehicles and equipment including trucks, excavators etc will generate noise during construction and decommissioning phase of the project. Construction phase noise will be generated by construction plant and equipment such as excavators, lifting equipment, dumper trucks, compressors, generators etc. Construction plant and equipment will be maintained in accordance with the preventive maintenance schedules in the manufacturer's instructions to ensure that such equipment does not produce excessive noise and vibration. During operation, there are no noise emissions that will be generated by the project other than from the vehicles that will bring materials into and outside of the facility.

During decommissioning phase noise levels will be generated, equipment such as excavators lifting equipment, dumper truck, compressors, generators etc. Machinery and equipment will be maintained in accordance with the preventive maintenance schedules indicated in the manufacturer's instructions to ensure that such equipment does not produce excessive noise and vibration.

2.2.8 Project sustainability

The irrigation water user association management committee will develop bylaws to operationalise the facilities. This involves introduction of fees for repairs and maintenance of the irrigation infrastructure. The IWUA will also link up with FPOs and SACCOs so that they can be able to access inputs, identify markets and save their incomes in SACCOs. The Committee also will initiate projects that will benefit the community directly while raising money for maintenance of the irrigation facility. For purposes of environmental conservation, the committee will promote sustainable land management practices. This will include soil

conservation, irrigation with minimal soil loss to combat erosion. A tree nursery will be established that will be able to sell tree seedlings to community members and beyond and this will raise money for maintenance. At later stage they will engage in processing of the tomatoes in order to enhance the shelf life of the farm products

3 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 Introduction

This chapter summaries and reviews the policy, legal and institutional frameworks governing environmental and social issues in Kenya and international connections and. Regulations including World Bank Environmental and Social standards. ESIA provision and procedure can contribute to the successful implementation of the proposed project if all the parties involved in its implementation follow the frameworks.

3.2 Relevant Policies

There are a number of policies that are pertinent to this project, the main overarching policy is the constitution of Kenya. Below is a summary of policies

3.2.1 Kenya Constitution 2010

The Constitution of Kenya 2010 is the overarching law. Article 43 deals with economic and social rights and includes the right to clean and safe water in adequate quantities as a fundamental human right. Article 42 states “every person has the right to a clean and healthy environment, which includes the right a) to have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69, and b) to have obligations relating to the environment fulfilled under Article 70”.

In respect to obligations concerning the management of natural resources the constitution has enshrined the principle of public participation that has been complied with in this SPR. The Proponent by this SPR has taken precautionary measures to make certain that the proposed Kogonga Kayundi irrigation project contributes to a clean and healthy environment.

3.2.2 Vision 2030

Vision 2030 is being implemented through a series of five-year Medium-Term Plans (MTP). The MTP identifies the key policy actions and programs for each Ministry Department and Agency (MDA). The overall goal of the Environment, Water and Sanitation Sector as outlined in the Vision is to attain a “clean, secure and sustainable environment” by 2030. Kenya vision 2030 includes equity as a recurrent principle in economic, social and political programs.

Devolution under vision 2030 is expected to play a key and enhanced role in correcting existing economic and social inequalities.

The implementation of the proposed irrigation scheme is an effort to contribute to economic and social benefits by increasing productivity, timely access to markets and increased income of tomato farmers

3.2.3 National Irrigation policy 2017

The policy aims to shift focus from rain-fed agriculture to irrigated farming, recognizing irrigation as a key enabler for economic growth and food security under Kenya Vision 2030 and the Big Four Agenda. *The irrigation scheme will enhance agricultural production since water will be available throughout and there will be no reliance on rain-fed agriculture*

3.2.4 National Gender and Development Policy, 2000

The State Department for Gender in the Ministry of Public Service, Youth and Gender is responsible for promoting gender equality and empowerment of women in Kenya. The Department has developed the National Gender and Development Policy as a review of the Gender Policy adopted by the cabinet in 2000. The policy outlines the national agenda for gender equality and how Kenya intends to realize these ideals.

The Constitution of Kenya creates a platform for gender equality and non-discrimination. It highlights such principles as equality, equity, inclusiveness and non-discrimination.

This Policy will be actualized during project implementation especially during hiring of staff, procurement of suppliers and sub consultants. The policy will provide safeguard against gender-based violence in the project. The proponent will ensure that the marginalised groups, vulnerable, disabled women and youth are actively involved throughout all the phases of construction, operation and decommissioning

3.2.5 Policy on Gender and Sexual Based Violence 2017

The overall objective of the policy is to progressively eliminate sexual and gender-based violence through the development of a preventive, protective, supportive and transformative environment. *The project proponent has put in place plans through the ESMP to develop and implement a SGBV action plan with an Accountability and Response Framework as required by of this policy*

3.2.6 Kenya National Youth Policy 2006

This Policy aims at ensuring that the youth play their role alongside adults in the development of the Country. The National Youth Policy visualizes a society where youth have an equal opportunity as other citizens to realize their fullest potential.

The proposed Kogonga Kayundi irrigation project will provide direct employment to the youth where applicable as required by the Policy.

3.2.7 Wetlands policy

The policy acknowledges that wetlands are highly productive ecosystems and that they perform many functions that maintain the ecological integrity of the system and also provide many goods and services. The policy also underscores the functions and benefits provided by wetlands and their significance for the general public as they support agriculture, tourism, industry and biodiversity, conservation, social economic and cultural activities. The policy decries deterioration of wetland

Irrigated farms extend to the wetlands areas. The proponent must not clear the wetlands for irrigation. the papyrus around the lake region must not be cleared or burnt. The wetland act It acts as safeguard in protecting the aquatic ecosystems

3.3 Institutional framework

3.3.1 National Environmental Management Authority

The Environmental Management and Coordination Act (EMCA) 1999 (Cap. 387) Revised 2015 provides for establishment of the National Environment Management Authority (NEMA) as the principal agency responsible for coordination, monitoring and supervision of environmental issues in Kenya. The Authority too has a cross-sectorial mandate to oversee the conduct of environmental assessments and audits through issuance of guidelines, regulations and registration of environmental practitioners. It reviews and approves reports for environmental assessments and audits in consultation with relevant lead agencies.

The National Environment Management Authority (NEMA) enforces environmental legislations through the Department of Compliance and Enforcement which is responsible for ensuring that projects comply with the various environmental regulations and standards. The Authority has appointed environmental inspectors whose powers and duties are listed out under section 117 of EMCA, 1999 (Cap. 387) Revised 2015. The environmental inspector may also

issue an improvement notice requiring an operator to cease any activity deleterious to the environment which is contrary to the Act. The Authority has power, to prosecute environmental offenders and offences committed under the Act and may earn the offender fines and prison sentences. It works with the county environment departments and committees at the county level in undertaking inspection, monitoring and compliance enforcement.

The National Environment Management Authority (NEMA) in consultation with lead agencies will review and approve this ESIA report or advise the Proponent. County environment officers represent NEMA at the county level and are responsible for monitoring environmental protection or regulatory compliance at the county level.

3.3.2 Environmental liaison units in other institutions with environmental management mandates in Kenya

The National Environment Management Authority (NEMA) is linked to sectorial lead agencies, private organizations and educational institutions through their environmental liaison units. These institutions include county environment departments, parastatals, learning institutions, NGOs and CBOs among others and are charged with implementation of environmental programmes and integration of environmental concerns in sectorial policies, plans and programs. Consequently, they monitor investment programmes at their respective sectorial levels.

Relevant environmental liaison units in other relevant ministries and departments such as Siaya County Ministry of Agriculture, Livestock, Fisheries and Cooperatives among others will give their inputs/ comments in the final ESIA before NEMA issues a license for the project to commence.

3.3.3 Water Resources Authority (WRA)

The objective of WRA is to protect, conserve, control and regulate the use of water resources through the establishment of a national water resource strategy. In addition, the WRA is responsible for: formulation and enforcement of standards, procedures and regulations for the management and use of water resources; policy development; planning and issuing of water abstraction permits; and setting and collecting permits and water use fees. As per the requirement of the Water Act (No. 43 of 2016), *the proponent will apply for the water abstraction permit and authorization permit from WRA and a hydrological survey report of the targeted project areas works.*

3.3.4 Irrigation Water Resource Users Association (IWRUA)

Kenya's irrigation policy recognizes **Irrigation Water User Associations (IWUAs)** as essential for managing water resources efficiently within irrigation schemes. The **Irrigation Act, 2019** provides a framework for their formation, governance, and responsibilities.

Under the **Irrigation (General) Regulations, 2020**, IWUAs are established to:

- Ensure equitable distribution of irrigation water among users.
- Maintain irrigation infrastructure within their service areas.
- Collect irrigation service fees and manage funds for sustainable operations.
- Resolve disputes related to water usage within their jurisdiction.

IWUAs operate under **guiding principles** that promote participatory management, accountability, and sustainability. They are legally recognized entities with defined membership, management committees, and financial oversight mechanism

The proponent will ensure that all the famers are registered as members of the Kogonga Kayundi Irrigation Water User Association and there will be proper maintenance of the infrastructure to minimize disposal effluent waste to the environment.

3.4 The Legal Framework

3.4.1 Environmental Regulatory Framework

3.4.1.1 EIA regulations 2003 (ESIA and EA regulations)

The prescribed format for Environmental Impact Assessment guidelines in Kenya has been developed and gazetted. The regulations require that EIA cover issues outlined in the schedule 2nd that is, (ecological, social, landscape, land use, and water considerations) and general guidelines in schedule 3 (impacts and their sources, projects details, national legislation, mitigation measures, a management plan, and environmental auditing schedules and procedures.

By this ESIA SPR the requirements of these regulations and those of the World Bank were integrated and followed throughout the process. The proponent did the screening and scoping then as advised by the NEMA office commissioned an ESIA SPR study. The ESMP has set out the mitigation measures to address key impacts identified such as waste management, safety among others to guide the Contractor and the Proponent.

3.4.1.2 Environmental Management and Coordination (Wetlands, Riverbanks, Lake Shores and Sea Shore Management) Regulation, 2009.

This Act applies to all wetlands in Kenya whether occurring in private or public land. It contains provisions for the utilization of wetland resources in a sustainable manner compatible with the continued presence of wetlands and their hydrological, ecological, social and economic functions and services. The project is will only capture a fraction of runoff in the catchment.

The Proponent shall comply with the provisions of the Act in protecting wetlands, preventing and controlling pollution and siltation of rivers, lakes during construction and operation phase by having an effluent handling plan and license of the same from NEMA

3.4.1.3 Environmental Management and Coordination (Waste Management) Regulations, 2006

According to part II of the regulations, a generator of waste should:

- a) Not dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle;
- b) Collect, segregate and dispose or cause to be disposed-off such waste in the manner provided for under these Regulations; and
- c) Ensure that the waste is transferred to a person who is licensed to transport and dispose-off such waste in a designated waste disposal facility.

All wastes from the proposed site will be managed in accordance with the procedures outlined in this report or as may be advised by the public health office and/or other authorities. The Proponent and contractor(s) will ensure that there is no environmental damage or nuisance resulting from wastes from the proposed project and site by regularly collecting and disposing the wastes.

3.4.1.4 The Environmental Management and Co-ordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006

The regulations are supposed to ensure Conservation of Biodiversity in the country because, Kenya has a large diversity of ecological zones and habitats including lowland and mountain forests, wooded and open grasslands, semi-arid scrubland, dry woodlands, and inland aquatic, and coastal and marine ecosystems. In addition, a total of 467 lake and wetland habitats are estimated to cover 2.5% of the territory. In order to preserve the country's wildlife, about 8% of Kenya's land area is currently under protection. One requires a NEMA approval if areas of

rich biodiversity are going to be affected by a development project. The Conservation of Biodiversity Act Sections 5-9 provides for the protection of endangered species, creation of an inventory, and monitoring of their status, protection of environmentally significant areas, provision of access permits, material transfer agreements and benefit sharing. These regulations layout pollution control measures with a view of avoiding areas of environmental significance and protection of endangered species.

- This proposed project is large and in an area with tress therefore the biodiversity is likely to be disrupted therefore there will only be selective cutting of indigenous trees. where need arises
- *The Proponent and contractor will ensure that great care is exercised in the protection of vegetation during construction.*
- *The proponent will have to work closely with KWS on wildlife management on wildlife related issues*
- *The contractor will abide by C-ESMP which provides for construction of gabions to arrest lake shore erosion*

3.4.1.5 Environmental Management and Coordination (Noise and Excessive Vibration, and Pollution Control) Regulations, 2009

These regulations prohibit under Section 3 (1) the causing of loud, unreasonable, unnecessary, or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

According to these regulations, Day means the time between 0601 hours and 2000 hours while night the time between 2001 hours and 0600 hours. In compliance with these regulations:

- a) There will be no construction at night.*
- b) Earmuffs will be provided to workers during construction.*
- c) Regular maintenance/repair of contractor's vehicles and machinery will be enforced to minimize vibrations and noise.*
- d) Any maintenance of construction vehicles and machinery will be carried out in the contractor's yard that may be onsite or off site.*

All noise to be produced at the proposed site in all its phases shall be managed in accordance with the guidelines in this report or from other authorities in control of noise. The Proponent

and contractor(s) shall ensure that there is no noise and vibration nuisance resulting from the proposed project.

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

These Regulations apply to drinking water, water used for industrial purposes, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife, and water used for any other purposes. Section 4 of the regulation focuses on the protection of sources of water by preventing any form of pollution.

Section 6 (1) of the regulation requires an EIA license issued in accordance with the provisions of the Act for the abstraction of ground and surface water. The Proponent has complied with this regulation by undertaking this ESIA SPR which has determined possible activities that may affect the quality and quantity of water during the construction and operation phases in the project context. Mitigation measures have been provided for all the predicted impacts on water quality. *The design of irrigation facility will provide for pollution prevention. The proponent and all other parties (including project beneficiaries) shall fully comply with the requirements of these regulations to ensure that its objectives are achieved.*

3.4.1.7 Environmental Management and Coordination Act (Air Quality) Regulations, 2014

The objective of these regulations is to provide for prevention, control, and abatement of air pollution to ensure clean and healthy ambient air. The regulations provide for compliance with emission standards for various sources of air pollution including mobile sources (e.g. motor vehicles) etc. as outlined in the Environmental Management and Coordination Act, 1999.

The proponent in this ESIA SPR has identified all sources of air pollution and provided adequate mitigation through the ESMP. The proponent will ensure compliance with air quality regulations by enforcing all the proposed preventive and mitigation measures in the ESMP such as sprinkling of on loose soils, soil piles and use of dust masks by the workers among others.

3.4.2 The Water Act, NO. 43 of 2016

According to the regulations under this Act, prior to constructing the waterworks, the owner or developer or other person charged with the mandate of developing, managing and or maintaining waterworks shall – (a) Apply for and obtain a water use permit under the Water Resources Regulations 2019, and (b) Apply for and obtain an environmental impact assessment license under the Environmental (Impact Assessment and Audit) Regulations 2003 made under Environmental

Management and Coordination Act 2015 (Act No.- of).The Act states an application for a permit shall be the subject of public consultation and, where applicable, of environmental impact assessment in accordance with the requirements of the Environmental Management and Coordination Act, 1999.

The proponent as required by the Act will apply for a irrigation water user association permit to Water Resource Authority (WRA) before the drawing water for irrigation. This ESIA SPR is among the documents to be submitted to National Irrigation Authority who provide water for irrigation.

3.4.3 Wildlife Conservation and Management (Amendment) Act, 2023

PART VI Conservation, Protection and Management Section 26. Environment law to apply

(1) The provisions of this Act with respect to conservation, protection and management of the environment shall be in conformity with the provisions of the Environmental Management and Coordination Act (Cap. 387) Section 33. Conservation and management of wetlands

(1) The Cabinet Secretary shall, on recommendation of the Service, in consultation with the National Land Commission, by notice in the Gazette, declare a wetland that is an important habitat or ecosystem for wildlife conservation a protected wetland.

(2) As soon as practicable, after declaring it a protected wetland, the Service shall, in collaboration with the person or community who hold a legal or communal interest in the wetland and the relevant lead agencies, prepare an Integrated Wetland Management Plan for the conservation and management of the protected wetland through a public consultative process.

The proposed Kogonga Kayundi Irrigation Scheme is located next to the Kogonga Beach which is part of the wetland area covered with papyrus The proponent will have to protect the wetland area by leaving it undisturbed and if possible fence off any area next to the wetland as per stipulations in the the Act

3.4.4 The Public Health Act (Cap. 242)

Part IX, section 115 of the Act states that no person/institution shall cause a nuisance or condition liable to be injurious or dangerous to human health. Work areas should be clean and sanitary to prevent the occurrence of nuisance or condition liable for injurious or dangerous to human health. *The proponent through this ESIA SPR and the ESMP has defined the necessary measures to prevent the occurrence of nuisance or condition liable for injurious or dangerous to human health during the construction and the operation phase of the project.*

3.4.5 Physical Planning and Land Use Planning Act, 2019

The objectives of the Act are to provide the principles, procedures, and standards for the preparation and implementation of physical development plans at the national, regional,

county, urban, and rural and cities level and provision of the procedures and standards for development control and the regulation of physical planning and land use.

The proposed project is in line with the proposed land use for the project site and compatible with the existing uses. The county government through department of lands have undertaken an assessment of the area and confirmed the use of land are for irrigation. Originally, it was a rainfed crop production area and a livestock grazing field.

3.4.6 The Occupational Health and Safety Act, 2007

The Occupational Safety and Health Act, 2007 require that workplaces be kept safe for workers therein. Workers who are exposed to wet or any injurious or offensive substances are required under Section 101 of the Act to be provided with suitable protective clothing.

In the ESMP the proponent has put in place measures to be observed by the contractor during the construction phase of the project to ensure the health and safety of workers. Examples of suggested measures include provision of appropriate PPEs, first aid kits, training on first aid etc.

The Bid document also places the responsibility of ensuring safety in the work place during construction on the Contractor.

3.4.7 Employment Act, 2007

Section 3. (1) States that this Act shall apply to all employees employed during the sub-project implementation under a contract of service. Section 5 (3) demand that no employer shall discriminate directly or indirectly, against an employee or prospective employee or harass an employee or prospective employee on grounds of race, colour, sex, language, religion, political or other opinions, nationality, ethnic or social origin, disability, pregnancy, mental status or HIV status.

The proponent through the contractor will make sure that fairness and gender equity are followed during recruitment of the labour force to be used during the construction phase and other project cycles when necessary.

The bid document binds the contractor to ensure fairness during recruitment of workers in the project. Locals will be given preference in labour, works. Women will be offered opportunities in the project. Also labour agreements and all due payments to be made

3.4.8 Work injury benefits Act, 2007

Section.7. (1) require that the proponent to obtain and maintain an insurance policy, in respect of any liability that the employer may incur under this Act to any of his employees.

In this SPR the proponent through the ESMP has outlined appropriate measures (such as provision of first aid kits, PPEs, training of workers in first aid and monitoring of OHS through DOSH among others) to address adverse effects that may occur from the project 's activities in the construction, operation and decommissioning phases.

The bid document has indicated the Contractors responsibility including ensuring safety.

3.4.9 National Construction Authority (2011)

The National Construction Authority Act, Number 41 of 2011 streamlines, overhauls and regulates the construction industry in Kenya. The Act contains provisions on the quality and safety standards of any construction work.

The Proponent will ensure the engagement of a registered and qualified contractor for the proposed work through competitive bidding. By this SPR and the ESMP the proponent, the Irrigation Water User Association and the supervising engineer will check and verify every step of the work by the Contractor to ascertain that quality and safety standards are met and that the work output does not compromise the set achievements of the project. The proponent will ensure that regular site meetings by all the relevant stakeholders are held to oversight the work.

The bid document has made provision for testing of material and equipment to ensure quality at Contractors cost.

3.4.10 Climate Change Act, 2016

The CCA aims to reduce vulnerability to climate change and improve our country's ability to take advantage of the opportunities that climate change offers. The Act is to be applied for the development, management, implementation, and regulation of mechanisms to enhance climate change resilience and low carbon development for the sustainable development of Kenya.

The development and implementation of the project will contribute towards the stated objectives of the climate change act and enhance the resilience of the Kogonga Kayundi irrigation water user association community particularly reliable availability of water for irrigation in the farms facilities. The project contributes to Kenya's NDC through proposed

solarization of the irrigation facility and irrigation through gravity flow and water abstraction from the lake

3.4.11 Malaria Prevention Act (CAP 246)

An ACT of Parliament to repeal and re-enact the Malaria Prevention Act, to establish the National Malaria Prevention and Control Institute, to provide for the prevention and control of malaria and for connected purposes.

The Proponent has adequately provided measures for the prevention and control of malaria sensitization of the community on use of nets, indoor residual spraying, draining of stagnant water etc. There will be limited amount of stagnant water because irrigation will be through gravity and open canals will be few mainly because water pipes will be connected across the farms.

3.4.12 The Energy Act, 2019

The Energy Act, 2019 was enacted in response to calls to consolidate the laws relating to energy; promote renewable energy; promote exploration, recovery and commercial utilization of geothermal energy; regulate midstream and downstream petroleum and coal activities, among others.

The proposed source of power running the irrigation systems is solar energy. Supply and installation of solar panels and pump is provided for in the design and bill of quantities. The project promotes use of renewable energy source which is also in line with the object of towards low carbon emission in the country's climate action strategies.

3.4.13 National legal provisions on Gender, HIV/AIDS and Gender Based Violence

1 The Sexual Offences Act of 2006 (The Sexual Offences (Amendment) Bill, 2016)

This Act makes provision about sexual offences, their definition, prevention and the protection of all persons from harm from unlawful sexual acts, and for connected purposes. It makes provision about sexual offences aimed at prevention and the protection of all persons from harm from unlawful sexual acts and for connected purposes.

Through this ESIA SPR as provided in the ESMP the proponent will address and resolve all identified and emergent SEA concerns.

2. HIV and AIDS Prevention and Control Act No. 14 of 2006

This legislation provides measures for the prevention, management and control of HIV and AIDS, to provide for the protection and promotion of public health and for the appropriate treatment, counseling, support and care of persons infected or at risk of HIV and AIDS infection. Among the purposes of this Act as outlined in section 3 (a) is to promote public awareness about the causes, modes of transmission, consequences, means of prevention and control of HIV and AIDS. Section 7 makes provision for HIV and AIDS education in the workplace in this case even the informal workplace is included. Section 31 prohibits discrimination in the workplace based on the HIV/AIDS status of a person.

The proponent in this ESIA SPR has captured HIV/AIDS as a risk in the proposed project and through the ESMP provided adequate measures. The HIV Policy, therefore, will be complied with during implementation of the Project; the Contractor will incorporate in bid document and implement HIV awareness initiatives during construction of the Project.

The proponent will ensure that the grievance redress mechanism and pathways exhausted

3.4.14 The National Museums and Heritage Act 2006

This is an Act of Parliament to consolidate the law relating to national museums and heritage; to provide for the establishment, control, management and development of national museums and the identification, protection, conservation and transmission of the cultural and natural heritage of Kenya. To repeal the Antiquities and Monuments Act (Cap. 215) and the National Museums Act; and for connected purposes.

This act together with World Bank ESS 8 Cultural Heritage (IPs/ SSAHUTLC) will be activated if the project will encounter such materials

The Contractor will follow the chance find procedures outlined if previously unknown heritage resource is accidentally encountered during the project construction period for the chance find procedure in Kenya.

3.5 Environmental and Social Standards

World Bank Environment Social Framework Categorizes projects into four levels of risks as High, Substantial, and Medium & Low. The magnitude of investments in NAVCDP are small - medium, temporary, site specific, predictable but reversible. The NAVCDP is aligned to the Environmental Social Framework especially 9 out of the 10 Environmental and Social Standards ESS

World Bank is committed to enhancing social, environmental and climate resilience through its projects and programs. The Environment and Social Standards outline how to manage risks and impacts, and integrate priorities into World Bank investments to achieve better development outcomes the table below shows the applicability of World Bank Standards to the proposed project.

S/No	Standards		Aligned
1	ESS 1	Assessment and Management of Environmental and Social risks and Impact	x
2	ESS 2	Labour and Working Conditions	x
3	ESS 3	Resource Efficiency and Pollution Prevention Management	x
4	ESS 4	Community Health and Safety	x
5	ESS 5	Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	x
6.	ESS 6	Biodiversity Conservation and Management of Living Natural Resources	x
7.	ESS 7	Indigenous Peoples/ Sub Saharan African Historically Underserved Traditional Local Communities	x
8.	ESS 8	Cultural Heritage (IPs/ SSAHUTLC)	x
9.	ESS 10	Stakeholder Engagement and Information disclosure	x

Table 3-1 Analysis of potential triggers to ESS Standards

No	Statement	Description	Applicability to World Bank ESS
1	ESS1 Assessment and Management of Environmental and Social risks and Impact	Anticipated environmental risks are: Those related to community safety (including dam safety and safe use of pesticides). Those related to climate change and other transboundary or global risks and impacts. Any material threat to the protection, conservation, maintenance and restoration of natural habitats and biodiversity. Those related to ecosystem services and the use of living natural resources, such as fisheries and fore	The ESS 1 will be triggered It is applicable during construction and operation phase of the Kogonga Kayoundi Irrigation water user association. During construction there will be excavation works for the reservoir and intake works for

		Anticipated Social risks: Threats to human security through the escalation of personal, communal or inter-state conflict, crime or violence 2. Risks that project impacts fall disproportionately on individuals and groups who, because of their particular circumstances, may be disadvantaged or vulnerable 3. Any prejudice or discrimination toward individuals or groups in providing access to development resources and project benefits, particularly in the case of those who may be disadvantaged or vulnerable 4. Negative economic and social impacts relating to the involuntary taking of land or restrictions on land use 5. Risks or impacts associated with land and natural resource tenure and use impacts on the health, safety and well-being of workers and project-affected communities 6. Risks of cultural heritage	foundation, During construction of the intake works aquatic life will be affected During construction of reservoir vegetation will be cleared in restricted areas During laying of pipes and opening farm fields there must be restricted vegetation clearance and indigenous trees must not be cut. Social risks will also be triggered in view of the influx of immigrants seeking for labor
2	ESS2: Labor and working condition	Develop and implement written labor management procedures applicable to the project 1. Detailing Renumeration / compensation 2. Nondiscrimination and equal opportunity 3. Workers organizations 4. Child labor and minimum age 5. Forced labor 6. Grievance mechanism 7. Occupation health and safety 8. Management of contracted workers - 9. Community workers – working conditions,	The proponent will follow all the labor requirement conditions as per the as per the Employment Act of Kenya and World Bank ESS 2. The ESS2 is triggered
3	ESS 3 Resource Efficiency and Pollution Prevention Management	Pollution Prevention: Management of Air Pollution: Requires an estimate of gross greenhouse gas emissions resulting from project Management of Hazardous and Non-hazardous Wastes: Requirements on management of wastes, chemical and hazardous materials, and contains provisions to address historical	In view of the application of fertilizers and bio-pesticides used in the farms. IPM procedures will be used to control pests in the irrigated farms, The ESS 3 will be triggered

		pollution Management of Chemicals and Hazardous Materials: • Management of Pesticides: Requires management of pesticides, preferring integrated pest management (IPM) and integrated vector management (IVM), and where pesticides are necessary, minimizing risks to human health and the environment Applies to facilities or projects that consume energy in: • Process heating and cooling; • Process and auxiliary systems, such as motors, pumps, and fans; • Compressed air systems and heating, ventilation and air conditioning systems (HVAC); • Lighting systems • Examples: leak elimination, insulation, electric motors (electric water pump), lighting fixtures	
4:	ESS 4 Community Health and Safety	Identify risks and impacts of project and its activities to the community and propose mitigation measures • Establish and implement appropriate quality management systems to anticipate and minimize risks and impacts that such services may have on community health and safety • Identify the investment's potential risks and impacts on ecosystem and appropriately mitigate them • Take measures to avoid or minimize transmission of communicable diseases that may be associated with the influx of temporary or permanent project labor implement measures and actions to control the safety of deliveries of hazardous materials, and of storage, transportation and disposal of hazardous materials and wastes	As per the Occupational Health and Safety requirements there will be risks associated with health and impacts during construction operation and decommission phase. Therefore, ESS4 will be triggered
5:	ESS 5 Land Acquisition, Restrictions on Land Use and	ESS applies to permanent or temporary physical and economic displacement resulting from • land acquisition or	The proposed project is being implemented on individual farms. The farmers have formed a CIG and an IWUA so the ESS is not triggered

	Involuntary Resettlement	• restrictions on land use imposed in connection with project implementation	The farmers presented a registration certificate, a letter with all members signing that the land belongs to several individuals
6	ESS 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources	Applicability of this ESS is established during the environmental and Social assessment / Screening described in ESS1. • All projects that potentially affect biodiversity or habitats, either Positively or negatively, directly or indirectly, or that depend upon biodiversity for their success. • Also applies to projects that involve primary production and/or harvesting of living natural resource	-ESS 6 is triggered. The whole project activity is located close to the Lake Victoria near a swampy wetland area with diverse ecological systems. The biodiversity of the area especially migratory birds, hippos and crocodiles will be identified and their sites protected by the proponent
7	ESS 7 Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	This ESS applies to a distinct social and cultural group identified in Accordance with paragraphs 8 and 9 of this ESS. • In Kenya, such groups are referred to as ‘Indigenous Peoples’. • For example; Garissa (Somali, Orma), Wajir (Somali), Mandera (Somali), Marsabit (Burji, Rendille, Gabra, Dasenach, Sakuye, Borana Galla (Oromo), Turkana (Turkana), Others in Kenya; Tana River (Waata/Watha, Sanye, Munyoyaya, Dahalo, Aweer/Boni, Malakote also referred to as Ilwana/Walwana), Lamu (Orma, Dahalo, Waata/Watha, Sanye),	ESS 7 is not triggered. The project is being undertaken in a place where there are no indigenous people as per the world bank classification however there are vulnerable marginalized Persons and the proponent will have to take special interest on persons classified as VMG
8	ESS8 Cultural Heritage	Cultural heritage - encompasses tangible and intangible heritage, which may be recognized and valued at a local, regional, national or global level, as follows: Tangible cultural heritage - movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Tangible cultural heritage may be located in urban or rural settings, and may be above or below land or under the water; • Intangible cultural heritage - practices,	There are no cultural heritage sites however, in case of chance finds, then the contractor will stop any proceeding activities and consult with the proponent and the national museums of Kenya. The ESS is not triggered

		representations, expressions, knowledge, skills—as well as the instruments, objects, artifacts and cultural space	
9	ESS 10. Stakeholder engagement and Information Disclosure	ESS10 applies to all projects supported through Investment Project Financing. 2. The project will engage with stakeholders as an integral part of the project’s environmental and social assessment and project design and Implementation, as outlined in ESS1. 3. Provide stakeholders with timely, relevant, understandable and accessible information, and consult with them in a culturally appropriate manner, which is free of manipulation, interference, coercion, discrimination and intimidating	ESS 10 is triggered-The project entails consent from the public. This is as per the constitution of Kenya article 10 and article 232 There will be serious consultation along all the project phases planning, construction, operation and decommissioning. This is for Environmental and Social aspects both positive and negative impacts ESS 10 cuts across all the other ESS and it is triggered

3.6 International Conventions and Treaties

Kenya has ratified various international conventions on environment that are applicable to this study. The Ministry of Foreign Affairs deals with international treaties at the primary stages of negotiation. The ministry offers advisory guide to the government on the need to ratify such a treaty if considered to be of national interest. Implementation portfolio then moves to the line ministry, relevant departments and co-operating agencies.

Kenya is signatory to several international conventions and treaties that would need to be adhered to in implementing this project and are geared towards environmental protection and conservation. Some of these include;

- ILO Conventions ratified by Government of Kenya
- Safety and Health in Construction Recommendation, 1988
- Convention on Wetlands or the Ramsar Convention
- Convention on Biodiversity
- The Convention on International Trade in Endangered Species (CITES)
- Convention on the Conservation of Migratory Species
- United Nations Framework Convention on Climate Change
- Important Bird Areas:

3.6.1 Ramsar Convention 1971

The convention governs wetlands of international importance. The convention was entered into force in Kenya in 1990 and it governs Lake Nakuru, Lake Baringo, and Lake Natron, which is a shared

ecosystem between Kenya and Tanzania. Kenya is therefore committed to avoid degradation of wetlands under its jurisdiction. Kenya has also ratified the Agreement of the Conservation of Eurasian Migratory Water Birds (2001) and the African Convention on the Conservation of Nature and Natural Resources (1968), the Convention on International Trade in Endangered Species of Wildlife Fauna and Flora (CITES) 1973 which prohibits trade in species such as Dugongs and also in Ivory.

Relevance

The proponent will need to ensure that these important conventions are not violated during construction, operation or decommissioning of the proposed projects.

3.6.2 The United Nations Framework Convention on Climate Change (UNFCCC)

This is an international environmental treaty produced at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro from 3rd to 14th June, 1992. The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The treaty itself sets no mandatory limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. In that sense, the treaty is considered legally non-binding. Instead, the treaty provides for updates (called "protocols") that would set mandatory emission limits. The principal update is the Kyoto Protocol, which has become much better known than the UNFCCC itself.

Relevance

The proponent will adhere to energy and water saving technologies such as recycling to reduce the environmental footprints

3.6.3 Sustainable Development Goals

Through the implementation of the Kogonga Kayundi irrigation project by the proponent the following SDGs will be achieved in the community. Goal 1: Eradication of extreme poverty Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture. Goal 6: Ensure availability and sustainable management of water and sanitation for all. Goal 5: protect, restore, promote sustainable use of terrestrial ecosystems, manage forests, and halt and reverse land degradation and halt biodiversity loss. Goal 13 Climate action

4 CHARACTERISTICS OF THE PROJECT AREA

4.1 Background information

Kogonga-Kayundi Beach Irrigation Water User Association (IWUA) submitting the proposal, is a registered community-led irrigation scheme undertaking horticultural crops (tomato, kale, onion) production within North Uyoma Ward, Rarieda Sub-County in Siaya County. The IWUA has 312 (104 F,208M)members with 105 acres under irrigated production out of the potential of 500 acres

The Kogonga Kayundi Irrigation Water Users Association, a community-based organization has been actively involved in horticultural crops (tomato, kale, onion) production within North Uyoma Ward, Rarieda Sub-County in Siaya County for the last 2 year. The association is formally registered and comprises of 312 members in approximately 9 CIGS/VMGs engaged in collective agricultural activities. The organization supports its members to access irrigation water, timely inputs access and marketing of produce. Members of the organization receive technical support in tomato production and capacity building from Siaya County Government Departments of Agriculture and Cooperative Development, through the lead farmer model, farmers understand Good Agricultural Practices and safe use of pesticides in horticulture production.

The farmers have partnered with Rarieda Horticulture Cooperative Society Limited to market their produce, from the 105 acres under irrigation along the beach at an average production of 6 metric tons of tomato per acre per season. However, there is a potential of 500 acres to be put under irrigation and yield increase to over 10 metric tons per acre with proper management under irrigation production.

The proposed project seeks to increase crop yields, reduce cost of production, increase land under irrigation by providing an efficient irrigation system to support consistent and high-yielding tomato farming, addressing the challenges posed by irregular rainfall and improving agricultural productivity.

..

4.2 Overview of Tomato Value Chain (Nationally, regionally and local)

In Kenya Tomato is the top most promising commodity for horticultural expansion and development in Kenya. The fruit plays a critical role in meeting domestic food and nutritional requirements. It also generates income by creating employment for the country's rural and urban populations. By value, the crop contributed 29.5% of the total exotic vegetable produce in Kenya (AFA, 2023), valued at 22.5 billion.

Production in Kenya has been increasing in recent years up to 2019. However, there has been a decline in production since 2019, with figures dropping to 686,667MT in 2021, 616,617MT in 2022 and 536,821MT in 2023 (AFA 2023)

The area under production was 30,882Ha 28,331Ha and 30,679Ha in 2021, 2022 and 2023 respectively

In Siaya tomato is predominantly produced in Bondo, Rarieda and Alego Usonga sub counties which constitutes 80%. While other sub counties of Gem, Ugenya and Ugunja produce (20%). In Rarieda Sub County where there are several irrigation schemes including Kogonga Kayundi, there are 777 Tomato producing farmers in an area of 659.485 acres. The production is 5275.88 MT with a market value of 211,035,200.00 in Million per Tonne

Average current production at the site is 6 metric tons of tomato per acre per season.

A key aspect of the irrigation scheme's development is its focus on horticultural crops, with tomatoes being the primary crop due to their high market demand and profitability. This strategic approach not only strengthens food security but also enhances farmers' income, supporting economic growth in the region

4.3 Project location

The proposed site for the expansion of Kogonga Kayundi Irrigation project is in Ndiru Village North Uyoma Ward Rarieda Sub County .It is found in Kogonga-Kayundi Beach . The area lies in GPS Coordinates Latitude -0.258056, Longitude 34.391667.The project is community led and targets to transform the rural livelihoods of the IWUA . The irrigated farms are individually owned totalling approximately 40ha whereas the proposed development of infrastructures will be installed in farms and agreements have been made as per the attached (Annex v). The proposed site is about 2.5 km away from the Kisumu-Luanda Kotieno tarmac road.It is located in Ndiru village and connected by a murram road from Ragegni junction.

The major facilities near the site are Matera dispensary which is 1.5 km away and Madiany Sub county hospital about 5 Km away. The nearest primary school, Nyamasore primary school is less than 1 km from the project site while the office of the chief is about 2Km away from the proposed site

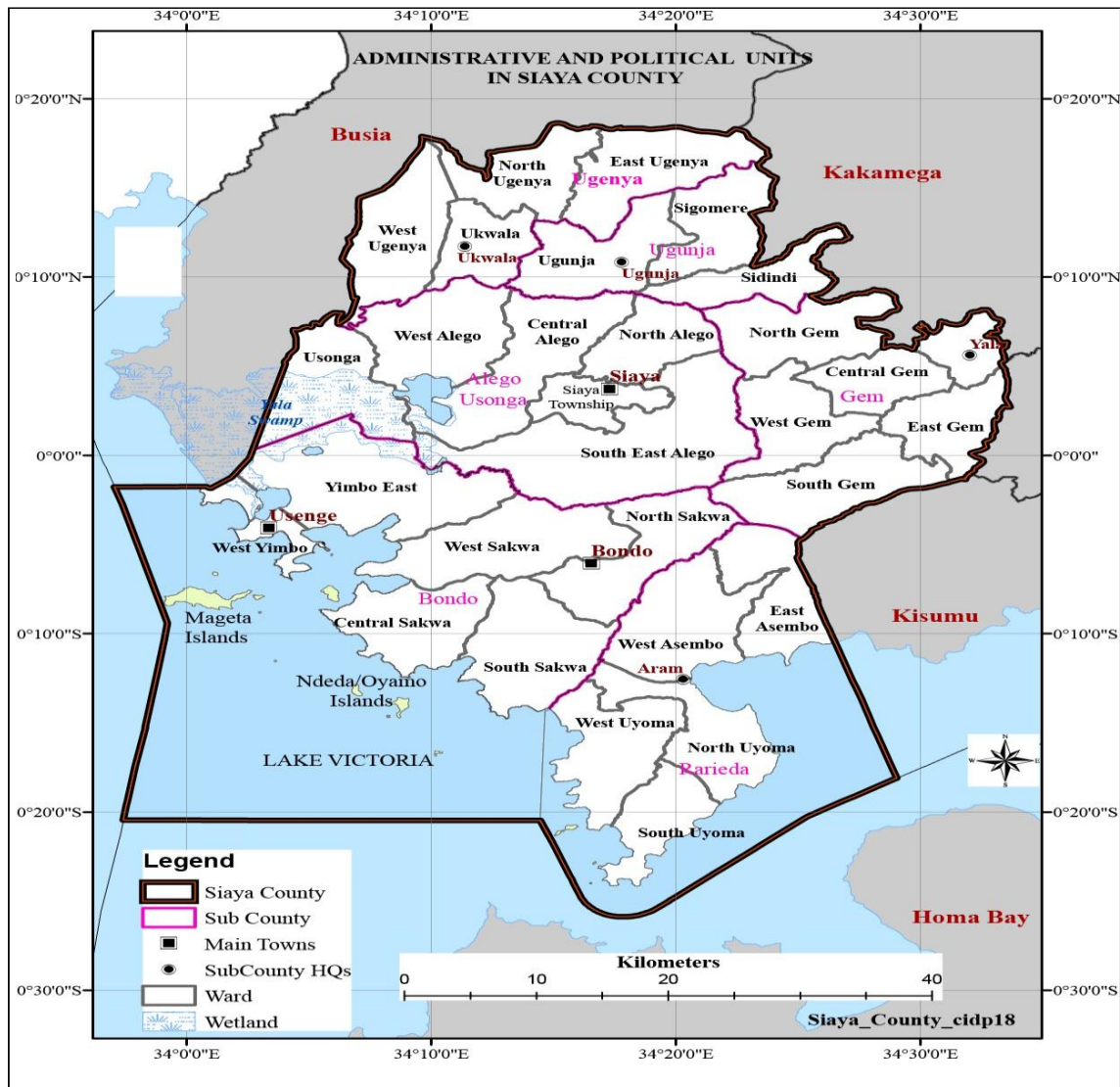


Figure 4-1: Administrative location of the project site

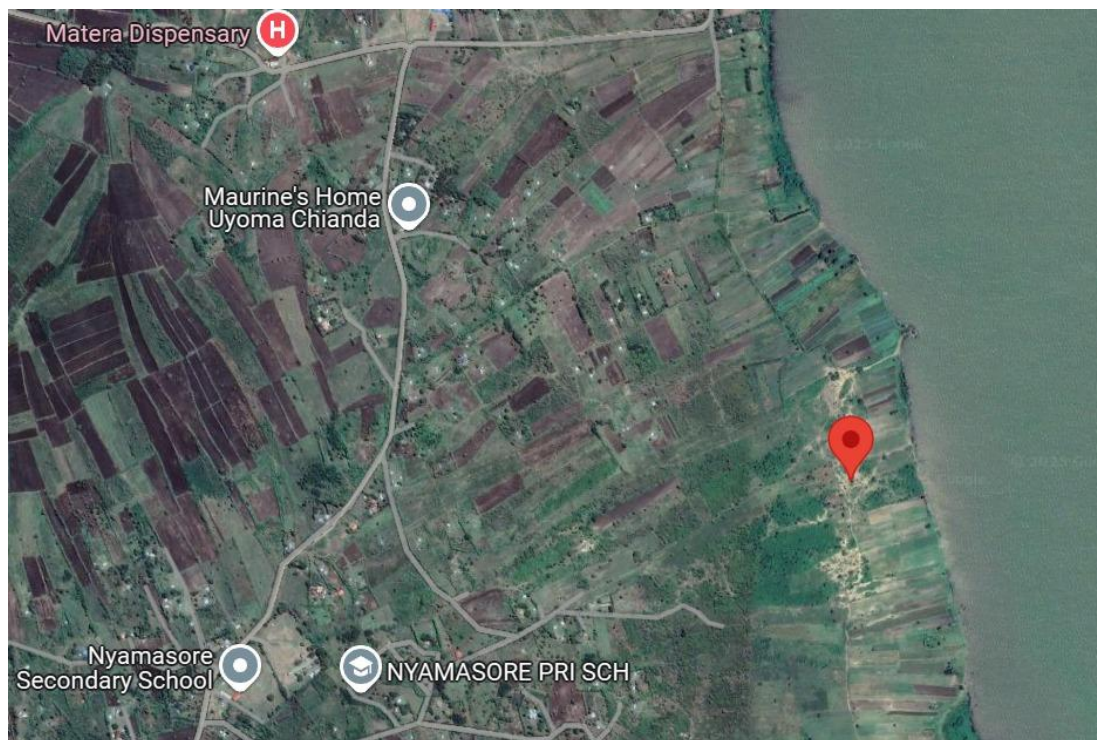


Figure 4-2: Proposed project site (Kogonga Kayundi Beach) Courtesy of Google Earth

4.3.1 Proof of Land Ownership

The project is community led and targets to transform the rural livelihoods of the farmers and the community at large. The irrigation will be done on individually owned farms who are members of the Kongonga Kayundi Irrigation water user association. The proposed development of irrigation infrastructures will cut across the farms who are members of the IWUA and also members of CIGs. A signed agreement letter by the relevant officer ascertaining that the land belongs to different persons who support and are beneficiaries of the project has been obtained and attached(annex

4.4 Demographic and population profile

4.4.1 Population

North Uyoma ward is densely populated as depicted in Table 4-2. This phenomenon puts pressure on need to basic services such as supply of water for both household and domestic use. Approximately 200hh depend on the irrigation scheme directly through planting of tomatoes and other related horticultural crops

Table 4-1: Population characteristics Rarieda sub county ward

		Total	Household Size	LandArea Km ²	Density per Sq. km
Ward	North Uyoma	33,072	4	73.9	359
	South Uyoma	24,368	5	57.8	422
	West Uyoma	34,699	4	92.1	377
	East Asembo	41,019	5	78.5	523
	West Asembo	44,846	4	101.1	408

Source: KNBS, 2019

4.4.2 Population by Ward & Gender

The following table provides the population totals and gender distribution for the five wards in Rarieda.

Table 4-2 Population by Ward & Gender

Ward	Total Population	Male	Female	Intersex
North Uyoma	33,072	15,644	17,427	1
South Uyoma	24,368	11,597	12,871	0
West Uyoma	34,699	16,742	17,975	0
East Asembo	41,019	19,632	21,387	2
West Asembo	44,846	21,639	23,207	0

Source: KNBS, 2019

4.4.3 Demographics by Age Group

While the Kenya National Bureau of Statistics (KNBS) usually releases granular age data at the Sub-county level rather than the Ward level, the general age structure for these areas follows the Rarieda Sub-county profile:

Children (0–14 years): ~41%

Youth/Working Age (15–64 years): ~53%

Seniors (65+ years): ~6%

4.5 Physical Environment

4.5.1 Topography

The Kogonga Kayundi area features a blend of flat plains and gentle slopes, which play a crucial role in determining land use, water drainage, and agricultural productivity. The plains provide large, flat expanses ideal for irrigation-based horticulture, allowing for efficient water distribution and mechanized farming. This terrain is well-suited for cultivating high-value

crops such as tomatoes, watermelons, and vegetables, which require consistent moisture and controlled water application. However, during heavy rains, these low-lying areas are prone to waterlogging, necessitating well-planned drainage systems to prevent soil degradation and crop damage.

On the other hand, the slopes in the region offer better natural drainage and support alternative agricultural activities such as rain-fed crop farming, agroforestry, and livestock grazing. These areas are less suited for large-scale irrigation due to the challenges of water retention and soil erosion. However, controlled irrigation methods, such as gravity terracing and drip irrigation, can enhance productivity on sloped land while minimizing water runoff. The diverse topography of Kogonga Kayundi therefore, allows for a variety of land-use practices, ensuring that both irrigated and rain-fed farming can coexist to support local livelihoods.

Soils

To determine the soil texture, a transect walk was undertaken in and around the proposed facility. It was noted that the soil texture is uniform in the said area and the soil profile was indicative of moderately well to imperfectly drain. To determine the soil texture further below depth texture, a trial pit was dug to a depth of 1.2m deep. The soils are very dark grey to very dark greyish brown, mottled, firm cracking clay, in places moderately deep over petroplinthic: Vertic LUVISOLS and partly petroferric phase, with chromic VERTISOLS

The soils are suitable for quite a wide range of horticultural crops and mainly vegetables such as tomatoes, kales, onions, chilies, water melons.

4.5.2 Ecological and Climatic conditions

Ecological conditions

The County spreads across agro-ecological zones LM1 to LM 5. According to the Kenya Soil Survey and Integrated Regional Development plan for the Lake Basin Development Authority, the lower part of the County and especially the shores of Lake Victoria can be categorized into semi-humid, semi-dry Lower Midland zones (LM4 and LM5). These zones cover the whole of Uyoma in Rarieda Sub-County. The Kogonga Kayundi region is divided into two main agro ecological zones, each shaped by its topographical and climatic conditions.

- The irrigated horticultural zone, found primarily in the plains, benefits from access to lake water, enabling year-round crop cultivation. This zone supports the production of high-value crops like tomatoes, vegetables, and watermelons, significantly contributing to local

food security and household incomes. With the expansion of irrigation systems, this zone has the potential to accommodate more farmers and increase agricultural productivity.

- The rain-fed agricultural zone, located on the slopes, relies on seasonal rainfall for farming activities. Due to the erratic nature of rainfall in the region, productivity in this zone is often inconsistent, making it more vulnerable to climate variability. Farmers in this area cultivate less water-intensive crops and engage in small-scale livestock farming. However, expanding irrigation infrastructure into these higher-elevation areas can help mitigate the challenges of rainfall unpredictability, allowing for more diversified and stable agricultural production.

Climatic conditions

The county has an inland equatorial climate modified by the effects of altitude, relief and the influence of the large body of water of Lake Victoria, the subproject is located in an agro-ecological zone classified as marginal cotton zone (LM-4), an indicator of severe water constraints that severally constraints agricultural production. The area has two rain seasons. The long rains are in March to May and short rains in September to December. The mean annual rainfall, subproject area over the last 30 years is 890-1020 mm with 60% of the annual total falling during long rains. The first season rainfall lies between 350-480 mm while the second season is 125-135 mm in most years unreliable. Temperatures range from mean minimum temperature of 16.3° C and mean maximum temperature of 29.1° C. Humidity is relatively high with mean evaporation being between 1,800mm to 2,200mm. The relative humidity ranges between 73 % the morning and 52 % in the afternoon. According to the Kenya Soil Survey and Integrated Regional Development plan for the Lake Basin Development Authority, the sub-Project area can be categorized as semi-humid, semi-dry Lower Midland zones (LM4)

.

Climate Change issues

Siaya County is characterized by high poverty levels (47.56%) and food insecurity. Agriculture is the main source of livelihood in the County, contributing about 60% of the household income and providing almost 61% of all employment opportunities. Droughts and intense rainfall already constrain agricultural productivity and food security in Siaya County; climate projections indicate increasing events of drought and intense rains. Impacts of extreme weather events are experienced lower midland zones which are relatively drier

4.6 Socio economic characteristics of the area

4.6.1 Land and Land use/Zonation

The project area can be categorized as semi-humid, in Lower Midland zones (LM4). The climate can support suitable crop varieties such as maize, beans sunflower, Sorghum, millet (Table 3-1), with butternut and other horticultural crops such as tomatoes having great potential under irrigation. *Leucaena*, *Sesbania sesban* *Acacia drepanolobium*, as an agroforestry species has the potential in soil fertility management and resilience building for livestock farmers.

Table 4-3 : Agro -Ecological Zonation Of Siaya County

Zone	Division /Subcounty	Suitable crops
LM1	Gem, Yala	Sugarcane, Maize, beans, finger millet, coffee, sweet potatoes and horticulture
LM2	Alego Usonga	Maize, beans, tobacco, finger millet, coffee, sweet potatoes and irrigated rice
LM3	Sakwa and Asembo	Maize, beans, finger millet, sorghum, cotton
LM4	Uyoma in Rarieda Sub-County and Yimbo in Bondo Sub-County	Sunflower, sorghum, cassava
LM5	Uyoma in Rarieda Sub-County and Yimbo in Bondo Sub-County	Sorghum, Millet

Source: Jaetzold et al. 2007

4.6.2 Land use and economic activities

Crop farming and livestock production

An agro-ecological zone describes agronomic conditions on basis of landform, soil types, rainfall, temperature and water availability which in turn influences the type vegetation, length of growing season and crop adaptability [FAO, 1996]. The ward spreads across agro-ecological LM4. The major land uses in the proposed site are conservation, settlements, artisanal fisheries, and small-scale agriculture. The area is predominantly rural with minor agro processing and small-scale fishing. Increasing ecological destruction and changes in land use are exerting tremendous pressure on ecosystem, placing millions of livelihoods within the project area at risk. However, the carrying capacity of the land is on average less than the county mean due to the semi- arid climate. Irrigation has great potential in increasing agricultural productivity in the area. The major economic activity in North Uyoma Ward is crop production. Most of the

people are small holder mixed farmers. The main food crops grown are maize, beans, sorghum and millet under irrigation the crops grown are kales, tomatoes. The main livestock kept in the ward is the indigenous zebus, goats, sheep, dairy goats, meat goats, indigenous and improved indigenous poultry The average farm size households is 1 to 3 acres

4.6.3 Flora and Fauna

The area next to the lake is largely open swampy with papayrus. Most common trees in the area include. *Balanites aegyptica*, *Acacia drepanolobium*, *Euphorbia sp* Common grass species is *Cynodon plactostachyus*, *Panicum sp* *Chloris sp* *Bothrocloa sp*. *Echinoloa sp*. The most common fauna found in the project area include: hippopotamus (Lake Victoria), crocodiles (parts of the Lake Victoria), migratory birds, insects, rodent and snakes Others are majorly domestic animals consisting of cattle, goat, sheep and poultry

4.6.4 Ecologically sensitive areas

There are migratory birds that reside within the wetlands next to irrigated farming areas and therefore the proponent would be encouraged to the use of integrated pest management or bio pesticides, where applicable

4.7 Physical infrastructure

4.7.1 Environmental Management Supportive Infrastructure

The proposed project site requires environmental supportive infrastructure. There exists an earth access road which is about 4km from the main Luanda Kotieno- Kisumu road that can be used to access the site. The water supply for both domestic and agricultural use is from Lake Victoria. The project site is connected to power from the grid.

4.7.2 Infrastructure and Access Road.

There is an electric power-line which located within the proposed site. There is no piped water around the surroundings of proposed site. Approximately 70 percent of the community draw water directly from the Lake Victoria. The average distance to a water point in the project area is 0.4 Km and it takes about 50 minutes which is above the county average of 0.5 Km and time of 0.5 hours respectively. About 80% of the residents have pit latrines but there is no sewerage system in the area. This could imply risk of surface water contamination with faecal material

4.7.3 Roads

Most roads in the ward are all-weather, and rural access roads are accessible during dry seasons, but some roads are somewhat inaccessible especially during the rainy seasons. The project site is about 3 km hinterland from the Luanda Kotieno -Kisumu road

4.7.4 Communication

The means of communication in the project area are as listed in Table 4. Access to the means of communication is relatively high especially the mass media. This could be advantageous in advocacy initiatives on issues such as GBV. The mobile network coverage in the area is relatively high at 83% compared to an average of 70% of the county but lower than the national connectivity rate of 85%. Network signal is good with all networks well represented.

Table 4-4 ACCESS Ownership and communication

Communication channel	% of Households with access/ownership
Radio	78 (75)
Tv	15 (13)
Mobile Phone	83 (90)
Computer	<1 %

Source: Field data collection, 2020

4.7.5 Electricity Coverage and use of Solar

The area is well covered to the national grid with electric power lines across.

4.7.6 Marketing Centres

There are three market centres in the ward. These are Chianda, Ragengni and Madiany. Within the project site the nearest market is at Ragengni

4.7.7 Housing

The major housing type in the area is mud walled iron roofed houses, however stone walled houses are coming up. Table 3-4 provides a comparison of housing type in the area with the county aggregated statistics. As housing type reflect wealth status, the Project area could be said to be relatively rich compared to other areas of the county.

Table 4-5: Housing type in the Project Area

Housing type	% of Households in the Project site	County indicators
Earth floor	83	90
Cement Floor	17	12

Mud walled	85	82
Corrugated Iron Roof	78	61
Grass thatched	22	25
Brick /Stone wall	15	5%

Source: CIDP 2022-2027

4.7.8 Health and Environment

Residence of the area primarily access health services from Matera dispensary which is 1.5 Km away from the site. The Madiany Sub County hospital is about 5Km from the project site.

The HIV prevalence in Siaya is above the national level, at 24.8 % and among the highest prevalence in Kenya. Drivers of HIV in the county can be attributed to several social, economic and cultural factors related to polygamy, circumcision, wife inheritance and poverty. The employment opportunities and influx of job seekers into the project site during construction of the proposed Irrigation facility may escalate the spread of HIV/Aids in absence of Mitigation measures as proposed in the ESMP, such as sensitization of the workers and involved in the construction, promotion of the use of protective sex and voluntary testing.

4.7.9 Water Access and Sanitation

Streams, wells, boreholes, roof catchment, rivers, Lake Victoria, water holes, dams, ground catchments and piped supplies are the main sources of water for communities in Siaya County. However, the Project area's groundwater potential is highly limited by lithology. The distribution of water sources most of which is surface water depends on the season and also weather patterns. Though the long-term objective of the Government is to enable household's access water within 500m of their settlement, the intervention measures the Ministry of water has put in place so far in terms of piped schemes, point water sources like boreholes, shallow wells have not been met in the area. The average distance to a water point in the project area is 200 meters and it is a borehole about 85 % of the residents have pit latrines but there is no sewerage system in the area. This could imply risk of surface water contamination with faecal material.

5 PUBLIC PARTICIPATION AND STAKEHOLDER CONSULTATIONS.

5.1 Public Participation

A public participation and stakeholders' consultations were undertaken in line with the Constitution of Kenya 2010, Environment Management and Co-ordination Act 1999, and the County Government Act, 2012 as well as the World Bank guidelines ESS 10. Plate provides evidence of the ESIA process compliance with the provision.



Plate 5-1 Associate Expert Benard Ayagah addressing participants

Consultation and public participation was conducted with an aim of gathering environmental and social data understanding likely impacts determining community and individual preferences, selecting project alternatives and designing viable and sustainable mitigation and compensation plans if any

The exercise took place on 5th April, 2025 at Ndiru in North Uyoma Ward. It was attended by 35 participants disaggregated as follows; Males. 25...Females 10. (Annex iii). It was very interactive, participatory and intensive session between community, Government officers, NAVCDP County staff and the ESIA consultant. About 20 questionnaires were randomly administered to the participants.

5.2 Purpose for the public and stakeholder consultation

The key objectives of the consultation and public participation for proposed expansion of the Kogonga Kayundi irrigation scheme was to:

- ✓ Disseminate and inform the project stakeholders about the proposed project, its key components and activities, location and expected impacts with particular attention to potentially affected persons
- ✓ Create awareness among the public and stakeholders on the need for ESIA for the proposed irrigation scheme

- ✓ Create a sense of ownership, capacity build and ensure transparency in all activities to related to the project including but not limited to designing, planning, implementing, environmental management, operation, monitoring evaluation of the project by all key stakeholders
- ✓ To seek and examine views on health, safety, social and environmental issues from the potentially affected community;
- ✓ To lay the foundation for future negotiations on any issues that may arise so as to build consensus and reach a mutually acceptable resolution of issues.
- ✓ Provide the establishment's neighbours/community with a forum to air any issues or concerns they may have with the establishment's operations on Health Safety, social and Environment (HSSE)
- ✓ Participants to take cognizes of the environmental and social risks and propose appropriate mitigation measures on the anticipated risks

5.3 Public Consultation process

5.3.1 Stakeholder mapping

The environmental and social assessment public participation exercise was conducted on 5th of April 2025 by the expert using 3 approaches (i) Focus group discussions and Key informant interviews, (ii) Field surveys and observational checklists and (iii) Public meetings. In general, the following steps were followed in carrying out the entire process: -

- ✓ Identification of institutions and individuals interested in the process and compiling a database of the interested and affected parties
- ✓ Administration of questionnaires to different target groups and local community members in the administrative area for the proposed project site (Annex I)
- ✓ Public / Technical Meetings at various levels and with different target groups

Below is a team of the ESIA lead experts facilitating community sensitization meetings



Lead Expert engaging participants on NEMA regulations, environmental and social risks



Engineer Charles Olang explaining the irrigation activities and associated risks

Plate 5-2 Community sensitization meetings



CCIDO engaging the community members during the public participation work for the Kayundi-Kogonga Irrigation project in North Uyoma

Plate 5-3: County Community Investment Development Officer

5.3.2 Public consultation questionnaires

Consultative experts' meetings were continuously held during the field exercise to consolidate the issues affecting the project as well as capturing issues raised by the project affected persons. Twenty questionnaire checklists given out to the stakeholders for filling and analysis was done.

5.3.3 Public consultation meetings

One comprehensive public meeting as well as technical meeting were held on the dates of 5th April 2025 with the local residents, Chief Mr Peter Odongo, Assistant chiefs Village elders, area ward administrator, NAVCDP County government project implementation officers and

other local administrative leaders in attendance in the project area. (Minutes of meeting and list of participants Annex II and III respectively). The Issues arising in the meeting are captured in as reported in the following sections. The meeting was used to publicize the proposed construction of Kogonga Kayundi irrigation project and the anticipated effects and benefits.

During the public participation meeting, stakeholders had a chance to interact with the proponent represented by the ESIA expert, Associate expert and county technical staff in charge of Agriculture crop production, agriculture, social service officers at county level. The findings are incorporated into this report and captures the issues, suggestions, concerns and recommendations from public meetings on site. The meetings were well attended and the attendees participated actively during the meetings (Plate 6-2).



Engineer Charles Olang expert taking participants through anticipated environmental impacts



Area Chief addressing the stakeholders of Arongo Irrigation Scheme in North Uyoma ward

Plate 5-4: Participants filling individual questionnaire



Plate 5-5: Participants at Uasi village raising hands in acceptance of the proposed project

5.4 Issue raised during the Consultation

The Annexes present the information on the public consultations undertaken under the environmental impact assessment for the proposed Kogonga Kayundi irrigation scheme. This information includes selected responses as detailed in the minutes (Annex ii). The members were in concurrence that the project will be beneficial and it should be implemented. However, there were a few areas that the members sought clarity. A summary of the key concerns raised by the participants is provided in table 5-1 below:

Table 5-1: Stakeholder Consultative meeting key concerns raised

SNo.	Issues raised by the members	Concerns	Response
1.	Employment opportunities	Project will create employment opportunities during the project cycle from construction to operation	The community agreed and promised to provide both skilled and skilled labour
2.	Construction of the intake works	Wont it temper with the riparian area and why can't it be concretized	The intake must be left open so that there can be flow of water and it can also be cleaned of debris
3.	Laying of pipelines passing through the farms	Question on whether there will be breakages pf pipes during ploughing by tractor	The pipelines will be placed 2.5 ft below ground. They will not be affected
4.	Installation of solar panels	Question was raised that what will happen if the solar panels fail to generate power	Some members of the community will be trained on operation and maintenance

5.	Excavation	Once the excavation is done where will the soil be deposited? Wont there be a lot of soil debris in the compound	The excavated soil will be spread out for landscaping
6.	Contingency funds	Is there any funds for contingency or in case of emergency	Yes in any BQ or budget there is 5 to 10 % c
7.	Erosion	During construction works and operation phase i.e ploughing wont there be soil erosion	Encourage communities to plant trees and construct terraces
8.	Mosquitoes/Malaria incidences	Wont there be increased incidences of malaria due to stagnant water in the irrigation fields	The surrounding community members will be provided with mosquito nets
9.	Maintenance and sustainability of irrigation infrastructuree	Who will maintain the infrastructure one the project ends	The project management committee Kogonag Kayundi IWUA will be trained on daily operations and maintenance
10.	Improved Economic status	Income at household level will be enhanced, communities will be able to sell produce,	The community members will be linked to potential markets through various service providers in order to fetch out better prices
11.	Enhanced livelihood resilience and alternatives	Since there will be irrigation throughout the year, It will be possible to produced food crops and animal feed products throughout the year	Idleness in the community will be reduced and community members will be engaged in productive labour
12.	Catchment protection	The stakeholders will be encouraged to establish tree nurseries and agro-forestry in their irrigated farms along the catchment areas	Communities around the catchment areas to be sensitized and encouraged to grow trees for commercial purposes
13.	Accidents during construction and operation	During construction and operation phases accidents are likely to occur	The proponent will strictly adhere to safe working practices to protect the workers, neighbors and passers-by

5.5 Anticipated impacts

5.5.1 Positive Impacts

Positive impacts identified by stakeholders include the following:

- Economic and social benefits to the communities and contribute to the attainment of the National priority goals and ongoing National efforts to accelerate economic growth

and alleviate poverty under the Food and Nutrition Security under BETA Transformation

- Enhanced food security and improved nutrition at the household level. This will alleviate impact of erratic and unreliable rainfall pattern on the community's productive resources. Continuous supply and availability of tomatoes throughout the year.
- Employment opportunities will be offered to the construction workers and any other person who will be hired to provide her/his services during construction phase. In addition to direct employment, more opportunities and acquisition of entrepreneurial skills. This will engrain a sense of project ownership within the community
- Reduction of idleness amongst the youth due to an increase in income generating activities either directly or indirectly
- Ease the direct resource dependency pressure on forest (charcoal burning) and wildlife resources
- The project would ensure that greenhouse gas emission is reduced by using solar energy to pump water
- Trees would also be planted in the project areas to act as carbon sink hence mitigating greenhouse gas effects to the environment
- Using solar powered energy will curb greenhouse gas emission.

5.5.2 Anticipated negative impacts

Some of the negative impacts identified include the following:

- d. Health risks associated with increased incidences of mosquitoes and malaria borne diseases due to increased breeding sites. This would be mitigated through capacity building to community on mosquito preventive control measures
- e. Solid Waste from products, materials used and post-harvest losses may increase emission and cause environmental degradation
- f. Lack of adequate knowledge and skills in irrigation. This could be attributed to limited knowledge and lack of irrigation crop production skills, tillage services, fertilizer, seed, integrated pest management and operations of irrigation equipment and management
- g. Inadequate road infrastructure that would hinder supply of farm produce to markets at Ndori and Bondo

- h. Clearing of vegetation during construction phase, this would be addressed through reforestation programs and sparing of indigenous trees during the expansion and clearing process
- i. Inadequate access to affordable and timely financial services, particularly for irrigation development, may constrain farmers' ability to invest in high-value crops, procure quality inputs on time, and adopt climate-smart agricultural technologies. Limited financial capacity can therefore undermine overall scheme productivity and long-term sustainability.
- j. Human Wildlife conflict: Some of the respondents felt that the proposed project would bring a problem of wildlife (hippopotamus and livestock conflict.)
- k. Accidents during Construction: There is likelihood that during the construction phase of the proposed project, construction workers may get involved in accidents as a result of falling building stones/bricks, sharp metals and machines used in the construction. The proponent will strictly adhere to safe working practices to protect the workers, neighbors and passers-by
- l. Noise pollution: There was concern over the possibility of high noise and vibration levels in the project site as a result of excavation and construction works. The sources of noise pollution will include transport vehicles, construction machinery and metal grilling and cutting equipment
- m. Incidences of erosion along the waterways and cases of siltation
- n. Chance of increased incidences of communicable and non communicable diseases

5.5.3 Suggestions and comments from public consultations

- The Kogonga Kayundi IWUA management team must take full responsibility in sustainability and maintenance of the Irrigation Scheme
- Farmer views should be incorporated in the programme. They suggested to have a dedicated committee to be airing farmers concerns.
- Ensure the workers/employees of the proposed project are insured through WIBA for adequate compensation due to injury while at work.
- Jobs opportunities that will arise during the construction and operation phase of the irrigation facility should be reserved for the residents of the project areas.
- Construction activities must strictly adhere to Occupational Health and Safety (OHS) standards, including the mandatory use of appropriate Personal Protective Equipment (PPE). Contractors shall ensure that workers are equipped with protective gear such as helmets, safety boots,

gloves, and reflective clothing to minimize workplace risks. During the operational phase, the consistent use of PPE such as gloves and gumboots should be emphasized to prevent occupational injuries, accidents, and exposure to health hazards. These measures are consistent with the requirements of the World Bank Environmental and Social Standard 4 (ESS4) on Community Health and Safety

- The contractor should have a holding/launching yard for materials and equipment to control environmental pollution.
- The contractor should also strive to use high quality construction materials as detailed in the design
- Educating on HIV aids control
- Proper waste disposal site should be demarcated and fenced off from scavagers

5.5.4 Grievance Redress Mechanism (GRM)

To ensure transparency, accountability, and timely resolution of concerns arising during project implementation, a structured Grievance Redress Mechanism (GRM) will be established at scheme, ward, and county levels. At the scheme level, the Irrigation Water Users Association (IWUA) will constitute a five-member Grievance Redress Committee (GRC) composed of representatives from the IWUA leadership, women, youth, vulnerable groups, and a technical or project liaison representative. The committee will receive grievances either verbally or in writing and will record all complaints in a standardized Grievance Register. Each complaint will be assigned a unique reference number and acknowledged within forty-eight (48) hours of receipt. The committee will investigate and seek to resolve grievances within seven (7) to fourteen (14) days. The IWUA Secretary will act as the focal person responsible for documenting, tracking, and updating the status of grievances, including indicating whether cases have been resolved at that level or require escalation.

Where a grievance cannot be resolved at the scheme level, it will be escalated to ward-level structures, including local administration and relevant sector departments for further review. If the matter remains unresolved, it will be forwarded to the County Social Safeguards and Grievance Management Officer (CSS&GMO), who will present it before the County Grievance Management Committee for review and final determination. All escalated grievances will be recorded, monitored, and tracked to ensure timely resolution and closure.

In addition to physical reporting channels, complainants may submit grievances through digital platforms, including a web-based grievance dashboard, toll-free SMS services, a WhatsApp reporting

line, and the official project email. These platforms will improve accessibility, confidentiality, and efficiency in grievance handling. All electronically submitted cases will be automatically logged into the system and tracked through to resolution.

To enhance awareness and accessibility of the GRM, the project will conduct regular community sensitization forums to explain grievance procedures, publicize toll-free numbers and reporting channels, clarify response timelines, and promote transparency and trust. Relevant information will also be displayed on public notice boards and shared during community meetings to ensure inclusivity and equal access to grievance resolution processes.

A discrete and confidential Grievance Redress Mechanism (GRM) channel will be established to specifically handle Gender-Based Violence (GBV) and Sexual Exploitation, Abuse, and Harassment (SEAH) related complaints. This specialized GRM pathway will operate independently from the general grievance system to ensure privacy, survivor-centered response, and protection from retaliation. A trained focal person will be appointed to exclusively manage GBV/SEAH-related grievances, ensuring that all cases are handled with strict confidentiality, sensitivity, and in accordance with established ethical and referral protocols. The focal person will coordinate with relevant service providers, including health, psychosocial, legal, and protection services, to facilitate timely support and redress for survivors while upholding the principles of safety, dignity, and informed consent

Operation and Maintenance (O&M)

Sustainable operation of the irrigation scheme will be achieved through structured capacity building, institutional strengthening, and the establishment of clear operational procedures. The IWUA Management Committee will undergo training in operation and maintenance of irrigation infrastructure, financial management and accountability, monitoring and evaluation (M&E), implementation of the Environmental and Social Management Plan (ESMP), integrated pest management practices, climate-smart and sustainable agricultural practices, conflict resolution, and gender mainstreaming. These capacity-building initiatives will enhance long-term sustainability, strengthen governance, and promote community ownership of the scheme.

To ensure proper governance, the IWUA will develop and adopt a constitution and operational by-laws to guide scheme management. These by-laws will outline water allocation procedures to ensure equitable and fair distribution, incorporate gender-inclusive participation principles, establish environmental protection and water conservation measures, and define penalties for non-compliance. Water tariffs will be determined through transparent and consultative processes to ensure affordability while generating adequate funds for operation and maintenance.

Funds for maintenance and system sustainability will be raised through a combination of mechanisms, including in-kind contributions such as labour for routine maintenance, cash payments based on the size of irrigated acreage, and monthly or annual household membership fees. The revenue collected will support routine maintenance activities, repairs, system upgrades, and other operational requirements. The IWUA will maintain comprehensive records, including a membership register, records of irrigable land per farmer, water fee payment registers, maintenance and repair logs, income and expenditure statements, and store and asset inventory records. All funds will be deposited in a registered bank account operated under a three-signatory system to enhance financial accountability and transparency. Scheme performance and financial reports will be regularly shared with members through Annual General Meetings (AGMs), printed reports, and public notices displayed at designated locations within the scheme.

The irrigation infrastructure comprises a reservoir draw-off intake system, a pumping sump, a solar-powered pumping unit with control panels, a pump house, and a distribution pipeline network. Routine maintenance activities will include clearing vegetation around the intake and reservoir, inspecting sump structures for cracks or structural weaknesses, checking the functionality of the solar pumping system, testing automatic control systems, regularly patrolling pipeline routes to detect leaks or damage, and inspecting air-release valves, washouts, and inspection chambers. Individual beneficiaries will be responsible for maintaining their respective on-farm irrigation systems to ensure overall efficiency and sustainability of the scheme.

5.5.5 Communication & Stakeholder Engagement Plan

Environmental / Social Aspect	Potential Impact / Risk	Mitigation / Enhancement Measure (Communication Actions)	Frequency
Stakeholder awareness	Limited understanding of project scope and benefits	Conduct community Barazas to explain project objectives, scope, benefits, and responsibilities	Once / As needed
Stakeholder participation	Exclusion of some groups (women, youth, PWDs)	Hold inclusive consultations; ensure representation of women, youth, and vulnerable groups	During planning
Information disclosure	Misinformation and rumors	Display project information on notice boards; share updates via SMS/WhatsApp	Continuous
Community safety & disruption	Complaints due to construction noise, access restrictions	Regular communication on construction schedules and safety measures	Weekly
Labor and community relations	Conflict between workers and community	Sensitize workers and community on code of conduct and grievance channels	Monthly
Grievance management	Unresolved complaints	Implement Grievance Redress Mechanism (GRM); maintain grievance logbook	Continuous

	escalating into conflicts		
Water allocation & use	Conflicts over water distribution	Communicate irrigation schedules and water abstraction rules via notice boards and SMS	Weekly
Financial transparency	Distrust over user fees and expenditures	Share financial reports during AGMs and general meetings	Bi-annually
Environmental protection	Poor compliance with water conservation measures	Awareness campaigns on water conservation and pollution control	Quarterly
Gender & social inclusion	Marginalization of vulnerable groups	Targeted communication and engagement sessions	Continuous
Feedback & continuous improvement	Lack of feedback from users	Collect feedback during meetings and through suggestion boxes	Quarterly
Information disclosure	Confusion on closure or transition	Inform members and stakeholders early on decommissioning plans	

5.6 Conclusion

Members of the public were very happy and appreciated the project and asked if the project could start immediately before the long rains March April which may delay the project implementation and hence postponing benefits.

6 ANALYSIS OF PROJECT ALTERNATIVES

6.1 Introduction

This section examines feasible alternatives to the proposed irrigation scheme. The benefits of the proposed project have been considered against any potential environmental cost. The general principle involved in identifying alternative option(s) to a proposed development was to ensure that the option chosen would result in optimal social, environmental, and capital benefits not only for the proponent but also for the general environment in the area. This section has explored five alternatives namely, no-action alternative, relocation alternative, water source alternative, source of power alternative, and the project alternative

6.2 “No-action” alternative

The selection of the “No-action” alternative would mean the discontinuation of the proposed project. Thus, the site is retained in its existing form. If this alternative is selected, the site is unlikely to undergo changes from its present condition. This choice is not feasible because currently the irrigation is at a small-scale level and tomato production through irrigation is not sustainable. The small-scale farmers are using small portable pumps to pump water from lake Victoria. The pumps are uneconomical and spill oil into the Lake Victoria. And not implementing the proposed irrigation facility, would mean that the Kogonga Kayundi farmers will continue to suffer due to the high losses in production of tomatoes



Plate 6-1 Current state (No action

6.3 Relocation Alternative

This option would mean the transfer of the proposed development to another site. The wide range of assessment of soil analysis, combined with topographical surveys designs and layouts and catchment area assessments would be exercise in futile. The proposed development will not contribute to any adverse or irreversible damage to the social, economic, physical or hydrological environment. The Kogonga Kayundi IWUAs do not have a major source of power

and infrastructure facility for irrigation. The farmers are actually irrigating individually hence the need for an organized reliable irrigation infrastructure in place. Relocation to another site is therefore not a feasible under the circumstances.

6.4 Alternative design and technology (Include wastes disposals)

The selection of appropriate irrigation technologies and infrastructure is crucial for the long-term success of the Kogonga Kayundi Irrigation Scheme. The head works, water conveyance, and distribution systems have been designed to maximize water efficiency, ensure sustainability, and minimize losses. By integrating solar-powered pumps, high-quality pipelines, and advanced water management practices, the scheme will provide farmers with a reliable and cost-effective irrigation solution. Additionally, the use of drip irrigation enhances water conservation, reduces disease risks, and improves crop productivity. This comprehensive approach will contribute to increased agricultural output, improved livelihoods, and enhanced food security in the region.

Liquid Waste Disposal Technologies: Methods include biological treatment, chemical treatment, and physical separation. Some advanced techniques involve anaerobic digestion, which converts organic waste into biogas, and membrane filtration, which removes contaminants from wastewater

Solid Waste Disposal Technologies: Common methods include landfilling, incineration, and composting. Alternative power source

This option involves considering several factors

Solar-Powered Irrigation: Solar panels can generate electricity to power water pumps, making it an efficient and eco-friendly solution, especially in regions with abundant sunlight.

Wind-Powered Irrigation: Wind turbines can be used to generate electricity or directly drive mechanical pumps for irrigation.

Hydropower: Small-scale hydropower systems can harness the energy of flowing water to pump irrigation water, particularly in areas with rivers or streams.

Biogas Energy: Organic waste can be converted into biogas, which can then be used to generate electricity or power irrigation pumps.

Gravity-Fed Irrigation: While not a direct power source, using elevation differences to move water without pumps can be an effective and energy-free irrigation method

Finally, the main feasible alternative power source is solar powered irrigation which pump water to a reservoir, this is followed by gravity fed irrigation where water flows through pipes to the farm under drip irrigation

6.4.1 The project alternative

This means implementation of the proposed project as is. The community through public participation has identified the proposed project site as ideal and corroborated through topographical survey, designs layouts, sizing, hydrological works, and runoff Catchment area assessment. Baseline information also shows that the area is void of any physical, biological, cultural, and socio-economic features of concern at/or near the proposed site. The project location in Ndiru – Kogonga – Kayundi village is found appropriate.

7 ANALYSIS OF POTENTIAL IMPACTS AND MITIGATION MEASURES

7.1 Introduction

This chapter presents the assessment of the issues likely to arise as result of implementation of the proposed project. The impacts are presented in-regard to their likelihood of occurrence on the physical, biological, occupational and socio-economic environments.

Table 7-1: Summary of expected impacts, rating and development stage

Summary of expected impacts, rating and development stage

Impact	Impact rating	Phase
Soil erosion impacts	Low (negative)	Construction phase and operation phase
Public health and safety	Low (negative)	Construction and operation
Impacts on air quality	Low (negative)	Construction and operation
Waste generation	Low (negative)	Construction and operation
Use of pesticides and fungicides	Low (negative)	Operation
Biodiversity conservation	Low (Positive)	Construction and operation
Excavation and laying of pipes	Low (Positive)	Construction and operation
Construction of the main reseivor (concrete works)	low(Positive)	Construction and operation
Socio-economic impacts	low (positive)	Operation
Visual impacts	Low	Construction

7.2 Positive Environmental and Social Impacts during construction phase

The anticipated positive impacts include the following: biodiversity conservation, production of quality Tomatoes for marketing and exports, improved household incomes, employment creation, enhance market economy, increased revenue generation the county

7.2.1 Positive environmental impacts

Soil Conservation: Proper land grading and erosion control measures can help prevent soil degradation and improve land stability.

Erosion Control: Construction of water harvesting structures i,e Construction of drainage channels, water ways

Water Management: The development of irrigation infrastructure can lead to better water distribution and conservation, reducing wastage.

Vegetation Growth: Some construction activities, such as creating reservoirs or canals, can promote vegetation growth in surrounding areas.

Employment & Awareness: Local communities often benefit from job opportunities, and environmental awareness programs can be integrated into the project.

Sustainable Practices: Using eco-friendly materials and energy-efficient machinery can minimize environmental harm.

Biodiversity conservation and enhancement: Selective clearing of vegetation identifying breeding sites of birds and other animals within the water catchment areas where there are swamps and protecting

7.2.2 Positive social impacts

Informal business Growth

During construction the informal sector will benefit from the operations. This will involve informal traders who will sell their products to be used on site. Such a move shall promote local informal entrepreneurs in the local project area

Employment opportunity

Both direct and indirect forms of employment shall arise from the project initiation. Direct employment will be mainly through skilled and unskilled labourers whose workforce shall be needed in the construction. Several workers including casual labourers, metal works, plumbing, masonry are expected to work on the site from onset of the project to the end. Indirect employment will be experienced through buying construction materials and sale of food to the construction workers by the neighbouring communities.

Economic gains

The local economy shall gain much from the project in that materials for building shall be sourced locally within the county and that all the materials are charged VAT, hence increasing revenue collection in the country

Provision of Market for Supply of Building Materials

The project will require supply of construction materials most of which will be sourced locally within the vicinity and environs. This provides ready market for construction material suppliers such as quarrying companies, hardware shops and individuals with such materials.

Increased revenue generation by the County and National Government

The project will contribute to the county and national government kitty. The contractor will pay Value Added Tax (V.A.T) on purchasing materials for the project. Construction workers will also pay income tax from their earnings while working on the project. Negative Environmental and Social Impacts during the Construction Phase and Mitigation Measures

7.2.3 Negative environmental impacts during construction phase

a) Vegetation Loss

Clearing of vegetation including grass, shrubs and trees is likely to occur during the laying of pipes, canals for water conveyance and other development that involve excavation. This will be done along the riparian area and within the farms. Devegetation in these areas will degrade the riparian area which plays a crucial role for fish breeding areas in Lake Victoria in addition felling of trees in this area will directly or indirectly affect the community who derive their livelihoods from these valuable trees

Mitigation measures

- Have strict control of on clearing of vegetation around the riparian areas the papyrus plantation next to the lake must NOT be cleared
- Proper demarcation of construction areas to minimize trees to be felled
- The contractor should ensure that vegetation is cleared only where necessary and if in the process mature trees are cut, new trees should be planted in areas adjacent to the cleared ones.

b) Increased soil erosion

Excavation of soil for canal construction and laying of pipeline as well as are major activities during the construction phase of the project. They are bound to result in significant amounts of loose of residual soil, prone to erosion through surface water runoff, especially during rainy season. Lake level rise due to siltation attributed to soil erosion from rivers might sink the solar power house.

Mitigation measures

- Minimize exposed areas by properly demarcating the project area to be affected by the construction works through minimal de-vegetation
- Control construction vehicles to ensure that they operate only within the area to be disturbed by access routes and other works to avoid accelerated de-vegetation that causes soil erosion
- The contractor must establish and protect drainage lines to avoid erosion in areas that are prone to erosion
- Topsoil must be reinstated and rehabilitated on top of subsoil
- All excavation works must be properly backfilled and compacted

c) Surface ground water pollution/contamination

Earth movement, disposal of vegetation and other cleared materials and the inadequate disposal of liquid and solid waste, including the human waste from the workers, are likely to cause physical and chemical alteration of surface and ground water quality. Civil works, excavations, or an inadequate planning of cuts and fills, may affect the water table significantly.

Mitigation measures

- ✓ Contractor to identify an appropriate site pit for disposal of vegetation and biodegradable plant material
- ✓ The contractor to construct a standard temporary pit latrine for the workers
- ✓ A temporary incinerator to be constructed to burn non bio degradable solid wastes such as plastics
- ✓ Civil works, excavations, cuts and fills to be compacted so that there is minimal soil loss

d) Oil spills/Fuels and Lubricants

The machines on site and vehicles contain moving parts which require continuous oiling to minimize the usual corrosion or wear and tear. Possibilities of such oils spilling and contaminating the soil and water on the site are possible. The potential for water contamination is likely and the effects are injurious to the aquatic life patterns and making drinking water unsafe for human consumption and domestic livestock

Recommended Mitigation Measures

- Vehicle maintenance should be done on purpose-built impervious concrete platforms with oil and grease traps
- Standard operating practices for re-fuelling mobile equipment such as a minimum 15m from any water channel should be practiced
- All above surface tanks should be bounded and mounted on paved surfaces
- Ensure that all equipment is in good condition, clean and free from leaks
- Oil spill containment and clean up equipment should be safely kept by contractor

e) Air quality degradation due to dust and exhaust emissions

The following emissions will be expected to arise from construction activities. This would in turn lead to poor quality of life as well as upper to lower respiratory infections and silicosis condition:

- ✓ Dust from excavations and earth moving vehicles as well as materials delivery;
- ✓ Emissions such as smoke, hydrocarbons and nitrogenous gases among others from machinery exhausts

Mitigation Measures

- ✓ Personal protective equipment (PPE) such as dust masks must be worn in the immediate vicinity of the operations during excavation;
- ✓ The stockpiles of earth generated during construction works should be suppressed by spraying water or water-based mixtures. Spraying should also be carried out on unpaved road accesses regularly;
- ✓ All machinery and equipment should be maintained in good working order to ensure minimum emissions including carbon monoxide, oxides of Nitrogen and Sulphur, as well as suspended particulate matter;
- ✓ Drivers of construction vehicles and delivery trucks should be cautioned to drive slowly near the site to avoid creating dusty conditions.

f) Increased generation of solid wastes

Large quantities of solid waste will be generated at the site during construction works. Such waste will consist cement, and gravel packs and other packets of materials and equipment metal cuttings, rejected materials, surplus materials, surplus spoil, and excavated materials, paper bags, empty cartons, empty paint and solvent containers, broken glass among others.

Mitigation:

- ✓ The excavated material shall be recycled
- ✓ Use of an integrated solid waste management system i.e., the 3 R's: 1. Reduction at source 2. Reuse 3. Recycle where possible.
- ✓ Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at site;
- ✓ Waste collection bins / receptacles to be provided at the project site

- ✓ Contractor to dump unused excavated materials and debris in designated places
- ✓ Containers or package for storing hazardous waste including used oil to be safely bundled and labelled as provided for by Regulation 18 under the Environmental Management Coordination (Waste Management) Regulations 2006 and the Public Health Act

g) Noise and Vibration

There will be noise and vibrations generated during the construction phase but it will be no different from that on any other typical construction site. The noise impact during construction is expected to be negative and short-term. Major sources of noises and vibration will come from construction equipment and earthmoving machinery, as well as noise from the work force itself. The major receptors are expected to be the construction workers as well as any immediate neighbouring premises.

Mitigations Measures:

- ✓ Conduct noise measuring to determine levels and extent of harmful noise and provide PPE (hearing protection) to persons who must operate within or visit the identified high noise areas;
- ✓ Investigate the possibility of investing in silencers on machines to reduce the quantity of noise produced
- ✓ Inform local residents of any abnormal noise generating construction activities to minimize disruption to local resident

h) Impact on access road

Although it is anticipated that the existing access roads are adequate for the transportation of materials, the contractor must maintain these roads during the construction period.

Mitigation Measures:

- ✓ *Vehicles should abide by the speed limits and by-laws of the area;*
- ✓ *Movement of heavy construction vehicles should be planned appropriately*

i) Safety Health and Environmental (SHE) Concerns

Every construction tool equipment and machines shall be well set adequately maintained. As well the construction area shall be kept free from objects such as sharps and tripping, which may cause emergencies and occurrences of accidents ranging from minor cuts to fatalities during construction

Recommended mitigation Measures

- The construction site shall be adequately protected or fenced off from unauthorized intrusions and warning signs, barricades should be properly displayed and strictly adhered to.
- Provision of safe working area with adequate and well-equipped First Aid should always be maintained on site at all times during the whole period of construction
- In addition to the proponent should ensure that the contractor adheres to rules set by authorities for protection of his workmen such provisions of insurance and protective gear
- Adequately washing facilities should be provided for workers' hygiene and protection
- Engage contractors who are fully conversant with occupational health and safety matters at workplace. As regards compliance by the contractor, the proponent on his part should ensure that all mitigation measures are strictly enforced through his site representative and his assurance should be firmly embodied in a signed contract document.

Information and education on operation and management of the facility, including all the environmental aspects should be offered to all the concerned for purposes of project responsibility, sustainability in terms of water quality and yields as well as safety

j) Water Quality & Pollution

Irrigation return flows (the water that drains off the fields) act as a vehicle for pollutants.

The Impact: Eutrophication occurs when fertilizers (nitrogen and phosphorus) wash into water bodies, causing massive algal blooms that suffocate fish. Pesticides and herbicides can also contaminate local drinking water and harm aquatic life.

Mitigation:

- ✓ Integrated Pest Management (IPM): Reducing chemical use by using biological controls.
- ✓ Buffer Strips: Planting grass or trees along the edges of fields to act as a natural filter for runoff.
- ✓ Lining Canals: Using concrete or plastic liners to prevent chemical-laden water from seeping into the groundwater.

7.2.4 Negative Social impacts during construction phase

a) Gender based violence and sexual harassment (GBV/SH)

This impact is triggered during project construction phase when the contractor(s) fail to comply with the following provisions:

- ✓ Gender Inclusivity requirements in hiring of workers and entire project management as required by Gender Policy 2011 and 2/3 gender rule; and
- ✓ Failure to protect human risk areas associated with, disadvantaged groups, interfering with participation rights, and interfering with labour rights.

The proposed Mitigation Measures of Human Rights and Gender Requirements are:

- ✓ Ensure clear human resources policy against sexual harassment that is aligned with national law.
- ✓ Ensure appointed human resources personnel to manage reports of sexual harassment according to policy
- ✓ The contractor(s) will implement provisions that ensure that GBV at the community level is not triggered by the project, including:
- ✓ Effective and on-going community engagement and consultation, particularly with women and girls.
- ✓ Review of specific project components that are known to heighten GBV risk at the community level, e.g. compensation schemes; employment schemes for women; etc.
- ✓ The contractor shall develop specific plan for mitigating these known risks, e.g. sensitization around gender-equitable approaches to compensation and employment.
- ✓ The contractor will ensure adequate referral mechanisms are in place if a case of GBV at the community level is reported related to project implementation.

b) Sexual Exploitation and Abuse by project workers against community members

This impact refers to sexual exploitation and abuse (SEA) committed by project staff against communities and represents a risk at all stages of the project, especially when employees and community members are not clear about prohibitions against SEA in the project.

The proposed mitigation measures to risks of SEA include:

- ✓ Develop and implement a SEA action plan with an Accountability and Response Framework as part of the C-ESMP. The SEA action plan will follow guidance on the World Bank's Good Practice Note for Addressing Gender-based Violence in Investment Project Financing involving Major Civil Works (Sept 2018).

- ✓ The SEA action plan will include how the project will ensure necessary steps are in place for:
- ✓ Prevention of SEA: including Code of Conducts and ongoing sensitization of staff on responsibilities related to the Code of Conducts and consequences of non-compliance; project-level IEC materials.
- ✓ Response to SEA: including survivor-centred coordinated multi-sectoral referral and assistance to complainants according to standard operating procedures; staff reporting mechanisms; written procedures related to case oversight, investigation and disciplinary procedures at the project level, including confidential data management.
- ✓ Engagement with the community: including development of confidential community-based complaints mechanisms discrete from the standard GRM; mainstreaming of PSEA awareness-raising in all community engagement activities; community-level IEC materials; regular community outreach to women and girls about social risks and their PSEA-related rights

c) Child Abuse

Children within project areas will be exposed to risks associated with interaction between them and Project Workers. This includes child labour and sexual abuse which coherently leads to teenage pregnancies and exposure to communicable diseases such as HIV/AIDS.

Mitigation

- The contractor will develop and implement a Children Protection Strategy that will ensure minors are protected against negative impacts associated by the Project including on SEA...
- All staff must sign, committing themselves towards protecting children, a contract which clearly defines what is and is not acceptable behavior
- Children under the age of 18 years should not be hired on site as provided by Child Rights Act (Amendment Bill) 2014.
- Wherever possible, ensure that another adult is present when working in the proximity of children.
- Refrain from hiring children for domestic or other labour, which is inappropriate given their age, or developmental stage, which interferes with their time available for education and recreational activities, or which places them at significant risk of injury.

d) Occupational Health and Safety Hazards

During construction the movement of construction materials may result in accidents if good supervision is not provided. Accidental cuts and bruises are common among construction workers as a result of the use of machinery and hand tools, an impact that needs due consideration.

Mitigation:

- Provide appropriate personal protective equipment (PPE).
- Implement a programme of assessment of routine monitoring of worker health.
- Redesign manual processes and rotate work tasks to reduce heavy lifting/repetitive activities, and where possible install mechanical lifting aids.
- Train workers in general safety procedures including first aid and fire safety.
- Use designated routes for machinery and personnel
- Engineer out sharp edges and access to dangerous parts of machinery through a hierarchy of controls (permanently fixed physical barrier, interlocked physical barrier, physical barrier, presence sensing system).
- Ensure that there are provisions for reporting incidents, accidents and dangerous occurrences

e) Labour Influx Effects

During construction the project will attract jobseekers and hawkers with possibility of thieves intruding into the area. This therefore leads to concentration of people in one area drawn from diverse social and cultural backgrounds often resulting to a number of issues as listed below;

- Strain on various resources especially water resources
- Grievances from local community members over job opportunities
- Sexual Exploitation and Abuse
- Unwanted Pregnancies

Mitigation measures to Labour Influxes

- The contractor awarded the Project will develop a labor Management Plan (LMP) in consultation with local leaders.

- The contractor will ensure effective community engagement and strong grievance mechanisms on matters related to labour, with a discrete mechanism for safely and confidentially reporting issues of SEA and GBV at the community level triggered by the Project
- Effective contractual obligations for the contractor to adhere to the mitigation of risks against labour influx, the contractor should engage a local community liaison person who is also trained in PSEA.
- The contractor will ensure proper records of labour force on site while avoiding child and forced labour
- The contractor will ensure comply to provisions of Workplace Injuries and Benefits Act (WIBA) 2007
- The contractor will develop and implement a children Protection Strategy; this strategy will ensure that no child under the legal age of 18 years is employed to the Project.
- The contractor should institute a security management plan e.g. through a register for all visitors and workers.
- The contractor will Adopt and adapt “Nyumba Kumi” strategies

f) Risk of Increased incidences of HIV/AIDS and STIs

The influx of people may bring communicable diseases to the project area, including sexually transmitted infections (STIs), or the incoming workers may be exposed to diseases to which they have low resistance. This can result in an additional burden on local health facilities and resources. Local health and rescue facilities may also be overwhelmed and/or ill-equipped to address the industrial accidents that can occur in a large construction site.

Proposed mitigation measure for this are:

- Contractor(s) to sensitize workers and community members on HIV/AIDS awareness and other communicable diseases to be instituted and implemented as part of the contractor’s Health and Safety Management Plan to be enforced by the Supervising Engineer. This will involve periodic HIV/AIDS and other communicable diseases Awareness Workshops for Contractor’s Staff.
- Controlled access to contractor’s workforce camps by outsiders.

- Contractor(s) to provide standard quality condoms at the construction site during the construction period.

g) Social Evils

This is the social impact expected from the proposed development during the construction stage. This will include for example an increase on the spread of STDs & AIDS, liquors drinking, drugs taking, prostitution etc. These are common anti-social vices at any construction site, which cannot be completely eradicated

Mitigation measures

- Sensitization of workers by the contractor in collaboration with stakeholders such as Ministry of Public Health
- Provision of social facilities such as HIV/AIDs counselling and testing centre

h) Loss and or destruction of cultural property

This include the impacts of the project on any known cultural or archaeological site.

Mitigation Measures

- ✓ The current site is not in known heritage site. However, during construction in case of any discovery, the site will have to be enclosed and protected
- ✓ The contractor must ensure that any materials found which may be of archaeological value must be handed over to a professional archaeologist for analysis and further disturbance of the area must be stopped.
- ✓ Chance find procedures

i) Grievances/conflicts

Common grievances expected to arise during the proposed project implementation include:

- ✓ Wildlife, Human and livestock interference with the project;
- ✓ Negative project impacts which may include disruption of income streams, physical harm, and nuisance from construction activities;
- ✓ Health and safety risks;
- ✓ Socially-unacceptable project staff relations with the communities and other stakeholders;

- ✓ Conflicts over water sources; and
- ✓ Pollution and other environmental related impacts.

Mitigation measures

The following are possible mitigation measures to manage grievances:

- ✓ Establish a grievance redress mechanism (GRM) for the proposed project;
- ✓ Seek to establish amicable relationships with stakeholders and manage the impact of the project activities on affected communities;
- ✓ Put in place a pre-emptive community liaison structure aimed at identifying potential issues arising from project-related impacts and addressing them before they become grievances;
- ✓ Establish a grievance redress mechanism targeting communities and other project stakeholders but not applicable to commercial and employee-employee relationships, and which will allow stakeholders to easily put forth their concerns relating to the project, implementation and have them addressed in a prompt and respectful manner;
- ✓ Ensure the grievance redress mechanism is available to the affected community members and stakeholders at no cost;
- ✓ Educate all project stakeholders on the availability and use of the grievance redress mechanism in a manner that is understandable to all, before, during and after construction of the proposed project.

j) Increased incidences of drug and Substance

The influx of migrant labor, increased disposable income in previously impoverished areas, and the stress of high-intensity seasonal work can unfortunately lead to a spike in drug and substance abuse.

Mitigating these social impacts requires a blend of corporate responsibility, community engagement, and law enforcement.

Mitigation measures

Mitigating these social impacts requires a blend of corporate responsibility, community engagement, and law enforcement.

- **Workforce Management & Policy**

The project proponent and the contractor must set a clear tone from the beginning to ensure the workplace remains safe and productive.

- **Drug-Free Workplace Policy:** Implementing clear contracts that prohibit the use or possession of illegal substances on project sites and in worker housing.
- **Pre-employment & Random Screening:** Regular, fair testing protocols to deter substance use, especially for those operating heavy machinery or irrigation equipment.
- **Employee Assistance Programs (EAPs):** The proponent shall provide a path for recovery rather than just punishment. This includes confidential counseling services for workers struggling with addiction.

Community-Based Prevention

Since the project exists within a broader community, mitigation must extend beyond the "farm gate."

- **Sensitization & Awareness Campaigns:** Organizing workshops for workers and local residents about the health and economic risks of substance abuse.
- **Alternative Recreational Outlets:** Often, substance abuse arises from boredom or a lack of social infrastructure. Developing sports facilities, community centers, or organized social events can provide healthy alternatives for migrant workers.
- **Support for Local Law Enforcement:** Collaborating with local police to monitor "hotspots" like informal settlements or bars that may crop up around the project site.

3. Economic & Social Support

Irrigation projects often change the "cash flow" of a region, which can be a shock to the local social fabric.

Financial Literacy Training: Teaching workers and local farmers how to manage their new income can prevent "windfall spending" on drugs or alcohol.

- **Strengthening Family Units:** Where possible, encouraging "family-style" housing rather than isolated male-only labor camps, as the presence of family units is statistically shown to reduce the prevalence of substance abuse.

7.3 Environmental and Social Impacts and Mitigation Measures during Operational Phase

7.3.1 Positive environmental impacts during operational phase

Employment Creation

Through farming and sale of farm produce and indirectly through the provision of auxiliary services such as marketing, Banking, transport, communication among others

Increased income level

The expansion of irrigation scheme will lead to increased tomato production and consequently increased household incomes.

Increased productivity

The increased production of tomatoes will sustain and support expansion of agro-based factories in the country

Improved food security

The project will increase food production by irrigation in the area and in the country at large. It will also improve the health status of the people and eliminate malnutrition problems that are prevalent in the area.

Extended cropping seasons

The community will have advantage of farming tomatoes throughout the year compared to other farmers who rely on rain. This will increase their output and consequently their income

7.3.2 Negative environmental impacts during operation phase

a) Vegetation loss

Clearance of vegetation in the farms may be done to allow for cultivation and this may lead to or aggravate soil erosion which eventually causes washing away of soils into Lake Victoria without adequate conservation measures triggers intensive soil erosion and siltation in the the shores of Lake Victoria. This will eventually affect biodiversity of aquatic habitat since the community also relies on fuel-wood as a source of energy the rate of de-vegetation might be aggravated as irrigation activities increase access to the buffer zone.

Recommended Mitigation Measures

- ✓ Strengthen the existing community-based groups that promote conservation of trees through registration as Kogonga Kayundi IWUA
- ✓ Selective felling of trees according to the provisions of the county environment agency

- ✓ Creating synergies with farmers, government and non-governmental groups to enhance tree planting
- ✓ Institute appropriate conservation measures along the banks of Lake Victoria

b) Water pollution

The proposed project may cause pollution of Lake Victoria through deposition of organic and inorganic matter from the farms. Such pollution include: sediment and particulate organic solids; Particulate bound nutrients, chemicals, and metals, such as phosphorous, organic nitrogen, apportion of metals applied with some organic wastes

Though insignificant in the area, the continued use of agrochemicals may cause non-point pollution to the existing water resources. This might have health implications on those who use the contaminated water. Water containing nutrients from fertilizers may cause eutrophication which causes death of fish and other aquatic biota. Farmers therefore need to be trained on safe use of agricultural chemicals and emphasis on integrated pest management

Mitigation measures

- ✓ Sensitize farmers on sustainable agriculture practices such as proper use of agrochemicals, conservation along the banks of the Lake, agroforestry and soil conservation
- ✓ Educate farmers on Integrated Pest Management practices, dangers of pesticide contamination and conservation of water bodies
- ✓ Strengthen existing customary laws on conservation of river

c) Salinization

The introduction of large volumes of water into the soil in a continuous basis through irrigation is likely to change both the soil physical and chemical attributes. Inappropriate management of water e.g through excessive irrigation and inadequate drainage will lead to water logging and leaching of water-soluble nutrients to levels where they are no longer available for use of plants.

Mitigation Measures

- ✓ Provide adequate drainage within the farms
- ✓ Regular maintenance of the channels
- ✓ Regular monitoring and soil analysis to manage potential problems
- ✓ Sensitization of farmers on farm water management

d) Soil Erosion

Different types of soil erosion are expected in the area including water erosion and gulley. Continuous cultivation on cleared land without conservation measures, and animal tracks and uncontrolled grazing may cause loose soils that become susceptible to erosion. Intensified agricultural practices due to irrigation may accelerate soil erosion in the project area. Out-of-date in fill water management practices involving poor cut and fill operations through watercourse embankments can result in soil erosion at the head end of the irrigated field and in sedimentation at the mid or tail-end locations of the field.

Mitigation Measures

- The design of farm irrigation systems will provide for conveying and distributing irrigation water without triggering soil erosion
- Provide free board in the design of the conveyance structures to protect them from floods and siltation
- Application of conservation treatments such as land levelling, irrigation water management, conservation tillage, and crop rotations to control irrigation-induced erosion
- Use cover crops to reduce soil displacement by water or wind

e) Solid waste disposal

The solid waste will comprise mainly of agrochemical packaging materials, soil excavated and rock debris, metal cut offs plastics, cardboards, paper, wood and waste concrete among several others, which can cause water pollution and animal health risks.

Mitigation Measures

- Establish a waste disposal site for hazardous waste in a location approved by NEMA in accordance with the waste management regulations
- Sensitization of farmers on waste management
- Designate waste disposal sites/areas for agrochemical packaging
- Regular monitoring of waste management status in the farms

f) Pests ,diseases and weed

Irrigated agriculture often provides improved conditions for crop diseases to develop particularly fungal and bacterial foliage diseases. This leads to increase in use of hazardous

chemicals to aquatic systems and become rapidly concentrated in the food chain. Use of fertilizers result in eutrophication of the Kogonga- Kayundi beach in Lake Victoria and may also affect health of the locals. Phosphates tend to be fixed to soil particles and therefore may reach the Lake when soil is eroded. Diseases and weeds spread rapidly through waste water and drainage water. Local variety of weeds may thrive in the irrigated environment and reduce agricultural productivity

Mitigation Measures

- Adopt integrated pest management control mechanism
- Training and awareness programmes on sustainable pest control
- Intensified extension services
- Use of linings, shade and intermittent drying out to complement traditional techniques of mechanical removal

g) Increased waterborne diseases

Polluted water is a major cause of human disease. The construction of irrigation might also lead to an increase in malaria incidences. Schistosomiasis is also a key disease caused by parasitic trematode worms, which in their adult form live in the blood stream of human hosts. Aquatic weeds provide an important substrate for the snails. Poor sanitation and poorly constructed sanitary facilities in the fields may also lead to contamination of water bodies leading to the spread of diseases.

Mitigation Measures

- Provision of convenient and culturally acceptable sanitary facilities in the farm
- Proper construction of toilets to prevent infiltration
- Equip health centers with facilities and drugs
- Provision of treated nets to the targeted communities

h) Occupational health and Safety

The use of pesticides, fertilizers and other agro chemicals may affect the farmers who handle them through inhalation or indirect skin contact. This may cause complicated health conditions. In addition, once they are washed into water bodies, they may cause contamination and affect downstream users who draw water from the Lake Victoria.

Mitigation measures

- Ensure that trained first aid personnel are always available on site to handle emergencies.

- Provide appropriate PPE including face masks, goggles, scarfs, boots and overalls among other protective clothing to all workers and people at the site and sensitize them to use them whenever they are in environments that warrant the use of such PPE especially in all situations where the body and skin are potentially exposed to hazards such as chemicals, harmful dusts, highly infectious wastes, sharp objects, burns and extreme temperature and/or when working in areas that present threatening experiences.
- Have a fully equipped First Aid Kit (containing a first aid manual and is equipped with sterile adhesive bandages, safety pins, cleansing agent/soap, latex gloves; sterile gauze pads triangular bandages, non-prescription drugs, scissors, tweezers and antiseptic amongst others) at the site at all times.
- Put in place an appropriate emergency response plan including having emergency contacts (such as ambulance, fire tender and police) conspicuously displayed.
- Frequently undertake workers through refresher courses in order to make them have a basic understanding of the tasks under them, the hazards involved, and how to manage them.

i) Moral decadence

Since project will lead to an increase in income and raise living standards in the area, there is a likelihood of increased social vices such as prostitution theft, alcoholism among others.

Mitigation Measures

- Creation awareness on HIV/AIDs, social responsibility
- Strengthen existing structures that address social responsibility issues

7.3.3 Negative social impacts during operational phase

a) Health impact – creation of vector and rodents breeding grounds

If the project commences with no well-designed canal water drainages, water may end up stagnating and hence creating conducive breeding areas for mosquitoes and other water based vectors leading to transmission of human diseases like malaria, Schistosomiasis and cholera. The canals themselves could become a potential breeding ground for mosquitoes if the circulation of water is not regular. Diseases such as malaria and bilharzia may be common

place due to the proliferation of mosquitoes and bilharzia parasites. Poor bush management practices around the scheme may also lead to breeding grounds for mosquitoes.

Mitigation measures

- All hollow areas at the site should be filled with soil to prevent stagnation of water.
- The inlet and outlet pipes to the canals should be properly fixed to ensure regular flow of water which will prevent water from stagnating in the canals for a long time.
- Bushes and long grass around the designated irrigation scheme will be cleared to prevent breeding of mosquitoes.
- The CBO to facilitate provision of mosquito nets to communities residing within the irrigation scheme

b) Gender based violence and sexual harassment (GBV/SH)

This impact is triggered during project operation phase when the Proponent or project management fail to comply with the following provisions:

- Gender Inclusivity requirements in hiring of workers and entire project management as required by Gender Policy 2011 and 2/3 gender rule; and
- Failure to protect human risk areas associated with, disadvantaged groups, interfering with participation rights, and interfering with labour rights.

The proposed Mitigation Measures of Human Rights and Gender Requirements are:

- Integrate provisions related to sexual harassment in the employee Code of Conduct.
- Ensure all employees and any personnel thereof engaged in the project implementation to individually sign and comply with a Code of Conduct with specific provisions on protection from sexual exploitation and abuse.
- Implement provisions that ensure that GBV at the community level is not triggered by the project, including:
 - i) Effective and on-going community engagement and consultation, particularly with women and girls.
 - ii) Review of specific project components that are known to heighten GBV risk at the community level, e.g. compensation schemes; employment schemes for women; etc.

- Develop specific plan for mitigating these known risks, e.g. sensitization around gender-equitable approaches to compensation and employment.
- Ensure adequate referral mechanisms are in place if a case of GBV at the community level is reported related to project implementation.

c) Sexual Exploitation and Abuse

This impact refers to sexual exploitation and abuse (SEA) against communities and represents a risk at all stages of the project, especially when employees and community members are not clear about prohibitions against SEA in the project.

The proposed mitigation measures to risks of SEA include:

- Develop and implement a SEA action plan with an Accountability and Response Framework as part of the C-ESMP. The SEA action plan will follow guidance on the World Bank's Good Practice Note for Addressing Gender-based Violence in Investment Project Financing involving Major Civil Works (Sept 2018).
- The SEA action plan will include how the project will ensure necessary steps are in place for:
 - i) Prevention of SEA: including Code of Conducts and ongoing sensitization of staff on responsibilities related to the Code of Conducts and consequences of non-compliance; project-level IEC materials.
 - ii) Response to SEA: including survivor-centered coordinated multi-sectoral referral and assistance to complainants according to standard operating procedures; staff reporting mechanisms; written procedures related to case oversight, investigation and disciplinary procedures at the project level, including confidential data management.
- d) Engagement with the community:** including development of confidential community-based complaints mechanisms discrete from the standard GRM;
- e) Risk of Increased incidences of HIV/AIDS and STIs**

The influx of people may bring communicable diseases to the project area, including sexually transmitted infections (STIs), or the incoming workers may be exposed to diseases to which they have low resistance. This can result in an additional burden on local health facilities and resources. Local health and rescue facilities may also be overwhelmed and/or ill-equipped to address the industrial accidents that can occur in a large construction site.

Proposed mitigation measure

- Sensitize workers and community members on HIV/AIDS awareness and other communicable diseases to be instituted and implemented as part of the contractor's Health and Safety Management Plan. This will involve periodic HIV/AIDS and other communicable diseases Awareness Workshops for Contractor's Staff.
- Controlled access to private offices and working places by outsiders.
- Provide standard quality condoms at the site at all times.

f) Grievances/conflicts

Common grievances expected to arise during the proposed project implementation include:

- ✓ Human and livestock interference with the project;
- ✓ Negative project impacts which may include disruption of income streams, physical harm, and nuisance from construction activities;
- ✓ Health and safety risks;
- ✓ Socially-unacceptable project staff relations with the communities and other stakeholders;
- ✓ Conflicts over water sources; and
- ✓ Pollution and other environmental related impacts.

Mitigation measures

The following are possible mitigation measures to manage grievances:

- Establish a grievance redress mechanism (GRM) for the proposed project;
- Seek to establish amicable relationships with stakeholders and manage the impact of the project activities on affected communities;
- Put in place a pre-emptive community liaison structure aimed at identifying potential issues arising from project-related impacts and addressing them before they become grievances;
- Ensure the grievance redress mechanism is available to the affected community members and stakeholders at no cost;
- Address all raised grievances, real or imagined and take reasonable steps to maintain confidentiality of the parties to the mechanism and regardless of the complainants'

participation in this process, give a guarantee that the complainant's statutory rights to undertake legal proceedings remain unaffected; and

- Educate all project stakeholders on the availability and use of the grievance redress mechanism in a manner that is understandable to all, before, during and after construction of the proposed project.

g) Child abuse

Children within the project area will be exposed to risks associated with interaction between them and project staff. This includes child labour and sexual abuse which coherently leads to teenage pregnancies and exposure to communicable diseases such as HIV/AIDS.

Mitigation measures

- The Proponent will develop and implement a Children Protection Strategy that will ensure minors are protected against negative impacts associated with the project.
- Children under the age of 18 years will not be hired at the site as provided by Child Rights Act (Amendment Bill) 2014.
- Comply with all relevant local legislation, including labour laws in relation to child labour specifically provisions of Kenya's Employment Act, 2007 (Cap. 226) Part VII on protection of children against exploitation.

7.4 Anticipated Environmental and Social Impacts during Decommissioning Phase and Mitigation Measures

Decommissioning refers to the formal process of removing something from the operational status. It requires time in order to properly deal with potential hazards and risks that may be encountered. A typical decommissioning involves water evacuation from the canal and pipeline securing irrigation infrastructure, demobilization of irrigation systems, pumps and plant and disconnection from the solar powered mains, removal of unstable fills and configuration for long term drainage, which includes measures such as out-sloping, water-barring, ditch removal and a variety to other site specific solutions

The decommissioning exercise will have both positive and negative impacts.

7.4.1 Positive Decommissioning Impacts

Employment Creation

For demolition to take place properly in good time, there will be need to employ people who will be involved in the demolition exercise for the proposed project on its decommissioning.

Rehabilitation

During the decommissioning stage rehabilitation works will be undertaken at the proposed scheme area to restore it to its original state. This will include replacement of topsoil and re-vegetation, which will enhance the aesthetic value of the area

7.4.2 Negative Environmental Impacts during Decommissioning phase

a) Solid Wastes

Some of the materials from the demolition shall be used in other construction sites as well as for landscaping activities on site while the remaining portions shall be disposed in accordance with the relevant National Environmental Laws and Regulations. The solid waste resulting from demolition works will also be managed as follows;

- Provision of facilities for proper handling and storage of demolition materials to reduce the amount of waste caused by damage or exposure to the elements
- Use materials that have minimal packaging to avoid the generation of excessive packaging waste
- Adequate collection and storage of waste on the site and safe transportation to the disposal sites and disposal methods at designed areas be provided

7.4.3 Negative Social Impacts during decommissioning phase

a) Gender based violence and sexual harassment (GBV/SH)

This impact is triggered during decommissioning phase when the Proponent or project management fail to comply with the following provisions:

- ✓ Gender Inclusivity requirements in hiring of workers and entire project management as required by Gender Policy 2011 and 2/3 gender rule; and
- ✓ Failure to protect human risk areas associated with, disadvantaged groups, interfering with participation rights, and interfering with labour rights.

The proposed Mitigation Measures of Human Rights and Gender Requirements are:

- i) Integrate provisions related to sexual harassment in the employee Code of Conduct.

- ii) Implement provisions that ensure that GBV at the community level is not triggered by the project, including:
- iii) Effective and on-going community engagement and consultation, particularly with women and girls.
- iv) Review of specific project components that are known to heighten GBV risk at the community level, e.g. compensation schemes; employment schemes for women; etc.
 - Develop specific plan for mitigating these known risks, e.g. sensitization around gender-equitable approaches to compensation and employment.
 - Ensure adequate referral mechanisms are in place if a case of GBV at the community level is reported related to project implementation.

b) Sexual Exploitation and Abuse

This impact refers to sexual exploitation and abuse (SEA) against communities and represents a risk at all stages of the project, especially when employees and community members are not clear about prohibitions against SEA in the project.

The proposed mitigation measures to risks of SEA include:

- Develop and implement a SEA action plan with an Accountability and Response Framework as part of the C-ESMP. The SEA action plan will follow guidance on the World Bank's Good Practice Note for Addressing Gender-based Violence in Investment Project Financing involving Major Civil Works (Sept 2018).
- The SEA action plan will include how the project will ensure necessary steps are in place for:
 - i. Prevention of SEA: including Code of Conducts and ongoing sensitization of staff on responsibilities related to the Code of Conducts and consequences of non-compliance; project-level IEC materials.
 - ii. Response to SEA: including survivor-centered coordinated multi-sectoral referral and assistance to complainants according to standard operating procedures; staff reporting mechanisms; written procedures related to case oversight, investigation and disciplinary procedures at the project level, including confidential data management.
 - iii. Engagement with the community: including development of confidential community-based complaints mechanisms discrete from the standard GRM;

mainstreaming of PSEA awareness-raising in all community engagement activities; community-level IEC materials; regular community outreach to women and girls about social risks and their PSEA-related rights.

c) Risk of Increased incidences of HIV/AIDS and STIs

The influx of people may bring communicable diseases to the project area, including sexually transmitted infections (STIs), or the incoming workers may be exposed to diseases to which they have low resistance. This can result in an additional burden on local health facilities and resources. Local health and rescue facilities may also be overwhelmed and/or ill-equipped to address the industrial accidents that can occur in a large construction site.

Proposed mitigation measure for this are:

- Sensitize workers and community members on HIV/AIDS awareness and other communicable diseases to be instituted and implemented as part of the contractor's Health and Safety Management Plan. This will involve periodic HIV/AIDS and other communicable diseases Awareness Workshops for Contractor's Staff.
- Controlled access to private offices and working places by outsiders.
- Provide standard quality condoms at the site at all times.

8 ENVIRONMENTAL SOCIAL MANAGEMENT AND MONITORING PLAN (ESM&MP)

8.1 Introduction

The overall objective of the Environmental Management and Monitoring Plan (ESMMP) is to ensure that mitigation measures of identified adverse effects throughout the design, construction, operation and decommissioning phases are implemented and that they are effective so as to promote the positive impacts. It will also enable response to new and developing issues of concern. The ESMMP is vital output of an Environmental Impact Assessment as it provides a checklist for project monitoring and evaluation.

8.1.1 Environmental Social Management& Monitoring Plan

The scope of this environmental social management and monitoring plan (ESMMP) document is to give guidelines to all parties involved in construction, maintenance and utilization of the Kogonga Kayundi irrigation scheme fulfillment of environmental and social requirements. The management plan has a long-term objective to ensure that Environmental management conditions and requirements are implemented from the start of the project and post construction period, and Precautions against damage to environment and property and claims arising

Tables 8-1 form the core of this ESM&MP for the construction, operational and decommissioning phases of the proposed Kogonga Kayundi irrigation scheme. In general, the tables outline the potential environmental, socio-economic, health and safety risks associated with the project and details all the necessary mitigation measures, their financial costs, as well as the persons responsible for their implementation and monitoring. The ESM&MP should be used as checklist in the initial environmental audit of the pro

Table 8-1: Environmental and Social Management and Monitoring Plan(EM&MP)

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
Construction phase						
Loss of vegetation	• Proper demarcation of construction sites to minimize disturbance • Protection of the riparian sites and vegetation around the riparian areas • As much as possible, avoid cutting down indigenous tree species of socio-economic importance	• Demarcation of sites • Number of indigenous palatable species planted • Acreage of riparian areas protected	Contractor Environmental Management Committees IWRUAs	Throughout the Construction phase	• Contractor reports/photographs from site meetings • -Site plan showing demarcation	50,000
Soil erosion	• Put in place erosion control measures to avoid erosion prone in areas e.g drainage lines • All excavation works must be properly backfilled and compacted	• Construction sites demarcated • All excavation backfilled	Contractor/Project management unit	Continuous	Reports Filed visits	N/A
Increased noise and vibration generation	• Ensure PPE such as ear muffs are provided to the workers where necessary • Construction work be done during the day when people are away and also the outside environment is also noisy. • Noise levels should be kept within acceptable limits • Limit pickup trucks and other small equipment to idling time	• No of PPE provided to workers • No. of cases reported relating to noise pollution	Contractor	Continuous during Construction	• Noise Levels • Duration/time of the day • Reports	Contractor cost
Air pollution (dust exhaust)	✓ Workers shall be trained on management of air pollution from vehicles and machinery	• No of Workers/vehicle operators	Contractor	Continuous during Construction	-site visit /reports Photographs	Contractor cost

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
	✓ Vehicles delivering soil material should be covered to reduce dust emissions ✓ Use of dust suppressants ✓ Sensitization of workers on occupational health safety ✓ Workers provided with protective gear like helmets, dust masks, ear muffs when working. ✓ Engines of vehicles and machinery not be left running. ✓ Equipment on the site should be properly maintained so as to emit minimal air pollution ✓	- sensitized on reduced emission • No. of PPE supplied			Sensitization meeting report	
Oil spills/Fuels and Lubricants	✓ Vehicle maintenance should be done on purpose built • Impervious concrete platforms with oil and grease traps. • Standard operating practices for re-fueling mobile equipment such as a minimum 15m from any water channel should be practiced	• No of Oil and grease traps established	Contractor	Construction phase	• Records Register on vehicle maintenance	Contractor cost
Increased generation of solid wastes	• Minimize waste generated • Recycling of the excavated material • Storage of construction waste in designed collection points • Appropriate waste disposal-directly/through licensed waste collectors • The disposal site need to be more that 100 meters from water course and in apposition that will facilitate	• Designed waste collection points established • -Waste collection company engaged	Contractor Site Engineer	Continuous during Construction	• Waste storage points • -Waste disposal facilities/contract collector	Contractor cost

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
	prevention of storm water run-off from the site from entering the water courses					
Visual Impacts and aesthetics	- Regular site clean-up to prevent littering - All excavated material should be compacted to minimize soil erosion - Restrict project activities to the actual project site - Establishment of a site store for storage of materials, tools and equipment	- Volume of waste cleaned up - Area compacted - Number and size of materials stores erected - Area of site rehabilitated	Contractor	Throughout the construction phase	- Cleaning up of waste - Compacting loose soils - Establishment of a materials store - Site rehabilitation	Contractor cost
Occupational Health and safety Hazards	- Provide workers with appropriate personal protective clothing: helmets, boots and overalls - Implement a programme of assessment of routine monitoring of worker health. - Redesign manual processes and rotate work tasks to reduce heavy lifting/repetitive activities, and where possible install mechanical lifting aids. ✓ Provide a well-stocked first aid kits on the site - Restrict proposed site for only authorised persons	- No. of HSE trainings - No. PPE provided - First Aid Kits availability - Availability of sanitation facility - No. of Accidents/incidents	Contractor/Project management unit	Continuous during construction	- PPE provided - Recorded accidents occurrences and near misses - OSH sensitization conducted - Field visits	20,000
	Social Impacts					
Increased Spread of STD, HIV & AIDS,	Community sensitization on HIV/AIDs	No of Cartons of condoms distributed and to	Contractor /Project management committee	Throughout construction Period	Reports	10,000

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
	Contractor to sensitive workers and provide condoms on site as well as within the project area.	- the relevant persons - No. of HIV trainings and awareness campaign - Code of Conduct				
Gender based violence and sexual harassment	- Integrate provisions related to Implement provisions that ensure that GBV at the community level is not triggered by the project, including: - Sensitization, community engagement and consultation, particularly with women and girls. - Ensure adequate referral mechanisms are in place if a case of GBV at the community level	- No. of cases of GBV reported - Number of sensitization workshops	Contractor/project management unit	Throughout construction Period	- Human resource policy in place - Code of Conducts signed - Separate sanitary convenience	10,000
Sexual Exploitation and Abuse by project workers	- Develop and implement a SEA action plan - Engagement with the community: including development of confidential community-based complaints mechanisms discrete from the standard GRM;	- Number of recorded cases - Number of sensitization workshops - Number of persons by gender sensitized	Contractor, Kogonga Kayundi IWUAs County department of social services	Throughout construction Period	Reports	20,000
Child abuse	- Contractor develop and implement a Children Protection Strategy - All staff signing and committing themselves towards protecting children, a contract which clearly defines what is and is not acceptable behavior	- Number of school going children who have dropped out of school - Number of workers to have	Contractor/project management unit	Throughout construction Period	- Child Protection Strategy - Workers signing and committing to child protection strategy - Age of employees	10,000

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
	- Children under the age of 18 years should not be hired on site as provided by Child Rights Act (Amendment Bill) 2014. - Wherever possible, ensure that another adult is present when working in the proximity of children.	- ratified to child protection strategy - No. of children/persons below the age of 18 yrs employed				
Grievances/conflicts	✓ Establish a grievance redress mechanism targeting communities and other project stakeholders but not applicable to commercial and employee-employee relationships ✓ Ensure the grievance redress mechanism is available to the affected community members and stakeholders at no cost ✓ Address all raised grievances, real or imagined and take reasonable steps to maintain confidentiality of the parties to the mechanism and regardless of the complainants',	- Number of reported cases on grievances - Number of sensitization awareness creation workshops on GRM - Number of community members trained on GRM	Contractor, Kogonga Kayundi IWUA grievance redress committee County department of social services	Continuous	Reports Existing records	20,000
Destruction of cultural heritage sites	✓ Proper identification and demarcation of sites of cultural heritage ✓ Establishing mechanisms for negotiation where disturbance of such sites is inevitable ✓ Protection of identified cultural sites	Affected cultural sites in the project area Number of mechanisms/meetings undertaken	National Museums of Kenya County department of Cultural services Contractor	Construction period	Reports Photos Existing records at the county government office	-
					Sub Total	120,000
Operational Phase Environmental Impacts						

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
Water pollution	-Sensitize farmers on sustainable agricultural practices, river bank conservation, agroforestry, soil conservation -Educate on integrated pest management dangers of contaminating the river with synthetic fertilizers -Regular water monitoring -Strengthen customary laws on conservation of the Lakes	-Soil conservation measures -Trees plant along with crop -Farmers practicing IPM - Regular water quality data from WRMA -	Kogonga Kayundi IWUA County Government Agriculture Office in Tana Rivere	Throughout operation period	-Training reports/photographs -Field observations on number of trees planting along with crop production -Minutes of community meetings	100,000
Sedimentation	-Sediment extraction at head works be carried out regularly	-amount sediment basin	County Government Agriculture Irrigation Office Siaya Kogonga Kayundi IWUAs	Throughout operation period	Low sediment levels in the larger part of the canal	20.000
Water logging	Construction and maintenance of adequate drainage system Apply soil and water conservation methods on farms Apply suitable irrigation methods	Drainage systems properly maintained Conservation methods applied Irrigation methods monitored	County Government Agriculture Irrigation Office Siaya Kogonga Kayundi IWUAs	Throughout operation period	Report on status of drainage systems Report on conservation methods being applied in the farms	N/A
Solid Waste management	-Establish waste disposal site for hazardous waste in allocation approved by NEMA in accordance with waste management regulations --Designed waste collection points established	Regular monitoring of waste management status in the farms - Storage of construction waste in	County Government Agriculture Irrigation Office Siaya Kogonga Kayundi IWUAs /WARMA	Throughout operation period	Number of Waste storage points -Number Waste disposal	200,000

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
	-The disposal site need to be more that 100 meters from water course and in apposition that will facilitate prevention of storm water run-off from the site from entering the water courses	designed collection points			facilities/contract collector	
Soil Erosion	-Provide free board in the design of the conveyance structures to protect them from floods and siltation -Use of cover crops to reduce soil displacement by water -Design irrigation system will provide for conveying and distributing irrigation water without triggering soil erosion	Design of farm irrigation systems conducted Cover crops used to reduced water displacement	NAVCDP project Community members Community forest Association. Kogonga Kayundi IWUAs	Operation period	Report on the conveyance structures established	50,000
Pest, disease and weeds	-Training and awareness programmes on sustainable pest control -Adopt integrated pest management control mechanisms -Intensified extension services	No of persons trained IPM mechanism adopted Extension services provided/intensified	Siaya County Government Department of Agriculture (Crops) WRUA members	Operation period	Reports Photographs	100,000
(IPMP) Incidences of pests and application of pesticides	Monitoring and Surveillance (The "Scouting" Phase) Before applying any treatment, the proponent must establish an observation routine. Threshold Levels: Define "Economic Injury Levels"—the point at which the cost of pest damage exceeds the cost of control. Regular Scouting: Trained field officers must inspect crops weekly for signs of distress, egg masses, or fungal growth.	Observation routine established Estimated cost of pest damage and cost Number of field officers trained	Siaya County Government Department of Agriculture (Crops) WRUA members	Operation period	Reports Photographs	300,000

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
	Pheromone Traps: Use traps to monitor pest populations and determine the exact timing for interventions.	Report on egg masses and fungal growth Number of pest populations trapped by pheromone traps				
	Crop Rotation: Breaking the life cycle of soil-borne pests by changing crop families each season. Synchronized Planting: Encouraging all farmers in the irrigation block to plant at the same time to avoid providing a "continuous buffet" for pests. Water Management: Avoiding over-irrigation, as excess moisture promotes fungal diseases and root rot.	Varieties and types of crops used for rotation Number of framers and timing of planting Amount of water and establish a water meter	Siaya County Government Department of Agriculture (Crops) WRUA members	Operation period	Reports Photographs	300,000
	Biological Controls (Nature's Defense) Using "good bugs" to fight "bad bugs." Biopesticides: Utilizing plant-based extracts (like Neem oil) or microbial agents (like Bacillus thuringiensis or Bt).	Methods and types of biopesticides used	County Government Department of Agriculture (Crops) WRUA members	Operation period	Reports Photographs	300,000
Conflicts	Animal corridors to watering points be provided within the scheme -Build capacity of local conflict resolution mechanisms	Animal corridors provided Capacities on conflict resolution built	Community members IWRUA members	Operation period Operation period	Number of corridors (Malkas) provided Number of farming communities trained on conflict resolution	20,000

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
	-Conflict among beneficiaries over water access and distribution within the scheme -Conflict among beneficiaries over allocation of the operations and maintenance costs	Ensure beneficiary participation and community management Water committee be established responsible for resource mobilization	Siaya County Agricultural office , Kogonga Kayundi IWUAs Community members NAVCDP project implementation team County Agricultural Office	Operation period Operation period	Number of beneficiaries targeted Irrigation Water User Conflict Management Committee established and functional	
Water borne diseases	-Provision of treated nets to the targeted communities -Equip health centres with drugs -Provision of water treatment tablets	Mosquito nets provided Health centers equipped Water treatment tablets provided Communities sensitized	County Government in charge of Health services County Director NEMA	Operation period	Number of targeted households provided with Mosquito nets, Water treatment tablets and sensitized	
Occupational Health Safety	All health risks equipments must be cleared from the project site Adopt integrated pest and disease control	Health risk equipments cleared Integrated pest and disease control adopted	County Government in charge of Health services Siaya county Agricultural office	Operation period	Number of health risk equipments cleared Report on activities adopted on integrated pest and diseases control	
Moral Decadence	-Create awareness on HIV/AIDs , social responsibility -Strengthen existing structures that address social responsibility	Awareness on HIV/AIDs social responsibility created	County Government in charge of Health services/NAVCDP/	Throughout the project period	Reports Social platforms established	

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
			Agric Office/ Social Service Office		No of Barazas/ Meetings	
Operation phase Social impacts						
Leadership issues in management	- Periodical capacity building to the PMC by NAVCDP - Elected finance committee with appropriate gender representation to handle funds. - Periodic update to the members financial status- transparency	- Number of trainings conducted - Number of meetings held - No of reported grievances - Periodic financial status updating	Proponent NAVCDP, Siaya County department of social services Kogonga Kayundi IWUAs	Throughout operation	- Training of PMCs - GRM mechanisms - Periodic financial status update	10,000
Creation of vector and rodents breeding grounds	✓ All hollow areas at the site should be filled with soil to prevent stagnation of water. ✓ The inlet and outlet pipes to the canals should be properly fixed to ensure regular flow of water which will prevent water from stagnating in the canals for a long time. ✓ Bushes and long grass around the designated irrigation scheme will be cleared to prevent breeding of mosquitoes. ✓ d) The Kogonga Kayundi IWUA to facilitate provision of mosquito nets to communities residing within the irrigation scheme	Length of hollow areas filled with soil Acreage of bushes in the irrigation area cleared Number of households facilitated with mosquito nets	Kogonga Kayundi IWUAs County department of Water/Irrigation County department of public health	Continuous	Reports Photos	50,000
Occupational Health and safety Hazards	✓ Provide workers with appropriate personal protective clothing: helmets, boots and overalls.	No. of accidents reported	Proponent NAVCDP Siaya	Throughout operation	Reports on Safety records	40,000

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
	✓ Provide a well-stocked first aid kits on the site ✓ Restrict livestock and human movement inside the reservoir by fencing the site. ✓ Put Signage (Warning signs in strategic sites)	• Number and types of PPE procured • No. of sensitization meetings	team and community		• Reports on number first Aid Kits available • Photos of signage sites	

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
Gender based violence and sexual harassment (GBV/SH)	✓ Effective and on-going community engagement and consultation, particularly with women and girls. ✓ Develop specific plan for mitigating these known risks, e.g. sensitization around gender-equitable approaches to compensation and employment. ✓ Ensure adequate referral mechanisms are in place if a case of GBV at the community level is reported related to project implementation	Number of GBV reported incidences Number of awareness , creation, consultative workshop/meetings	Kogonga Kayundi IWUAs County department of Social services County department of Childrens Gender based violence expert	Continuous	Reports	20,000
Sexual Exploitation and Abuse	✓ Develop and implement a SEA action plan with an Accountability and Response Framework as part of the C-ESMP. ✓ Engagement with the community: including development of confidential community-based complaints mechanisms discrete from the standard GRM; mainstreaming of PSEA awareness-raising in all community engagement activities;	Number of SEA reported incidences Number of awareness, creation, consultative workshop/meetings	Kogonga Kayundi IWUAs department of Social services Gender based violence expert	Continuous	Reports	-
Child Abuse	✓ Develop and implement a Children Protection Strategy that will ensure minors are protected ✓ Comply with all relevant local legislation, including labour laws in relation to child labour specifically provisions	Number of child abuse related cases reported and addressed Number of awareness creation workshops/meetings	Kogonga Kayundi IWUAs department of Social services	Continuous	Reports	10,000

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
Risk of Increased incidences of HIV/AIDS and STIs	✓ Sensitize workers and community members on HIV/AIDS awareness and other communicable diseases to be instituted and implemented as part of the contractor's Health and Safety Management Plan,	Number of awareness, creation, consultative workshop/meetings Number of condoms distributed	Kogonga Kayundi IWUAs County department of social services and County Public Health department	Continuous	Reports	-
Grievances/conflicts	✓ Put in place a pre-emptive community liaison structure aimed at identifying potential issues arising before they become grievances; ✓ Ensure the grievance redress mechanism is available to the affected persons at no cost; ✓ Address all raised grievances, real or imagined and take reasonable steps to maintain confidentiality \	Number of conflict related cases reported and addressed Number of awareness creation workshops/meetings	Kogonga Kayundi IWUAs GRM committee County department of Social services County NAVCDP GRM Committee	Continuous	Reports	10,000
					Sub Total	900,000
Decommissioning phase						
Demolition Waste	-Use an integrated solid waste management system i.e Through a hierarchy of options: Source reduction; Recycling Reuse; Sanitary land filling -Provide facilities for proper handling and storage of demolition materials to reduce the amount of waste caused by damage -Use materials that have minimal packaging to avoid the generation of excessive packaging waste.	Registered waste collector engaged	Contractor	One-off	Inspection and observation	200,000

Potential Impact	Proposed Mitigation Measures	Performance Monitoring Indicator	Responsibility	Timeline	Means of Verifiable	Cost (Ksh)
	Ensure adequate collection and storage of waste on the site and safe transportation to the disposal site					
Noise	-Use equipment designed with noise control elements -Limit vehicles to a minimum idling time encourage workers to switch off engines whenever possible -Install sound barriers for pile driving activity -The noisy demolition works will be planned to be during the day	PPEs provided to workers Number of cases reporting relating to noise pollution	Contractor	Throughout decommissioning period	Observation	
Loss of livelihood	• The impact is low as it is anticipated and can be mitigated by training farmers on other forms of business and other strategies for continuous improvement of local breeds	• Training on alternative business	Proponent	Continuous during decommissioning	• No. of trainings conducted	20,000
Occupational health and safety risks	-Adherence to the Occupational Health and Safety Rules and Regulations stipulated in the occupational Safety and Health Act, 2007 -Provision of appropriate personal protective equipment as well as ensuring a safe and healthy environment for demolition workers	Number of reported incidences	Proponent	Throughout decommissioning period	Inspection and observation	20,000
Sub Total						240,000
Total Cost of ESM&MP(Kshs)						940,000

Table 8-2: Integrated Pest Management Plan (IPMP)

Impact Issue / Pest & Pesticide Threat	Mitigation Measures	Implementation Tool	Expected Results	Monitoring Indicators	Responsibility	Cost Estimate (KES)
Excessive use of chemical pesticides	Promote use of bio-pesticides and IPM practices (crop rotation, intercropping, trap cropping)	Farmer training, demo plots, extension services	Reduced chemical dependency, improved soil and crop health	% of farmers adopting IPM techniques	IWUA, County, sub-county and ward Agriculture Office	60,000 for training materials, transport, facilitation
Pest resistance due to repeated pesticide use	Rotate pesticide classes and encourage integrated pest management	Pest management plans, record-keeping template	Reduced pest resistance, improved pesticide effectiveness	Number of farms with updated pest rotation plans	IWUA, Agro-dealers, County, sub-county and ward Agriculture Office, Pest Control Products Board (PCPB)	30,000 for Pest record booklets, scout training for lead farmers
Improper storage and disposal of pesticides	Establish pesticide storage protocols and disposal pits for containers	Storage Standard Operation Procedures (SOPs), awareness campaigns, waste pits	Reduced contamination risks	Number of farms with compliant storage and disposal	Farmers, NEMA, IWUA, County, sub-county and ward Agriculture Office	55,000 for construction of disposal pits and awareness materials
Health risks to farmers during pesticide handling	Train farmers on safe pesticide use and provide PPE	Capacity building sessions, PPE kits	Safer handling, reduced exposure to chemicals	Number of farmers using PPE	County Health, County, sub-county and ward Agriculture Office, IWUA,	80,000 for purchase of PPE kits and awareness sessions

	(gloves, masks, boots)					
Water contamination from pesticide runoff	Promote buffer zones, and drip irrigation to reduce leaching	Layout maps, water quality testing	Protected water sources, healthier aquatic systems	Pesticide residues in water samples/ water quality test results	NEMA, WRMA, IWUA, County, sub-county and ward Agriculture Office	70,000 for field visits and water quality analysis
Invasive pests (e.g. Fall Armyworm, Tuta absoluta)	Early detection and rapid response measures	Pest surveillance, reporting app	Controlled spread of invasive pests	Frequency of pest reports and response times	KEPHIS, MOALD, IWUA, County, sub-county and ward Agriculture Office	40,000 for surveillance tools, phone-based alert system training
Limited farmer knowledge on IPM	Regular capacity building and farmer field schools	Field schools, posters, radio sensitization	Increased awareness and adoption of IPM	Number of sensitization events, attendance records	IWUA, farmers, County, sub-county and ward Agriculture Office	45,000 for farmer field schools, radio airtime and training materials
Pesticide residues on produce	Promote pre-harvest intervals and good agricultural practices (GAPs)	IPM manual, harvest scheduling	Safer produce meeting market standards	Residue test results on sampled crops	KEBS, Public health department, Farmers, IWUA, County, sub-county and ward Agriculture Office	30,000 for residue testing and training on harvest timing

9 CONCLUSION AND RECOMMENDATION

The proposed project presents multiple environment and social benefits including: Increased tomato production, increased household incomes, local economic growth and enhanced climate resilience in a semi-arid region. It will also allow for optimal use of natural resources in the County. On the other hand, the project could spur negative environmental impacts. These include: vegetation clearance during expansion and rehabilitation of the irrigation infrastructure; intensified conflicts on access to the water points, siltation and encroachment into sensitive ecosystems such as riparian land. The negative impacts however can be mitigated through technical design consideration, community sensitization, strategic partnerships, staff capacity building-implementing agencies and continuous monitoring of environmental conditions against the baseline

9.1 Conclusions

From the findings of the study that are detailed in this report, the Kogonga Kayundi IWUAs irrigation project will play an important role in improving the livelihoods of the local community through increased and improved agricultural production. The improved agricultural production will enhance household food security; generate local employment and increased household incomes of targeted Kogonga Kayundi Village members and the larger Kogonga Kayundi community

The potential negative impacts of the project are low, easy to mitigate, and the benefits to the community are very significant. In addition, if the proponent and the community undertake the necessary measures to mitigate the negative impacts as identified in this report, then there should be no reason to prevent the project from proceeding on as planned.

9.2 Recommendations

In addition to following the laid down guidelines and according to the information collected, collated and analyzed during the study, it is the lead experts considered opinion that:

- The project DOES NOT pose any irreversible environmental impacts identified that are generally related to development projects and the mitigation measures for those that have been clearly articulated;
- The project will bring positive environmental impacts that surpass the few and minor negative impacts identified. The negative environmental impacts are addressed by the

detailed environmental management plan, which will be executed during the project implementation and operation phases to safeguard the environmental interests

- The project is in line with the existing county plans within the various sectors of water, environment, land and general development.
- The proponent will collaborate with key stakeholders in environment, water, health and agriculture among others to ensure successful implementation and monitoring of mitigation.
- The proponent has agreed to adhere to the laid down laws and procedure of NEMA in setting up the project. Its successful implantation will contribute to the economic growth of the country in regards to poverty eradication as well as reducing the water use conflicts
- The proposed project is a socially environmentally and economically viable venture the befits support in order to contribute to the Vision 2030 development goals; its implementation will be beneficial to the country through its contribution to food security, poverty eradication and improved water resource management and reduced water related conflicts
- A copy of the environmental and social management plan must be given to the contractor prior to construction. The contractor needs to demonstrate how the ESMP will be implemented in the construction process.
- The proponent and government agencies particular NEMA-environmental lead agency should strengthen their grievances redress mechanisms the project from proceeding on as planned

10 REFERENCES

- Government of Kenya (2010). The constitution of Kenya, government printer, Nairobi, Kenya
- Government of Kenya (2000): Kenya gazette supplement Acts, Environmental Management and Coordination Act Number 8 of 1999 and 2015 Amendments (Cap 387). Government printer, Nairobi, Kenya.
- Government of Kenya (2003): Kenya gazette supplement number 56. Environmental Impact Assessment and Audit Regulations, Government Printers, Nairobi, Kenya.
- Government of Kenya (2007): The Occupational Safety and Health Act, Government Printers, Nairobi, Kenya.
- Government of Kenya (2012): The Land Act, Government Printer, Nairobi, Kenya.
- Government of Kenya (2012): The Land Registration Act, Government Printer, Nairobi
- Government of Kenya (2012): The National Land Commission Act, Government Printer, Nairobi, Kenya.
- Government of Kenya. (2019). Energy Act, 2019, government printer, Nairobi, Kenya.
- Government of Kenya. (2012). The County Government act, 2012, government printer, Nairobi, Kenya
- Government of Kenya. (2012). The National Land policy, 2012, government printer, Nairobi, Kenya
- Government of Kenya. (2006). Museums and Heritage Act, No. 6 of 2006, government printer, Nairobi, Kenya.
- Government of Kenya. (2007). Kenya Roads Act No. 2 of 2007, government printer, Nairobi, Kenya.
- Government of Kenya. (2012). Public Health Act (Cap 242), government printer, Nairobi, Kenya.
- Government of Kenya. (2008). Vision 2030, government printer, Nairobi, Kenya.
- Government of Kenya. (2012). National Environmental Policy, government printer, Nairobi, Kenya.
- Government of Kenya. (2014). National Energy Policy, government printer, Nairobi, Kenya
- Government of Kenya. (2011). Gender Policy, government printer, Nairobi, Kenya.
- Kenya gazette supplement Acts Land Planning Act (Cap. 303) government printer, Nairobi
- Kenya gazette supplement Acts Physical Planning and Land Use Act, 2019 government printer, Nairobi
- Kenya gazette supplement Acts Water Act, 2016 government printer, Nairobi
- Kenya gazette supplement number 69, Environmental Management and Coordination(Waste management) Regulations 2006, Gvernment printer, Nairobi
- Kenya County Climate Risk Profile Series 2018, Climate Risk Profile for Siaya County.
- Noise Prevention and Control Rules 2005, Legal Notice no. 24, Government Printers, Nairobi

•

Siaya County Government. (2022). County Integrated Development Plan (CIDP) for 2022-2027 T

The Occupational Safety and Health Act, 2007, Government Printers, Nairobi

World Bank (1998). Environmental Assessment Sourcebook volume II: Sectoral Guidelines.

World Bank, Washington.

World Bank (2025) <https://projects.worldbank.org/en/projects-operations/environmental-and-social-framework/brief/environmental-and-social-standards>