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Republic of Kenya

WSDP-CLSG II

With Support from World Bank (IDA)

Environmental & Social Impact Assessment (ESIA)

Water and Sanitation Development Programme (WSDP), CLSG-II Grants for the Proposed Interventions for Kirinyaga Water Service Provider (WSP)

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Comprehensive Project Report (CPR): Kirinyaga Water Supply System

FINAL REPORT

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Bubicha Mohamed Jaldesa (Lead EIA/EA Expert, Reg No. 7683) prepared this report in accordance with the professional service agreement (contract under Water Sector Trust Fund (WSTF)). It is one of the outputs of the Consultancy Services for undertaking Environmental and Social Impact Assessment (ESIA) for the proposed interventions for Kirinyaga Water and Sanitation Company (KIWASCO) Water Service Provider (WSP) (Ref No. WSFT/CLSG11/VOL.1/219 (1)) for the Water and Sanitation Development Project (WSDP). The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects consultant's best judgement in light of the information available to it at the time of preparation. Consequently, the findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of WSTF or the WSP.

CERTIFCATION

ESIA /EA Lead Expert Mr. Bubicha Mohamed (Reg. No. 7683) have prepared this Comprehensive Project Report (CPR) for the proposed Kirinyaga Water and Sanitation Company (KIWASCO) Interventions in Kirinyaga County**.** The report adheres to the World Bank Operational Procedures (OPs), the EMCA, 1999 (Cap 387) and the Environmental (Impact Assessment and Audit) Regulations, 2003 to bring out the true nature of the intended development**.** The report was prepared based on the information provided by various stakeholders and village elders at Kangai, Kiaga, Kimicha and Ngaru Villages in Kirinyaga County as well as from primary and secondary sources. It is therefore issued without any prejudice.

We, the undersigned, certify that the particulars in this CPR are correct and righteous to the best of our knowledge.

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Disclaimer:

This Environmental Impact Assessment Comprehensive Project Report is strictly confidential to (the Proponent) and any use of the materials thereof should be strictly in accordance with the agreement between the Proponent and the consultant. It is, however, subject to conditions in section 34 of the Environmental (Impact Assessment and Audit) Regulation, 2003.

ABBREVIATIONS AND ACCRONYMS

AoI	Area of Influence
BoQ	Bills of Quantities
CCKP	Climate Change Knowledge Portal
CIDP	County Integrated Development Plan
CLSG	Conditional Liquidity Support Grant
CPP	Consultation and Public Participation
CPR	Comprehensive Project Report
DPF	Diesel Particulate Filters
EA	Environmental Audit
EF	Electrofusion
EHS	Environmental, Health and Safety
EHSG	Environmental Health and Safety Guidelines
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
ESIA	Environmental & Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMMP	Environmental and Social Management and Monitoring Plan
ESMS	Environmental and Social Management System
FGD	Focused Group Discussion
GBV	Gender Based Violence
GoK	Government of Kenya
HDPE	High Density Polyethylene
HIV/AIDS	Human immunodeficiency virus/acquired immunodeficiency syndrome
JICA	Japan International Cooperation Agency
KeNHA	Kenya National Highways Authority
KeRRA	Kenya Rural Road Authority
KESHP	Kenya Environmental Sanitation and Hygiene Policy
KII	Key Informants Interview
KICOWASCO	Kirinyaga Water and Sanitation Company
KNBS	Kenya National Bureau of Statistics
KURA	Kenya Urban Roads Authority
LAA	Local Assessment Area
MIR	Minimum Internal Requirements
MoWS&I	Ministry of Water Sanitation and Irrigation
NCCRS	National Climate Change Response Strategy
NECC	National Environmental Complaints Committee
NEMA	National Environment Management Authority
NGEC	National Gender and Equality Commission
NRW	Non-Revenue Water

OP	Operational Policies
OSHA	Occupational Safety and Health Act
PAD	Project Appraisal Document
PAPs	Project Affected Persons
PDA	Project Development Area
RAP	Resettlement Action Plan
SCR	Selective Catalytic Reduction
SEA	Sexual Exploitation and Abuse
SH	Sexual Harassment
TOR	Terms of Reference
TVET	Technical Vocational and Educational Training
UPVC	Unplasticized Polyvinyl Chloride
VECs	Valued Environmental Components
WB	World Bank
WRA	Water Resources Authority
WSDP	Water and Sanitation Development Project
WSP	Water Service Provider
WSTF	Water Sector Trust Fund

EXECUTIVE SUMMARY

E.1 Introduction (Chapter 1)

The Government of Kenya's Vision 2030 underscores the pivotal role of water in economic growth and social development. The Kirinyaga Water and Sanitation Company (KICOWASCO) proposes to rehabilitate and extend three critical water pipelines—Kiaga, Kangai, and Kiamwenja—to address water scarcity, enhance reliability, and reduce water losses. Funded by the World Bank through the Water Sector Trust Fund, this project aligns with national goals to improve access to safe water and sanitation.

E.2 Project Description (Chapter 2)

The project rehabilitates 7.18 km of pipelines using HDPE materials, installed within road reserves to minimize resettlement. The three sections include: Kimicha-Kangai extension (1.66 km): 160 mm HDPE pipeline with a 2 m trench depth and masonry offtake chamber; Kiaga town extension (0.8 km): 90 mm HDPE pipeline and Kabedoso-Kiamwenja extension (4.72 km): 110 mm HDPE pipeline with washout and air valve chambers. Consultations with the relevant road authorities secured approvals (See annex 12). Temporary structures and crops in road reserves will be compensated as outlined in the PAP register. PAPs' details have been documented to ensure fair compensation, as outlined in the project's summary asset register.

The project phases include preconstruction (planning, ESIA, design), construction (trenching, pipe laying, restoration), and operation (monitoring and maintenance). With a 50-year lifespan, it will improve water supply in Kangai, Gatuto, and Nyaga villages, enhancing livelihoods and public health sustainably.

E.3 Legal, Regulatory and Policy Framework (Chapter 3)

The ESIA was prepared according to the legislative framework of Kenya, as well as with the World Bank Operational Policies (OP), World Bank Group Environmental Health and Safety Guidelines on Water and Sanitation, World Bank Group Environmental, Health and Safety (EHS) Guidelines and international conventions to which Kenya is a party. Relevant Kenyan policies and statutes have therefore been analysed and the Institutional framework within which it is being developed has also been described (see chapter 3).

E.4 Approach and Methodology (Chapter 4)

The ESIA study was conducted in compliance with the Environmental Management and Coordination Act (EMCA) (Amendment) 2015, the Impact Assessment and Audit Regulations (Amendment) 2019, and the project's Environmental and Social Management Framework (ESMF). The methodology included: **Screening:** Legal and desktop review classified the project as medium-risk, requiring a Comprehensive Project Report (Annex 8); **Scoping:** Key environmental and social issues were identified to guide impact assessment and mitigation planning and **Baseline** Data Collection: Established through desktop review of legislation, policies, and studies, coupled with extensive field surveys (May 28th – June 29th, 2024) and site investigations (June 10th – 12th, 2024). These involved stakeholder engagement and site observations to document the project area's physical, biological, and socio-economic conditions.

E.5 Baseline Environmental and Social Conditions (Chapter 5)

The baseline environmental and social conditions of the project area, spanning Kiaga Sub-location, Kangai Location, and Kanyekiine Ward in Kirinyaga County, reveal a tropical climate with annual rainfall ranging from 1,212 mm to 2,146 mm and temperatures of 8.1°C to 30.3°C. The region features fertile volcanic soils

in the highlands and semi-arid lowlands, with rivers like the Tana serving as key water sources despite agricultural runoff impacts. Biodiversity includes Mount Kenya forests, indigenous flora, and mixed vegetation along pipeline routes, supporting wildlife and aquatic ecosystems. Socio-economically, agriculture employs over 70% of the rural population, with key crops like bananas and macadamia. Freehold land tenure dominates, and cultural practices influence inheritance. Villages such as Gatuto and Gathiga have populations averaging 4–5 people per household. Infrastructure includes Kerugoya Referral Hospital, an extensive but largely unpaved road network, near-universal mobile coverage, and airstrips, with minimal cultural heritage identified.

E.6 Stakeholder Engagement and Consultation (Chapter6)

In accordance with the Environmental Management and Coordination Act (Amendment) 2015 and World Bank OP/BP 4.01, the project emphasizes community participation in project planning and implementation. The ESIA process involved actively engaging with stakeholders, particularly the local communities in the project areas, to gather their views, concerns, and feedback, ensuring their inclusion in the planning process.

The primary goal was to inform stakeholders about the proposed water pipeline projects, their potential impacts, and to integrate their feedback into the project's design and implementation. Engagement activities included community meetings, Focus Group Discussions (FGDs), and Key Informant Interviews (KIIs), conducted in multiple local languages including Kikuyu, Kiswahili, and English. Detailed concerns raised during stakeholder engagement and corresponding responses are provided in section 6.5 (see Table 27 and 29).

E.7 Alternative Analysis (Chapter 7)

The ESIA considered various project alternatives (see section 7.1) from the conceptual design stage to the construction activities. Alternatives reviewed at the conceptual design stage include: The No Project Alternative, The alternative Water Source, The pipeline Material Alternative, The alternative Project Route.

E.8 Environmental and Social Impact Assessment and Mitigation Measures (Chapter 8)

The implementation of the water pipeline projects is expected to result in both positive and negative impacts on the physical, social, economic, and biophysical environment of the project site. The assessment of project impacts is based on the methodology described in Chapter 4, considering pre-mitigation and post-mitigation (residual) impacts on Valued Environmental Components (VECs). Additionally, cumulative impacts assessment was carried out to evaluate the combined effects of the project along with other past, present, or future developments. Key VECs considered include surface water quality, soil stability, health and safety, and over-abstraction of water. The assessment focused on a 10 km zone around the project area and considered a time frame of 10-20 years in the past and future.

Positive Impacts:

The project is anticipated to generate multiple positive impacts, including employment creation across skill levels, boosting the local economy through demand for construction materials, and enhancing skills transfer through on-the-job training. It will increase government revenue via taxes and regulatory fees while providing reliable water access, improving sanitation, hygiene, and community health. Women will benefit from reduced water collection burdens, enhancing their well-being. Replacing old pipes with HDPE will minimize water losses, reduce illegal connections, and safeguard revenue, leading to improved service delivery, customer satisfaction, and infrastructure upgrades.

Negative Impacts

There are also various negative impacts anticipated which were ranked and analysed in detail as presented in chapter 8. Key construction phase concerns include crop loss, vegetation clearance, soil disturbance, and air quality impacts, mitigated through community engagement, controlled vegetation clearing, and pollution prevention measures. Water quality, noise, waste, and occupational health issues are managed with erosion control, noise limits, proper waste disposal, and strict safety protocols. The operation phase focuses on water abstraction monitoring, soil erosion prevention, and managing pipeline integrity and illegal connections through technology and community involvement. Decommissioning phase impacts such as livelihood disruptions, waste generation, and visual intrusion are mitigated with measures like skill development, recycling of materials, and site rehabilitation. Community health, gender-based violence, child labor, and worker influx concerns are addressed by fostering awareness, implementing grievance mechanisms, and enforcing codes of conduct. Proactive engagement with stakeholders ensures that impacts on infrastructure, cultural heritage, and community safety are minimized across all phases. For more detailed mitigation measures and corresponding impacts, refer to Chapter 8: Environmental and Social Impact Assessment and Mitigation Measures.

E. 9 Environmental and Social Management and Monitoring Plan (Chapter 9)

The ESMMP has been developed to address the negative impacts of the project during its construction, operation, and decommissioning phases. It includes a summary of impacts, mitigation measures, responsibilities, and monitoring requirements. The estimated implementation costs are Ksh 630,000 for construction, Ksh 310,000 for operation, and Ksh 150,000 for decommissioning. The contractor will ensure plan implementation, with oversight by the Kirinyaga WSP Technical Manager. Annual environmental and social audits will be conducted to assess the effectiveness of mitigation measures, with reports submitted to NEMA. Internal monitoring of construction activities will also be carried out.

E. 10 Project Affected Persons (PAPs)

The KICOWASCO water supply project does not cause physical displacement or land loss as it primarily traverses road reserves; however, it will affect crops, plantations, and structures encroaching on the wayleave. Controlled farming will be permitted post-construction, and affected crops, including Napier grass, coffee, and bananas, will be compensated fully. A total of 46 affected persons (PAPs) were identified in Gatuto and Kangai, with impacts (62 Items/properties) on 11 plantations, 30 business operations, 3 staircases, and 18 makeshift structures. Compensation amounts to Ksh 171,808 for Gatuto and Ksh 241,415 for Kangai, with a total cost of Ksh 413, 223, inclusive of a 15% contingency, vulnerable PAPs support and transportation cost.

E.11 Conclusion and Recommendation (Chapter 10)

The ESIA for the Kirinyaga Water Project identifies potential impacts during construction, operation, and decommissioning, including land loss, soil erosion, dust, noise, social issues, and water contamination, with proposed mitigation measures such as stakeholder engagement, dust control, and maintenance protocols. The project is recommended for approval with safeguards to ensure sustainable development and positive community outcomes. However, KICOWASCO lacks a dedicated Environmental and Social (E&S) team for ESMP monitoring and is advised to enhance its E&S capacity through staff training, incorporating E&S provisions in contracts, and designating personnel to ensure compliance throughout the project lifecycle.

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1. INTRODUCTION

1.1 Project Background

Kenya is classified as a chronically water-scarce country, with annual freshwater availability of 526 cubic meters per capita, ranking among the lowest globally. Over 80% of its land is arid or semi-arid, with deforestation and unsuitable agricultural practices exacerbating water scarcity. Vision 2030 highlights the critical role of water in economic growth and livelihoods, prioritizing projects like water supply expansion, sanitation improvement, and irrigation. In collaboration with the World Bank, the Government of Kenya initiated the Water and Sanitation Development Project (WSDP) to enhance water supply and sanitation services, with the Water Sector Trust Fund (WSTF) implementing key interventions under the CLSG-II program to support financial recovery of Water Service Providers (WSPs) post-COVID-19.

The CLSG-II program pre-qualified 31 WSPs with 77 interventions totaling KES 2.198 billion, targeting financial recovery within 12 months. WSTF, as the Contracting Authority, initiated a transparent tender process to select consultants for Environmental and Social Impact Assessments (ESIA). Cluster I interventions, covering Kirinyaga, Kahuti, Othaya-Mukurweini, and Ngandori-Nginda WSPs, include expanding water supply in Kimicha, Kangai, and Kanyekiine areas served by KICOWASCO. This WSP serves a population of 500,000 over 1,000 km², addressing significant water deficits in the lower areas of Kangai and Kanyekiine wards.

The proposed project involves constructing HDPE pipelines of DN90 (800 m), DN160, and DN100, categorized as medium-risk under the Environmental (Impact Assessment and Audit) Regulations, 2019, requiring a Comprehensive Project Report. The ESIA aligns with Kenyan regulations, including EMCA (Amendment) 2015, and World Bank safeguards policies. An Environmental and Social Management Framework (ESMF), disclosed in 2017, guides the screening, assessment, and mitigation of impacts for sub-projects under the program.

This ESIA Project Report complies with EMCA, 1999, and subsequent amendments, ensuring adherence to Kenyan regulatory requirements and World Bank policies. The project will address critical water shortages in targeted areas, enabling communities to apply for connections through KICOWASCO and improve water supply services sustainably, aligned with Vision 2030 goals.

1.2 Project Objectives

The project aims to improve water supply and sanitation services in Kiaga, Kangai, and Kiamwenja while enhancing the financial performance of the WSP by installing a 7.18 km pipeline (DN63–DN90 mm HDPE). This supports the WSP's financial recovery to pre-COVID levels or better. Key benefits include:

- Reliable water supply expansion to Kanga and surrounding areas.
- Enhanced water quality due to non-corrosive and contaminant-resistant HDPE material.
- Longevity and durability of HDPE, ensuring minimal maintenance.
- Reduced non-revenue water through minimized leaks and losses.
- Improved accountability by curbing illegal connections and water theft.

1.3 Project Proponent

Kirinyaga Water and Sanitation Company (KICOWASCO) is the project proponent. KICOWASCO is a Water Service Provider Company Limited by guarantee and was incorporated in the year 2006 under the Companies Act Cap 486 of the laws of Kenya. KICOWASCO has been mandated through a Service Provision Agreement (SPA) to carry out water and sewerage services in both urban and rural areas of

Kirinyaga County. The Company takes charge of public resources to provide quality, affordable, reliable, sustainable and portable water and sewerage services in the target community.

KICOWASCO is jointly owned by the Government of Kenya, County Government of Kirinyaga and the Local Community to be Kirinyaga County Water and Sewerage Company (KICOWASCO). The project proponent (KICOWASCO) is to implement the CLSG-II through WSDP. The water scheme was placed under the National Water Conservation and Pipeline Corporation, from 1989 to February 2004.

1.4 ESIA Objectives

Under the laws of Kenya, and as per World Bank safeguards policies, the Project requires the completion of an ESIA. The main objectives of the ESIA are to:

- Identify and evaluate potential environmental and social effects associated with the Project development and implementation;
- Design appropriate mitigation measures for the potential risks and impacts identified;
- Provide a record of comments and responses received from Interested and Affected Parties (I&APs) during the ESIA process;
- Facilitate an informed decision-making process by the relevant authorities

The ESIA is prepared according to the Final Version of the ESIA Terms of Reference (TOR) for the Cluster I WSPs Project dated February 9th June, 2024. The TOR details the key methodological guidelines to be considered during the development of the ESIA.

1.5 ESIA Consultants

WSTF have contracted Bubicha Mohamed Jaldesa (Lead EIA/EA Expert, NEMA Reg. No. 7683) as an individual expert consultant to conduct the ESIA. In collaboration with Sociologist and Environmentalist (assistants), the consultant will carry out the ESIA for Kirinyaga KICOWASCO WSP. This section outlines the team composition and qualification; tailored for the expedited ESIA for the KICOWASCO Water Supply Project, demonstrating expertise and commitment to delivering a comprehensive assessment within accelerated timelines. The ESIA team is presented in Table 1 below.

Table 1: Team Composition

S. No.	Experts Names	Qualifications	Position	NEMA Registration
1.	Bubicha Mohamed Jaldesa	- Masters in Biodiversity and Natural Resources Management - B.Sc. Environmental Science	Team Lead	Lead Expert Reg. No 7683
2.	Lucy Bii	B.Sc. Environmental Resource management	Team Coordinator Environmentalist	Lead Expert Reg. no 2033
3.	Gearoid Kieti	B.Sc. Environmental Science	Assistant Environmentalist	Lead Expert Reg. No 7818
4.	Priscillah Wanjiru	Bachelor's Degree Sociology	Sociologist	Associate Expert Reg. No. 8229

1.6 Report Structure

The ESIA is presented within ten chapters, the contents of each chapter is described as follows:

Non-Technical Executive summary

Chapter 1 - Introduction: outlines the context for the Project and ESIA;

Chapter 2 - Project Description: Description of the proposed project activities and location of project.

Chapter 3 - Policy, Legal, Regulatory and Institutional Framework: describes the legal, institutional and

Regulatory frameworks applicable to the Project;

Chapter 4 – Approach and Methodology: assessment purpose and Methodology, **o**utlines types and sources of evidence and methodologies employed to complete the environmental and social impact assessment

Chapter 5- Baseline of Environmental and Social Conditions: Description of biophysical, socio-economic, and cultural environment.

Chapter 6 - Stakeholder consultations: provides a description of the consultations completed during the ESIA process. It also offers a summary of the observations, requests and comments expressed by the participating stakeholders;

Chapter 7 - Alternatives Analysis: provides an analysis of the various project design options considered, as well as the process and justification for the selection of preferred options;

Chapter 8 - Impact Assessment and Mitigation: Assessment of significant environmental and social impacts, cumulative impacts assessment and proposed mitigation measures; Occupational, Health and Safety concerns; Social aspects including labour influx, child labour, impacts on local communities, GBV SEA/H and HIV/AIDS.

Chapter 9 - Environmental & Social Management Plan: set of mitigation, monitoring and institutional measures to eliminate minimize or reduce to acceptable levels of adverse environmental impacts and/or maximise socio-economic benefits. Cost outlays for the proposed measures as well as their institutional and financial support.

- **Environmental & social Monitoring plan**- specific description, and technical details, of monitoring measures, including the parameters to be measured, methods to be used, sampling locations, frequency of measurements, and definition of thresholds that will signal the need for corrective actions as well as deliver monitoring and reporting procedures. The Consultant should provide a time frame and implementation mechanism, staffing requirements and cost outlays.

Chapter 10 - Conclusions and recommendations: Summarizes the key findings of the EIA and provides recommendations for the mitigation of potential impacts and the management of the proposed Project

References

Annexes:

2. PROJECT DESCRIPTION

This chapter of the ESIA provides a description of the Project's key components and features as well as the main construction and operation requirements in terms of input and material, output and wastes, equipment and machinery, workforce, schedule, investments, and lifespan.

2.1 Project Context and Justification

Access to safe and reliable water is essential for public health, hygiene, and improved livelihoods. Kenya's Vision 2030 emphasizes water resource management to meet growing demands. The Government of Kenya, through MoWS&I and WSTF, with funding from the World Bank, is addressing water scarcity by enhancing water infrastructure.

The project in Kirinyaga County involves constructing a 7.18 km HDPE pipeline (DN250mm–DN90mm) to improve water supply in Kiaga Town, Kangai, and Kiamwenja. This initiative ensures consistent water access, reduces illegal connections, and improves public health by minimizing waterborne diseases and supporting hygiene practices. Additionally, the project promotes environmental sustainability and alleviates burdens on vulnerable populations, enabling better education and economic.

2.2 Project Location and Existing Land Use

Line 1- Kiaga Town project is located in Kiaga sub location in Kirinyaga Central Sub County. **Line 2- Njegas-Kimicha pipeline** is in Kangai location affecting Kangai, Kimicha, and Komboini sub location and is located in Mwea East Sub County**. Line 3; Kabedoso-Kiamwenja** pipeline extension to area of Kiamwenja, Ngaru and Gatuto, Kirinyaga central and Mwea West Sub County in Kirinyaga County.

Cumulatively, the project will be 7.18km. The proposed water transmission pipe route will basically run in parallel to the existing pipelines in the area. The pipeline will affect a few parcels of private lands with Napier grass, tea plantations for Kimicha-Kangai and make shift kiosks and temporary structures and stairs of shops at Ngaru market. The pipe is to be installed along with the public road reserve, there is no inhabitation along the proposed line, and no involuntary resettlement of resident will be caused. Nonetheless, there is clear encroachment onto the road reserve.

Agriculture remains the most important economic activity in the project area, largely along the proposed pipelines, subsistence agriculture is evident. Kirinyaga water supply area of jurisdiction under Ndia treatment plant that serves the proposed lines is as presented in the Figure 1 overleaf.

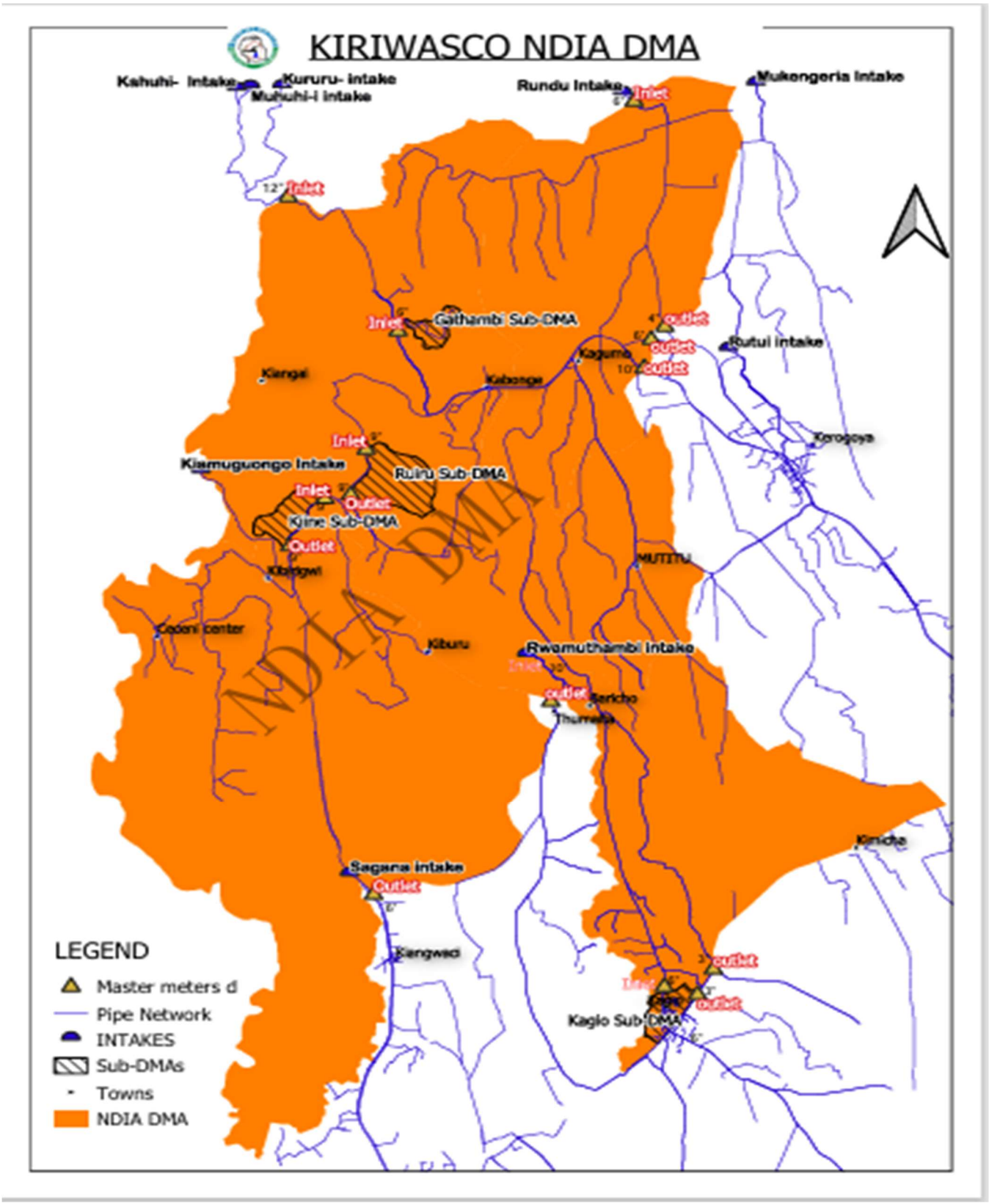


Figure 1: NDIA Water Supply Area Coverage
Source: KICOWASCO WSP

2.3 Study Area Delineation and Existing Water Supply System

2.3.1 Delineation of proposed area

The Rural Areas and Trading Centres along the proposed pipeline network has an estimated population of about 100,000. The Peri-urban consists of Kangai and Kiaga which is within vicinity of Kirinyaga central Sub-County with institutions, residences and religious premises. Kiamwenja line is in a rural set up with no business/market centres and school situated far away from the settlements. The current water service coverage is 75%, with an abstraction potential of 50,000 m^3/day from the Kiringa and Thiba River.

Regarding water safety measures, rigorous protocols are observed at both the Ndia Treatment Plant and at consumer premises. The treatment plant conducts comprehensive water treatment and quality analysis to meet regulatory standards and ensure the purity of supplied water. Additionally, bacteriological analysis is outsourced to accredited external laboratories, underscoring the commitment to maintaining high levels of water safety and public health protection throughout the distribution network.

2.3.2 Existing Water Supply System

The Existing Water Supply System for Kirinyaga consists of the intake at Kiringa and Thiba River and local Storage and Distribution Networks as detailed in the following subsections. The water from the river is conveyed through Muratiri treatment plant to storage tank field strategically located. The abstracted water is chlorinated and conveyed via a series of pumping and gravity transmission mains to the Kirinyaga consumers. Githiori, Samson water storage.

2.4 Presentation of Project Components and Features

As previously mentioned, the Proponent WSP project involves establishment of 7km pipeline of between DN63-DN90mm and the project involves the following primary component:

- Installation of DN160m pipeline between Kimicha-Kangai (1.6km)
- Installation of DN90mm pipeline between Kiaga town (800m)
- Installation of DN110mm pipeline between Kabedoso-Kiamwenja (4.7km)

Additionally, the following components are included in the projects:

- Provision of valve chambers (Air Valve and Washout Valve) including points where maintenance and control mechanisms will be installed
- Installation of 27 No. electromagnetic bulk master meters and fittings
- In addition, construction of the project components will be supported by ancillary facilities such as temporary storage area for the contractor

Temporary facilities will be necessary during construction. These temporary facilities will be located on existing proposed sites/offices which is located in each of the three-pipeline area. The main installations include pipeline works area, concrete work areas (for chambers and where repair for affected community property will be needed), and store area for material control. These installations will be mainly located on road reserves and there will be no land acquisition and easement permit envisaged. Nonetheless, the proponent obtained authorization from relevant road authorities (in this case County Road department, KeNHA and KeRRA whose reserve will be utilised) (See annex 12).

2.4.1 Proposed Works

The pipeline will be made of High-Density Polyethylene (HDPE) material, which is durable, resistant to corrosion, and suitable for water transmission to be constructed along the road reserves. The HDPE material was selected based on its durability, resistance to corrosion, and suitability for water transmission. The pipeline will be jointed using electrofusion (EF) joints, which provide a strong and reliable connection between the pipes. The works to be carried out include replacements of UPVC pipes which are in dilapidated state, with frequent leakages and construction of a new lines to Kangai and Kimicha.

2.4.2 Project Design and Material

Pipeline Layout - The pipeline will be laid in a trench with a depth of approximately 2meters and a width of approximately 1.5 meters. The pipeline will be covered with a layer of compacted soil. The pipeline for Kiaga shall run parallel to an existing upvc pipeline – upgraded to DN250mm HDPE pipeline and for the pipeline will be of 90mm HDPE. Kimicha pipeline follows the road reserve for 1.6km to areas of Komboini, Kimicha and Kimicha areas. The Kabedoso-Kiamwenja pipeline extension shall be of 4.72km of DN250mm DN100mm within Kanyekiine ward. The Water deficient social amenities such as schools, hospital/dispensaries and churches along the route will be connected to the Pipeline. The project includes water demand projections that account for the additional demand from new connections, including schools, hospitals/dispensaries, and churches along the pipeline route. These projections were incorporated into the design to ensure that the increased water demand is adequately met, and the capacity of the pipeline is sufficient to support both existing and new users (See Table 5, 6 and 7).

Pipeline Installation - The pipeline will be installed using a qualified technician, local community will excavate the trench and lay the pipeline. The pipeline will be jointed using electrofusion (EF) joints, and the joints will be tested for leaks.

Material – The proposed Proponent water supply project entails construction of approximately 7kms (cumulative) of DN90mm (Kiaga line), DN160 (Kimicha-Kangai) and DN110mm (Kabedoso-Kiamwenja line) valve and associated valve chambers (air valve & washout). The project will be constructed using modern materials and procedures to avoid compromising the safety of the neighbouring community and the environment. These materials shall comply with both local and international standards, ensuring they meet the required public health, occupational safety and health, and environmental criteria. The main construction materials and equipment for this project will be:

- HDPE pipeline and accessories (sockets, joints)
- Electromagnetic meter installation
- Appropriate valves (e.g. air valves, sluice valves, washouts)
- Pipe jointing equipment and accessories (electrofusion jointing machine)
- Excavation tools (Manual and Mechanical)
- General labour force (skilled and unskilled)

Air valves will be installed to release trapped air from the pipeline, which can accumulate at high points and cause air locks, reducing the efficiency of water flow

Washout valves will be provided to drain the pipeline for maintenance or to remove sediment and debris that can accumulate at low points.

Electromagnetic metres installation, a critical component that enhances the efficiency and accuracy of water flow measurement. The metres will provide real-time data that is crucial for monitoring water usage, detecting leaks, and ensuring the efficient operation of water supply systems by providing accurate and reliable data, these meters help ensure the effective distribution and usage of water, ultimately contributing to the sustainability and success of the project.

2.4.2.1 Applicable Design and Operational Standards

Design Standards: Adherence to the Kenyan Bureau of Standards (KEBS) for HDPE pipes, specifically KS ISO 4427-2:2007. Relevant international standards include ISO 4427, which outlines the specifications for polyethylene (PE) pipes for water supply.

- **KEBS KS ISO 4427-2:2007:** Standards for polyethylene (PE) pipes and fittings for water supply.
- **ISO 4427:** International standards for PE pipes used for water supply applications.
- **AWWA C901:** American Water Works Association standards for PE pressure pipe and tubing, 1/2 inch (13 mm) through 3 inch (76 mm) for water service.
- **DIN 8074/8075:** German standards for HDPE pipes used in water supply.

Operational Standards: Compliance with the Water Act, 2016, which governs water resources management and relevant health and safety regulations during construction and operation to ensure the project, meets national and international benchmarks for water infrastructure projects.

- **Occupational Health and Safety Act, 2007:** Ensures the safety and health of workers during construction.
- **ISO 9001:2015:** Quality management systems requirements.
- **ISO 14001:2015:** Environmental management systems requirements.

2.4.3 Topographical Profile

The county has three ecological zones: the lowland (1158 to 2000 meters above sea level), characterized by gentle rolling plains covering most of Mwea constituency; the midland (2000 to 3400 meters above sea level), covering Ndia, Gichugu, and Kirinyaga Central constituencies; and the highland (3400 to 5380 meters above sea level), covering the upper parts of Ndia, Gichugu, and Central constituencies, as well as the entire mountain area.

Kabedoso profile: The Kabedoso pipeline area exhibits a varied topographical profile with elevations ranging from 1278 meters to 1291 meters above sea level. The terrain includes gentle slopes and a mix of flat areas. The elevation data shows a gradual increase in altitude with occasional slight dips, indicating a relatively stable landscape suitable for infrastructure development.

Kiaga Profile: The Kiaga area has elevations ranging from 1259 meters to 1267 meters above sea level. The topography is characterized by gentle inclines with minor variations in slope. The area demonstrates a consistent gradient, making it favorable for pipeline installation with minimal earthwork adjustments required.

Kimicha Profile: The Kimicha area features elevations from 1264 meters to 1271 meters above sea level. The topographical profile shows a series of moderate slopes and flat segments, reflecting a diverse terrain. This variability in elevation may necessitate targeted engineering interventions to ensure stability and proper alignment of infrastructure.

2.5 Project Stages and Activities

2.5.1 Preconstruction Phase

The ESIA is vital in the preconstruction phase, identifying environmental and social concerns and recommending mitigation measures for the construction, commissioning, operation, and decommissioning phases. The proponent prepared a detailed proposal to justify the project's need and evaluate its suitability in meeting water demand. The design process involved reconnaissance and topographical surveys, hydrology analysis, water demand identification, layout development, and preparation of Bills of Quantities (BOQ) and tender documents. Local community interactions for gathering information on physical features and design considerations also occurred. Implementation schedules are developed, and the ESIA uses design outputs to assess impacts and recommend a management plan to mitigate them.

2.5.2 Construction Phase

Site Clearing and Trenching - Given that the proposed pipeline will pass through the project site within the established road reserve, and plantations (Napier grass, maize, tea and coffee bushes as observed during field assessment) vegetation will need to be cleared in some sections to facilitate the laying of the pipeline and establishment of temporary campsites (where need be). The predominant vegetation along the reserve consists of maize plantations, tea plantation, grass and short bushes as observed along the proposed pipelines. Site clearance and trenching will disturb the topsoil, which is rich in organic and humic content. The topsoil needs to be stored separately from the overburden to ensure that it can be effectively used for rehabilitation purposes.

Summary of the asset register has been developed to address potential impacts on livelihoods and ensure that affected persons, including farmers whose crops or vegetation may be cleared, are fairly compensated in accordance with the applicable legal and policy framework

Public Amenities - The proposed pipeline crosses public roads (unpaved road in both lines, private farms, and run adjacent to power lines and an existing water pipeline. These features are likely to be disrupted during construction and therefore need to be appropriately managed in collaboration with the relevant service providers and authorities. The proponent engaged road agencies (KeNHA and KeRRA) and obtained authority to use the road reserve (See Annex 12).

Pipe Laying - This stage will involve the transportation of the pipeline, placing the pipes in the dug trenches, pipe joining works, and backfilling. This will be carried out by the contractor with the involvement of casual workers, preferably sourced from the surrounding community members.

Restoration Activities - Upon completion of the project construction, all damaged road sections, road reserve areas and private property will be restored. Landscaping of the backfilled areas through re-vegetation and/or leveling to encourage the growth of natural grass will be conducted as a means of environmental conservation and to enhance aesthetics, with the excavated material being properly used for backfilling and land reclamation.

2.5.3 Operation Phase

The operational phase of the pipeline is expected to last at least 50 years, with HDPE pipe having a potential lifespan of over 100 years, offering better longevity than traditional materials. Upon completion,

the proponent will ensure the resolution of social concerns, completion per design specifications, rehabilitation of affected sites, and operational functionality of pipeline components before formal hand-over. A physical evaluation will be conducted with the contractor, and a finalization report shared with WSTF and relevant County Executive Members. Continuous monitoring will ensure the pipeline conveys the designed flows, detecting and addressing leakages or illegal connections. Regular maintenance, including inspections, cleaning, and testing, will be conducted to keep the pipeline in good condition.

Table 2: Water Demand Projections

Year	Water Demand (m3/day)		
	Kimicha-Kangai	Kiaga Town	Kabedoso-Kiaga
2023	398	31	357
2033	456	36	397
2043	530	42	459

Maintenance Works will include: **Operation & Routine Maintenance** – The Routine Maintenance Programme will outline the inspection frequency and maintenance activities for the pipelines and associated facilities. **Emergency Works and Response** – Maintenance staff will be trained to respond to potential and immediate failure events to mitigate any adverse impacts on users, with regular patrols conducted to ensure an appropriate response.

2.5.4 Decommissioning Phase

The decommissioning phase of the water pipeline project involves systematically ceasing operations and closing activities to minimize environmental and social impacts. If decommissioning occurs, it will include safe removal of equipment, restoration of affected areas, and monitoring to ensure effective restoration. All activities will follow approved plans and regulatory requirements to mitigate long-term impacts. Although decommissioning may not be imminent, proactive planning ensures that potential impacts are managed in compliance with regulations and best practices, demonstrating responsible stewardship of resources and infrastructure throughout the project.

2.6 Input and Materials

Various materials and inputs will be required for a water pipeline project. Table 3 below provides an estimate as well as projected sources of each.

Table 3: Materials Required for the Pipeline Installation

Material/Input	Quantity	Source
HDPE Pipes	7500 meters	Local suppliers or manufacturers of HDPE pipes
Fittings	Based on pipe joints	
Valves	Several types as needed	
Jointing Materials	Depending on joint type	
PPE		Local suppliers of PPEs
Electrofusion Jointing Machine	1 unit	Local suppliers
Testing Equipment (Pressure testing; Leak detection; Flow meters)	One set per testing type (on need basis)	Import
Electromagnetic meters	27	Local suppliers
Cement/concrete	depend on the extent of damage and the area needing repair	Local suppliers of cement or concrete products
Bedding materials	650m^3	Suppliers of crushed stone or graded materials
Backfill material	420m^3	Excavated soil from the trenches

2.6.1 Power Supply:

No additional power will be required for pumping, as the water will be conveyed through gravity using the existing infrastructure within the Project Area.

2.7 Output and Wastes

Wastes generated by the project activities will need to be managed and disposed of in a manner to prevent potential impacts on the environment and risks to human health. These Potential wastes may include excavated soil (overburden), pipe cuttings, unused pipe segments, packaging wastes, debris (including cleared shrubs, tea leaves etc.), concrete/cement wastes generated from repairs or adjustments to private properties or infrastructure affected by construction. These outputs and wastes should be managed according to environmental regulations and project-specific requirements to minimize environmental impact and ensure efficient project execution. At this stage, the quantity of waste generated has been estimated but it must be noted that the supplied values may change as details on the development of the Project are finalized.

Table 4: Potential Wastes Estimates and Management Measures

Waste (s)	Estimated Quantity	Source	Potential Management
Excavated Soil (Overburden)	70,000m^3	Excavated soil	Reuse as backfill or disposal in designated areas
Unused Pipe Segments/cuttings	TBD	Cut sections or leftover pieces of HDPE pipes	Recycled or disposed properly
Broken or Damaged Materials (fittings/valves/pipes)	TBD	Broken pipes, fittings/valves, PPEs	Recycled or disposed properly
Concrete or Cement Waste:	TBD	Generated from repair activities	Reuse/recycle

2.8 Equipment and Machinery

Pipeline construction will primarily rely on manual excavation methods due to the DN63 to DN90 mm water pipeline's size, ensuring precision and minimal disruption in line with environmental and project-specific requirements. In areas where the ground is hard or rocky, machinery such as excavators, backhoes, and drill hammers may be used as needed. Recent water supply projects in Kirinyaga County have successfully utilized local contractor expertise for manual installation of water transmission pipelines. The Government of Kenya encourages labor-intensive methods for less complex tasks, and there is sufficient local labor available for such projects. However, an independent contractor may choose to use machinery based on specific site conditions.

2.9 Workforce

The approximate workforce (includes categories of skilled, semi-skilled and unskilled labour) requirements during the construction phase will be:

- Approximately between 25-30 manual laborers will be assigned to handle excavation duties across the 4.7km in Kabedoso-Kiamwenja pipeline section and approximately 14-20 laborers for the 1.6km Kangai section. Cumulatively, total manual laborer for excavation will be approximately 40. If the excavation is to go for estimate 1 month.
- Approximately at team of 20-25 workers responsible for pipe handling, laying, and backfilling for Kiaga line and between 18-20 workers for Kanga and Kiamwenja line.
- Supervision and engineering oversight will be provided by 2-5 personnel throughout the project duration.

However, the exact number of personnel to be involved in the project may not be clear at this stage. The contractor will be required to give priority to youths, from local community when hiring construction workers. The workforce will be employed for the duration of all construction works. To promote the local employment, it is estimated that about 95% of the construction workers will be composed of locals. It is expected that the execution of the project will not go beyond 1 month.

2.10 Access and Land Acquisition

The existing roads (Spenza-Ngaru, Kutus-Kagio and Kimicha-Kangai Road) will serve as crucial pathways for transporting materials, and personnel to construction sites along the pipeline route. The pipelines will be installed within existing road reserves and run parallel to existing pipelines for Tana water works. Where private properties or businesses are affected, asset register has been prepared to address any disruptions and ensure fair compensation. In certain sections of the pipeline route, such as Ngaru-Spenza and Kimicha-Kangai, encroachments have been identified, including maize and Napier grass plantations within the road reserve. Engagement with affected stakeholders has already been conducted to address their concerns and minimize disruptions. Fair compensation for any loss of crops or economic displacement will be provided in line with the summary asset register, which outlines a clear framework to ensure all affected individuals are adequately compensated, with implementation overseen by WSTF. The project affects 46 Project-Affected Persons (PAPs) (20 in Gatuto, 26 in Kangai), impacting 62 assets, including structures, crops, and businesses (summary presented in Chapter 10).

Temporary Land use: - Material Storage: Designated areas within the Water Service Provider (WSP) premises will be utilized for storing pipes, fittings, and construction materials required for the project. The contractor will coordinate with the WSP to identify and prepare appropriate spaces for material storage. This approach eliminates the need for leasing private land and ensures efficient use of existing resources. All storage activities will be managed in compliance with the agreed terms to minimize disruption and ensure orderly implementation of the project.

Construction Staging Areas: The contractor may set up at strategic points along the route for equipment and machinery staging. These areas may be rented temporarily where need be.

2.11 Road Crossings

At points where the pipeline crosses roads, existing sleeves will be utilized to facilitate the crossings, eliminating the need for trenchless road crossing methods or open cutting and road reinstatement. The use of these pre-installed sleeves aligns with the guidelines of the Roads Authorities, minimizing disruption and maintaining road integrity. Consultations with the relevant road authorities have been conducted, and the required authorization for road crossings has been obtained and is appended to this report (see Annex 12).

2.12 Cost Estimates

The estimated total cost of the project is 24,149,250 (Ksh Twenty-Four Million, One Hundred and Fourty Nine, Two Hundred and Fifty only) and a summary breakdown of the costs is presented in Table 5 overleaf:

Table 5: Project Budget Estimates

KIRINYAGA WATER AND SANITATION COMPANY LTD CLSG II PROPOSED INTERVENTIONS

	INTERVENTION 1				
PIPELINE EXTENSIONS					
ITEM NO	DESCRIPTION	UNIT	QTY	RATE(kshs)	AMOUNT(Kshs)
1	**Supply of pipes**				
1.1	Supply of OD 110mm HDPE PN 10(100m roll) for Kabedoso Kiamwenja pipeline extension	m	4,720.00	1,119.00	5,281,680.00
1.2	Supply of OD 90mm HDPE PN 10(100m roll) for Kiaga town extension (Kiaga junction offtake)	m	800.00	650.00	520,000.00
1.3	Supply of OD 160mm HDPE PN 10(50m roll) for Njegas Kimicha extension (Njegas offtake to connect to Kimicha distribution network)	m	1,660.00	2,780.00	4,614,800.00
2	**Pipe excavations and backfilling**				
3	**pipe laying and jointing**				
	labour for pipe fixing through butt fusion (per joint)	nr	89.00	1,500.00	133,500.00
4	**Supply of valves**				
4.1	Supply and install DN 150mm sluice valves PN 16. AVK type or equivalent. cost to include rubber gaskets, bolts, nuts and washers	nr	2.00	55,000.00	110,000.00
4.2	Supply and installation of DN 100mm sluice valve. Avk type or equivalent. The cost to include rubber gaskets, bolts, nuts and washers	nr	2.00	43,535.00	87,070.00
4.3	Supply and installation of DN 75mm gate valve. Avk type or equivalent. The cost to include rubber gaskets, bolts, nuts and washers	nr	1.00	18,000.00	18,000.00
	Subtotal				**10,765,050.00**
5	**New connections**				
5.1	Supply of DN 15mm consumer meters. Diehl type or equivalent	nr	210.00	4,500.00	945,000.00
	Subtotal				**945,000.00**
	TOTAL CARRIED TO SUMMARY PAGE				**11,710,050.00**
	INTERVENTION 4				
PRODUCTION AND ZONAL MASTER METERS					
ITEM NO	DESCRIPTION	UNIT	QTY	RATE (Kshs)	AMOUNT(Kshs)
1	Supply and install M5000 battery operated electromagnetic bulk meters with passive pulse output for telemetry. This to include concentrators and beacon software access				
1.1	DN 200mm	nr	7.00	391,392.10	2,739,744.70
1.2	DN 150mm	nr	15.00	280,987.00	4,214,805.00
1.3	DN 250mm	nr	2.00	442,722.21	885,444.42
1.4	DN 225mm	nr	2.00	415,831.96	831,663.92
1.5	DN 100mm	nr	1.00	210,338.00	210,338.00
2	**Supply of valves**				
	Supply and sluice valves PN 16. AVK type or equivalent.				

	cost to include rubber gaskets, bolts, nuts and washers				
2.1	DN 250mm	nr	2.00	171,534.00	343,068.00
2.2	DN 225mm	nr	2.00	07,519.00	215,038.00
2.3	DN 200mm	nr	6.00	07,519.00	645,114.00
2.4	DN 150mm	nr	12.00	55,000.00	660,000.00
2.5	DN 100mm	nr	1.00	43,535.00	43,535.00
3	**Supply of fittings**				
	supply of vj couplings and adaptors				
3.1	DN 250	nr	4.00	13,500.00	54,000.00
3.2	DN 225	nr	4.00	12,500.00	50,000.00
3.3	DN 200	nr	12.00	10,800.00	129,600.00
3.4	DN 150	nr	24.00	8,500.00	204,000.00
3.5	DN 100	nr	2.00	6,574.50	13,149.00
4	**chambers**				
4.1	construction of meter chambers 1.5m*1.5m. Depth n.e 2m	nr	27.00	20,500.00	553,500.00
	TOTAL CARRIED TO SUMMARY PAGE				**11,793,000.04**
				GRAND TOTAL	23,503,050.04

2.12.1 The ESMMP Costs

The total estimated cost for implementing this plan is Ksh. 1,064,254 for construction phase; Ksh. 250,000 for operational phase, and an additional Ksh. 150,000 allocated for the decommissioning phase amounting to a total ESMMP cost of Ksh 1,464,254.

3. POLICY, LEGAL, REGULATORY AND INSTITUTIONAL FRAMEWORK

This chapter sets out the standards to which the legal, policy and administrative framework within which the proposed water project will be developed. It identifies the applicable national standards and lender requirements. For convenience and to demonstrate a systematic approach to identifying legal constraints, it has been structured around the broad topic areas set out in the Kenyan laws and policies as these comprehensively address the environmental and social risks that may be faced by the proposed water project. The ESIA will conform to the Kenyan legislative and regulatory framework and in line with the World Bank Operational Policies. For most disciplines, where there is a difference between the national Kenyan standards and World Bank Safeguard Policies, whichever is more stringent will apply.

3.1 The Constitution of Kenya

The constitution of Kenya, 2010 spells out the fundamental rights of every Kenyan citizen. Article 42 of the bill or rights of the Constitution provides that 'every Kenyan has the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative and other measures.' Article 43 defines the right of each person to clean and safe water in adequate quantities. Article 58 requires the State to put in place affirmative action programmes designed to ensure that minorities and Marginalised groups have reasonable access to water, health services and infrastructure. The Constitution goes further ahead and stipulates under article 69 of part II, chapter 5 (environmental and Natural Resources) that the State shall;

i. Ensure sustainable use, management, and conservation of the environment and natural resources while equitably sharing benefits.
ii. Promote public participation in environmental management and safeguard biodiversity, genetic resources, and indigenous knowledge.
iii. Establish systems for environmental assessments, audits, and monitoring, and eliminate harmful activities to protect the environment for future generations.

Moreover, every person has been mandated to cooperate with the State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources. In addition to the environmental and natural resources provision, part 1 of the same chapter emphasizes the following;

i. Land use and management shall by law benefit local communities
ii. Community land is protected from encroachment by State.
iii. Law shall protect Rivers, forests and water bodies.
iv. Equitable access to land.
v. All lawful land rights are secured; only someone who has stolen land needs to worry.
vi. County governments will manage land in trust of the people in accordance with the constitution.

In addition to these provisions, article 70 provides that if a person alleges that their right to a clean and healthy environment recognized and protected under article 42, is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress.

Relevance

The Constitution of Kenya stipulates for sustainable and sound management of the environment in relation to development projects. In article 69, the project proponent is mandated to cooperate with State

organs and other persons to protect and conserve the environment. Kirinyaga WSP should therefore ensure compliance with the constitution in so far as ensuring sustainable development. Moreover, the proposed project should aim at ensuring sustainability of the livelihoods and biological resources within the project area while taking cognizance to the powers given under the constitution to communities and individuals to enforce their rights through legal redress.

3.2 Kenya Vision 2030

The Kenya Vision 2030 provides the national development blueprint for the period 2008 to 2030 emanating from the Economic Recovery Strategy for Wealth and Employment Creation. It aims at making Kenya a newly industrializing middle-income country providing high quality life for all its citizens by the year 2030. The vision has been developed through an all-inclusive stakeholder consultative process, involving Kenyans from all parts of the country. The vision is based on three pillars namely; the economic pillar, the social pillar and the political pillar.

The Kenya Vision 2030 economic pillar aims at providing prosperity of all Kenyans through an economic development programme aimed at achieving an average GDP growth rate of 10% per annum over the next 25 years from the year 2008. The social pillar seeks to build a just and cohesive society with social equity in a clean and secure environment '. On the other hand, the political pillar aims at realizing a democratic political system founded on issue-based politics that respects the rule of law, and protects the rights and freedoms of every individual in the Kenyan society.

Relevance

Kenya's Vision for the water and sanitation sector is to ensure universal access to water and improved sanitation by 2030. As a water-scarce country with renewable fresh water at 647 m^3 per capita (below the UN-recommended 1,000 m^3), the strategy focuses on expanding access to safe water and sanitation through water services boards and private sector partnerships. Key initiatives include upgrading urban water supply and sanitation systems, with the proposed project directly supporting these goals through planned water distribution network investments, contributing to environmental and social sustainability objectives.

3.3 Relevant Policies

3.3.1 National Environment Policy, 2013

The National Environment Policy, 2013 sets out important provisions relating to the management of ecosystems and the sustainable use of natural resources. The policy further acknowledges that natural resources are under immense pressure from human activities particularly for critical ecosystems including forest, grasslands and arid and semi-arid lands. The policy seeks to develop an integrated approach to environmental management, strengthening the legal and institutional framework for effective coordination, promoting environmental management tools. The objectives of the Policy are inter alia to:

- Provide a framework for an integrated approach to planning and sustainable management of Kenya's environment and natural resources;
- Strengthen the legal and institutional framework for good governance, effective coordination and management of the environment and natural resources; and
- Ensure sustainable management of the environment and natural resources, such as unique terrestrial and aquatic ecosystems, for national economic growth and improved livelihoods.

Relevance

This assessment will develop an environmental and social management and monitoring plan to mitigate the impacts that may result during the construction and operation phases of the proposed water project. This tool is aimed at promoting coordination of environmental management of the project such that sensitive ecosystems are not destabilized by the subsequent project activities.

3.3.2 Kenya youth Development Policy 2019

This Policy defines youth employment as a means of providing youth with opportunities for work that are productive and deliver a fair income, security in the workplace and social protection, better prospects for personal development and social integration, freedom for the youth to express their concerns, organize and participate in the decisions that affect their lives and equality of opportunity and treatment.

Relevance

The contractor is encouraged to ensure that the youth access relevant education and training; have opportunities to associate, and are protected from harmful retrogressive practices and exploitation throughout the term of employment.

3.3.3 National Water Policy, 2021

Sessional Paper No. 01 of 2021 on National Water Policy aims at building on the achievements of the water sector reforms over the years and moving it to the next level of development in order to contribute to the National Goals and realization of the Sustainable Development Goals.

This National Water Policy is developed in line with the mandate and mission of the Ministry responsible for water affairs and within the Constitutional framework providing the respect of the human rights to water, sanitation services, and a clean environment, and therefore aims at enhancing sustainable management of water resources, and further, at improving water harvesting and storage, moving the water sector to the next level of development, in order to contribute to the National Goals, and realization of the Sustainable Development Goals. This Policy focuses on the following objectives:

- Enhance sustainable water resource management, develop water harvesting and storage infrastructure, and improve access to sewerage and non-sewerage sanitation services.
- Strengthen regulatory frameworks, water education, training, and research, while mainstreaming gender equality, youth inclusion, and climate change considerations.
- Promote alternative dispute resolution mechanisms, including the Water Tribunal, and ensure governance guided by public participation, consumer protection, and the precautionary and polluter-pays principles.

The Policy defines the content of each objective and explains the statements and the specific strategies and Policy directions, including: water resources and surface water, protection and conservation of riparian land and wetlands; integrated land use and water resources management; transboundary water resources management; water access rights and related conflicts and disputes; water quality and pollution control; rainwater harvesting and watershed conservation; drought and floods mitigation; accessing land for development of the infrastructure for water harvesting; wastewater management.

Relevance

While this policy enhances a systematic development of water facilities in all sectors of socio-economic progress, it recognizes the by-products of this process as wastewater. The policy requires that those who pollute water bodies must pay the full cost of remediation of the contaminated water; in tandem with the "Polluter Pays Principle." The proposed water project aims at providing sufficient and good quality water supply to residents of Kimicha, Kangai, Kabedoso and Kiaga area. As an ongoing process, it is important for the proponent to put in place strategies and plans for a wastewater management system having in mind that the project area lacks a sewerage system coverage.

3.3.4 National Climate Change Response Strategy, 2010

The National Climate Change Response Strategy (NCCRS) is a strategic document with a multi-sectoral approach whose vision is for a prosperous and climate change resilient Kenya. The objective is to strengthen and focus nationwide actions towards climate change adaptation and Global Greenhouse Gas emission mitigation. In summary, the objective of the NCCRS is to respond to climate change by, among other aspects:

- enhancing understanding of the global climate change negotiations process, international agreements, policies and processes and most importantly the positions Kenya needs to take in order to maximize beneficial effects;
- assessing the evidence and impacts of climate change in Kenya;
- recommending robust adaptation and mitigation measures needed to minimize risks associated with climate change while maximizing opportunities;
- enhancing understanding of climate change and its impacts nationally and in local regions;
- Recommending vulnerability assessment, impacts monitoring and capacity building framework needs.

The NCCRS recognizes the link between climate change and food security: climate change affects the four components of food security, namely food availability, food accessibility, food utilization and food system stability. The strategy aims to help eliminate hunger, food insecurity and malnutrition. With a view to making agriculture more sustainable, sectoral adaptation and mitigation interventions are set out under Chapter 8. Adaptation measures include the prevention, tolerance or sharing of losses, changes in land use or activities, changes of location, and restoration. The strategy also aims to reduce poverty, not only in urban but also in rural areas. Focus is given to increasing the resilience of livelihoods to disasters.

Relevance

This strategy provides guidelines on climate resilience, sustainable resource management, and adaptation measures that have to be complied with to ensure the proposed water project is environmentally sustainable and aligns with the national climate goals.

3.3.5 Kenya Environmental Sanitation and Hygiene Policy 2016-2030.

The Kenya Environmental Sanitation and Hygiene Policy 2016-2030 (KESHP) proposes a range of complementary activities including the provision of sanitation services and maintenance of sanitary facilities for proper collection, treatment and environmentally sound disposal of liquid and solid wastes, water treatment and safety, promotion of hygiene practices, public education, sanitation marketing, regulation and legislation supported by clearly mandated institutions, sustainable financing and research

and development. It covers urban and rural areas including households and local institutions. The areas of concern include, among others, rural sanitation, treatment of household water, disposal of (industrial) wastes, protection of wetlands and water courses from indiscriminate disposal of wastes, and food safety and hygiene, safe water supply. County governments will enforce standards regarding sanitation and hygiene at household levels in rural areas. The policy measures shall embrace the specified principles that impact on the access to improved environmental sanitation and hygiene services and a clean and healthy environment such as the recognition of a clean and healthy environment and sanitation as human rights, community-led total sanitation, gender responsiveness and social inclusion, and the polluter pays.

To achieve the goal of universal access to improved sanitation and a clean and healthy environment, the Policy will focus on eight key strategies as follows:

1. Scaling up access to improved rural and urban sanitation.
2. Assuring clean and healthy environment free from public nuisances.
3. Fostering private sector participation and investment in sanitation.
4. Building governance and leadership capacity for sanitation.
5. Sustainable financing and investment for sanitation.
6. Building enabling legal and regulatory environment.
7. Establishing an effective research and development framework for sanitation.
8. Strengthening monitoring and evaluation systems for the sanitation sector.

Relevance

This policy outlines the standards and guidelines for ensuring proper sanitation and hygiene. It aims to prevent waterborne diseases, promote public health, and ensure safe and sustainable water management. Incorporating its principles into this ESIA ensures the proposed water project aligns with national health objectives, mitigates adverse environmental and social impacts, and enhances the community's quality of life by providing safe water and adequate sanitation facilities.

3.3.6 National Land Policy (Sessional Paper No. 3 of 2009).

The Mission of the Policy aims at: promoting positive land reforms for the improvement of the livelihoods of Kenyans through the establishment of accountable and transparent laws, institutions and systems dealing with land. The overall objective of the National Land Policy is to secure rights over land and provide for sustainable growth, investment and the reduction of poverty in line with the Government's overall development objectives. Specifically, the policy offers a framework of policies and laws designed to ensure the maintenance of a system of land administration and management that will provide:

a) All citizens with the opportunity to access and beneficially occupy and use land;
b) Economically viable, socially equitable and sustainable allocation and use of land;
c) Efficient, effective and economical operation of land markets;
d) Efficient and effective utilization of land and land-based resources; and
e) Efficient and transparent land dispute resolution mechanisms.

Relevance

The proposed water project shall be located within the existing road reserve and as such, the proponent is required to ensure environmental protection of the subject land and respect land rights in the proposed project area.

3.3.7 National Policy on Gender and Development, 2019

The National Policy on Gender and Development (2019) aims to promote gender equality and empower all genders in Kenya. It replaces the Gender Policy of 2011, emphasizing the integration of gender perspectives in all sectors of development. The policy focuses on eliminating gender disparities, promoting women's rights, enhancing women's participation in decision-making processes, and addressing gender-based violence. It underscores the government's commitment to achieving gender equality as a fundamental human right and a driver of sustainable development.

Relevance

This policy will be referred to during project implementation, ensuring that both men, women, and youth are accorded equal opportunities in staff hiring, procurement of suppliers, sub-consultants, and subcontractors.

3.3.8 HIV and AIDS Policy, 2009

The HIV and AIDS Policy, 2009 establishes a framework to: (i) set minimum internal requirements (MIR) for managing HIV and AIDS, (ii) promote and establish programs to prevent discrimination and stigma towards individuals infected, (iii) contribute to national efforts to reduce the spread of HIV and AIDS and mitigate its impact, (iv) allocate adequate resources for HIV and AIDS interventions, and (v) provide guidance to human resource managers and employees on their rights and obligations related to HIV and AIDS.

Relevance

This policy shall provide a framework to both the project proponent and contractor to address issues related to HIV and Aids. The Policy will be complied with during implementation of the proposed water project. The tender document and contract should incorporate implementation of HIV awareness initiatives during the construction phase of the proposed water project.

3.3.9 National Sustainable Waste Management Policy, 2021

The National Sustainable Waste Management Policy, 2021, provides a framework for sustainable waste management in Kenya, aligned with Vision 2030. It promotes waste minimization, recycling, and responsible disposal through a circular economy approach, integrating waste management into urban planning and infrastructure while ensuring compliance with environmental laws. The policy defines the roles of stakeholders, including government and the private sector, and emphasizes capacity building, public awareness, and the adoption of innovative technologies to enhance waste management practices across the country.

Relevance

This policy is highly relevant in managing waste during both construction and operation phases. The project must minimize waste, recycle materials where possible, and ensure proper disposal to prevent environmental pollution, thereby contributing to the project's sustainability and alignment with national environmental goals.

3.4 Legal Framework

There exists national statutes and regulations that Kirinyaga WSP will have a legal duty and social responsibility in ensuring the proposed water supply project is implemented in a manner that does not compromise the current status of natural resources, socio-cultural setting as well as the economic

potential of the communities in the proposed project area. The proposed works will be implemented within the provisions of the following applicable Acts of Parliament and their respective regulations:

3.4.1 Environmental Management and Coordination Act, 1999 (and the Amendments of 2015)

The Environmental Management and Coordination Act, (EMCA) Cap 387 provides legal and institutional framework for environment management in Kenya. EMCA as such supersedes all environmental regulations that may be contrary to the provisions therein owing to its comprehensive coverage of environment management and judicial enforcement. Part II of the Act confers to every person the right to clean and healthy environment and to its judicial enforcement. Every citizen is also charged with the duty to safeguard and enhance the environment. In achieving this provision, part VI of the Act directs that any new programme, activity or operation should undergo environmental impact assessment and a report prepared for submission to the National Environment Management Authority (NEMA), who in turn may issue a license as appropriate.

As per the act's second schedule, Water resources infrastructure is listed as one of the activities that must undergo environmental impact assessment. Section 42 of the Act specifies the protection of rivers, lakes and wetlands. The Act forbids interference with water bodies without the express permission from the Director General of NEMA. The permission can be granted subject to the findings of an Environmental Impact Assessment. The Act also empowers the Minister of Environment to declare a lakeshore, wetland, coastal zone or riverbank as protected area and impose such restrictions, as he considers necessary to protect the lakeshore, wetland, coastal zone and riverbank from environmental degradation.

Relevance

The proposed project falls under Medium Risk Projects (Water Resources and Infrastructure including water supply and distribution infrastructure) under the Act's second schedule. The project is therefore required to undergo an environmental impact assessment.

The Act has further provided for the development of several subsidiary legislations and guidelines which govern environmental management and are relevant to the proposed water project implementation. These are tabulated in table 6 below:

*T*able 6: Regulations under EMCA relevant to the proposed water project

S.N.	Subsidiary Legislation	Description	Relevance
1.	The Environmental Management and Coordination (Strategic Assessment, Integrated Impact Assessment and Environmental Audit) Regulations, 2018	These Regulations contain rules relative to the content and procedures of an EIA, to environmental audit and to Monitoring and strategic environmental assessment. These rules regulate other matters such as the appeal for, and registration of, information regarding EIA. The rules also provide the applicable environmental licensing fees for the different project categories.	The EIA to be carried out on the potential interventions should be carried out in accordance to these regulations. An initial environmental audit should also be carried out in the first year of operation of the project.
2.	The Environmental Management and Coordination (Conservation and Management of	These Regulations apply to the protection, conservation and management of Inland, coastal and marine, lake basin and river basin wetlands, whether occurring on private,	The proposed project will be part of water transmission from River Kiringa resources in the project area and hence the regulation is relevant. The proponent has taken measures to

	Wetlands) Amendment Regulations, 2017	public or community land, both natural and man-made.	ensure that the ecology of the Kiringa River will be protected by adopting adequate mitigation measures.
3.	The Environmental Management and Coordination, (Water Quality) Regulations 2006	The regulation provides for the protection of ground and surface water resources. It also Provides the water quality standards for sources of domestic water which shall be complied with.	The Proponent is expected to adhere to the water quality standards during the project construction and operation phase
4.	The Environmental Management and Coordination (Waste Management) Regulations (2006)	-Provides standards for handling, transportation and disposal of various types of wastes including hazardous wastes. -Requirements to ensure waste minimization or cleaner production, waste segregation, recycling or composting. -Provides for licensing of vehicle transporting waste. -Provides for the licensing of waste disposal facilities.	The project will have to adhere to these regulations because of the fact that during construction, waste will be generated from the construction materials as well as by the construction workers.
5.	The Environmental Management and Coordination (Air Quality) Regulations, 2014	-Provides for ambient air quality tolerance limits. -Prohibits air pollution in a manner that exceed specified levels. -Provides for installation of air pollution control systems where pollutants emitted exceed specified limits. -Provides for the control of fugitive emissions within property boundary. -Provides for the control of vehicular emissions. -Provides for prevention of dispersion of visible particulate matter or dust from any material being transported. -Provides for acquisition of an emission license.	The contractor will comply with these regulations by regulating. -Exhaust emissions from construction machinery. -Dust from Site clearance and excavation of foundations. -Dust and exhaust emissions from transportation and disposal of spoil.
6.	The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009	-Prohibits the generation of unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. -Provides for the maximum noise levels permissible in various environmental set ups such as residential areas, places of worship, commercial areas and mixed residential	The Contractor will be required to ensure compliance with the above regulations in order to promote a healthy and safe working environment throughout the Construction Phase.
7.	Extended Producer Responsibility Regulations, 2020	The Extended Producer Responsibility (EPR) Regulations, 2020, mandate that producers are accountable for the entire lifecycle of their products, particularly the post-consumer phase. These regulations aim to reduce environmental impact by requiring producers to establish take-back schemes, recycling programs, and	These regulations are relevant in ensuring that materials used during construction and maintenance comply with EPR principles. The project should work with suppliers who adhere to these regulations and incorporate EPR principles into its procurement strategy, thereby reducing its

		waste management plans, and to design products that are easier to recycle, use fewer resources, and generate less waste. The EPR framework shifts waste management responsibility from the public to the private sector, promoting a circular economy and reducing the environmental burden of waste.	environmental footprint and aligning with national sustainability goals.

3.4.2 Water Act, 2016

The Act provides for the regulation, management and development of water resources and water and sewerage services in line with the constitution. It provides that

- Subject to the Land Act, 2012, land required for national public water works may be acquired in any manner provided by law for the acquisition of land for public purposes;
- Compensation on just terms shall be payable by the Government to the owner of the land on which any such works are constructed;
- Every person in Kenya has the right to clean and safe water in adequate quantities and to reasonable standards of sanitation;
- Provides that a permit is required for use of water from a water resource;
- A person shall not, without authority conferred under this Act throw, convey, cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive matter or thing into or near to any water resource in such manner as to cause, or be likely to cause, pollution of the water resource;
- Provides for payment for water use as part of the permit conditions.

Relevance

The proponent operates as a result of the act. Kirinyaga intends to increase the water supply in areas of Kimicha, Kiamwenja and Kiaga through tapping of the water from an existing main line (Muratiri Line) for Kanyekiine and Kabedoso-Kiamwenja line) for which the Company has WRA permit for abstraction. Relevant permits must thus be acquired/renewed at all times in compliance with the law and consequent notification of the relevant authorities under the Act.

3.4.3 Land Act 2012

It is the substantive law governing land in Kenya and provides legal regime over administration of public and private lands. It also provides for the acquisition of land for public benefit. The government has the powers under this Act to acquire land for projects, which are intended to benefit the general public. It also provides that just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. The Land Act mandates the Land Commission and other public officers to use the following guiding principles and values:

- Equitable access to land;
- Security of land rights;

- Sustainable and productive management of land resources;
- Conservation and protection of ecologically sensitive areas

Relevance

The proposed project shall be constructed along the existing road reserve within the project area, and no land acquisition is envisaged. However, coordination with relevant government agencies will be undertaken to ensure compliance with applicable regulations, particularly regarding wayleave access and any necessary easements .

3.4.4 County Government Act No. 17, 2012

This act provides for the roles and duties of County governments. Part II of the Act empowers the county government to be in charge of function described in Article 186 of the constitution, (county roads, water and Sanitation, Health), Part XI of the Act vest the responsibility of planning and development facilitation to the county government with collaboration with national government, this arrangement has been adopted for interventions in order not to conflict with provisions of the Kenyan Constitution. Furthermore, the Act emphasizes the need for public participation and stakeholder engagement in the planning and decision-making processes, ensuring that affected communities and stakeholders are adequately consulted and involved in the implementation of development interventions.

Relevance

The Project once commissioned shall be handed over to Kirinyaga County Water and Sanitation Company who are owner of the project to manage and maintain the system, to provide a cost effective and affordable quality water and sanitation local community in accordance with the Act. In compliance with the legal requirement for public participation, the ESIA process has actively engaged stakeholders, including local communities, businesses, and relevant government authorities. This engagement included consultations, focus group discussions (FGDs), and public meetings to gather feedback, address concerns, and ensure that the project is aligned with community needs and expectations.

3.4.5 Kenya Roads Act Of 2007

The Act stipulates the legal and institutional aspects of the road sub-sector policy. The Act provides for the establishment of three independent Road Authorities, namely: (i) Kenya National Highways Authority (KeNHA), responsible for the administration, control, development and maintenance of all class A, B and C roads in Kenya, (ii) Kenya Rural Roads Authority (KeRRA), responsible for rural and small-town roads including class D, E roads and Special Purpose Roads and (iii) Kenya Urban Roads Authority (KURA) responsible for all City and Municipal Roads. The Authorities fall under the Ministry of Transport and Infrastructure, which will retain the role of policy formulation, and general oversight of public roads including regulatory aspects such as technical standards. Section 22 of the Act details the procedure for acquisition of any land required by an authority for the purposes of its functions under this Act.

Relevance

The water supply pipeline shall be traversing along and crossing some sections of the project area roads. The proponent shall liaise with the relevant road authority in acquisition of permits for using the road reserve and road crossings as it maybe envisaged by the WSP.

3.4.6 Physical and Land Use Planning Act, 2019

This Law provides for the principles, procedures and standards for the preparation and implementation of physical and land use development plans at the national, county, urban, rural and cities level; and the administration and management of physical and land use planning in Kenya, amongst other things. The Law mandates that any person engaged in the physical and land use shall foster principles for the overall public good, for instance the physical planning and use shall promote the sustainable use of land and that it shall integrate economic, social and environmental needs of present and future generations.

Relevance

The proposed project identified will be implemented as provided by Kirinyaga County Land Use Plan.

3.4.7 Occupational Safety and Health Act (OSHA), 2007

This act provides for the safety, health and welfare of workers and all persons lawfully present at workplaces. It provides for the registration of workplaces and outlines safety requirements in use of machinery to prevent accidents and injuries.

Under this Act, the duties of the Occupier are:

i. Ensure, as far, as is reasonably practicable, the safety, health and welfare at work of all his employees.
ii. Without prejudice to the generality of an employer's duty under subsection (1), the matters to which that duty extends include in particular;

    a) The provision and maintenance of plant and systems of work that are, so far as is reasonably practicable, safe and without risks to health;
    b) Arrangements for ensuring, so far as is reasonably practicable, safety and absence of risks to health in connection with the use, handling, storage and transport of equipment, machinery, articles and substances;
    c) The provision of adequate and suitable protective clothing or devices of an approved standard to employees who in the course of employment are likely to be exposed to the risk of head, eye, ear, hand or foot injury, injury from air contaminant or any other bodily injury and the provision of adequate instructions in the use of such protective clothing or devices;
    d) The provisions of such information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the safety and health at work of his employees;
    e) So far as is reasonably practicable as regards any place of work under the employer's control, the maintenance of it in a condition that is safe and without risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks;
    f) The provision and maintenance of a working environment for his employees that is, so far as is reasonably practicable, safe, without risks to health, and adequate as regards amenities and arrangements for their welfare at work; a
    g) Compliance with sections 7, 12, 37, 46, 75 and 76, Parts III and IX and such other duties as may be imposed on him by regulations made under this Act.

Relevance

Construction sites require registration as a workplace; -Safety measures are required in use of tools and machinery on site; and Protection of the workers and general public with any form of interaction with the construction sites is necessary.

3.4.8 The Public Health Act (Cap 242)

This Act provides for the prevention of the occurrence of nuisance or conditions dangerous/injurious to humans. The relevant local authority must take all necessary and reasonable measures to prevent pollution that could harm the health of any water supply used by the public for drinking or domestic purposes, whether the source is within or beyond its jurisdiction. Additionally, the authority is responsible for purifying any such water supply that becomes polluted. This includes taking legal action, if necessary, against any person polluting the water supply or any stream in a manner that constitutes a nuisance or poses a health risk.

Relevance

The Act provides Guidelines on how to manage all wastes (Liquid and Solid Wastes) emanating from the proposed water project in a way not to cause nuisance to the community.

3.4.9 Sustainable Waste Management Act, 2022

The Sustainable Waste Management Act, 2022 establishes the legal and institutional framework for the sustainable management of waste. The Act ensures the realization of the constitutional provision on the right to a clean and healthy environment and for connected purposes. Section 12 of the Act stipulates that all private and public sector entities shall segregate non-hazardous waste into organic and non-organic fractions, The segregated waste shall be placed in properly labelled and colour coded receptacles, bins, containers and bags. Section 13 of the Act states that every producer shall bare extended producer responsibility obligations to reduce pollution and environmental impacts of the products they introduce into the Kenyan market and waste arising therefrom. Each county government is required to prepare an integrated county waste management plan once every five years and submit to the county assembly for approval under section 18 of the Act. In section 19, a private sector entity is required to prepare a three-year Waste management plan and submit an annual monitoring report to the authority.

Relevance

The proponent and the contractor will be required to bare extended producer responsibilities obligations of any products they introduce and practice waste segregation. The Contractor should also develop a waste management plan during the water project's operation phase as required under the Act.

3.4.10 Employment Act 2007

This Act of Parliament prohibits discrimination in labour relations, sexual harassment, forced labour and child labour. It obligates all employers with twenty or more employees to issue a policy statement on sexual harassment.

Relevance

The provisions of this Act will guide both the proponent and the contractor on matters touching on equality of opportunities in employment, terms of service, age limit and prevention of sexual harassment in the workplace.

3.4.11 Work Injury Benefits Act, 2007

The Act provides for compensation to employees for work related injuries and diseases contracted in the course of employment. Section 7 directs all employers 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. Section 10 gives direction on compensation for work related injuries. Part (1) of the Section states that an employee who is involved in an accident resulting in the employee's disablement or death is entitled to compensation.

Relevance

The project proponent will need to observe the provisions of this Act during the course of the project. The contractor employed by the company should also meet this requirement during the proposed water project's construction phase.

3.4.12 Children Act, Cap 141

An Act of Parliament to implement Article 53 of the Constitution, providing for children's rights, parental responsibilities, alternative care such as guardianship, foster care placement, and adoption. The Act also addresses the care and protection of children, including those in conflict with the law, and regulates the administration of children's services. It establishes the National Council for Children's Services and related matters.

Relevance

The proponent and the contractor under this proposed project will be required to comply with provisions of the Act during Project implementation by ensuring that measures are in place to prevent violation of children's rights particularly protection from child labour.

3.4.13 National Gender and Equality Commission Act, Cap 7K

The Act establishes the National Gender and Equality Commission (NGEC) as a successor to the Kenya National Human Rights and Equality Commission pursuant to Article 59(4) of the Constitution; to provide for the membership, powers and functions of the Commission, and for connected purposes. The over-arching goal for NGEC is to contribute to the reduction of gender inequalities and the discrimination against all women, men, persons with disabilities, the youth, children, the elderly, minorities and marginalized communities.

Relevance

This Act will be applied during the hiring of workforce in both the construction and operation phases by ensuring that the recruitment process adheres to principles of gender equality and non-discrimination. The project will promote equal employment opportunities for all, regardless of gender, and actively encourage the participation of women and marginalized groups. This will be achieved by implementing inclusive hiring practices, providing clear guidelines for equitable recruitment, and ensuring that job advertisements are accessible to all potential candidates. The project will also establish monitoring mechanisms to ensure compliance with the Act, with regular reporting and adjustments as necessary to maintain gender balance in the workforce.

3.4.14 Sexual Offences Act, 2006

This Act of parliament makes provision about sexual offences aims at prevention and the protection of all persons from harm from unlawful sexual acts and for connected purposes. Section 15, 17 and 18 focuses mainly on sexual offenses on minor (children).

Relevance

The contractor is obligated to put in place mechanisms which are necessary or expedient in order to achieve or promote the objectives of this Act, including for instance, a sexual harassment policy

3.4.15 HIV and AIDS Prevention and Control Act, 2006

The object and purpose of this Act is to

a) Promote public awareness about the causes, modes of transmission, consequences, means of prevention and control of HIV and AIDS;
b) Extend to every person suspected or known to be infected with HIV and AIDS full protection of his human rights and civil liberties.

This legislation prevents discrimination in all forms and subtleties against persons with or persons perceived or suspected of having HIV and AIDS. Without prejudice to the generality of subsection (1), no person shall compel another to undergo an HIV test as a precondition to, or for continued enjoyment of employment.

Relevance

All employees, suppliers and contractors in this project shall be treated fairly and in accordance with the provisions of this Act. The Act provisions will be applied during Project implementation phase where the contractor will be required to create awareness among workers and community at large on HIV / AIDS spread and mitigation measures

3.4.16 Penal code, Cap 63

Section 191 of the Penal Code states that any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same act says a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighbourhood or those passing along public way, commit an offence.

Relevance

The project intends to supply water to Kangai, Ngaru and Kimicha residents and the neighbouring areas. The proponent is tasked to always provide clean water free from any contamination during the operation phase.

3.4.17 Climate Change (Amendment) Act, 2023

The Climate Change Amendment) Act, 2023 is pivotal for water infrastructure projects in Kenya, emphasizing comprehensive environmental impact assessments (EIAs) to evaluate climate change impacts such as altered precipitation patterns and water availability. Further, the Act, strengthens Kenya's commitment to addressing climate change by enhancing the role of county governments, mandating the development of comprehensive Climate Action Plans, and increasing public participation. The amendments require counties to establish Climate Change Units and appoint officers to coordinate local

climate actions, ensuring integration into planning and budgeting. The Act introduces rigorous monitoring and reporting requirements for both public and private entities, promotes climate financing through the establishment of a Climate Change Fund, and incentivizes private sector investments. These measures aim to foster localized, transparent, and well-resourced climate mitigation and adaptation efforts, ensuring that climate considerations are central to development projects, including the proposed water pipeline installation.

Relevance

Water infrastructure projects are crucial under the Climate Change (Amendment) Act, 2023 as they align with goals of climate resilience and sustainable development. They necessitate rigorous assessment of climate impacts via EIAs, integrate adaptive measures to enhance resilience against extreme weather events, and promote sustainable water management practices to mitigate environmental impacts and support long-term climate goals in Kenya.

3.5 National Water Quality Standards

In supplying water to consumers, the Kirinyaga Water Project will adhere to the relevant national regulatory drinking water quality standards and the World Bank Group (WBG) water quality guidelines, applying the more stringent of the two. Regular monitoring will be conducted by the Water Service Provider (WSP) to ensure compliance. Where necessary, corrective or mitigation measures will be implemented. The national drinking water quality standards are outlined in the Environmental Management and Coordination (Water Quality) Regulations, 2006, while microbiological limits for drinking water are specified in KS 05-459: Part 1:1996 and the WHO Drinking Water Guideline.

3.6 Institutional Framework for Environmental Management

The following administrative agencies regulate water development and its environmental implications in Kenya and play a critical role in the ESIA authorization process:

3.6.1 Ministry of Environment, Climate Change and Forestry

Responsible for conserving, protecting, and sustainably managing the environment and natural resources, with a focus on biodiversity, climate change mitigation, and socio-economic transformation.

3.6.2 National Environment Management Authority

NEMA coordinates environmental management activities and implements environmental policies. It is responsible for granting ESIA approvals, monitoring activities, and ensuring environmental protection.

3.6.3 County Environment Committees

These committees manage environmental matters at the county level and develop strategic environmental action plans.

3.6.4 National Environment Complaints Committee

NECC investigates environmental complaints and litigates on behalf of the public in environmental matters.

3.6.5 National Environment Tribunal

NET hears appeals related to environmental decisions and provides direction on complex legal matters involving environmental issues.

3.6.6 Institutional Framework for the Proposed Project

The National Water Policy, 2021 and the Water Act, 2016, currently guide water resources management in Kenya. The following administrative agencies are responsible for regulation of water and sanitation development in Kenya.

- **Ministry of Water, Sanitation, and Irrigation:** Develops policies, coordinates the water sector, and ensures water resource sustainability.
- **Water Resources Authority (WRA):** Regulates and manages water resources.
- **Basin Water Resources Committees:** Advise on water management, conservation, and equitable water allocation within basins.
- **Water Resource Users Associations:** Facilitate community-based water resource management.
- **Water Works Development Agencies:** Manage national public water works within their jurisdiction.
- **Water Services Regulatory Board:** Sets national standards, regulates service providers, and protects consumer interests.
- **Water Service Providers:** Licensed by the Regulatory Board to provide water services at the county level
- **Water Sector Trust Fund:** Provides financial assistance for water development in underserved areas.
- **Water Tribunal:** Resolves disputes related to water resources and services.

3.7 World Bank Operational Policies

The World Bank has well set Safeguard Policies aimed at ensuring the organization's funded projects adhere to environmental and social protection. Applicable World Operational Policies (OPs) are listed in Table 7 below.

Table 7: Applicable World Bank Operational Policies

OPs	Provision	Relevance
World Bank OP 4.01 on Environmental Assessment	Provides for environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making.	The proposed water project is classified under category C, as it is likely to have minimal or no adverse environmental impacts.
World Bank OP 4.12 on Involuntary Resettlement	▪ The objective of this policy is to avoid where feasible, or minimize, exploring all viable alternative Project designs, to avoid resettlement. This policy is triggered in situations involving involuntary taking of land and involuntary restrictions of access to land. ▪ This policy is triggered when a Project activity causes the involuntary taking of land and other assets resulting in: Relocation or loss of shelter, loss of assets or access to assets, loss of income sources or means of livelihood, whether or not the affected persons must move to another	The project will not result in any physical resettlement. Nonetheless, it is anticipated that some PAPs may experience economic displacement due to the presence of crops (maize, nappier grass) and small-scale business that have encroached into the proposed water pipeline easement; these PAPS are likely to suffer economic displacement. This economic displacement may result in the loss of assets, income, and livelihood for these PAPs. In accordance with the World Bank OP 4.12 on Involuntary Resettlement, the project will apply the provisions of this policy to address these impacts. Specifically, a summary of RAP will be developed and implemented to ensure that affected persons are compensated for their losses and provided with support to restore their livelihoods.

	location.	
World Bank OP 4.11 on Physical Cultural Resources	▪ Provides for measures to protect cultural heritage from the adverse impacts of project activities and support its preservation; ▪ Provides for measures to promote the equitable sharing of benefits from the use of cultural heritage; and ▪ Provide for measures to address impacts on physical cultural resources in projects proposed for Bank financing, as an integral part of the environmental assessment (EA) process.	No physical cultural resources were identified nor reported to exist within the proposed project areas. However, the ESIA has provided chance find procedures (appendix 8) to be adopted by the contractor during civil works.

3.7.1 World Bank Group Environmental Health and Safety Guidelines on Water and Sanitation

The World Bank Group Environmental, Health, and Safety (EHS) Guidelines on Water and Sanitation provide industry-specific performance levels and measures for managing environmental and health risks in water supply and sanitation projects. These guidelines outline best practices for water resource management, water conservation, sanitation systems, and the control of water quality, including the reduction of pollutants and the management of wastewater. They emphasize the importance of protecting public health by ensuring safe water supply and effective sanitation while minimizing environmental impacts. Compliance with these guidelines helps projects align with international standards, ensuring sustainable and responsible development.

These industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site -specific targets, with an appropriate timetable for achieving them.

Relevance

The EHS Guidelines for Water and Sanitation address the operation and maintenance of potable water treatment and distribution systems, as well as sewage collection and treatment. Key environmental issues include water system leaks, pressure loss, and discharges. The project design incorporates measures to mitigate these risks and ensure adequate water supply capacity.

3.7.2 World Bank Group Environmental, Health and Safety (EHS) Guidelines

These are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These General EHS Guidelines are used in addition to the local guidelines to provide mitigation measures for the various environmental and social impacts that will be identified in this report. Where there is difference between the Kenyan regulations and the WBG EHS Guidelines, the stricter one will be applied in the project. The main EHS guidelines that will be used alongside local policies include:

- Environmental Guidelines;
- Occupational Health and Safety Guidelines; and

- Community Health and Safety Guidelines.

www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines

3.7.3 Gender Based Violence in Investment Project Financing Involving Major Civil Works

The World Bank has developed this good practice note to assist in the identification of risks of SEA/SH as opposed to all forms of GBV that can emerge in project involving major civil works and contract. The good practice note is also to assist in addressing SEA/SH risks in projects. Application of the guidelines informs on the following:

- Pre-project identification and assessment of SEA/SH risks and response capacity.
- Establishment of mitigation measures and monitoring measures.
- Response to GBV during the project implementation phase.
- The guideline provides a broad understanding and contextualization of project related SEA/SH. In addition, the document gives guidance on SEA/SH risks assessment.
- Provides assessment tools and ethical consideration in the process of conducting these assessments.

https://documents1.worldbank.org/curated/en/399881538336159607/Environment-and SocialFramework ESF-Good-Practice-Note-on-Gender-based-Violence-English.pd

Table 8: Summary of Gaps between Kenyan legislation and World Bank Safeguards giving recommendations on how to bridge the Gaps

World Bank OP 4.01	EMCA (amendments), 2015	Comparison	Recommendation
O.P 4.01 requires screening of sub project investments in order to determine if further environmental and social assessments (ESIAs) are needed Following screening and determination of the category of ESIA required, an ESIA will be prepared before project design and implementation (which also includes an assessment of social impacts). Also gives guidelines on air, noise, water, waste management, emissions and wetlands management.	EMCA requires screening of project investments in order to determine if further environmental and social assessments (ESIAs) are needed An ESIA of a project will be prepared in accordance to EMCA guidelines and the report submitted to NEMA for licensing. EMCA is also equipped with regulations on air, noise, water, waste management, emissions and wetlands management.	Both the Kenyan and World Bank safeguards require screening to establish the level of ESIA prepared. The ESIA will be prepared with mitigation measures for any negative environmental and social impacts. The various limits set out in the regulations are close to World Bank and IFC policies with minimal differences in the actual figures.	Preparation of the ESIA comply with both NEMA and World Bank Standards. Use of Kenyan regulations in accordance to EMCA.
World Bank OP 4.11	**EMCA (amendments), 2015**	**Comparison**	**Recommendation**
This policy guides in preserving physical cultural resources and helps reduce chances of their destruction or damage	The National Museums and Heritage Act identifies the need for the protection, conservation and transmission of the cultural and natural heritage of	The World Bank policy offers more detail on the physical and cultural resources other than archaeological finds identified in the Kenyan	Use of the World Bank policy in handling any physical and cultural site, while making use of the Kenyan institutional framework

	Kenya	Policy	
World Bank OP 4.12	**EMCA (amendments), 2015**	**Comparison**	**Recommendation**
Involuntary resettlement should be avoided wherever possible, or minimized, exploring all alternatives.	Involuntary resettlement may occur as a result of projects implemented in public interest.	The Kenyan Policy does not stipulate that resettlement should be avoided wherever possible; on the contrary, as long as a project is for public interest, involuntary resettlement is considered to be inevitable.	Resettlement issues considered at the design stage of the project in order to avoid/ minimize resettlement.

3.8 International Conventions

There exist several international conventions on environment that have social and/or environmental aspects tied to them. Kenya is a signatory to some of these conventions and applies them in environmental management. Some of the conventions that the State is signatory to or has acceded is as presented in Table 9 below:

*T*able 9: Relevant International Conventions Kenya is party to

Relevant International Convention	Relevance
Vienna Convention for the Protection of the Ozone Layer (1985)	This treaty mandates the reduction of ozone-depleting substances. The project must ensure that construction and operational processes do not involve or release such substances, thus contributing to global efforts to protect the ozone layer.
Convention on Wetlands of International Importance (Ramsar Convention 1971)	Where the pipeline route intersects or is near wetland areas, the project must implement measures to avoid disrupting these ecosystems. Compliance with this convention ensures the preservation of wetland biodiversity and ecological functions.
Convention on the Elimination of All Forms of Discrimination against Women	This treaty require that the project promotes gender equality and safeguards women's rights. This involves ensuring equal employment opportunities and addressing specific needs of women in community engagement and project implementation.
The Protocol to the African Charter on the Rights of Women in Africa (Maputo Protocol)	The Maputo Protocol underscores the importance of gender equality, emphasizing equitable access to resources and the involvement of women in decision-making. In the context of the water pipeline project, this means ensuring that women and girls have equal access to the new water resources and are actively included in planning and decision-making processes to address their specific needs. By aligning with these principles, the project supports gender equality and enhances its overall effectiveness.
Convention on the Rights of the Child	The project must consider and protect the rights and welfare of children, ensuring that construction activities do not adversely affect their health, education, or overall well-being.
The African Charter on the Rights and Welfare of the Child	The African Charter on the Rights and Welfare of the Child emphasizes the right to access clean water and protection from harm. For the water pipeline project, this means ensuring the pipeline delivers safe water to children and implementing measures to safeguard them from

	construction-related hazards.
Convention on the Rights of Persons with Disabilities	This requires the project to ensure accessibility for persons with disabilities, both in terms of physical access to project areas and in employment opportunities.
The African Charter on Human and Peoples" Rights (African Charter)	The project must respect and uphold the human rights of local communities, including their right to a healthy environment and participation in decision-making processes
Convention on Biological Diversity (2006)	This requires that the project minimizes its impact on local biodiversity. Measures should be taken to protect plant and animal species and their habitats during construction and operation.
Paris Agreement, 2015	The treaty for aligning with global climate action goals, particularly in terms of minimizing greenhouse gas emissions and considering climate adaptation.

3.9 Permits/Licenses

The Project must comply with the requirements of national legislation that requires certain permits that the contractor will need to put in place. Some permits may be obtained during the operation stage of the KICOWASCO project since they will be determined as need arises. Table 16 below lists permits/Licenses required for this project.

Table 10: Relevant Permit/Licenses Required

S/No	Requirement	Issuing Authority	Remarks
1.	ESIA License for the project	NEMA	This report is part of the acquisition of the NEMA license.
2.	Water Abstraction Permit	WRA	Abstraction permits already in place. See Annex 11
3.	Requisite permissions from Road Authorities	KeNHA (Kutus-Kagio Road), KERRA (Spenza-Ngaru Road) and the County Government to lay the pipes within the road reserves	Permissions obtained for the laying of pipes within the road reserves. See Annex 12.

4 APPROACH AND METHODOLOGY

This chapter outlines the approach and methodology used to complete this ESIA, including the following aspects:

- Delineation of spatial boundaries considered;
- Methodological approaches used for the collection of desktop data and field surveys;
- Assessment methodology used to characterize the Project-related construction and operation impact on physical, biological, and socioeconomic Valued Environmental Components (VECs);
- Assessment methodology used to characterize the Project-related cumulative impact.

4.1 Spatial Boundaries

Two distinct levels of spatial boundaries have been established and considered in this ESIA; this includes:

- The Project Development Area (PDA) corresponds to the existing reserve where there is an existing pipeline and Project footprint or direct influence area associated with the implementation of the Project;
- The Local Assessment Area (LAA) includes the PDA and its nearby and adjacent surroundings where Project impact can be induced, anticipated, and reasonably expected.

Physical Environment - For the Physical Environment, 500m on either side of the PDA is considered sufficient to incorporate environmental changes that can be felt directly and indirectly on the selected physical VECs. For the water pipeline project, the selected physical VECs typically includes Soil and Geology, Water Resources, Air Quality (Monitoring dust and emissions during construction and operation phases), Land Use and Vegetation cover.

Biological Environment - For the Biological Environment, the LAA is a 2 km buffer around the PDA, which corresponds to the zone where direct impact because of the project is likely to affect the local level biodiversity. The selected VECs typically includes riparian vegetation, aquatic life, riverine ecosystem and avifauna.

Human Environment - For the Human Environment, the PDA will correspond to the limits of the villages within which the project falls while the LAA will correspond to the limits of the main locations crossed by the Project.

4.2 ESIA Methodology

The approach and methodology of the study was carried out as per the requirements under the Environmental Management and Coordination Act, (Amendment) 2015 as well as the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, (Amendment) 2019, WSDP ESMF, Project Appraisal Document (PAD), CSLG-II Environmental and Social Screening Report & Road Map. It involved largely an understanding of the project background, the preliminary site layout plan, as well as the implementation plan. The following techniques were used by the ESIA study team to meet the objectives of the ESIA.

4.2.1 Screening

EMCA requires screening of project investments to determine if further environmental assessments (ESIAs) are needed. The proposed Kirinyaga project was screened to determine the need to undertake an ESIA based on:

- Project characteristics;
- The Second Schedule (Amendment) vide legal notice No. 31 of EMCA, No. 8 of 1999 which lists the mandatory projects that must undergo an EIA;
- World Bank safeguards policies, specifically OP 4.01 Environmental Assessment;
- Applicable provisions of IFC's General Environmental Health and Safety Guidelines;
- Applicable provisions of IFC's Environmental, Health, and Safety Guidelines for Water and Sanitation.

Based on the above criteria, it was concluded that an ESIA would be necessary for the proposed water pipeline due to the following aspects:

- Amendment of Second Schedule of EMCA, 1999 vide Legal Notice No. 31 lists water resources infrastructures as project that must undergo ESIA. Further, as specified under Amendment of Second Schedule, This Project is classified as a **Medium Risk project** (3 (c) water supply and distribution infrastructures). Completed screening form has been attached in Appendix 9.
- The nature and extent of the potential impacts of the Project. Considering nature and extent it is recommended that Comprehensive Project Report (CPR) is submitted to the National Environment Management Authority. It is on this basis that this CPR was prepared.

4.2.2 Scoping

The scoping exercise was conducted to identify the key environmental issues to be addressed in the study and to determine the anticipated impacts throughout the project lifecycle. During the scoping phase, primary environmental and social issues were identified to guide the ESIA process during the detailed study. As a first step of the ESIA process a scoping study was undertaken. The objectives of the Scoping Study were to identify the potentially significant environmental and social issues relating to the Project that will need to be addressed as part of the ESIA. As part of the scoping study the following activities were undertaken:

- Establishing the nature of the landscape, settlements and habitats served by the project;
- Identifying critical habitats that might be directly and indirectly affected by the project;
- Identification of sources of data on baseline conditions;
- Determination of the likely area of influence to be considered in the ESIA;
- Consideration of alternatives related to the Project;
- Identification and consultation with stakeholders who would be interested and/or affected by the Project;
- Identification of cross-sectoral issues and impacts, prioritizing them on a shortlist which would need to be considered as part of the ESIA;
- Defining the environmental and legislative setting of the proposed project.

4.2.3 Baseline Data Collection

In order to understand the existing baseline environmental and social conditions in the area, a variety of data collection methods were undertaken.

4.2.3.1 Document Review

A literature review was undertaken based on the findings of the scoping process, which involved reviewing legislation, policies, County development plans and previous studies carried out in the area to determine the baseline conditions and establish the legal, institutional and biophysical and socioeconomic environmental setting of the proposed project. The desk-based study also included the development of fieldwork tools, fieldwork schedules as well as the approach to stakeholder engagement as outlined in the Stakeholder Engagement Plan. To better understand the project area in a more in-depth setting, relevant existing literature was reviewed. This included but not limited to:

- CSLG-II Environmental and Social Screening Report & Road Map;
- The World Bank's Operational Policies triggered under the WSDP-CLSG II project;
- Relevant local laws, policies, regulatory frameworks and standards;
- Relevant international guidelines (E.g. WHO)
- WSDP Environmental and Social Management Framework
- The Kenya National Bureau of Statistics (KNBS) 2019 Kenya Population and Housing Census – Population Distribution by Administrative Units, Volume 2, December 2019.
- Tana Water Services Board. (2010). Basic design study report on the project for improvement of water supply system in Kirinyaga and surrounding area in the Republic of Kenya.

The full list of information sources reviewed during the preparation of ESIA study is provided in the Reference Chapter of this Report.

4.2.3.2 Site Visits

The Consultant carried out an initial site reconnaissance visits between 28th to 29th June 2024 to assess the existing conditions, identify potential environmental and social impacts, and gather preliminary data for the ESIA for the proposed water pipeline project. During this visit Consultant was accompanied by the Kirinyaga Technical Manager so that any environmental, social or technical constraints could be discussed.

A Detailed site investigations visit was undertaken starting the 10th to 12th of June, during which time a site walkover was undertaken including consideration of the proposed wayleave and meetings with stakeholders with key stakeholders at the County and Community level were undertaken to announce the Project, identify data sources and commence the process of determining potential impacts. Primary environmental and social data was collected through public meeting, Focus Group Discussions, key informant interviews and further site walk overs.

During the site visits, photography and GPS were used to record the salient features and baseline conditions in the Project site and its surroundings. The photos were used to define existing features in the project area and identify soils and floral species. Photography was combined with transect walks and used to identify possible impacts of the proposed project. All the relevant images were stored and are attached to this Report.

Flora and fauna assessment the methodology for assessing flora and fauna at the proposed work sites and their immediate surroundings involved a combination of site walks, interviews, and secondary data collection. Walks were conducted along the project route, allowing for direct observation and ecological data gathering. Supplementary information was obtained through interviews with local stakeholders and secondary data sources. GPS coordinates, digital photographs, and data sheets were used to document the findings comprehensively. This multi-faceted approach facilitated the identification and mapping of sensitive receptors, ensuring that all relevant ecological considerations were captured.

4.2.3.3 Stakeholder Engagement and Public Participation

Section 17 of the Environmental (Impact Assessment and Audit) Regulations of 2003, requires that all ESIA Studies undertake Consultation and Public Participation (CPP) as part of the study. The aim of the CPP is to ensure that all stakeholders interested in a proposed project such as project affected persons, government officers and the public in the vicinity of the proposed project be identified and their opinion considered during project planning, design, construction, operation and decommissioning phases. Consequently, public consultations were carried out in the project area in a bid to inform the public and other interested parties on the proposed project and obtain their views on the same. The consultations also presented an opportunity for the community to raise issues and concerns pertaining to the project.

Public consultations were conducted thorough public barazas organized at appropriate locations near each of the proposed Kirinyaga pipeline. Key stakeholder's views on the project were solicited through interviews and discussions with County officials, technical teams at Kirinyaga County Department of Water and KICOWASCO and the technical team.

a) Stakeholder Identification and Mapping

Stakeholder engagement and participation was carried out at different levels and with different stakeholders. Stakeholder's identification and mapping was done based on the following criteria that is project affected persons and interested persons or parties. The stakeholders include;

- PAPs of the proposed project who largely are the community members living within 2km radius of the proposed project;
- Interested parties include
    - County government departments including the land and environment department, road;
    - Public administration such as County commissioner, Deputy County Commissioner, Assistant County Commissioner, Chief, Assistant Chiefs, ward and village administrators.

b) Approach and Methodology used in Carrying Out the Public Participation

Owing to the different categories of the stakeholders, the ESIA team opted to employ various methods in engaging them. The methods included face to face discussions for the government officers (as part of KII), FGD with the men, women and youth and a public Baraza/meeting for the community members.

- **Mobilization for the Community Meeting**

Prior to the community engagement meetings, a two weeks' notice was done/issued through a letter (letter Ref No. WSTF/CLSG 11/ VOL. 1/219/ (1) dated 4st June, 2024) sent out to the Deputy County Commissioner for Kirinyaga central Sub County and Kirinyaga West Sub County, who cascaded down to

the ACC and Chiefs to inform the community members of the meeting. The mobilization was done by the area Assistant chiefs through village administrators of the area after firming up where the meeting was to take place and the locals informed of the meeting and venue with regards to Kirinyaga water project. The message was announced by word of mouth at public social gatherings and churches.

- **Meeting with Kirinyaga County Key Stakeholders**

A meeting was held with the KICOWASCO Ag. Managing Director, on 4th June, 2024. The main agenda was to explain the ESIA project to them and solicit their views on the project. Further, the county officer was also briefed that on the need for carrying out consultations with the target communities. NEMA office was visited to understand the project and requirements in terms of reporting and prerequisite documents to allow for approval of the report once submitted.

- **Public Forum/Meeting**

The consultant's team undertook community engagement forums with the target PAPs and the communities where the project will be implemented. The main objective was to explain the project details including need for land identification and solicit broad community support and acceptability of the project. Separate meetings for Ngaru, Kiaga, Kangai and Kimicha were held with the community members. The team explained to the community members about the project and other related information as discussed in the minutes. The meeting was then opened for a plenary session.

Community engagement proceedings and resolutions are presented in form of minutes taken/written during the meetings. The meetings were well attended by all people including men, women, youth and persons with special needs.

- **Focus Group Discussions**

It was important to have the group discussion to focus on different groups in the community to discuss project further and allow these groups more opportunities to ask questions or give suggestions regarding the project. Therefore, three separate meetings for men, women and youth were held. In these meetings the message on the project was echoed again especially on benefits and impacts (both positive and Negative) of the project to the community, rights of the community and the need to have a grievance redress mechanism and committee with representation from all groups in the community.

- **Key Informant Interviews**

The key informant interviewed was from the education sector, Health sector and Administration. Key Informants were identified both at the locational and county levels and they were interviewed to obtain baseline information regarding the proposed project.

4.2.3.4 Socio-Economic Baseline

The socio-economic baseline was established through secondary data collection, consultations, and on-site observations. The primary focus was on data collection and observations in the beneficiary communities and those through which the pipeline passes. Attention was given to areas of direct impact while ensuring efficient and effective engagement with the communities involved, thereby avoiding consultation fatigue.

Secondary socio-economic data was obtained from books, reports, journals and other sources such as the County Integrated Development Plan (CIDP) for County Government of Kirinyaga, Kirinyaga County Water Supply Improvement Report, Kenya National Bureau of Statistics Reports, Feasibility study report among others. Primary data was collected from key informants and consultations which included public barazas, community profile forms and FGDs.

4.2.3.5 Assessment of Project Impact

This section describes the step-by-step impact assessment process that leads to the final assessment of the significance of the residual impact. The method used to identify and assess the Project impact rely primarily on extensive knowledge of the Project and its environment, as well as on experience in conducting environmental and social impact assessments for similar projects. Lessons learned from previous experiences provide relevant information on the nature and intensity of impact associated with this type of project, as well as on the real effectiveness of mitigation and compensation measures generally applied. The process involved in assessing the potential impacts of the project used the following steps:

- **Prediction:** What will happen to the environment as a consequence of the project?
- **Evaluation**- will it have beneficial or adverse effects? How big is the change expected to be? How important will it be to the affected receptors?
- **Mitigation**- if the impact is of concern, can anything be done to avoid, minimize, or offset the impact? Or to enhance potential benefits?
- **Assessment of residual impacts-** after mitigation, is the impact still of concern?

The following are methods deployed in assessing of the impacts from the proposed Kirinyaga project:

a) Sources of Impacts

- A systematic evaluation was conducted to determine what activities of the Project may induce direct or indirect effects on the selected VECs.
- The identification of the direct, indirect, positive, negative impact considered as part of the ESIA will be completed by using a "matrix"

b) Mitigation of Impacts

- General and specific management measures (avoidance, mitigation, compensation, and enhancement) will be identified using the mitigation hierarchy (avoid, mitigate, compensate), to reduce adverse impact and improve environmental and social acceptability for the Project. These measures will be incorporated into the Environmental and Social Management and Monitoring Plan (ESMMP). Effective use of this ESMMP will promote improved environmental and social performance.

c) Impact Characterization/Assessing Significance

Significance is a function of the magnitude of the impact and the likelihood of the impact occurring. For each potential impact, the intensity, geographical extent and duration of the impact is established considering the proposed mitigation measures. As part of characterization of the impacts identified, the following will be considered:

Intensity: - The intensity of the impact indicates the degree to which the assessed VECs is disturbed. The analysis shall consider the VECs sensitivity and capacity to accommodate to changes (apprehended impact), as well as its estimated value. Impact intensity is described at three levels:

- **High:** the impact damages the concerned VEC permanently, jeopardizes significantly its integrity, or changes substantially or irreversibly its environmental distribution or role;
- **Medium:** the impact alters the concerned VEC s quality, and its environmental distribution or role, without damaging its integrity;
- **Low:** the impact slightly alters the concerned VEC without changing substantially its quality, and environmental distribution or role.
- **Negligible:** The impact that does not cause perceptible change to VEC

Extent: - The extent of an impact refers to the geographic area over which the impact can express itself. The geographic extent is described as limited, local, or regional based on the following definitions:

- **On-site:** impacts that are limited to the boundaries of the development site;
- **Local:** the impact will extend beyond the PDA, thus affecting the vicinity and neighboring areas. This area corresponds to the LAA defined in section 4.1.
- **Regional:** impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries.

Duration: - The duration of the residual impact refers to the period during which the impact will be felt and whether the impact will occur intermittently. The duration of an impact is described as long-term, medium-term, or short-term based on the following definitions:

- **Long-term:** impacts that will continue for the life of the Project, but ceases when the project stops operating
- **Medium-term**: the impact is felt continuously during the entire construction period of the Project (estimated to 30 days) and/or for the full or partial duration of operation;
- **Short term**: the impact is felt temporarily or intermittently for a limited period corresponding to one or a few construction activities/phases.

Likelihood: - the likelihood that an impact will occur

- **Unlikely:** The impact is unlikely to occur.
- **Likely:** The impact is likely to occur under most conditions.
- **Definite:** The impact will occur.

Persistence: - The time that supposedly the effect stays, from the moment the hazard that causes the impact was triggered

- **Temporary:** the impact is considered to cause a change that is short-term and reversible, with conditions expected to return to their original state once the activity causing the impact has ceased or mitigation measures have been implemented
- **Permanent:** the impact is considered to cause permanent change or irreversible;

Magnitude: - The magnitude of the impact reflects the intensity of the impact, its extent, and its duration. Impact magnitude is ranked as minor, moderate, or major. Once an assessment is made of the magnitude and likelihood, the impact significance is rated through a matrix process as shown in Table 17 and Table 18 overleaf.

Once a rating is determined for magnitude and likelihood, the following matrix can be used to determine the impact significance.

Significance of Impacts: - The determination of potential impact severity was based on the product of the intensity of the impact and the sensitivity of the receiving environment. To illustrate impact severity, numerical or relative descriptors were assigned to both impact intensity and receptor sensitivity for each potential impact. Each factor was assigned a numerical descriptor of 1, 2, 3, or 4, corresponding to Negligible, Low, Medium, or High, respectively. The table below shows examples of the types of impacts assigned to different grades of severity. The severity of the impact is then established by multiplying the two numerical descriptors, resulting in a severity described as negligible, minor, moderate, or major. The impact assessment criteria rating was used as indicated.

Table 11: Significance Rating Matrix

SIGNIFICANCE					
			LIKELIHOOD		
MAGNITUDE			Unlikely	Likely	Definite
			1	2	3
	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Table 12: Significance Colour Scale

Negative Rating	Positive Rating
Negligible	Negligible
Minor	Minor
Moderate	Moderate
Major	Major

Approach to Impacts Mitigation and Management

The ESIA outlines the measures designed to prevent, reduce, and, where possible, offset any significant adverse impacts on the environment. Identifying these measures is an iterative process conducted in parallel with the project design to facilitate their integration during development. Early adoption of appropriate mitigation strategies helps minimize significant environmental impacts to a practicable minimum. The following hierarchy of mitigation measures is applied to reduce the significance of impacts to acceptable levels:

- Mitigation/Elimination through Design: Incorporating design elements that inherently prevent or eliminate adverse impacts.
- Site/Technology Choice: Selecting sites and technologies that minimize environmental harm.
- Application of Best Practices: Employing industry best practices to manage and mitigate impacts.

As part of the ESIA approach, a comprehensive Environmental and Social Management and Monitoring Plan (ESMMP) will be produced for each key stage of the development by the contractor. These plans set the framework for the Environmental and Social Management System (ESMS) for the project moving forward. The assessment of the significance of impacts and identification of residual impacts considers any mitigation measures adopted by the project. This assessment is largely dependent on the extent and duration of change, the number of people or size of the resource affected, and their sensitivity to the change. The criteria for determining significance are specific to each environmental and social aspect and are detailed within each impact assessment chapter. Generally, for each impact, the magnitude is defined (quantitatively where possible) and the sensitivity of the receptor is determined.

4.2.3.6 Social Acceptability Assessment

Social acceptability is a concept that evolves as the water pipeline project progresses and is influenced by the information communicated to and the expectations of the concerned population. During the environmental and social impact assessment process, information on the project was communicated, and insights on social acceptability were obtained through:

— Interactions with various stakeholders, including informal meetings with the PAPs, and encounters during biophysical survey activities, provided ongoing insights into social acceptability.

— Public Consultations: Public consultations were held separately for different sub locations, each including a dedicated period for questions and comments from participants. The feedback received during these sessions provided valuable indications of the project's social acceptability.

Assessing social acceptability is challenging, as most people have mixed feelings about the project. Individuals within the vicinity of the pipeline often have high expectations for the project, which can lead to positive initial perceptions. However, if these expectations are not met, social acceptability can significantly deteriorate. Concerns raised by individuals included safety issues, access to water, and social risks associated with construction activities. Some individuals also mentioned issues with the compensation process.

It is possible that social acceptability will vary by location and demographic group, with some areas and communities being more supportive of the project than others. Therefore, the assessment of social acceptability for the water pipeline project will be an ongoing process and will be better evaluated in the ESIA report when final sets of mitigations and community benefits are developed and presented to the community (e.g., improved water access and infrastructure). Experience has shown that community trust is the most important factor contributing to social acceptability.

4.2.3.7 Cumulative Impacts Assessment

The Project's cumulative impact assessment will help consider its possible interactions with other activities and projects, which might affect the environmental and social components. This assessment involves a comprehensive evaluation of the project's impact in conjunction with the impacts of past projects in the sector, as well as existing or planned projects in the area and its surroundings. This is particularly important for water-related components, as the project will be part of a broader network of water infrastructure, ensuring a holistic understanding of cumulative impacts on water resources, ecosystems, and community well-being.

It is therefore appropriate, based on available information or logical assumptions by professional judgement, to list the environmental effects that can be combined with the impact of the Project, resulting in cumulative impact.

Cumulative impact refers to the environmental changes that occur when a project's effects combine with those of past, present, and future human activities[1]. This means that a project's effects can interact over time or across locations with the effects of other projects, leading to direct or indirect impacts on different environmental components.

The methodology deployed involved reviewing existing environmental and social baseline data of the project area, identifying other relevant past, present, and future projects, consulting with stakeholders, and evaluating the combined effects of these projects using quantitative approaches.

4.3 Gaps and Uncertainties

In any ESIA process it is inevitable gaps remain. This section summarizes the gaps and uncertainties which were considered when undertaking the ESIA.

- Gaps in Project Description

At this stage it is unknown, although unlikely, whether heavy machineries material will be required for the construction of Project.

- Lack of Recently Available Secondary Data.

Much of the secondary socio-economic data (such as demographics, water access etc.) is taken from the Kenya National Bureau of Statistics (KNBS) census dated 2019, as per the Kirinyaga County Integrated Development Plan (2023-2027). While the Consultant made every effort to collect more recent data from the relevant Offices, it was not possible to fill all the gaps with more recent secondary data. Consultant, however, also carried out primary data collection through Focus Group Discussions (FGD) and Key Information Interviews (KII) and public engagement to collect additional socio-economic data.

[1] Hegmann, G., Cocklin, C., Creasey, R., Dupuis, S., Kennedy, A., Kingsley, L., Ross, W., Spaling, H., and Stalker, D. (1999). Cumulative Effects Assessment Practitioners Guide. Canadian Environmental Assessment Agency.

5 BASELINE OF ENVIRONMENTAL AND SOCIAL CONDITIONS

5.1 General Overview and Approach

The collection of baseline data focused on providing information to support the assessment of any potential impact of the Project.

In this chapter of the report provides a description of the existing physical, biological and social conditions of the Project site and surrounding areas, which may directly or indirectly be affected by the proposed water pipeline projects. It is essential that the baseline conditions of an environment are characterized to accurately predict the potential effects the Project may have on the environment. Information was collected at the following levels:

- ***National Level:*** Secondary information was collected at the national level to provide a high-level contextual overview of Kenya.
- ***County Level:*** Secondary information was collected at the county level aimed at providing a contextual overview of Kirinyaga County.
- ***Project Site:*** Secondary and primary information was collected along the Project line, specifically within Kangai Village, the area has a large population and with more economic activities.

To collect the information on the existing physical, biological, and social conditions, the following methodology was employed:

- **Desktop study:** A desktop review of publicly available data, such as the Kirinyaga County Integrated Development Plan 2023-2027, was carried out to investigate the natural environment at the three levels outlined above.
- **Site Investigation:** Site visits were conducted on 4th June 2024, as well as between 6th and 9th June 2024. During the site visits, information pertaining to the natural environment, particularly related to existing flora, fauna, soils, and hydrology within the Area of Influence, Project Footprint, and Project Site, was photographed and GPS data was collected. Further, during the site visits, social investigations were also conducted. This involved engaging with local communities through interviews and focus group discussions to gather information on demographics, socio-economic conditions, cultural practices, and community structures. Data on the social environment was documented through photographs, notes, and audio recordings where appropriate, and GPS data was collected for relevant social features.

5.2 Geographic Context

The project is located in Kirinyaga County, Central Kenya, covering an area of 1,478.1 km², situated between latitudes 00°1′ and 00°40′ south and longitudes 37°0′ and 38°0′ east, with elevations ranging from 1,158 to 5,380 meters above sea level. Kerugoya Town, about 124 km northwest of Nairobi, lies within the county, along with Kutus, the county headquarters, 10.5 km southwest of Kerugoya. The project spans the Kirinyaga West and Kirinyaga Central sub-counties, covering Kariti, Kerugoya/Kanyekiine, Nyagati, Mutithi, and Wamumu wards, with a total area of 2,818 km². The county shares borders with Kitui, Machakos, Murang'a, Tharaka Nithi, and Meru counties.

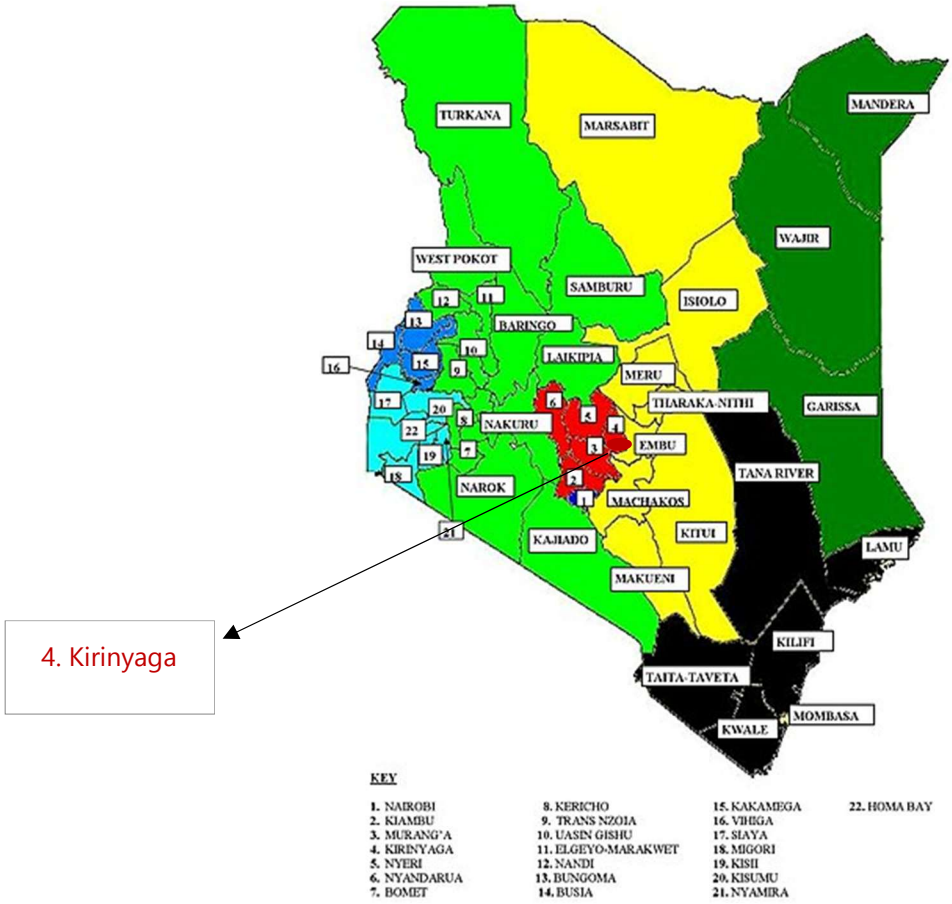


Figure 2: Map Showing the Counties of Kenya
Source: Geocurrents

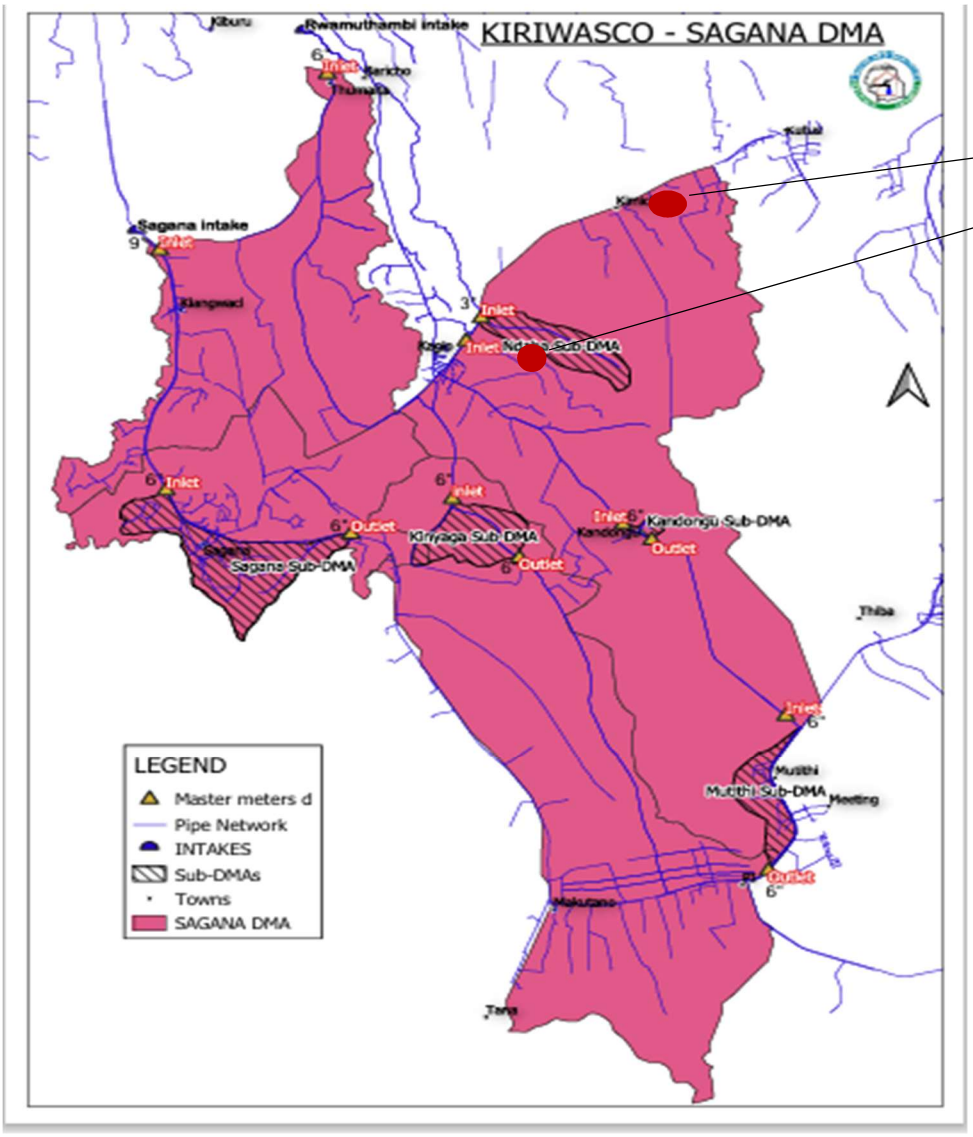


Figure 3: General view of Kirinyaga County

Source: KICOWASCO WSP

Administrative and political units: Administratively, the county is divided into five districts namely; Kirinyaga East, Kirinyaga West, Mwea East, Mwea West and Kirinyaga Central.

Table 13: Kirinyaga County Administrative Wards.

County Constituencies	Area(km^2)	No. of Division	No. of locations	No. of sub location
Kirinyaga West	211.3	3	8	16
Kirinyaga Central	173.6	3	5	18
Kirinyaga East	229.7	3	10	27
Mwea East	512.8	1	5	16
Mwea West	204.0	2	2	4
Forest Area	308.2	-	-	-
TOTAL		**12**	**30**	**81**

Source: Kirinyaga County Commissioner's office

The county has four constituencies namely Mwea, Ndia, Kirinyaga Central and Gichugu. Mwea Constituency comprises of two districts namely Mwea East and Mwea West Districts, while the other constituencies form Kirinyaga West, Kirinyaga Central and Kirinyaga East districts respectively. Kirinyaga County has twenty (20) county assembly wards. Table 14 below shows the constituency, name of County assembly wards and number of County Assembly wards per constituency.

Table 14: Distribution of County Assembly Wards

Constituencies	Name of County Assembly Wards	Number of County Assembly Wards
Mwea	Mutithi, Kangai, Thiba, Wamumu, Nyangati, Murinduko, Gathigiriri, Tebere	8
Gichugu	Kabare, Baragwi, Njukiini, Ngariama, Karumandi	5
5 Ndia	Mukure, Kiine, Kariti,	3
Kirinyaga Central	Mutira, Kanyekini, Kerugoya, Inoi	4
Total (County)		20

Source: Independent Electoral and Boundaries Commission

5.3 Physical Environment

5.3.1 Climatic Conditions

5.3.1.1 Rainfall

The county has a tropical climate and an equatorial rainfall pattern. The climatic condition is influenced by the county position along the equator and its position on the windward side of Mt Kenya. The county has two rainy seasons, the long rains which average 2,146 mm and occur between the months of March to May and the short rains which average 1,212 mm and occur between the months of October to November. The amount of rainfall declines from the high-altitude slopes of Mt. Kenya towards the Semi-arid zones in the eastern part of Mwea constituency. The temperature ranges from a mean of 8.1^{0}C in the upper zones to 30.3^{0}C in the lower zones during the hot season. Figure 4 overleaf shows annual mean precipitation received in Kirinyaga County. The pipeline project area falls within the climatic conditions described for Kirinyaga County.

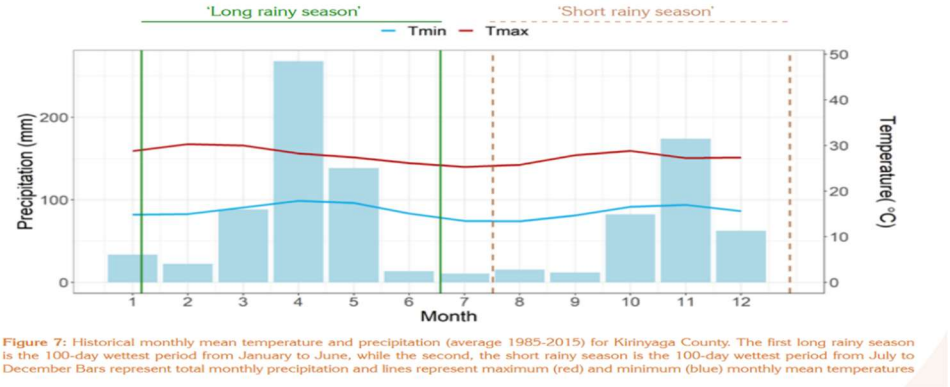


Figure 7: Historical monthly mean temperature and precipitation (average 1985-2015) for Kirinyaga County. The first long rainy season is the 100-day wettest period from January to June, while the second, the short rainy season is the 100-day wettest period from July to December Bars represent total monthly precipitation and lines represent maximum (red) and minimum (blue) monthly mean temperatures

Figure 4: Historical Mean Annual Precipitation for Kirinyaga County[2]

[2] MoALF. 2016. Climate Risk Profile for Kirinyaga. Kenya County Climate Risk Profile Series. The Kenya Ministry of Agriculture, Livestock and Fisheries (MoALF), Nairobi, Kenya

While the long-term average of precipitation shows no substantial changes in total amounts received every year (Fig 4 & 5), changes in the seasons and anomalies are becoming more common and unpredictable. The county experiences bimodal rainfall in March, April, and May, as well as October, November, and December. The observed variations are consistent with the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report, which shows increased evidence in the frequency and intensity of climate and weather extremes, including hot extremes on land and in the ocean, heavy precipitation events, and drought, have resulted in widespread, pervasive impacts to ecosystems, people, settlements, and infrastructure. Figure below shows trends of rainfall patterns received over the years.

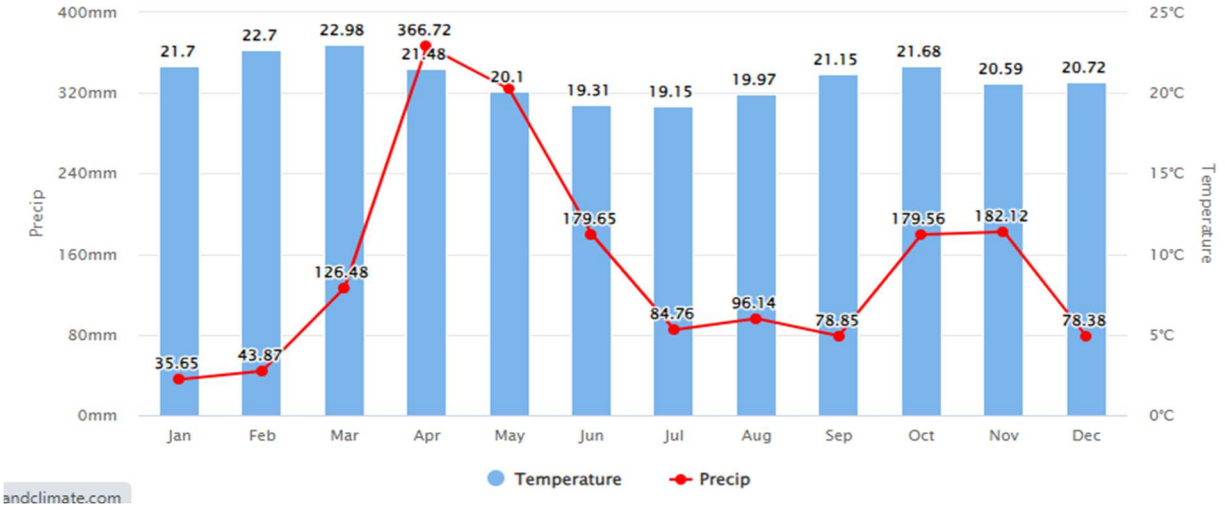


Figure 5: Monthly rainfall and temperature trend in Kirinyaga County

5.3.1.2 Temperature

Due to the high altitude in the area, temperatures are relatively low and range from to 12°C in July to highs of 30°C in March (Kirinyaga County, 2014). The average temperature in the area is 21°C. July is usually the coldest month, with an average monthly temperature of 150C while September is the warmest month, with an average monthly temperature rising to 27.1^{0}C. Different agro ecological zones (AEZ) causes Kirinyaga County's varied climate conditions to fluctuate substantially over short distances. On the slopes of Mount Kenya, the chilly and damp highlands of Manyatta and Runyenjes see temperatures of about 15°C and an average of 1250 mm of precipitation annually. The hot and arid lower zones of Mbeere North and South, on the other hand, frequently experience temperatures above 24°C.

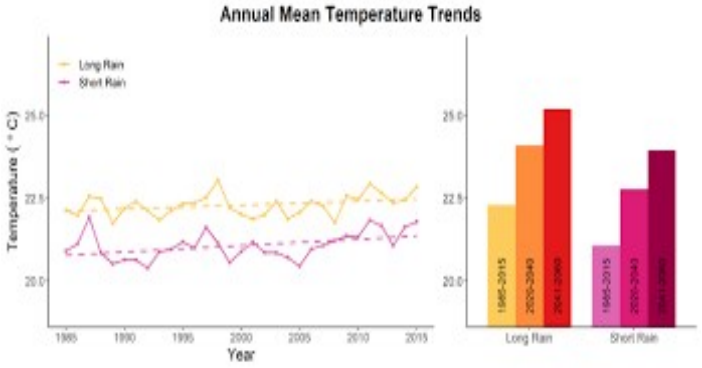


Figure 6: Historical Mean Annual Temperature for Kirinyaga County[4]

5.3.2 Topography and Landscape

Kirinyaga County borders Nyeri County to the North West, Murang'a County to the West and Kirinyaga County to the East and South. It covers an area of 1,478.1 square kilometers. Mt. Kenya which lies on the northern side of the County greatly influences the landscape of the County as well as other topographical features. The County is well endowed with a thick, indigenous forest with unique types of trees covering Mt. Kenya. Mt. Kenya Forest covers 350.7 Km2 and is inhabited by a variety of wildlife. These river valleys, characterized by deep gorges and alluvial plains, are vital for irrigation and agriculture in the drier southern regions. Additionally, significant portions of Kirinyaga County are covered by forests, especially in the higher elevations around Mount Kenya, forming part of the Mount Kenya Forest Reserve, which is an essential water catchment area. These forests support diverse flora and fauna and play a crucial role in the local ecosystem.

The project pipeline areas identified are generally flat as evidenced by photos below. There are no predominant mountains or hills nearby that may result in shading of the site and the pipeline route itself is flat with gentle slopes in some sections.



Plate 1: maize plantation



Plate 2: ACK Gatuto church

Source: Consultant's site visit 13th June 2024

5.3.3 Geology and Soils

The County's geology and soils represent a diversified terrain shaped by its topography and climate. The highlands, shaped by Mount Kenya's volcanic activity, are dominated by fertile volcanic soils (Andosols), which are good for tea, coffee, and horticulture. Maize, beans, and bananas thrive in the midlands' red loam soils. The lowland and semi-arid areas, particularly in North and South, have sandy and clay soils that, despite their low fertility, are good for drought-resistant crops like sorghum and millet. River valleys, notably along the Tana River, have lush alluvial soils that are ideal for irrigation-based agriculture. However, concerns such as soil erosion and degradation require sustainable land management strategies to maintain soil productivity and agricultural viability. The project route is characterized by

5.3.4 Flooding Risk

The average risk of flooding and excessive precipitation is considerable during both seasons. Extreme events and distribution abnormalities tend to become more extreme Rainfall events in Kirinyaga County that fall short of or surpass the average are happening increasingly frequently.

Kirinyaga the frequency and magnitude of extreme weather events in Kirinyaga causing water scarcity, flooding, land degradation (deforestation, pollution, and soil erosion), pest and diseases, erratic rains, drought among other adverse impacts. An example is the torrential rains and severe flooding from March to May 2018 that devastated communities that were already struggling to recover from a prolonged drought. Climate change is likely to negatively impact Kirinyaga's future development. The county government has instituted efforts towards mainstreaming climate change in development planning and implementation. The county has developed the third-generation County Integrated Development Plan (CIDP) which has embedded the green economy considerations as outlined in the international climate change treaties and national level laws and policies.

The county government has also gazetted a department and a County executive Member to coordinate climate change matters in the county. To guide planning and implementation of climate action, the county government has adopted the Kirinyaga County Climate Change Policy 2023 and has enacted the Kirinyaga County Climate Change Act 2023 and subsequent regulations to offer the financial resources required to implement climate actions. Earlier, the county government has implemented various projects in Agroforestry (hass avocado and macadamia) and Sustainable Land Management (SLM) practices to improve the agricultural land resilience to climate change.

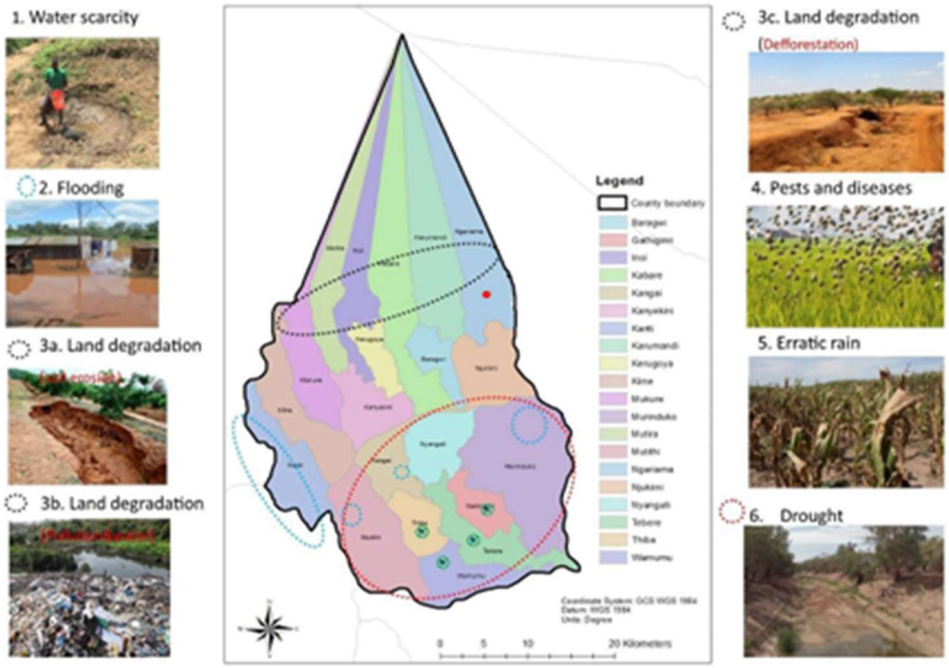


Figure 7: The Trend of Extreme Rainfall Events

5.3.5 Ecological Conditions

The county can be divided into three ecological zones; the lowland areas that fall between 1158 metres to 2000 metres above sea level, the midland areas that lie between 2000 metres to 3400 metres above sea level and the highland comprising areas of falling between 3400 metres to 5380 metres above sea level. The lowland area is characterized by gentle rolling plains that cover most of Mwea constituency. The midland area includes Ndia, Gichugu and Kirinyaga Central constituencies. The highland area covers the upper areas of Ndia, Gichugu and Central constituencies and the whole of the mountain area.

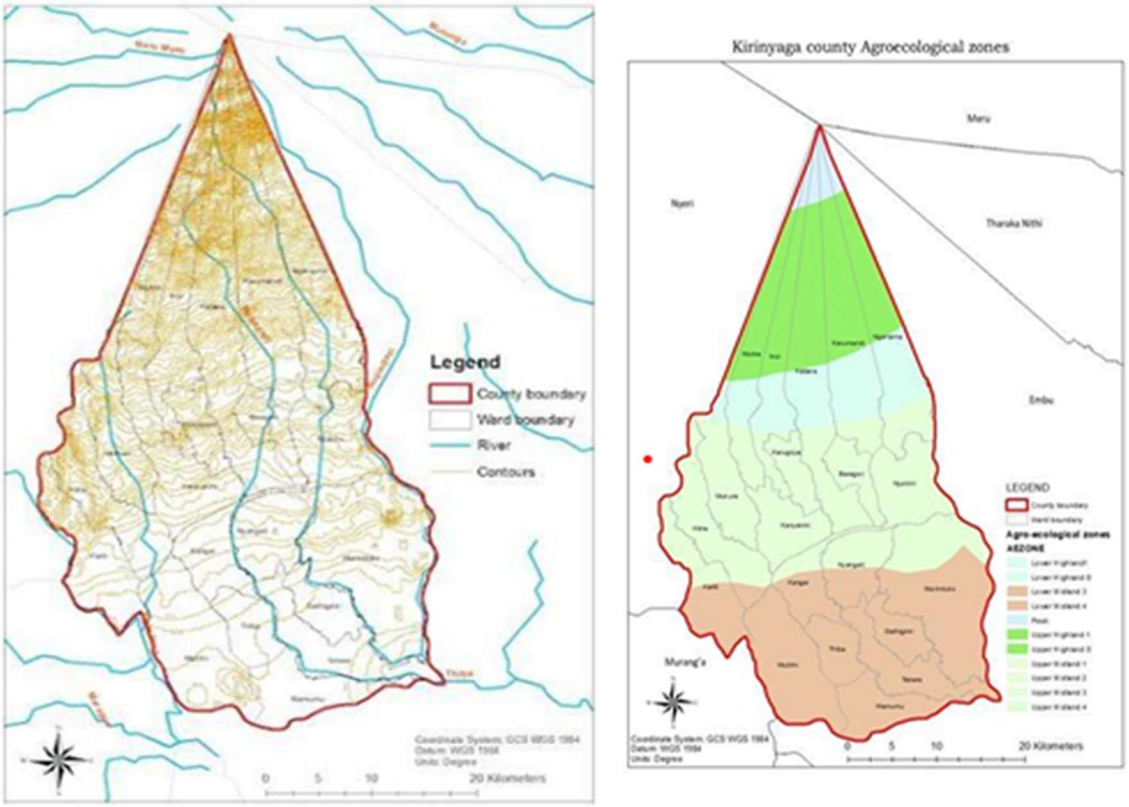


Figure 8: Kirinyaga agro-ecological zones
Source: CIDP2023-2027)

5.3.6 Hydrology

The County has six major rivers namely; Sagana, Nyamindi, Rupingazi, Thiba, Rwamuthambi and Ragati, all of which drain into the Tana River. Other rivers converging to River Tana are Thiba and Mrubra. The Project area is drained by River Thiba, which flows southwards, generally parallel to the Project pipeline (Figure 6.3). The Project does not cross any river or stream; however, it crosses an artificial channel mainly used for animal watering. Field observations and consultation with the community indicated that the water within the channel is of poor quality. Further, from the discussions with the participants in FGD it was reported that the water running from their taps is turbid and cloudy.

5.3.7 Water Resources and Water Quality

From the discussion with locals, it was reported that the quality of the water resources in the area is generally good especially upstream, they have clear water, which is a pointer to low pollution. For this reason, the local households upstream usually consume its waters without any form of treatment.

However, owing to the intense agricultural activities in the sub-catchment areas, the water quality of the river is increasingly being compromised. The area is steep; therefore, when it rains runoff may wash off the residual fertilizers and other agrochemical farm inputs into the river. Pollution of the ground water may occur in the area either through fertilizers leaching to the lower horizons and mixing with the groundwater or through contamination through seepage from the pit latrines which are common among the households. This may be aggravated by the high-water table (as evidenced by the springs).

The proposed project main water source is Thiba and Kiringa River. The springs are mostly found on the ridges and steep slopes. It was reported that springs support farming of wetland crops like arrow roots among other crops. Shallow wells are mainly used by people who can't access the river[3]. The area also has various community-based water projects which supply piped water to the community members. Some of the intakes of these projects are found in the section of the river that is in the forest. The Kirinyaga water project undertakes rigorous water quality monitoring monthly to ensure that the water meets and exceeds the standards required for safe consumption. This consistent monitoring helps to identify and address potential contaminants promptly, ensuring the provision of clean, safe drinking water to the community. The proactive approach not only safeguards public health but also fosters community trust in the water supply system.

5.3.8 Air Quality

Air quality within various regions of Kirinyaga is influenced by factors such as urbanization, industrial activities, agricultural practices, and natural vegetation. In general, the county experiences good air quality, especially in rural and forested areas, but there are some concerns in more urbanized and industrial regions.

a) **Rural and Forested Areas**: These areas, particularly those near Mount Kenya and dense forest regions, tend to have excellent air quality. The abundance of vegetation, including montane forests and riparian zones, contributes to cleaner air through natural filtration processes. These regions have low levels of pollution due to limited industrial activities and vehicular emissions.
b) **Urban Areas:** Towns such as Kerugoya and Kutus experience moderate air quality levels. While not heavily industrialized, these areas see increased vehicular emissions and some pollution from small-scale industries. However, air quality issues in these urban centers are generally less severe compared to major cities.
c) **Agricultural Areas:** Wards with extensive agricultural activities might experience periodic air quality issues due to the use of agrochemicals and burning of crop residues. Dust from unpaved roads and fields can also contribute to particulate matter in the air.

Efforts by the county to manage and improve air quality include afforestation and reforestation projects primarily led by the Kenya Forest Service (KFS), promoting the use of clean energy to reduce reliance on wood and charcoal, which are major sources of indoor air pollution, and conducting awareness campaigns to educate the public on the impacts of air pollution and encourage practices that contribute to cleaner air. For Kiaga and Kimicha projects there were limited sources of air pollution, this is due to the relatively rural location of the area. Based on the observations from the site visit, the main sources of air pollution were dust generated by tractors and cars moving along the unpaved Road.

[3] Information from guided Transect Walk with Local Farmers during Site visit on 9th June, 2015

5.4 Biological Conditions

5.4.1 Flora and Fauna

Because of its varied temperature and topography, Kirinyaga County is home to a wide variety of flora and wildlife. The environment of the county sustains a wide variety of species and offers a home to both familiar and unusual flora and animals.

a) Flora

The highland regions of Kirinyaga County, particularly around Mount Kenya, are characterized by montane forests containing a variety of indigenous trees such as Camphor (Ocotea usambarensis), African Olive (Olea europaea), Podo (Podocarpus latifolius), and Hagenia (Hagenia abyssinica). In contrast, the biodiversity of the project location is significantly influenced by the Mt. Kenya Forest ecosystem, particularly in terms of indigenous plant species. However, human activities have led to the displacement of many native species, which have been replaced by economically valuable exotic species. Prominent among these are tea, coffee, Eucalyptus spp., Cypress spp., Casuarina spp., Grevillea spp., and various wattle tree species. Additionally, the area features a diverse array of other plant species, including grasses, ferns, napier grass, avocado, banana, yams (predominantly in river flood plains), cassava, sugar cane, pineapple, arrowroot, and coffee.

The observations along the proposed Kimicha and Kiaga town pipeline reflects the presence of Napier grass, eucalyptus trees, avocado fruit trees, macadamia trees (*Macadamia integrifolia)*, and landscaped flower beds. These features form part of the baseline conditions and are not necessarily affected by the project, as any impacts are already documented in the PAP register.



Plate 3: Maize and Napier grass at Ngaru high school.



Plate 4: Banana plantation within Ngaru market

Source: Consultant's site visit 6th June 2024

b) Fauna

Kirinyaga County hosts a diverse range of mammals, particularly in its forested and protected areas, Human habitation and agricultural activities have significantly disrupted both terrestrial and aquatic habitats in the project areas. No terrestrial wildlife has been observed in these areas, as extensive agricultural use over many years has driven animals into the Mt. Kenya Forest. However, some small rodents like squirrels and moles, as well as various bird species, can still be found in the region. Detailed assessment will establish specific habitat characteristics. Aquatic species present include frogs and

freshwater fish that naturally inhabit the rivers. Livestock keeping is prevalent, with dairy cows, sheep, goats, poultry, and household pets (dogs and cats) contributing to the area's broader biodiversity.

County is Located in the more fertile and higher altitude areas; these wards feature lush montane forests. The fauna here includes larger mammals like elephants and a diverse range of bird species due to the dense Mount Kenya forest cover proximity. Each location where the project is located has its unique characteristics based on its geographical location and climate. These areas, with their riverine environments, are rich in plant species associated with water bodies and support amphibians and reptiles.

It is important to note that at the time of the field work studies, no fauna was observed.

5.4.2 Ecosystems and Habitats

The diverse ecosystems and habitats of Kirinyaga County are crucial for maintaining environmental health, supporting a wide range of plant and animal species, and offering essential ecosystem services to the local community. They include

a. **Forest Ecosystem**
    i. **Montane Forests:** Predominantly found in the highland areas around Mount Kenya, these forests are characterized by dense stands of indigenous trees such as camphor (Ocotea usambarensis), African olive (Olea europaea), podo (Podocarpus latifolius), and Hagenia (Hagenia abyssinica). These forests are crucial for water catchment, soil conservation, and providing habitats for a variety of wildlife.
    ii. **Riparian Forests:** Located along rivers and streams, these ecosystems include species such as sycamore fig (Ficus sycomorus), waterberry (Syzygium cordatum), and papyrus (Cyperus papyrus) in swampy areas. They play a vital role in maintaining water quality and supporting aquatic life.

b. **Grassland and Savannah Ecosystems**
    i. **Savannah Grasslands:** Predominantly found in the midland and lowland areas of Mbeere North and South wards, these ecosystems are characterized by grasses and scattered acacia (Acacia spp.) and baobab trees (Adansonia digitata). They support herbivores such as antelopes and various bird species.
    ii. **Agricultural Landscapes:** These areas, especially in the Midlands, are modified ecosystems where crops like coffee, tea, and maize are cultivated. While primarily agricultural, these areas also support certain wildlife species adapted to farm environments.

c. **Wetland Ecosystems**

i. **Swamps and Marshes:** Located in low-lying areas and along river floodplains, these wetlands are crucial for water filtration, flood control, and providing habitats for amphibians and water birds. Key species include papyrus (Cyperus papyrus) and various sedges.

d. **Urban and Peri-urban Ecosystems**
    i. **Urban Green Spaces:** Found in Kutus and Kerugoya towns, these include parks, gardens, and tree-lined streets that contribute to urban biodiversity and provide recreational spaces for residents. They help mitigate urban heat and improve air quality.

ii. **Peri-urban Areas:** Transitional zones between urban centers and rural areas, these ecosystems often contain a mix of agricultural land, woodlots, and small forests. They are important for maintaining ecological connectivity and supporting diverse wildlife.

5.5 Socio-Economic Environment

This section aims to describe the socio-economic environment within which the Project is situated. Establishing a baseline is essential for identifying and assessing any potential socio-economic impacts of the Project.

The socio-economic context of Kirinyaga County is briefly outlined, with a more detailed focus at the local level, which are the primary areas of interest in this socio-economic baseline. The information presented in the following sections is collected from primary data sources, including on-site observations and consultative discussions. Specifically, data was gathered through FGD and KII with local elders, chiefs, healthcare professionals, teachers, and residents (both men and women) of the area. Additional information was obtained from secondary data sources, such as the Kirinyaga County Integrated Development Plan (CIDP) 2023-2027 and publicly available ESIA reports from other studies conducted in the area.

5.5.1 Administrative Structure

Kirinyaga County is divided into six administrative sub-counties: Kirinyaga East, Kirinyaga West, Kirinyaga North, Mbeere North, Mbeere South, and Mwea. The Sub Counties are further sub-divided divided into 16 divisions, 47 locations, and 120 sub-locations. Kirinyaga County has 4 constituencies, namely Runyenjes, Manyatta, Mbeere North and Mbeere South and 20 wards.

5.5.2 Population and Demographics

According to the Kenya Population and Housing Census 2019 report, the population of the County was 613,511 in 2019. Based on the projections, the population in 2021 was projected to be 632,195 and 651,449 in 2023. 60.78% of the County population is below the age of 30 years. The highest population is in the age group of 5-9 years followed by those between 0-4 year's and10-14 years, indicating a high dependency level and the need to think about opportunities for the youth. In 2009, the County had a population density of 468 persons per square kilometre which was projected to increase to 542 and 560 persons per square kilometre in 209 and 2021 respectively. Generally, there are two types of settlements in the County; namely, clustered settlement and scattered settlement. Clustered settlement patterns are primarily found around towns and irrigation schemes where those who work in the rice fields have settled. Scattered settlement patterns are found mostly in the lower zones of the County where land sizes are large. Factors that influence clustered settlement in upper zones include:

- Ecological and climatic factors where land is fertile and receives more rainfall.
- The type of farming practiced (cash crops such as tea and coffee are grown in the upper zones and these attract a high population because residents have a higher preference for cash crops farming compared to food crops).
- The growth of towns such as Kerugoya, Sagana, Wang'uru and Kagio where there are many migrant workers and business people.

Table 15: Demographic Projections as per Sub Counties

Sub-County		2019 (Census)		2025 (Projection)		2027 (Projection)	
	Area (Km^2)	Population	Density	Population	Density	Population	Density

Kirinyaga East	253	129562	512	140,866	557	143,459	567
Kirinyaga North	111	79,553	717	86,496	779	88,088	794
Kirinyaga West	158	127,091	804	138,187	875	140,730	891
Mbeere South	784	108,877	139	118,379	151	120,558	154
Mbeere North	795	100,973	127	109,747	138	111,764	141
Mwea	517	62,497	121	67,942	131	69,192	134

Source: KNBS Kenya Population and Housing Census (KPHC) Report, 2019

5.5.2.1 Specific Site Demographics

During the field visit, the current number of population and household size was estimated for each village to be: (Kimicha 6100 people and 1500 household; Kiaga 386 and 98 Households and Kiaga 4914 people and 1230 households). Nonetheless, the figure as provided contradicted the design projections of WSP. The projections by the WSP as acquired from the WSP design is as presented in below table.

Table 16: Design Population projections for the two villages

Village	2019	2023	2033	2043
Kimicha-Kangai	6110	6485	7527	8736
Kiaga town	386	410	476	553
Kabedoso-Kiaga	4914	5216	6053	7025

From the public consultations, average household was estimated to be around 4 to 5 people are in a household. It should be noted that many households consist of multiple generations living on one plot of land. Communities also indicated that men of working age migrated out of the area in search of employment opportunities in larger towns like Nairobi and Mombasa, as their wives usually remain in the area and are generally considered within the population numbers provided.

5.5.3 Gender Roles

In all villages, gender roles are strongly defined, with women generally serving as housewives and caretakers of children. In Kangai women are also responsible for collecting water and firewood for cooking, as well as growing vegetables such as tomatoes, spinach, and onions. Men typically work and acquire the income derived from farming of tea leaves and khat "Muguka". However, both men and women engage in casual jobs for survival and to cover schooling costs, such as working on larger farms for weeding, harvesting, and sowing. In Kimicha village, a notable number of households are female-headed due to men traveling to other areas in search of work. Many women reported having no ownership or control over productive assets such as land. All the women interviewed indicated that they did not possess title deeds for land, which forms a significant barrier to gender equality and economic development.

Additionally, youthful men in Kimicha are observed to engage in drug use. This behavior is linked to broader gender issues, as economic hardships, lack of employment opportunities, and defined gender roles contribute to frustration and substance abuse. Addressing these underlying factors is crucial for promoting gender equality and improving community well-being.

5.5.4 Land Use and Land Tenure

Land holds a significant position in the social and economic well-being of the population. Further, land is key in meeting the basic subsistence needs of the households in the area and it's perceived to be as a

source of wealth and prestige to the family. Land ownership in the project area is predominantly free hold whereby it is registered with title deed under individual absolute ownership. Land sizes vary in acreage from ½ to 10 acres. Land use rights are passed down by inheritance, purchasing or leasing the land.

It was noted that majority of land within Kangai and Ngaru are designated for rice farming; nonetheless, along the pipeline route the land is subdivided and utilised for residential house and subsistence farming practices. In Kiaga land is mainly subdivided and developed as individual plots and opposite side of the proposed line is mainly maize plantation. From the FGD it was mentioned that all land is owned by men, in particular older men in the area. This is because traditionally sons inherit land from their fathers, the land is subdivided between the sons once the elderly die or divides for the children. Because of this inheritance system land plots are getting smaller and smaller. Most people in the area have land title for their land plots or a member of their family will hold the title (both men and women reported to have equal opportunity on this.

During the Focus Group Discussion (FGD), the men from Kangai, Kiaga and Ngaru reported that land disputes are rare and, when they do occur, the Chiefs and Elders are usually able to resolve them effectively. Nonetheless, family disputes over land mainly arise when a will has not been written or when land sub-divisions are deemed unfair. In these cases, as well, the Chiefs and Elders play a crucial role in resolving the disputes, ensuring that conflicts are addressed and managed within the community.

5.5.5 Crop Production

Agriculture is the mainstay of the Kenyan economy and currently represents 24% of the Gross Domestic Product (GDP) – vision 2030. More than one-third of Kenya's agricultural produce is exported and this accounts for 65% of Kenya's total exports. The agricultural sector accounts for 18% of total formal employment in the country.

There are more than 5 million smallholders engaged in different types of agricultural activities in the country. Estates and plantation farms of various sizes are fewer in number and make up a smaller part of the sector. The agricultural sector is made up of four major sub- sectors namely, industrial crops, food crops, horticulture, livestock and fisheries.

- Industrial crops contribute 55 % of export and 17% to the national GDP
- Horticultural crops contribute 38.5% of exports and 33% to the national GDP
- Food crops contribute 0.5% of exports and 32% to the national GDP
- Livestock and fish contribute 6 % of exports and 14% to the national GDP

In larger Kirinyaga County, the major crops can be categorized as food crops, industrial crops and horticultural crops. Maize and beans which are often intercropped comprise the most important food crops. Others are sweet potatoes, Irish potatoes, sorghum and pulses in that order. Industrial crops comprise of tea and coffee as the major crops. Macadamia is also an important industrial crop. There are also traces of rice in the lower, drier area of the district. Bananas top the list of horticultural crops followed by mangoes and avocadoes. Other horticultural crops are paw paws, tomatoes, kales and French beans. Most of these are however in very small scale due to lack of sufficient irrigation water and high dependency on rain fed agriculture. From the field visit, the observed crops including maize, macadamia, avocados, coffee, sweet potatoes, and arrow roots, reflect the agricultural plantations in the area and serve as part of the baseline information for the project.

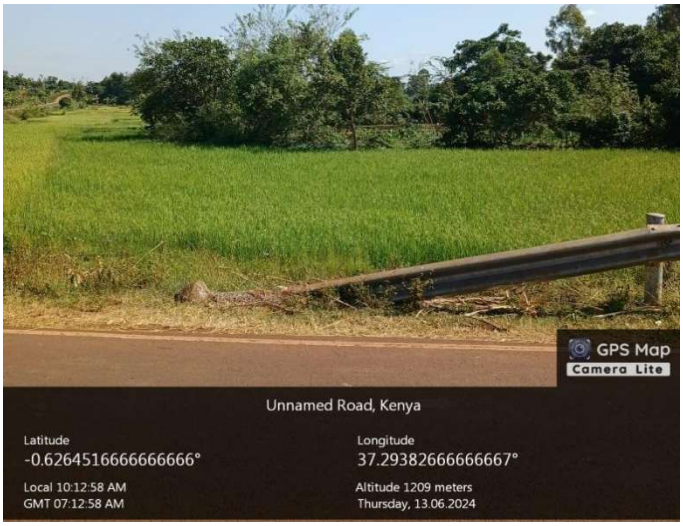


Plate 5: Rice plantation observed in Kangai area



Plate 6: Maize, Banana plantation (for subsistence)

Source: Consultant's site visit 13th June 2024

5.5.6 Infrastructure and Services

5.5.6.1 Transport

According to Kenya Rural Roads Authority the county has an extensive road network of tarmac roads. Kirinyaga County has largely Investment in transportation infrastructure which has yields considerable economic benefits by reducing transportation costs for existing activities, providing access to new areas with economic development potential and assists in generating new investment opportunities. The proposed Project is expected to stimulate the economy of Kirinyaga County and the country at large by easing struggle of search of water within Kirinyaga west sub-county, and Kirinyaga Central Sub- County (which has the highest population density in Kirinyaga County). Kutus-Kagio Road, Ngaru-Spenza and Kimicha-Kangai road, serves the pipeline route. During the consultation, it was reported by communities that during the rainy season rural roads in the area (mostly off the paved roads) are unpassable due to the amount of mud making it difficult for communities to access services



Plate 7: Kimicha-Gatuto Road- pipeline to run on the reserve
Source: Consultant's site visit 7th June 2024



Plate 8: Kangai junction Road (pipeline to run on the reserve)

5.5.6.2 Posts and Telecommunication

The mobile phone coverage in the County is at 99% while the number of fixed lines is 693 units. There are 5 sub- post offices and 25 cyber-cafes. Five private courier services operate in the County which are mostly linked to the Public Service Vehicles (PSV) (Kukena travelers SACCO, 4NTE SACCO, 2NK SACCO, Karombu SACCO, Emuki SACCO, Mt. Kenya SACCO, Supreme SACCO, G4S courier services and Wells-Fargo courier services). The courier services deliver parcels to and from major towns around the Country.

From the consultations, mobile coverage in the area was confirmed to be stable by the local community. The community access postal services from the Kerugoya town and Kutus, which are within vicinity.

5.5.7 Economic Activities

The following are the economic activities practiced in the county

1. Agriculture

Agriculture is the most important activity in the County with 87% of the total population deriving their livelihood from the agriculture sector and accounting for 72% of household income (Kirinyaga CIDP, 2018 – 2022). The main crops grown include rice which is grown in paddies in the lower zones and tea which is grown in the upper parts of the County. Coffee is also a major crop grown in the upper and middle zones. Other major crops grown include bananas, tomatoes, beans, mangoes, maize and other horticultural crops. The total arable land in the County is 116,980 Ha which represent 79% of the total land area. The total land under food crop production is currently 50,864 Ha and 31,244 Ha under cash crop production which is an indication that only 70% of the arable land is utilized in food production.

2. Trade and Commerce

There are 16 industries located in Kirinyaga County which specialize in agriculturally based products. There are five tea factories (Thumaita Tea Factory, Kimunye Tea Factory, Kangaita Tea Factory, Mununga Tea Factory and Thima Tea Factory), 1 coffee miller (KPCU), 2 maize millers (Joymax Millers and Centur Millers), 7 major rice millers (Mwea Rice Mills, Mwea Rice Growers Multipurpose (MRGM), Tai Rice Millers, Victory Rice Millers, Top Grade Rice Millers, Nice Rice Millers and Boma Rice Millers). There is also John Kaburo animal feeds in Kangai ward. There are 22 jua kali associations around the County and 1,270 jua kali artisans. Aquaculture has recently emerged as a major agricultural activity in the County with a total of 1,281 fishponds spread throughout the County. Most of the public primary and secondary schools in the county have also embraced fish farming with the aim of enhancing their income. Fishing is also carried out at Tana River, mostly in the Sagana area. There are 200 fishermen who sell the fish by the roadside. The fishermen use hooks for fishing and the main species of fish found in the river are mudfish, tilapia and catfish.

3. Tourism

Mount (Mt.) Kenya forest and Mt. Kenya National Park located in the upper parts of the County boasts of thick indigenous forests with a lot of wildlife and cottages, providing a serene environment for both domestic and foreign tourists. Sagana white water rafting is another tourist attraction offering visitors with a chance to learn canoe rafting as a sport. Other tourist attractions are Daraja ya Mungu ("God's Bridge") and numerous waterfalls located in the upper parts of the County.

5.5.8 Archeological and Cultural Heritage

Cultural heritage refers to tangible and intangible forms of cultural heritage, such as tangible property and sites having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values, as well as unique natural environmental features that embody cultural values, such as sacred groves. Intangible forms of culture, such as cultural knowledge, innovations and practices of communities embodying traditional lifestyles, are also included. From the field assessment, there were no archeological and/or cultural site observed/reported on by the local community.

5.5.9 Health Access

The health department ensures standard healthcare services to the people and the sustainability of technological-driven medical services. It has also been working towards ensuring universal health services to all residents. There are 202 health facilities in the county with a total bed capacity of 764 comprising 109 public health institutions, 39 mission/NGO institutions the largest one being Mwea Mission hospital, and 54 private clinics. There are 3 level four facilities located in Kirinyaga Central, Gichugu, and Mwea Constituencies in addition there is one private hospital namely Mt. Kenya hospital located in Kerugoya town. In addition to these, there are 10 level three facilities, 45 level two facilities, and 51 level one facilities which are spread all over the county.

The residents are mostly suffering from flu as the most prevalent disease which is at 38%. Other diseases that affect the residents include respiratory diseases at 36.9 percent others are Malaria/fever at 21.6 percent, diarrhea at 6%, and stomach ache at 2 percent. The county has 98.3% vaccination level and 42% antenatal care attendance. In collaboration with the national government the department has been administering the vaccines and antenatal services freely.

From the community consultations, it was reported that there exists health centres and small dispensaries within reach and for referrals Kirinyaga level four hospital is within reach. Further, health centres in Kutus are located along the main highway and has capacity.

5.6 Social Structure and Dynamics

5.6.1 Community Structure

Community structure and dynamics in Kirinyaga County are characterized by cultural diversity, socioeconomic activities centered on agriculture and trade, governance structures at the sub-county level, and efforts in health, education, and community development.

1. Ethnicity and Languages

Kirinyaga County's population includes a variety of ethnic groupings, including Kikuyu, Mbeere, Meru, and Kamba. The Kirinyaga are the dominant ethnic group, making up a sizable share of the population. Each ethnic group adds to the county's cultural richness and tradition, enhancing the social fabric of the community. The main languages spoken include Kikuyu and Kirinyaga, Additionally, English and Swahili are widely spoken and are the official languages of Kenya.

2. Governance and community development

The County is divided into administrative units known as sub-counties (e.g., Kirinyaga west, Kirinyaga central). Each sub-county has its administrative structure overseeing local governance and development. Social welfare, economic empowerment, and community development programs are actively promoted by community-based organizations (CBOs), self-help groups, and cooperatives.

3. Religion

Christianity is the predominant religion, with various denominations present, including Catholic, Protestant, and Evangelical churches. A small percentage practices Islam and other religions.

5.6.2 Education and skills

Kirinyaga County demonstrates a strong commitment to education, evidenced by a literacy rate of 78.4% and support through increased schools, bursaries, and a university. The county has 198 public ECDE centers with 447 teachers, 326 primary schools with 2,916 teachers serving 111,400 students (teacher-pupil ratio of 1:38), and 143 secondary schools with 1,329 teachers for 39,988 students. Additionally, the county's DVET subsector employs 105 instructors and 12 principals. Kirinyaga Technical Institute became a constituent college of JKUAT, now Kirinyaga University. Despite these efforts, financial constraints challenge further expansion. Educational attainment reveals 3.4% with no formal education, 13.4% completing primary school, 24.9% completing secondary school, and 6.6% attaining postsecondary education[4].

5.6.3 Energy Access

According to Kirinyaga County CIDP 2023-2027, Kirinyaga County has 66% electricity coverage, compared to the national average which stood at 76% in 2022 (according to the World Bank collection of development indicators, compiled from officially recognized sources). Other significant sources of energy include paraffin, firewood, charcoal and tin lamp. In general, the project area was observed to have electricity coverage, through the Kenya Power and Lightening Company where the overhead electricity connection and distribution lines were observed in the vicinity. At the time of the site visits, very few households within the community were observed not to have been connected to electricity. The main sources of power are therefore paraffin for light and firewood for cooking.

[4] Kirinyaga County CIDP (2023-2027)

6 STAKEHOLDER ENGAGEMENT AND CONSULTATIONS

6.1 Introduction

This This chapter outlines the approach to stakeholder participation and communication within the ESIA process. Effective engagement with local communities and stakeholders is crucial for successful project delivery, fostering constructive relationships with authorities, organizations, and communities throughout the project's development phases. The program prioritizes stakeholders interested in or directly affected by the Kirinyaga WSP water distribution system upgrade under the CLSG II program. Continuous engagement ensures that stakeholders' views and concerns are incorporated from the project's implementation to operation phases, minimizing opposition and adverse effects while promoting the adoption of optimal designs and systems. The engagement process adheres to Kenyan legal requirements, notably the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019, and aligns with international standards such as the World Bank OP/BP 4.01: Environmental Assessment. This ensures comprehensive stakeholder involvement, fostering collaboration and partnerships that contribute to the project's success and long-term sustainability.

6.2 Objectives of Stakeholder Engagement

Specific objectives of the Stakeholder Engagement for the proposed project include the following:

- **Communication with stakeholders:** To identify the best methods for project developers to provide stakeholders with balanced and objective information on the proposed projects and to obtain their feedback;
- **Ensuring understanding:** The project adopts an open, inclusive, and culturally sensitive approach to engagement, ensuring stakeholders are informed transparently and comprehensively at every stage, with timely and appropriate information disclosure;
- **Involving stakeholders in the assessment**: Stakeholders are actively involved in identifying key issues, evaluating impacts, proposing mitigation measures, and finalizing the ESIA report. Local knowledge significantly enriches the baseline data and informs the impact assessment process;
- **Building relationships**: Develop a model for the project developers to use for enhanced community participation and collaboration through the project lifecycle, including environmental mitigation and management;
- **Managing Expectations**: To manage expectations effectively by ensuring the dissemination of accurate information to prevent unrealistic expectations about project benefits;
- **Ensuring Compliance**: The process is designed to ensure compliance with both local regulatory requirements and international best practices on stakeholder engagement;
- **Grievance Redress**: To provide tools for effective resolution of community issues during project implementation.

One of the key outcomes of engagement should be free, prior, and informed consultation of stakeholders, where this can be understood to be:

- **Free:** engagement free of external manipulation or coercion and intimidation;
- **Prior**: engagement undertaken in a timely way, for example the timely disclosure of information; and
- **Informed**: engagement enabled by relevant, understandable and accessible information

6.3 Overview of Engagement Requirements

6.3.1 National Requirements

Consultation and Public Participation (CPP) is a mandatory requirement for proposed projects as entrenched in the Constitution of Kenya, 2010 and in the EMCA 1999 (amended 2015) section 58, by achieving sustainable development. Part III Section 17 of the Environmental (Impact Assessment and Audit) Regulations of 2003, further requires that all ESIA studies incorporate public consultation with an aim to ensure all parties interested in a proposed project are informed of anticipated project impacts and benefits. Moreover, their views, concerns and recommendations are incorporated in project planning, design, construction and operation and decommissioning phases. The Kenya Public Participation Bill of 2018 further supports the CPP process.

Specifically, public participation and consultation requirements in the Environmental (Impact Assessment and Audit) Regulations state that the Proponent will:

1. Seek the views of persons who may be affected by the project in consultation with the Authority (NEMA);
2. Publicize the project and its anticipated effects and benefits by erecting posters in strategic public places informing the affected parties and communities of the proposed project;
3. Hold public meetings with the affected parties and communities to explain the project and its effects, and to receive their oral or written comments.
4. Ensure that appropriate notices are sent out at least one week prior to the meetings and that the venue and times of the meetings are convenient for the affected communities and the other concerned parties.
5. Publish a notice on the proposed project in a newspaper that has a nation-wide circulation and make an announcement in both official and local languages in a radio with a nationwide coverage;

Upon submission of the ESIA report to NEMA, the Authority shall, within fourteen days of receiving the report, invite the public to provide oral or written comments. If deemed necessary, the Authority may then hold a public hearing based on these comments.

6.3.2 World Bank Requirements.

6.3.2.1 OP/BP 4.01: Environmental Assessment

This World Bank OP/BP 4.01: Environmental Assessment emphasizes stakeholder engagement through consultations with affected groups and local NGOs, ensuring their views are considered in decision-making. It mandates timely, relevant, understandable, and culturally appropriate information disclosure, free from coercion or discrimination. The stakeholder engagement process includes identifying and analyzing stakeholders, planning engagement, disclosing information, conducting consultations, addressing grievances, and reporting back to stakeholders.

Stakeholder Identification and Analysis

The developer, represented by the WSP, identified stakeholders as either "project-affected parties," directly impacted by the project, or "other interested parties" with a vested interest. An assessment also identified disadvantaged or vulnerable individuals or groups, including a limited number of Project-

Affected Persons (PAPs) due to the project's alignment along the road reserve. The project design incorporates consultations and mitigation strategies to address the needs of these PAPs, ensuring compliance with relevant safeguard policies.

Stakeholder Engagement Plan

According to the World Bank standards, the developer should develop a Stakeholder Engagement Plan (SEP) proportionate to the nature and scale of the project and its potential risks and impacts. The elements of the SEP may be included as part of the Environmental and Social Commitment Plan and preparation of a stand-alone SEP may not be necessary. The SEP will describe the timing and methods of engagement among stakeholders throughout the lifecycle of the project.

Information Disclosure

The developer disclosed the project information to allow stakeholders to understand the risks and impacts of the project, and potential opportunities. Further, the developer provided stakeholders with the following information:

a) The purpose, nature, and scale of the project;

b) The duration of the proposed project activities;

c) Potential risks and impacts of the project on local communities, and the proposals for mitigating these, highlighting potential risks and impacts that might disproportionately affect vulnerable and disadvantaged groups, and describing the differentiated measures taken to avoid and minimize these;

d) The proposed stakeholder engagement process highlighting how stakeholders can participate;

e) The time and venue of any proposed public consultation meetings, and the process by which meetings will be notified, summarized, and reported; and

f) The process and means by which grievances can be raised and will be addressed.

Meaningful consultations

Meaningful consultation is a two-way process, that:

a) Begins early in the project planning process to gather initial views on the project proposal and inform project design;

b) Encourages stakeholder feedback, particularly as a way of informing project design and engagement in the identification and mitigation of environmental and social risks and impacts;

c) Continues on an ongoing basis, as risks and impacts arise;

d) Is based on the prior disclosure and dissemination of relevant, transparent, objective, meaningful, and easily accessible information in a time frame that enables meaningful consultations with stakeholders in a culturally appropriate format, in relevant local language(s), and is understandable to stakeholders;

e) Considers and responds to feedback;

f) Supports active and inclusive engagement with project-affected parties;

g) Is free of external manipulation, interference, coercion, discrimination, and intimidation; and;

h) Is documented and disclosed by the developer.

Grievance Mechanism

The developer will respond to concerns and grievances of project-affected parties related to the environmental and social performance of the project promptly. For this purpose, the developer will propose and implement a grievance mechanism to receive and facilitate the resolution of such concerns and grievances.

A Grievance mechanism is an accessible and inclusive system, process, or procedure that receives and acts upon complaints and suggestions for improvement in a timely fashion and facilitates resolution of concerns and grievances arising in connection with a project. An effective grievance mechanism provides project-affected parties with redress and helps address issues at an early stage.

Reporting to Stakeholders

The implementing agency (KICOWASCO WSP) will continuously engage with different stakeholders and provide information to, project-affected parties and other interested parties throughout the life cycle of the project, in a manner appropriate to the nature of their interests and the potential environmental and social risks and impacts of the project.

Ongoing stakeholder feedback is useful to monitor risks and impacts and to assess the effectiveness of the measures designed to mitigate environmental and social risks and impacts. The developer will continue to conduct stakeholder engagement in accordance with the SEP and will build upon the channels of communication and engagement already established with stakeholders. In particular, the developer will seek feedback from stakeholders on the environmental and social performance of the project, and the implementation of the mitigation measures.

6.4 Engagement Approach: Affected Parties and Other Stakeholders

6.4.1 Stakeholder Identification and Analysis

Stakeholder identification and analysis was the critical first step in stakeholder consultation and engagement process carried out for the project. This section outlines the process of addressing the following:

- Approach to the identification of stakeholders;
- Analysis of stakeholders to determine the extent to which they are potentially impacted by the project, or could exert influence on the project; and
- Overview of consultation and engagement approaches and tools relevant.

Recognizing that it is neither practical nor necessary to engage with all stakeholder groups with the same level of intensity throughout the project, a comprehensive stakeholder identification and analysis process was undertaken. This process involved identifying and mapping stakeholders to effectively plan and design successive stakeholder engagement activities. The stakeholder mapping was done based on the identification of individuals, communities, groups, and institutions who:

- Are most likely to experience at significant levels, the negative and/or positive impacts of the proposed project
- Have the mandate over the various elements of the project's activities (such as Government ministries and departments and leadership)
- Are considered the project's main supporters and opponents.

The stakeholder analysis process sought to prioritize identified stakeholder based on: interest and expectations in relation to the proposed project; required levels of participation for each stakeholder throughout the project lifecycle; degree of influence of each stakeholder group to the direction and success of the proposed project; interrelationships between different stakeholders and the convergence/divergence between their interests and expectations.

'Interest' measures the degree to which stakeholders are likely to be affected by the project and the degree of interest/concern they have in or about it.

'Power/Influence' refers to leverage a stakeholder may have in relation to decisions either taken by or affecting the project and the degree to which they can affect project success/failure. Table 17 below depicts the recommended stakeholder communication strategy based on their level of influence/power and interest concerning the proposed project.

Table 17: Communication strategy based on the stakeholder power/interest matrix

Increasing level of interest			
	Some interest to significant interest	**Manage Closely** ✓ Treat fairly, honor commitments made to these stakeholders, and principally endeavor to keep them satisfied insofar as balance of costs and benefits allow	**Keep Satisfied** ✓ Strategic threat or opportunity - invest in engagement processes to understand concerns and develop solutions. Engage closely, develop strong relationship and influence actively
	No interest to little interest	**Inform** ✓ Low priority - provide access to general channels of information and feedback and monitor regularly	**Monitor** ✓ Keep involved and informed, but ensure a balance between the concerns of high-influence stakeholders and those of people impacted by decisions
		No influence/power to little influence/power	Some influence/power to significant influence/power
	Increasing level of influence/power		

Table 18 overleaf presents the findings of the stakeholder analysis for the proposed upgrade works. This is a live matrix that will be updated before the commencement of and during every phase of the proposed project improvements.

Table 18: stakeholder Power/Interest matrix

I.D.	Stakeholder Group	Stakeholders	Area of interest	Influence/ Power	Level of Interest	Power/Interest Rating	Periods of Active Engagement	Method of communication
PUS	Project Implementing Agencies	- Ministry of Water, Sanitation and Irrigation (MoWS&I)	- Mobilizing of resources and ensuring efficiency in their utilization - Improved water provision	9	9		Throughout the project's lifetime	- **Official Letters** - **One on one meetings** - **Contractual Agreements**
PUS		- Water Sector Trust Fund (WSTF)	- Contracting authority for the project - Disbursing of the conditional grants - Environmental and social sustainability of the project	7	9		Throughout the project's lifetime	- **Official Letters** - **One on one meetings** - **Contractual Agreements** - **Workshops**
PUS		- KICOWASCO - Local community	- Beneficiaries of the project - Improved water supply - Increased revenue collection - Oversee project implementation - Environmental and Social	8	9		Throughout the project's lifetime	- **Official Letters** - **One on one meetings** - **Contractual Agreements** - **Website**
PUS	National Regulatory Bodies and Government Agencies	- National Environment Management Authority (NEMA)	- Issues environmental-related permits (EIA License) and monitors compliance of operations - Inspect and monitor the impacts of the project on the environment - Grants or withdraws permits (such as EIA license, Effluent Discharge License) - Impose measures (Improvement Orders) to fulfil legal obligations	7	6		Throughout the project's lifetime	- **CPR Report** - **Annual Environmental Audits**
PUS 5		- Directorate of Occupational Safety and Health Services (DOSHS)	- Issue Workplace Registration certificate to the EPC Company - Registers the upgrade works site as 'construction site'	7	4		Preconstruction and construction phase	- **Official Letters**
PUS	Ministry of	- Deputy County	- Are Representatives of local	3	6		Throughout the project's	- **Official Letters**

I.D.	Stakeholder Group	Stakeholders	Area of interest	Influence/ Power	Level of Interest	Power/Interest Rating	Periods of Active Engagement	Method of communication
	Interior and Coordination of National Government (National Government Administrative Officers)	Commissioner (affected Sub-County) - Assistant County Commissioners (affected wards) - Area Chiefs for the affected locations - Assistant Chiefs for the affected sub-locations - Nyumba Kumi Officials/Opinion Leaders from various settlements within the affected sub-locations	communities that fall within their jurisdiction. - Concerned with community socio-economic development and public participation & citizen engagement - Mobilization of Locally affected persons neighboring communities, business communities, etc.) for engagement - Security measures to be adopted				lifetime	- **Tele conversations** - **Key Informant Interviews (KIIs)** - **Scheduled Public Barazas/ community meetings**
PUS	County Government of Kirinyaga	Sub-County Department of Public Health	- Compliance with the Public Health Act - Sanitary requirements for the workers - Welfare of labour force (medical conditions etc.) - Environmental and Social operations of the project	4	4		Pre-construction and construction phases	- **Official letters** - **One-on-one meetings** - **Key Informant Interviews** -
PUS		Sub-County Department of Physical Planning/Public Works	- Issues approvals on the structural plan of the project	5	5		Pre-construction phase	- **Official letters** - **One-on-one meetings** - **Design approvals**
PUS		Sub-County Department of Water, Environment and Climate Change	- Development and maintenance of water infrastructure - Environmental conservation	5	5		Pre-construction and construction phases	- **Official letters** - **One-on-one meetings** - **Key Informant Interviews**

I.D.	Stakeholder Group	Stakeholders	Area of interest	Influence/ Power	Level of Interest	Power/Interest Rating	Periods of Active Engagement	Method of communication
PRS 1.	Lenders	World Bank/IDA	- Envisions strategic fit with Lenders/DFI requirements - Ensures that project fits in with Bank policies - Provides project financing	8	9		Required before financial close/commissioning Post financial close Operational phase-need status updates from IHPL	- **Weekly meetings to be held prior financial close to supply IHPL with information for credit and policy assessment** - **Construction phase-cash flow forecast etc.**
PRS 2.	EHS Consultant	Individual Consultant	- Recommend mitigation measures for adverse impacts - Provide ESMS inputs on all aspects of the project	4	8		Pre-construction Phase	- **Regular meetings with Project Manager on SEP aspects** - **Regular meetings with IHPL on HSE-related issues affecting the project**
PRS 3.	Contractors and sub-contractors	To be determined	- Cooperation with Govt. agencies and all other stakeholders - Compliance with Kenya's construction and E&S laws and regulations - Successful completion of the project	7	8		Pre-construction and construction phase	-
PRS 4.	Affected communities and Institutions	- Households, schools, tertiary institutions, Businesses (coffee factories, manufacturers) - The general public in the areas of influence	- Anticipated impacts (positive and negative) of the project - Employment opportunities - Increase in water supply - Information sharing on the impact of the project on the community and its environs.	6	8		Throughout the project lifetime	- **Scheduled Public/community meetings (Barazas)** - **Public Posters** - **FGDs/KIIs** - **Public Meetings/Barazas** - **Media announcements** - **Surveys and**

I.D.	Stakeholder Group	Stakeholders	Area of interest	Influence/ Power	Level of Interest	Power/Interest Rating	Periods of Active Engagement	Method of communication
								questionnaires
PRS 5.		- Women	- Employment opportunities - Gender consideration in labor recruitment - Increased water supply (responsible for fetching water when supply is interrupted)	4	7		Throughout the project's lifetime	- **Public Baraza meetings** - **FGDS**
PRS 6.		- Youth	- Employment opportunities - Economic improvement	4	7		Throughout the project's lifetime	- **Throughout the project lifetime**
PRS 7.		- Vulnerable Groups i.e. (to be identified)	- Employment opportunities - Economic improvement	4	7		Throughout the project's lifetime	- **Throughout the project lifetime**
PRS 8.	**Business Community**	- **Business owners/operators /traders**	- **Anticipated impacts on their businesses** - **Available opportunities for business**	**2**	**4**		**Preconstruction and construction phases**	- **FGDs** - **Public Barazas** - **Surveys and questionnaires** - **Surveys and questionnaires** - **Website**

NB: * The sub counties affected include Kirinyaga Central Sub-County and Kirinyaga west sub-County.

Line 1-Kimicha Kangai project is located in Mwea East sub county, Kirinyaga County. The project covers rural areas of Kimicha, Kangai and Komboini sub locations; **Line 2- Pipeline to Kiaga town** is located in Kirinyaga Central sub county, Kirinyaga County. The project covers rural areas of Kiaga town shopping centre; **Line 3- Kabedoso-Kiaga line** is located in Kirinyaga Central sub county, Kirinyaga County. The project covers rural areas of Kiamwenja, Ngaru and Gatuto locations.

power/Interests Rating Colour Scale

	Very Low
	Low
	Moderate
	High

Scale for Categorizing Influence/Power and Level of Interest

Category	1-2	3-4	5-7	8-10
Influence/Power	Very Low	Low	Moderate	High
Level of Interest	Very Low	Low	Moderate	High

6.4.2 Disclosure of the Project Information

Dissemination of project information was done through verbal discussions. In addition, stakeholder invitation letters were prepared for stakeholder dialogue. The invitation letters contained a synopsis of the proposed project and the ESIA study. The community public meetings/barazas and FGDs were conducted in both Kikuyu and English languages while the KIIs were conducted in English. Questions and comments were received and noted down.

6.4.3 Data Collection Tools

Data collection tools/materials were developed prior to the stakeholder consultation and participation activities. The tools developed were mainly surveys and questionnaires to give the stakeholders feedback on the proposed project and its potential environmental and social impacts. The tools aimed to capture public concerns/views regarding the project and gather demographic data of the target stakeholder group. The nature of the data collected using these materials was a combination of both qualitative and quantitative depending on how the tool was structured. The following are the data collection tools that were used:

1. Focus Group Discussion Guide

Structured questionnaires/guides were used to undertake FGDs to elicit their perception of the project i.e. expectations, opinions, and suggestions on the proposed project. Additionally, the questionnaires contained queries on roles, livelihoods, health issues, water challenges, etc.

2. Key Informant Interviews Guide

These were structured questionnaires customized with questions relevant to the sector for which information was being sought to enrich the socio-economic baseline profile of the project area i.e. Health, Education, Security, and Community profile.

3. Minutes Template

The views/concerns expressed by the stakeholders and all other discussions were captured and recorded through the minutes. The minutes also detailed how specific project team members who were available in the meetings to provide information on the proposed project responded to the issues raised.

4. General ESIA Guide

Structured questionnaires were used as part of the data collection tool to gather comprehensive information from various stakeholders. The questionnaires included sections designed to capture detailed insights on environmental and social aspects of the project. Key areas covered by the questionnaire included: environmental and social impacts, infrastructure and services, mitigation measures etc.

6.5 Stakeholder Consultations

Stakeholder consultation and public engagement is fundamental to an effective environmental and social impact assessment process and for the successful implementation of the proposed project. It serves to promote confidence and trust between the Proponent and Project Stakeholders.

Stakeholder engagement is an ongoing process; for the proposed project, stakeholder consultation was initiated during the scoping phase and will continue throughout the construction, operational, and decommissioning phases of the project. The approach to public engagement has been designed to promote meaningful, two-way communication between the proponent and the stakeholders.

As depicted in the**Error! Reference source not found.** Stakeholder Identification and Analysis the stakeholder consultation was focused on engaging: affected communities, implementing agencies, regulatory authorities, National and County authorities/departments, community leaders, the general public as well as other individuals or groups that express interest in the project. The Proponent is committed to effective and open consultation to ensure that potentially affected members of the public are fully aware of the project and have the opportunity to make their views known. The concerns will help ensure that all the important issues are considered in the environmental and social assessment. It is important to note that stakeholder consultation is an ongoing process and further consultations will be conducted as the project progresses.

6.5.1 Consultation and Message

During the ESIA stage, the message and the method used for consultation and participatory process was adapted. The following elements were carefully planned for each consultation activity:

- The message to convey to each group of stakeholders (in collaboration with KICOWASCO technical team)
- How stakeholders will be notified of upcoming meetings and the invitation process;
- The choice of appropriate venue;
- The preparation of tools to be used during consultation.
- The resources required to facilitate the consultation.
- How minutes will be written, recorded, and disclosed; and
- How grievances will be addressed.

The engagement program included:

- Preliminary consultations.
- Community Public Meetings (Barazas);
- Focus Group Discussions.
- Key Informant Interviews.

Minutes and attendance lists of the meetings held during the stakeholder consultation and digital photographs taken during the meetings are appended at the end of this report (Annex 6, 7 & 8).

6.5.2 KICOWASCO WSP Stakeholder Engagement Activities

6.5.2.1 Preliminary consultations

The preliminary consultation aimed to gather initial feedback from key stakeholders, including the, Kirinyaga WSP team, and project area administrative officials (this included the deputy county commissioners, Assistant County commissioners, Chiefs, Assistant chiefs, NEMA, and Water Resource Authority). This consultation was undertaken during the reconnaissance phase with the aim of mapping and to understand stakeholder concerns and expectations.

From the consultations held with the administrative officials, the aim was to agree on steps of mobilization and the exactly affected community based on the project coverage area. From the meeting with the specific area chiefs, program was drawn which formed part of the notification letter to the County Commissioner, who cascaded down to the DCCs who then cascaded down the letters to ACC and to the chiefs for planning of public consultation meetings.

Additionally, consultation was held with Kirinyaga technical team and the Managing Director as part of the preliminary discussions. The meeting attended by Kirinyaga technical manager, and the Managing Director where project documentation and expected technical support was discussed. This consultation provided an opportunity to review technical specifications, project timelines, and implementation strategies, ensuring alignment with the assignment TOR. The feedback from the WSP was instrumental in refining the project approach, addressing potential technical challenges, and confirming the feasibility of the proposed activities.

Additionally, plans were made for a public meeting to further engage the community, inform them about the project details, and gather broader input. This meeting was scheduled by the specific area Chief's, where stakeholders had opportunity to raise concerns, ask questions, and provide valuable feedback, ensuring transparent communication and community involvement from the onset.

6.5.2.2 Public Baraza Meetings

Four different public baraza meetings was held. For Kimicha and Kabedoso, meetings were held for each of the locations on 11th June 2024 where first meeting was held at Ngaru market, AIPCA church ground and second one at St. Bartholomew Catholic Church. In Kangai, two separate meetings were held, with first meeting held at Kangai chief camp on 12th June 2024 and second one at AIPCA Church Grounds Center. The chosen meeting points served as ideal venues for the baraza meetings because they provided a convenient congregation spot for many of the targeted stakeholders.

Community member turned out in good numbers, so as to discuss the impacts of the project. The meetings were also attended by the National Government Authority Officers in charge of the area i.e. the area Chiefs together with the village elders.

The Consultants (Environmentalist and Social Experts) together with the WSP officers were in attendance to provide information to the public and to receive and address comments. Through verbal discussions, the barazas were presented with information on:

- Description of the project (project design and location);
- The requirements of the EMCA for new projects in Kenya;
- The Environmental Assessment Process;
- Baseline environmental studies being undertaken as part of the ESIA; and
- Potential environmental and social impacts associated with the proposed project.

After giving a presentation on the proposed project, the stakeholders were provided with an opportunity to comment and give views on their perceptions of the proposed project.

The verbal discussions were done in both Kikuyu and Swahili languages as it had been established through the Chiefs that the audience would be most comfortable with the two languages.

The respondents were able to comment on the project, highlight the potential positive and negative impacts of the project, and if they are for or against the project.

All substantive issues raised with the Firm of Experts during the Baraza were noted and responded to. The issues were then recorded in an Issues and Response Report. Table below shows a summary of the views expressed by various stakeholders during the public meetings.

Table 19: summary of the views expressed by various stakeholders during the public meetings

Subject	Question/Concern	Response
Landowners' Benefits	Inquiries on whether there will be any benefit to the landowners in scenario where the water line will pass through their land?	There are no specific benefits targeting affected landowners, aside from those achieved through rehabilitation of the line.
Existing infrastructure Damage	Will permanent structures be damaged?	The laws governing the water pipeline remain unchanged, and the project is designed to minimize impacts on permanent structures, as it runs along the road reserve. However, it is acknowledged that the installation may affect extensions to structures, pavements, and other temporary structures that have encroached into the pipeline route, particularly in areas such as Spenza. A summary of Resettlement Action Plan (RAP) has been developed as a standalone document and will be implemented to ensure that any affected persons are appropriately compensated.
Community Relationship	There has been a good relationship between the community and the water service provider; they support the project for improved water services.	The project aims to improve water services to the community, reflecting the support received from the community and the water service provider.
Water Cost	The current cost per unit for water is high.	Application shall be done their applied a meter cost and management cost to which is a reasonable figure.
Community Employment	Will the community be given priority in employment opportunities?	The contractor will prioritize locally available labor unless local capacity is insufficient.
Trench Depth and Wages	What is the trench depth and expected wage rate?	Trench depth will be 3 feet unless design recommends otherwise. The minimum wage will be determined based on Kenya's labour laws.
Consumer Connection Fees	Will changing the water line affect current consumers in terms of connection fees?	Current consumers will not be affected by the change to the new water line, with no extra connection fees incurred. Consumers may need to purchase some fittings for seamless transition to the new line once installed.
Cost Implications	Will there be any cost implications for current consumers?	Consumers will incur costs for purchasing fittings to ensure seamless transfer of their connections to the new water line.
Water Use	Is the new water supply line for irrigation or household use?	The new water line is intended for household use, not irrigation.
Pipeline Location	Will the pipeline be constructed across the road from its current position?	The new water line will remain on the current side of the road, and where there are crossings, it will do so through existing sleeves. The WSP have engaged with relevant road entity (KeRRA, KURA, and County Roads Department) as per regulations given and authorization issued.
Proximity to Farms/Land	How close will the new line be to farms or land?	The new line will maintain proximity to the current line, minimizing impacts on adjacent farms or land.

Payment System Enhancement	How can the company enhance seamless payment of water bills, especially for those who find USSD systems challenging?	The company introduced USSD payment via M-Pesa to facilitate easier bill payments without requiring customers to visit offices. Assistance is available at the water office for those needing support with payments.

In the Kangai consultative meeting, stakeholders expressed shared concerns similar to the Kimicha line hence highlighting a collective focus on addressing these critical aspects to ensure the project's alignment with community needs and regulatory requirements.

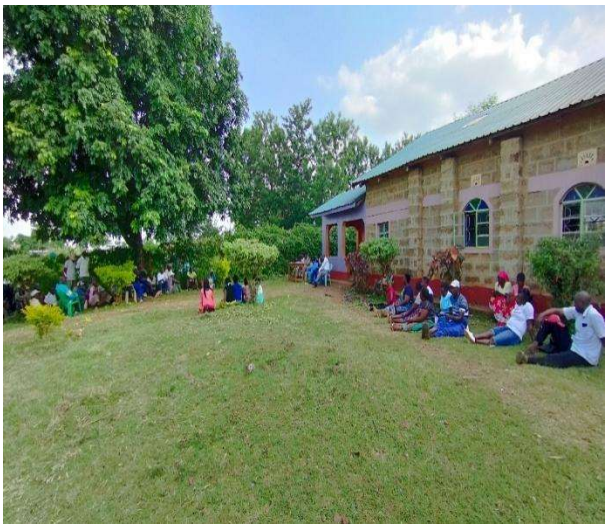


Plate 9: AIPCA church Public Participation Baraza
Source: Consultant's site visit 12th June 2024



Plate 10: Kangai location Public Participation Baraza

Table 20: Summary of Consultative Public Meetings Attendance

Meeting Venue	Date	Participants	Male	Female	Total No.
Ngaru market	11th June 2024	- Local administration (Chief, assistant chiefs, elders) - Community members (men, women, youth) -KICOWASCO representative - EHS Consultants team	27	13	40
St. Bartholomew catholic church	11th June 2024	- Local administration (Chief, assistant chiefs, elders) - Community members (men, women, youth) -KICOWASCO representative - EHS Consultants team	13	54	67
Kangai chief camp and	12th June 2024	- Local administration (Chief, assistant chiefs, elders) - Community members (men, women, youth) -KICOWASCO representative	49	25	74

		- EHS Consultants team			
Muthatura AIPCA church	12th June 2024	- Local administration (Chief, assistant chiefs, elders) - Community members (men, women, youth) -KICOWASCO representative - EHS Consultants team	34	16	50
		Total	**123**	**108**	**231**

6.5.2.3 Focus Group Discussions

Following the public Baraza meetings, separate focus group discussions (FGDs) were conducted with men, women, and the youth from the affected community. Using open-ended questions, the FGDs explored:

- Expectations and suggestions for the proposed project: Participants shared their hopes and concerns regarding the project's potential impact on their lives;
- Community dynamics and challenges: Participants discussed their roles and contributions to society, economic activities, community development, land use, educational access, and existing challenges.

NB: *The information collected from the FGDs has been incorporated into the project area baseline.*

I. Feedback from the FGDs undertaken with the Kangai Community

Feedback from the Men:

Feedback from male participants in the Focus Group Discussion (FGD) in Kangai highlighted several important aspects concerning the proposed water pipeline project. They demonstrated a strong understanding of the project's objectives and potential benefits, with particular emphasis on:

- Enhanced community health: Participants noted the positive impact on public health due to improved water quality and availability.
- Community cohesion: They highlighted the project's potential to strengthen social ties through collective involvement and shared resources.
- Skill development: The participants expressed optimism about opportunities for skill development, particularly for youth, through employment and training associated with the project.

The Participants expressed several concerns regarding the proposed water pipeline project, particularly:

- Water supply interruptions: There were worries about potential disruptions in water availability during the project's implementation phase;
- Population pressure: The group voiced concerns about the possibility of increased competition for water resources due to anticipated population growth from in-migration, new marriages, and birth.

In light of their concerns, the group put forward the following requests:

- **Durable infrastructure:** They urged for the installation of robust water pipeline infrastructure to minimize the risk of bursts and leakages.
- **Future-proofing:** Recognizing the potential for population growth, participants emphasized the importance of designing the project to accommodate future water demands.

- **Local employment:** Given the high levels of youth unemployment, they requested that the Water Service Provider (WSP) prioritize job opportunities for local community members.

The group outlined their expectations, which include:

- Community collaboration: They anticipate ongoing engagement with the community throughout the project's implementation to ensure transparency and inclusivity.
- Timely execution: Participants stressed the importance of completing the project on schedule to meet the community's pressing needs.

Feedback from the women

During the focus group discussion, five female participants actively contributed with valuable insights:

- They acknowledged that incidences of water-borne diseases will be reduced since an alternative source of potable water will be available;
- There will be an increase in the hygiene practices of the community since water will be
- made available;
- They emphasized the need to increase water supply in the area to meet the demands of its growing population
- They expressed concerns on construction phase that might see the destruction of existing infrastructure (i.e. excavation of tarmacked sections at road crossings as well as existing water connections.

Feedback from the Youth

During the focus group discussion, twelve female participants actively contributed with valuable insights, highlighting several key issues and suggestions:

Benefits:

- **Health improvements:** They acknowledged that the availability of an alternative potable water source would significantly reduce incidences of water-borne disease;
- **Enhanced hygiene practices:** The participants noted that the increased water supply would lead to better hygiene practices within the community, particularly in households;
- **Support for education:** The women emphasized that a reliable water supply would reduce the time spent fetching water, allowing children, especially girls, more time to focus on their education.

Impacts:

- **Environmental concerns:** Participants expressed concerns about the potential impact of the construction phase on the local environment, particularly the risk of soil erosion and the loss of vegetation;
- **Infrastructure preservation:** They voiced worries about the possible destruction of existing infrastructure, such as the excavation of tarmacked sections at road crossings and damage to current water connections during construction;
- The water pipeline might affect private property and disrupt business, this calls for fair compensation of the affected;

Suggestions:

- Minimizing disruptions: The group urged the project team to minimize water supply disruptions by ensuring that replacement works are completed as quickly as possible;
- **Supporting agriculture:** They recommended an increase in water supply and suggested that locals be allowed to use the water for irrigation, thereby supporting job creation and income generation through farming.

Expectations:

- Uninterrupted water supply: The women expect a consistent and increased water supply once the project is completed;
- **Skill development opportunities:** They anticipate opportunities for skills development and training in areas such as water management, pipeline maintenance, and other relevant technical fields, which could empower local women and youth.



Plate 11: Women FGD Participants



Plate 12: Youth Participants being interviewed



Plate 13: Male FGD Participants at AIPCA church ground.
Source: Consultant's site visit 12th June 2024

Feedback from FGDs undertaken with Kiaga Community

Feedback from the Men:

In Kiaga, three set of FGDs were conducted for male based on age group. During the FGD engagement with the men, twelve participants in each of the sessions shared the following insights on the proposed project. They expressed a clear understanding of the project's goals and benefits:

- **Increased reliability:** The upgrade of the water pipelines will enhance reliability, reducing leaks and bursts and ensuring a consistent water supply;
- **Access to clean water:** They believe that the pipeline will significantly improve access to clean water, essential for the health and well-being of their households.
- **Employment opportunities:** Participants expressed interest in the job opportunities that the construction phase might bring;
- **Environmental protections:** There was a consensus on the importance of implementing robust environmental safeguards during construction to protect local flora and fauna.

However, they also raised concerns and presented the following requests:

- **Construction disruptions:** Concerns about disruptions during construction, especially regarding access to roads and essential services; and
- **Environmental impact:** Participants highlighted worries about the potential negative impact on nearby agricultural lands and natural water sources.

Feedback from the Women:

Twelve female participants contributed significantly to the FGD. They expressed the following opinions:

- They highlighted expectations that improved water infrastructure would lead to better sanitation and hygiene conditions in their communities.
- Participants hoped that local service providers would improve customer service and promptly address water-related issues.
- The project is expected to alleviate the burden of fetching water, a task that predominantly falls on women.

Concerns were raised about significant water loss due to the poor condition of existing water pipes, with hopes that the project will mitigate these losses. Further, Participants expressed hopes that local service providers will enhance customer service and respond promptly to water-related issues

Feedback from the Youth

3 youth members (low turnout in youth was attributed to by casual job hunting in the rural area of Kerugoya and Kutus) actively participated in the FGD, expressing their awareness of the project and offering the following feedback:

Benefits:

- Youth participants highlighted the potential for job creation across various skill levels, anticipating opportunities for both skilled and unskilled labor;
- They were optimistic about the project's promise to ensure a steady supply of safe drinking water.

Impacts:

- Concerns were raised about potential damage to local roads caused by trenching activities.
- Concerns were raised about potential noise pollution from construction activities, which could disrupt daily life and studies.

Suggestions:

- Participants suggested maintaining clear and consistent communication with the community about project timelines and potential disruption
- There was a consensus on the need for rigorous supervision of trench digging activities to minimize environmental impact
- Participants suggested scheduling construction activities thoughtfully to mitigate disruption to residents and activities.

Expectations:

- They anticipate opportunities for the community to be involved in monitoring the project's progress and ensuring transparency.
- There is hope that the project will support local businesses by providing reliable water for commercial activities, thereby boosting the local economy.



Plate 14: Public Participants at Kiaga chief camp



Plate 15: Female FGD Participants at Kiaga



Plate 16: Youth FGD Kiaga Participants
Source: Consultant's site visit 12th June 2024



Plate 17: Area MCA sharing his views.

Feedback from FGDs undertaken with Ngaru Community

Feedback from the Men:

In Ngaru the FGDs were held for both Nyaga and Ngaru consultation meetings; 13 number males were engaged in the discussions for both Ngaru and Nyaga. During the FGD engagement with the men, the

participants shared the following insights on the proposed project. They expressed a clear understanding of the project's goals and benefits:

- **Community health programs:** The men suggested that the project could support community health programs by providing clean water for clinics and health centers;
- **Support for livestock:** They emphasized that a reliable water supply would greatly benefit livestock, which are a critical part of their livelihood.
- **Educational support:** Participants believed that the availability of clean water would improve school attendance and performance, as children would spend less time fetching water;
- **Water security:** They appreciated the project's potential to improve overall water security in the region.

However, they also raised concerns and presented the following requests:

- **Dust pollution:** Concerns about dust pollution during the construction phase affecting air quality and health; and
- **Environmental impact:** Participants highlighted worries about the potential negative impact on nearby agricultural lands and natural water sources.

Feedback from the Women:

Ten female participants contributed significantly to the FGD in Ngaru and for Nyaga where there were two sets of female FGDs, 8 no. for first FGD and 12 no. for the second FGD were engaged. They expressed the following opinions:

- The women highlighted the project's potential to improve health and nutrition by ensuring a steady supply of clean water for cooking and drinking.
- Participants believed that the project would strengthen social cohesion by providing a shared resource that everyone benefits from.
- They expressed hope that the project would include initiatives to empower women, such as training in water management and small business skills.

Concerns were raised about waste management during construction and requested proper disposal measures to avoid pollution. Further, Participants expressed the need for strategically placed water access points to ensure that all parts of the community could benefit from the project.

Feedback from the Youth

No youth participants were present during the FGD session of Ngaru and 7 no. youth were engaged for Nyaga FGDs. The absence for Ngaru youths was attributed to the majority of the youth being occupied with casual job hunting in the rural areas. Despite the lack of youth presence in Ngaru, insights gathered from Nyaga members suggested the following:

- There is anticipation that the project will include skill development programs for youth, particularly in technical and water management fields
- There is hope that the project will contribute to building community resilience against future water shortages and climate change impacts.

6.5.2.4 Key Informant Interviews (KIIs)

A key Informant Interview (KII) is a structured interview with an individual who can provide specialized information that might not be known by the general community i.e. a Health practitioner, community leader, an educator etc. the outcomes of the KIIs contribute to the understanding of the severity of a certain situation in a community by sector. The target groups for the KIIs for this study were schools, health institutions, security management personnel, and community leadership.

Key informant Interviews were undertaken with staff members of local institutions that offer basic services and will equally be affected by the project i.e. Educators for St Kangai Secondary School and county department of health, and county water department.

Additionally, the Assistant County Commissioners and County Director Department of Water, Environment, and Climate Change were interviewed to provide information on the security and water situation in the area, respectively.

Community profile checklists were also filled in with the assistance of the respective area Chiefs and assistant Chiefs and prominent elders who were deemed most knowledgeable on the sub-location and location profile.

The baseline information gathered from the KIIs has also been provided as part of the project area baseline.

Summary of Feedback of the KIIs on Project Perception

The table below highlights the perceptions of the interviewees on the project;

Table 21: Summary of Feedback of the KIIs on Project Perception

No	Interviewee	Institution	Project Perception
1.	Director	Kirinyaga County Water and Sanitation Department	- Sees the project as crucial for improving water supply reliability in the area, potentially enhancing public health outcomes through better access to clean water. Suggests ensuring minimal disruption to existing water services during construction and emphasizing water conservation practices post-project. Emphasizes the project's role in meeting Sustainable Development Goals (SDGs) related to water and sanitation.
2.	County director of Health	Kirinyaga Referral hospital	- Believes increased water availability will positively impact health outcomes, reducing waterborne diseases and improving sanitation. Emphasizes the need for community health education during and after construction to maximize health benefits. Considers potential challenges related to health risks during construction and suggests mitigation measures.
3.	Public health Officer	Level 5 hospital	- Expects improved water access to benefit nutrition programs, particularly in schools and healthcare facilities. Recommends monitoring nutritional outcomes pre- and post-project to assess improvements and address any emerging issues. Highlights the potential for improved

			food security and dietary diversity.
4	Environment Officer	NEMA	- Emphasizes adherence to environmental regulations and standards throughout the project lifecycle. Recommends comprehensive mitigation measures for potential impacts on local flora, fauna, and ecosystems, ensuring compliance with IFC and national guidelines for environmental management. Highlights opportunities for biodiversity conservation and habitat restoration.
5.	Assistant County Commissioner (ACC)	National Government (OPP)	- Views the project as a catalyst for community development, potentially enhancing local economic activities through improved infrastructure. Advocates for transparent communication with affected communities and timely resolution of any grievances during project implementation. Considers social cohesion benefits and potential for community empowerment. Provide skills during project implementation (knowledgeable in water-related projects)
6.	Principal	Kangai secondary school.	- Sees the project positively impacting education by ensuring reliable water supply for students and staff. Suggests integrating educational programs on water conservation and environmental stewardship into the school curriculum. Emphasizes the project's role in enhancing school infrastructure and facilities.

6.6 Grievance Redress

A Community Grievance Procedure/Mechanism will be prepared to allow stakeholders to raise questions or concerns with the Proponent/ Contractor and have them addressed promptly and respectfully. Further, the procedure will aim to address all complaints received, regardless of whether they stem from real or perceived issues and whether the Grievant/Complainant is named or anonymous.

All affected stakeholders will have access to the procedure at no cost. The statutory rights of the Complainant to undertake legal proceedings remain unaffected by participation in the process. The grievance mechanism should be focused on communities and other stakeholders and should not incorporate employee–related grievances, which should be addressed through other channels. The Grievance Mechanism will be a dynamic document that shall be revised and updated periodically based on experience and feedback from stakeholders.

6.6.1 Principles of the GRM

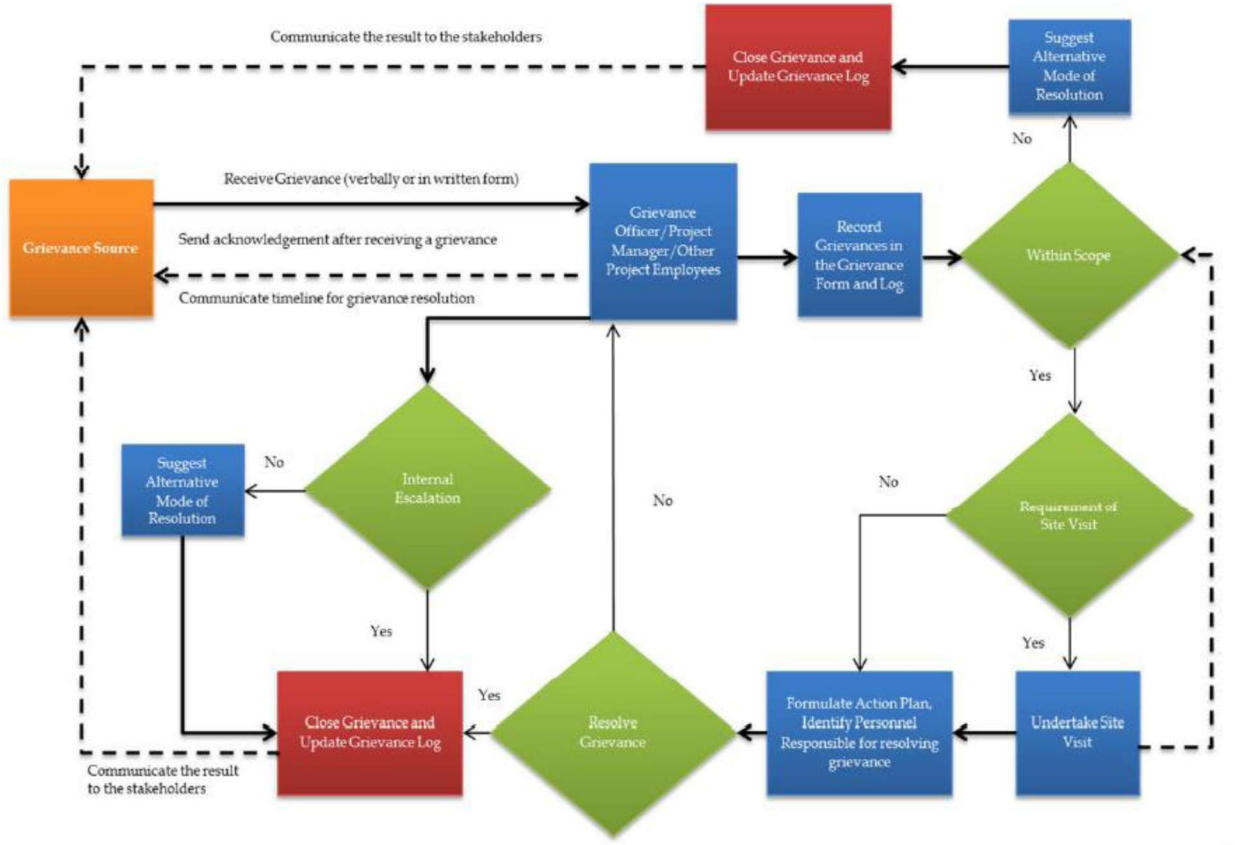
Some GRM principles have been developed with the consultations that have taken place so far that will be used in the proposed project. The principles may be developed further as more consultations take place with the affected parties. The following are the principles:

1. **Equity** – Aggrieved parties will have a chance to be heard even in situations that require them to write their complaints when some cannot write. The project will put in place mechanisms to allow proxies draft complaints for community members who cannot write;
2. **Transparency** – grievances or complaints will be dealt with openly before local leaders or other formal institutions with facts being disclosed as and when required without favour;

3. **Language** – the language of discussion in the process of handling grievances shall be that that is used by the community members namely, Kikuyu. When community members cannot read or write in this language, they will be assisted by the project to grasp what is written that affects them;
4. **Options** – parties to any dispute or any person with a grievance will be given options openly to follow customary procedures or formal procedures. If they begin with customary procedures and are not happy with the outcomes, they will be allowed to proceed to formal processes. These options and courses of action will be made known to them beforehand; and
5. **Monitoring** – grievances and complaints will be monitored to have them settled within the shortest possible time. The project will facilitate the speedy resolution of grievances to the extent possible.

6.6.2 Grievance Procedures

Grievance Receipt: The Contractor will have a Public Grievance form to be completed by anyone who wishes to lodge a grievance. The process to be followed for the redressal of the stakeholder grievances is summarized below:



6.6.2.1 Publicizing and Disclosure of GRM

The GRM will be disclosed to the stakeholders through written and verbal communication. The mediums to be used for this purpose are public meetings and group discussions. The GRM disclosure will be done along with the disclosure of other management plans

6.6.2.2 Receiving and Recording Grievances

As part of the GRM, the grievances from the stakeholder or their representatives may be communicated verbally (in person or over a telephonic conversation) or in written form (in the format given below) to the project representatives or to the GO directly. If the grievance is received directly by the GO or other project representatives, it will be recorded directly into the Grievance Form as soon as the personnel return to site. A sample grievance form is provided as annex 13

All project staff will be informed that they must pass all grievances, and communications to the Grievance Officer (discussed in the following section) on site as soon as possible after they are received. Details of the person lodging the grievance shall be noted and passed along with the grievance. The Grievance Officer in turn will communicate all grievances to the Environmental and Social Officers for the contractor. To assist the communication of grievances, a register will be maintained at the project office and camp, at which any individual/group can come have their complaint registered. Village leaders and government departments will also be advised to pass any complaints they receive to the Contractor.

6.6.2.3 Maintaining a Grievance Register

Each grievance thus received, shall be recorded in a grievance register. The format for the grievance register shall be as follows:

This receipt is an acknowledgment of grievance registration by _____, a resident of village _____ on date_____. His/her Case number is _____

The date for the response is _____

Full name& signature of recording person_____

In case the grievance is assessed to be out of the scope of the GRM, a communication towards the same shall be made to the grievant, and an alternative mode of redressal shall be suggested.

6.6.2.4 Site Inspection and Resolution

For the purpose of verifying and resolving the grievances received, site inspection may not be required in all cases. Depending upon the sensitivity of the issue, the requirement for a site inspection will be identified. A site inspection will be undertaken by the project member assigned by the contractor's Environmental and Social officer. The purpose of the site inspection will be to check the validity and severity of the grievance.

For this purpose, the personnel may also undertake discussions with the concerned external stakeholders. The inspection will be undertaken within two days of receiving the grievance. The assigned individual will then work with other relevant members of the Project team to investigate the problem and identify measures to resolve the grievance as appropriate. The personnel to be involved in the grievance resolution shall be dependent upon the nature of the grievance.

6.6.2.5 Resolution, Escalation, and Closure

Based on the understanding thus developed, the Grievance Officer in consultation with the concerned departments, shall identify a suitable resolution to the issue. This could involve the provision of information to clarify the situation, undertaking measures to remedy actual problems or compensate for any damage that has been caused either by financial compensation or compensation in-kind, and introduction of mitigation measures to prevent the recurrence of the problem in the future. This

resolution shall be accordingly communicated to the grievant within 10 working days of completing the site investigation. Different resolution approaches include:

- ✓ Contractor/KICOWASCO proposes a resolution;
- ✓ Contractor/KICOWASCO and the complainant jointly decide;
- ✓ Contractor/KICOWASCO and the Complainant use traditional practices
- ✓ Complainant seeks legal redress

Legal Redress

The proponent/contractor should establish an escalation mechanism for unresolved grievances, allowing complainants to seek external review or arbitration or judicial redress if they are not satisfied with the project's response.

6.6.2.6 Update or Records

The records of the grievance register shall be updated every working week with the present status of the grievance. Once the grievance is resolved, and the same has been communicated to the grievant, the grievance shall be closed in the grievance register. The grievance register should also provide an understanding of how the grievance was resolved. These instances shall then serve as references for any future grievances of similar.

6.6.2.7 GBV, SEA and SH GRM

The records There will be a separate reporting mechanism for GBV, SEA, and SH cases that are discrete from standard GRM. Issue from this mechanism will not go through the typical GRM. The Social Expert will be the focal point and will establish the system to handle these complaints which will include reference to confidentiality, safety, and a survivor-centered approach. All registration of the data will be confidential and anonymized.

6.6.3 Monitoring of the GRM Implementation

It is important to monitor GRM to ensure that the grievances are addressed and resolved. The monitoring of the GRM implementation will be undertaken every month by KICOWASCO. Monitoring will include:

- Auditing the implementation of the GRM;
- Monitoring the formal and informal consultation activities conducted with the stakeholder groups with respect to GRM;
- Tracking feedback received from engagement activities
- Recording and tracking commitments made to communities; and
- Assessing the efficacy of the engagement activities in terms of the desired outcomes and the participation of the stakeholder groups

6.6.4 Reporting of the GRM

The performance of the GRM will be reviewed monthly during the implementation period. For review, the monthly reports will be considered for analysis and discussion. Based on these reports, a Grievance Redressal Report will be prepared.

7 ANALYSIS OF ALTERNATIVES

This chapter describes the various alternatives considered for the conceptual design stage of the proposed Kirinyaga water Project. Analyzing environmentally and socially viable alternatives for this project involves considering several factors. These include assessing:

- The option of not proceeding with the project (No Project Alternative);
- The proposed development.
- Alternative sources of water;
- Evaluating interventions for water pipeline rehabilitation and construction.
- Exploring alternative pipeline locations; and
- Assessing timing and scheduling options.
- Considering various environmental classification alternatives.

7.1 The No Project Alternative

The overall objective of the project is to improve water supply and sanitation services in and improve the financial performance of Kirinyaga County. In addition, the project will increase water supply capacity to provide sufficient water to the population from the current 75% coverage. The proposed Project involves:

- Laying of DN160mm water pipeline areas of Kimicha and Kangai locations.
- Laying of DN110mm water pipeline for Kabedoso-Kiamwenja area and use the existing line which may require a few maintenances.
- Laying of DN90mm water pipeline for Kiaga.
- Installation of 7 No. electromagnetic bulk master meters and fittings

Economically, opting for the no project scenario would prevent potential impacts from materializing, but it would also forfeit the opportunity to realize the economic benefits associated with addressing issues such as water leaks and water scarcity through this project. Additionally, the environmental benefits of the project, such as improved water conservation and reduced environmental degradation, would not be achieved.

The KICOWASCO WSP has for a long time been struggling with cases of non-revenue water and theft through illegal connections; non-revenue water, which arises primarily from physical losses like leaks in aging infrastructure and systematic issues such as billing inaccuracies. Addressing these challenges is crucial for improving water utility efficiency and ensuring sustainable water supply to consumers. Further, illegal connections contribute significantly to water losses through the community irrigating the crops and using domestic water. This practice exacerbates non-revenue water issues by diverting water from legitimate sources without proper authorization or metering.

To mitigate these challenges and enhance service delivery, KICOWASCO is also planning to implement new connections and pipeline extensions to areas that have historically lacked access to the water supply network. These expansions aim to ensure that previously underserved or unserved communities receive reliable access to clean water, reducing the incentive for illegal connections and helping to bring more consumers into the formal billing system. By doing so, the WSP hopes to decrease non-revenue water,

improve overall water management, and ensure that water resources are used more sustainably across the service area.

The no project alternative means the current situation described above is maintained and the associated adverse effects would continue and inevitably be aggravated in the years to come. Consequently, the No-Project alternative is thus not a feasible alternative and is not supported.

Due to the proposed quality of the development, it is anticipated that it would provide a major opportunity for increased revenue because of water supply increase, reduction of non-revenue water and water meter installation campaign through this project will help KICOWASCO attain financial stability.

Advantages of this alternative

- The proposed site is on road reserves, less interruptions to the community.
- Prevents ground compaction, maintaining soil structure and minimizing impacts on groundwater.
- By less construction activities, the No-Project alternative could potentially mitigate immediate environmental disturbances and social disruptions to local communities, preserving current land use patterns and community cohesion.
- Eliminates air pollution that would otherwise result from construction-related activities like drilling.

Disadvantages of No-Project Alternative:

- **Missed Opportunity for Water Production and Service Expansion:** Without the project, the planned increase in water production capacity will not be achieved. This means areas currently lacking sufficient water supply will continue to face shortages, hindering potential economic and social development.
- **Continued Water Losses:** The reduction of Non-Revenue Water (NRW) through the installation of new distribution pipes and reservoirs will not occur, leading to ongoing water losses and inefficiencies in the water distribution system.
- **Environmental and Health Implications:** Without the project, efforts to improve water quality and reduce leakage ratios will not be realized, potentially impacting public health and environmental sustainability goals.
- **Infrastructure Development Stagnation:** The planned construction of reservoirs and expansion of distribution pipes to support areas with inadequate water service will not proceed, hampering infrastructure development and modernization efforts in the region.

The 'No Action' alternative is therefore ruled out.

7.2 Alternative Water Source

7.2.1 Drilling Borehole

Drilling boreholes involves tapping into underground water sources. Once drilled and equipped, water is pumped to elevated storage tanks, from where it flows to user points via gravity. The distribution network and number of user points depend largely on borehole yields and other factors. In the context of

Kirinyaga, specifically Kiaga and Kathiga areas and the rise on water demand, boreholes water may be insufficient, unable to meet community needs. Considering boreholes as a viable water source was dismissed due to their high-cost relative to low yields, which would not adequately meet population demands. Moreover, boreholes require equipping, transmission pipelines, elevated storage tanks on suitable land, distribution pipelines, and user points (such as water kiosks or standpipes), making them a more expensive option compared to the preferred alternative.

Moreover, boreholes require ongoing maintenance and operational costs for pumps, water quality monitoring, and potential treatment of saline water, adding to their overall expense. Environmental impacts, such as potential groundwater depletion or contamination, also necessitate rigorous assessment and management. Community consultation and regulatory compliance further complicate their implementation. Given these factors, alternative options like river-based pipelines are favored for their reliability, lower operational costs over time, and ability to meet larger water demands effectively.

7.2.2 Other Existing Rivers and Surface Water Sources

The primary water sources in Kirinyaga County the Sagana, Nyamindi, Rupingazi, Thiba, Rwamuthambi, and Ragati rivers. These drain into the Tana River. Additionally, Kirinyaga County has 29 unprotected springs, 208 shallow wells, numerous boreholes, and protected springs. There are also 12 water pans and three dams. The upper parts of the county are endowed with numerous springs which provide good water quality. In the lower parts, fertilizer and pesticide runoff enters important water sources, namely the Thiba and Nyamindi Rivers, compromising water quality. There are 12 established Water Resource User Associations in Kirinyaga County, which are organized along various sub-catchments (County Government of Kirinyaga, 2023)

The limited flow from rivers within, despite their proximity and connection to the main river system, renders them unsuitable for meeting the water demands of the project. The environmental impact assessment reveals that the lower discharge rates could potentially exacerbate environmental stress, affecting local ecosystems and biodiversity dependent on these water sources. Stakeholder consultations highlighted concerns from communities and environmental groups regarding the ecological implications of increased water abstraction from these already fragile river systems. Consequently, these factors collectively informed the decision to reject these alternative rivers as viable water sources in favor of maintaining the current abstraction.

7.3 Pipeline Material Alternative

Commonly used materials for water pipes include polyvinyl chloride (uPVC), cast iron, copper, steel, and older materials like concrete or fired clay, typically joined using methods such as flange, nipple, compression, or soldered joints to extend their length. For our project, alternatives such as concrete, cast iron, and copper were considered but ultimately rejected. Instead, we will exclusively utilize High-density polyethylene (HDPE) pipes. HDPE is chosen for its exceptional durability, corrosion resistance, and environmental benefits compared to traditional materials. Unlike galvanized steel, HDPE does not require a protective zinc coating, reducing maintenance costs and environmental impact while ensuring long-term reliability in diverse soil conditions. This decision aligns with current best practices in the industry, emphasizing sustainability and efficiency in water pipeline construction.

HDPE pipes offer superior durability and resistance to corrosion, ensuring a longer service life and reduced environmental impact through minimized material waste and lower maintenance requirements. They also present cost advantages due to lower installation and lifetime operational costs compared to traditional materials. Technically, HDPE's flexibility and ability to withstand diverse soil conditions make it ideal for installation in varied terrains without compromising performance. Moreover, HDPE's non-toxic nature ensures the integrity of water quality, supporting health and safety standards. These factors collectively affirm HDPE as the preferred choice for our pipeline project, reflecting our commitment to sustainable practices and community welfare.

7.4 Alternative Project Route

Considering alternative routes for the water pipeline project involves weighing several factors, particularly the costs and practical implications of land acquisition and site preparation. Rerouting away from existing road networks would necessitate significant expenditures on land negotiations and potentially disrupt local environments or communities. Moreover, relocating to entirely to the opposite side would pose numerous risks; for Kangai pipeline changing to opposite side will force the pipeline through maize and other plantations and other existing permanent structures, this poses logistical challenges and may require costly adaptations. These considerations highlight the economic and operational advantages of maintaining the current sites for the two lines along established road networks as proposed in the design.

By utilizing the existing road network, the project can take advantage of infrastructure that is already in place, allowing for the installation of pipelines in areas that currently lack water services, including those along access roads and utility corridors. This strategy simplifies the construction process and reduces environmental impact, as it avoids the need for extensive new developments. This approach not only makes the project easier to implement but also keeps it on track with planned timelines and budget limitations, ensuring that resources are used efficiently and that the project is completed on time. Moreover, continuing with the current site preserves the connection to existing facilities and operational systems, making the project more feasible and effective in the long run. In summary, following the existing road network is the most practical and cost-efficient choice for reaching the project's objectives. It minimizes potential disruptions, supports environmental sustainability, and ensures the project is completed smoothly and within budget.

In conclusion, relocating to a different site is not an option for the project implementation, as the project aims to improve the already identified zones with challenges of pipe leaks and high non-revenue water.

7.5 Approaches to Water Pipeline Installation

Specifically, this analysis compares the use of heavy machinery with the use of manual labor to achieve the project objectives of the water pipeline installation, considering environmental, social, and economic factors.

a) **Use of Heavy machinery: -** This alternative involves the utilization of heavy machinery for the excavation, laying, and backfilling of the water pipeline. The machinery includes excavators, trenchers, and cranes. The operational process is characterized by rapid excavation, precise trench formation, and efficient pipe laying, resulting in a shorter project timeline.

The use of heavy machinery is associated with higher levels of air and noise pollution due to fuel combustion and mechanical operations. There is also a greater risk of soil compaction and vegetation disturbance. Additionally, the use of heavy machinery limits local employment opportunities, as fewer workers are required. There may be concerns about the safety of operating machinery near populated areas. Heavy machinery is highly efficient, capable of handling large volumes of work quickly and accurately. It is suitable for complex and large-scale projects but requires skilled operators and regular maintenance.

b) **Use of manual labour: -** These alternative focuses on employing manual labor for most of the construction activities. It involves local laborers using hand tools for excavation, pipe laying, and backfilling. This approach emphasizes community involvement and employment generation, although it may extend the project timeline due to the slower pace of work.

Utilizing manual labor significantly reduces air and noise pollution. The environmental footprint is minimized, with less disturbance to the local ecosystem and reduced carbon emissions. Further, employing manual labor provides substantial employment opportunities for the local community, contributing to income generation and social cohesion. It also enhances community acceptance and support for the project. However, it necessitates thorough training and safety measures to protect workers. Manual labor is less efficient and slower compared to machinery. It is more feasible for smaller-scale projects or in areas where machinery access is limited.

After evaluating the materials, design, excavation mode, and transportation logistics of both alternatives, it is recommended to adopt manual labor for the installation of small-sized pipelines. Manual labor provides numerous benefits, including reduced environmental impact, lower costs, and enhanced community involvement. This approach ensures that the project is executed efficiently and sustainably, while also providing local employment opportunities and fostering community support. Alternatively, where the contractor wants to deploy machineries for efficiency and time saving, hybrid approach is recommended. This approach would combine the use of heavy machinery for major excavation and pipe laying tasks with manual labor for less intensive activities and finishing work.

8 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND MITIGATION MEASURES.

The implementation of the water pipeline projects Kirinyaga WSP is anticipated to result in both positive and/or negative impacts on the physical, social, economic, and biophysical environment of the project site area. This chapter identifies and discusses both negative and positive Environmental and Social impacts associated with the proposed water pipeline project.

8.1 Overview

For the identification of impacts, a breakdown of the various actions or activities of the project under study was done; categorizing the activities and associated impacts according to project implementation phases, namely: Pre-construction Phase, Construction Phase, Operational Phase, and Decommissioning Phase. The assessment of environmental and social risk for proposed Projects was guided by Kenya's Environmental Management and Co- ordination Act (Amendment) Act, 2015 and the World Bank OP 4.01 on Environment Assessment.

The impacts of the proposed project were identified based on the findings of public consultation, the existing baseline conditions and professional knowledge. Impacts were first distinguished as either positive or negative. The cross-sectoral issues and aspects: health, safety, biodiversity, air quality, pollution, social aspects; water resources; climate; infrastructure, and utilities etc.

8.2 Impact Types and Definitions

An impact is any change to a resource or receptor brought about by the presence of a Project component or by the execution of a Project related activity. The evaluation of baseline data provides crucial information for the process of evaluating and describing how the Project could affect the biophysical and socio-economic environment. Impacts are described according to their nature or type, as summarised in Table 22.

Table 22: Impact Nature, Type and Definition

Nature or Type	Definition
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change
Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor
Direct impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (e.g. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality
Indirect impact	Impacts that result from other activities that are encouraged to happen because of the Project (e.g. in-migration for employment placing a demand on resources).
Cumulative impact	Impacts that act together with other impacts (including those from concurrent or planned future third-party activities) to affect the same resources and/or receptors as the Project.

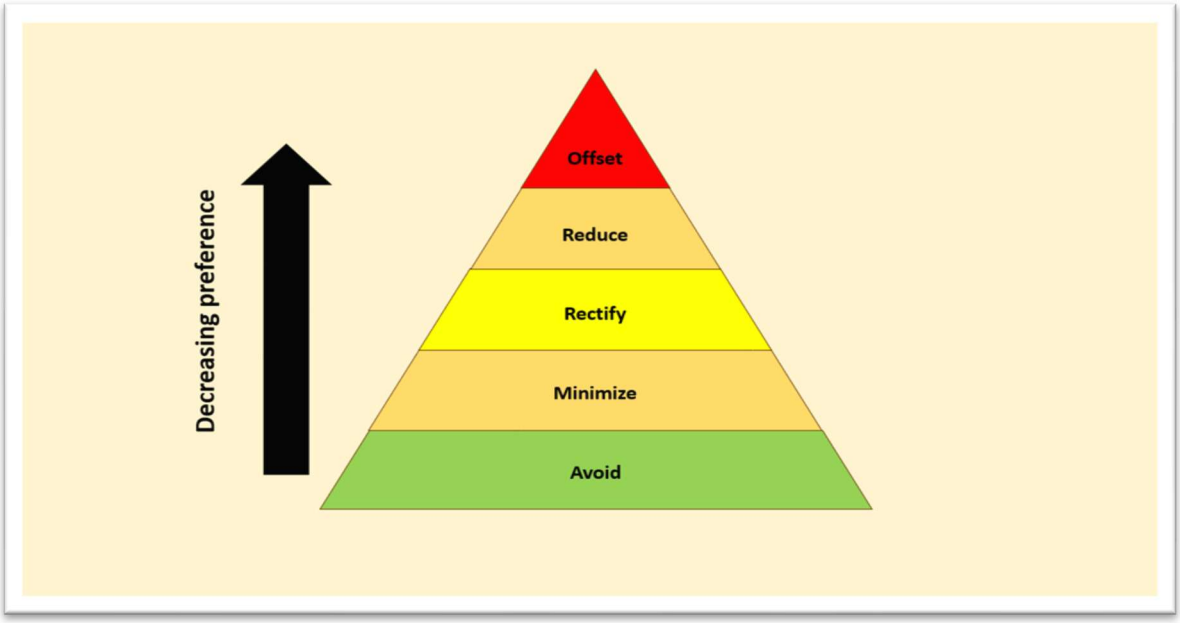
8.3 Mitigation Hierarchy

A mitigation hierarchy is a set of guidelines used to clearly define and establish how to improve the environmental and social performance of a given project. Mitigation is vital to the ESIA process because it ensures that the adverse environmental impacts of a development project are minimized or completely

avoided. This concept, commonly referred to as the "mitigation hierarchy" in ESIA literature, involves a variety of levels. The hierarchy consists of five steps to mitigate environmental and social impacts at the project site:

- Avoid
- Minimize
- Rectify
- Reduce, and
- Offset.

The hierarchy begins with the most beneficial method of mitigation and progresses to the least beneficial method.



Avoidance: - This is the initial option in the mitigation hierarchy. It involves the complete mitigation of an impact through adequate prevention measures. This option is highly preferred since it ensures that the environment is not damaged. For instance, impacts associated with child labour can be adequately avoided if contractor implements measures to ensure they do not engage employees, children, or persons without identification cards.

Minimize - This is the second step in the hierarchy, based on the understanding that the environmental impact cannot be completely mitigated. Therefore, measures are taken to ensure minimal damage to the environment. The goal is to minimize unavoidable impacts to acceptable levels. For instance, sedimentation of water sources can be minimized by controlling erosion during construction, as implemented by the contractor.

Rectify: - Rectification of an impact involves damage control, acknowledging that an impact has already occurred. Essentially, rectification allows the proponent to correct the mistake that led to the adverse environmental impact. For example, the implementation of a project can lead to labor influx, and employees might be injured. However, after safety incidents, proper measures can be enhanced, such as providing appropriate PPEs for employees.

Reduce: - If rectification is not possible, the proponent can reduce the extent of the impact through management practices or changes in methodology. For instance, tripping on the trenches can be managed by using barricading tape and/or backfilling promptly.

Environmental Offset: - Environmental offset refers to actions taken outside the development site to compensate for the impacts within the development site. Essentially, this means that the proponent undertakes environmental conservation activities to achieve "no net environmental loss," or more specifically, "no net biodiversity loss." For instance, trenching activities may require the clearance of vegetation along the pipeline route. Contractor can compensate for this by engaging in conservation measures such as tree planting elsewhere within the project area.

The assessment conducted in this chapter is based on the methodology presented in section 4.2.3.5 of Chapter 4: Approach and Methodology. Further, the significance considered hereafter were previously defined in the same section. Further **Assessment of Significance** has been presented in Chapter 4: Approach and Methodology, Section 4.2.3.5 and matrix provided in Table 11 and Table 12.

8.4 Sensitive Receptors Likely to be Impacted

The assessment identified several sensitive receptors located adjacent to the pipeline routes and within proximity of 200m to 500m to the proposed water lines that might be affected by project civil activities during construction. These receptors could suffer damage associated with the project activities. For instance, if the receptor is a school, the impact could relate to the health and safety of pupils. If the receptor is a market, the associated impacts could include the disruption of business and the demolition of structures. If the receptor is a communal water body, the associated impact could be the pollution of the water resource. The likely impacts that the project can pose to the receptors are summarized below.

Health and safety risks are associated with accidents involving the contractor's equipment and plant, as well as open excavations and destroyed access culverts, which can pose risks to students, patients, worshipers, and the public. In the case of hospitals and health centers, open trenches can restrict the movement of ambulances, and fire engines' movement can also be restricted during emergencies. Dust pollution, triggered by the movement of plant and equipment on dusty roads, poses health risks, particularly respiratory illnesses. Noise and excessive vibrations beyond 60 decibels during the day can pose health risks, such as ear-related illnesses. Additionally, the destruction of existing public utilities, especially domestic water pipelines, can trigger grievances from users or lead to the contamination of the water supply.

8.4.1 Sensitive Receptors along the Pipeline

The cumulative 7km pipeline (DN160mm 1.6km Kangai pipeline; DN110mm 800m Kiaga pipeline and 4.8km Kabedoso pipeline) consisting of HDPE pipe. Generally, these pipelines traverse through a densely populated area that includes a mix of residences, schools, business premises, churches, and agricultural lands. This route interacts closely with various community elements, such as residential neighborhoods, educational institutions, and commercial establishments, as well as surrounding farms. The proximity to these sensitive receptors requires careful consideration to minimize any potential impacts on daily life and local activities during the construction and operation of the pipeline.

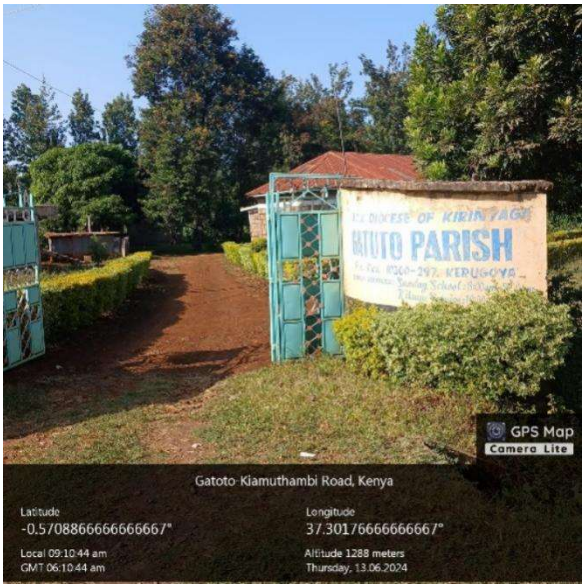


Plate 18: ACK Gatuto parish

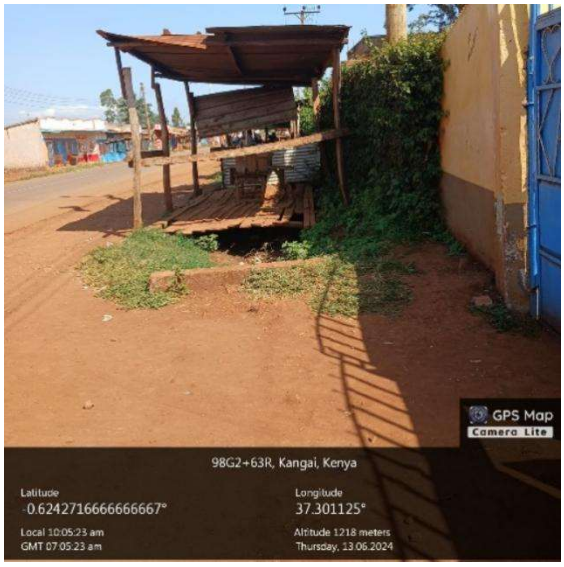


Plate 19: Kangai catholic church

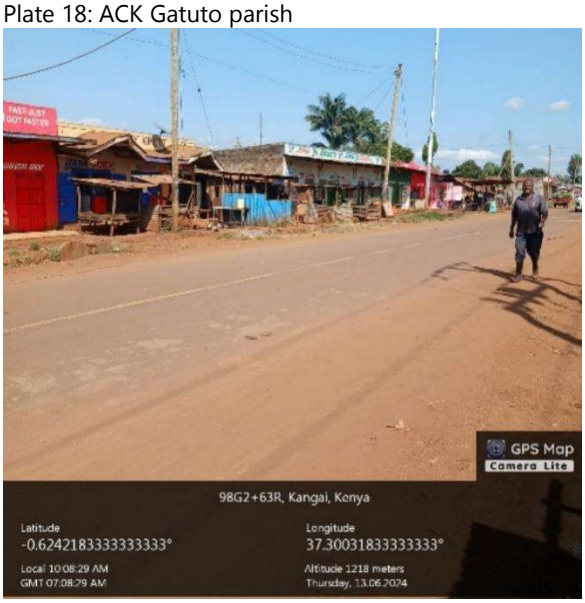


Plate 20: Tarmac Road at Kangai Market



Plate 21: Kangai market

8.5 Positive Impacts

This section enumerates and discusses the positive impacts associated with the proposed project during construction phase and the operation phase of the Project.

8.5.1 Construction Phase Positive Impacts

- *Creation of Employment Opportunities*

The commencement of project activities is anticipated to create job opportunities both for the skilled, semi-skilled and casual laborers. This will include employment opportunities for women. It will be necessary to put in place measure to maximize local recruitment potential and to prepare the local people to take advantage of these opportunities. Most of the interviewed persons are semi-skilled, while a smaller proportion is unskilled.

The population observed to be primarily self-employed; mostly working in their farms, boda-boda and small-scale retail shops. For the youth in the area, majority are unemployed; some are engaged in informal temporary labour as and when opportunities arise. Construction phase activities will include site clearance, excavations, general construction, assembly, site security and site rehabilitation. The construction phase of the Project will create direct employment opportunities across different skills levels, from unskilled to highly skilled labour.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Positive	Local	Short-term	Medium	Definite	Moderate	Temporary

Enhancement Measures: -

- Prioritize local recruitment through targeted advertising.
- Ensure gender inclusivity in recruitment efforts.
- Equal opportunities should be given to both men and women.
- Conduct community awareness campaigns.
- Monitor and evaluate recruitment outcomes for effectiveness.

- *Injection of Money into Local Economy*

Provision of ready market for construction materials such as sand, ballast and cement that will be sourced from local market for use in any repairs needed will lead to cash flow in the area hence improving local economy.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Positive	Local	Short-term	Medium	Definite	Moderate	Temporary

Enhancement Measures: -

- Kirinyaga WSP should ensure that their contractors/suppliers remit taxes and have a tax compliance certificate.
- Prioritize local purchases over imports.
- Contractor should prioritize local purchases over imports;
- Contractor should give preference to local labour which increases the local's ability to spend

- *Skills Transfer*

The Project will be associated with technological and knowledge transfer to the local sector, this will be through the artisans who will be employed and trained on job by the Project.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Positive	Local	Long-term	Medium	Likely	Moderate	Permanent

Enhancement Measures: -

- Implement structured on-the-job training programs for local artisans.

- Facilitate mentorship and knowledge-sharing sessions between experienced staff and local hires.
- Provide access to industry-standard tools and resources.

- *Increased Revenue Generation for National/County*

The project will contribute to the national kitty. The contractor will pay Value Added Tax (V.A.T) on purchasing materials for the project. The proponent will pay fees to NEMA, road agencies affected (KURA and KeRRA) to be allowed to construct the pipeline across the local roads.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Positive	Regional	Long-term	Medium	Definite	Moderate	Permanent

Enhancement Measures: -

- Kirinyaga WSP should ensure that their contractors/suppliers remit taxes and have a tax compliance certificate.
- KICOWASCO to pay for necessary permits.

8.5.2 Operation Phase Positive Impacts

- *Improved and reliable water supply for the resident Kangai, Kiamwenja and Gatuto.*

The operational phase of the water pipeline project will deliver improved and reliable water access to residents of ensuring consistent supply for health, economic activities, and community development. Further there will be an end to water rationing in the area.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Positive	Local	Long-term	Medium	Definite	Moderate	Permanent

Enhancement Measures:

- Implement regular maintenance schedules to ensure infrastructure reliability.
- Conduct community awareness campaigns on water conservation practices.
- Establish a responsive customer service system for timely issue resolution.
- Introduce water quality monitoring programs to maintain high standards.
- Develop contingency plans for quick response to supply disruptions.

- *Improved sanitation due to increase supply of water.*

Increased water supply during the operational phase will enhance sanitation practices in the villages to support better hygiene, health outcomes, and overall quality of life for residents.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Positive	Local	Long-term	Medium	Likely	Moderate	Permanent

Enhancement Measures: -

- Provide education on proper hygiene practices and sanitation.
- Collaborate with local health authorities for comprehensive sanitation initiatives.

- *Creation of employment opportunities*

During the operational phase, long term employment opportunities will also be created (e.g. Line inspectors, maintenance) which will generate income and improve the living standards of the local population and its environment.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Positive	Regional	Long-term	Medium	Likely	Minor	Permanent

Enhancement Measures: -

- Conduct job fairs and outreach to ensure broad community participation.
- Monitor employment impacts to optimize local economic benefits.

- *Reduced Water and Sanitation Burden to Women*

Availability of reliable potable water sources in the project area will significantly alleviate the burden on women, who often bear responsibility for collecting water and caring for sick family members affected by water-related illnesses. This improvement not only lessens their workload but also enhances overall family health and well-being.

- *Improved Service Delivery*

The revenues generated from water supply fees by will fund infrastructure improvements, expand coverage, reduce Non-Revenue Water (NRW), and enhance customer experience. These efforts aim to increase citizen satisfaction with their service provider's service delivery.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Positive	Regional	Long-term	Medium	Likely	Moderate	Permanent

Enhancement Measures: -

- Implement regular maintenance schedules to upkeep infrastructure.
- Introduce technology for efficient Non-Revenue Water (NRW) management.
- Establish customer feedback mechanisms for continuous improvement.
- Expand coverage through strategic infrastructure investments.
- Conduct periodic service quality audits to maintain high standards.

- *Reduced Non-Revenue Water*

Risk of Pipeline Bursts leads to rampant water loss in the two proposed lines of with replacement of the old, dilapidated pipes with HDPE, NRW will reduce. Illegal connections are common where residents connect to water supply pipes illegally to avoid paying connection fees and monthly service levies. This practice will lead to NRW and loss of revenue to Kirinyaga WSP.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Positive	Regional	Long-term	Medium	Likely	Moderate	Permanent

Enhancement Measures: -

- Schedule frequent inspections and maintenance of HDPE pipes.

- Use advanced leak detection systems like acoustic sensors and smart meters.
- Educate the community about the impacts of illegal connections and how to report issues.
- Strengthen and enforce laws against illegal connections with clear penalties.
- Ensure accurate metering and billing based on actual usage, using smart meters.

8.6 Negative Impacts

8.6.1 Construction Phase

ENVIRONMENTAL IMPACTS

8.6.1.1 Impacts on Vegetation

Vegetation forms a crucial part of the natural environment, supporting a variety of fauna, including surface-dwelling organisms and soil microorganisms. It provides essential food and shelter for these organisms. Clearing vegetation will not only affect plant species but also disturb the fauna inhabiting the area, leading to potential disruptions in the local ecosystem. Sections of the alignment has crops, tea leaves, and shrubs, with shrubs being the primary vegetation likely to be cleared during construction. However, this development will have minimal impact to the biodiversity because the vegetation cover along the Kiaga line is minimal and the Kangai line area is built up area with minimal coverage. Further, removal of vegetation and soil cover will be restricted to only those areas necessary for excavation work. In particular, unnecessary removal of groundcover vegetation from the soil will be avoided.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Medium-term	Medium	Likely	Moderate	Temporary

Impact Significance Before Mitigation

It is likely for the impact to occur during the construction phase and at a local spatial scale. Severity is Medium considering the few species to be affected leading to Moderate impact significance.

SIGNIFICANCE

			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Clearly demarcate construction zones to restrict vegetation clearance to only those areas essential for the pipeline installation;
- Implement selective clearing to avoid the unnecessary removal of significant or mature vegetation;
- Replant native vegetation in disturbed areas immediately after construction to facilitate rapid ecological recovery;

- Give chance to affected community to harvest the targeted vegetation that are within the raw water mains if they so wish

Impact Significance After Mitigation

The significance of impact after mitigation is expected to reduce from moderate to minor as shown below

SIGNIFICANCE					
		LIKELIHOOD			
		Unlikely	Likely	Definite	
		1	2	3	
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

8.6.1.2 Impacts on Water Quality

The construction phase will involve removing topsoil, excavating for the pipeline, and compacting soil, activities that may occur near these water bodies. This proximity poses several risks:

Sedimentation: Erosion of loose or bare soil surfaces can result in increased sediment load in adjacent rivers and streams due to surface runoff and contamination: There is a risk of run-off containing petroleum contaminants (fuel, lubricants, and used oil) from project machinery and equipment leaks. Soil compaction from construction equipment will lead to increased surface runoff and directed flow, reducing the infiltration capacity of compacted soils. Contaminated water percolating through the soil can degrade groundwater quality within the area of influence (AOI). Consequently, the degradation of river and groundwater quality poses health risks to users and threatens aquatic life.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	Low	Likely	Moderate	Temporary

Impact Significance Before Mitigation

Pollution of surface water sources and land is likely and could affect water quality and affect the health of communities at a local spatial scale. The severity is Medium given that it rarely rains and the distance from the proposed pipelines to the seasonal streams is far, hence moderate impact significance.

SIGNIFICANCE					
		LIKELIHOOD			
		Unlikely	Likely	Definite	
		1	2	3	
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Use mulching, hydro seeding, or other ground cover methods to stabilize exposed soil and prevent erosion;

- Regularly inspect and maintain construction machinery and equipment to prevent leaks of petroleum products;
- Limit the movement of heavy machinery to designated paths to reduce the overall area of soil compaction;
- Where possible construction activities close to these rivers should be scheduled for the dry seasons;
- The removal of vegetation and soil cover will be restricted to only those areas necessary for excavation work. Particularly, the unnecessary removal of groundcover vegetation from the AoI will be avoided.

Impact Significance After Mitigation

The significance of impact after mitigation is expected to reduce from moderate to minor as shown below

SIGNIFICANCE					
			LIKELIHOOD		
MAGNITUDE			Unlikely	Likely	Definite
			1	2	3
	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

8.6.1.3 Soils and geological disturbance

During the construction phase, heavy machinery delivering the pipes and excavations works will inevitably lead to soil disturbance. Therefore, the Contractor must implement mitigation measures aimed at minimizing soil disturbance and erosion. These measures should include clearing excavated materials from the project site promptly, protecting excavated areas from storm water runoff, avoiding excavation in floodplains or near stream banks, and developing emergency procedures to protect soil integrity.

Vegetation clearance will expose the soil to erosion agents such as surface runoff and wind, especially in mountainous areas receiving high precipitation. The loose soil thus exposed will be highly susceptible to wind erosion, leading to the loss of topsoil crucial for vegetation growth. Additionally, frequent movement of heavy machinery will compact the soil, reducing air and water penetration and limiting aerobic activity of soil organisms. While this primarily affects local soil productivity, compaction also increases runoff during the rainy season.

The pipeline route includes sections with varying slopes and gradients, Steeper slopes are more prone to erosion as water runoff can move more rapidly, carrying soil with it. The movement of construction vehicles and machinery can compact the soil, reducing its permeability and increasing surface runoff, which can lead to erosion. The creation of access roads can also disturb soil and vegetation.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	Low	Likely	Moderate	Temporary

Impact significance before mitigation

It is likely that the impact will occur at a local spatial scale and on short term, and severity will be medium considering that the site doesn't experience rainfall to suppress soil/dust emission. Likewise exposed soil due to clearance of vegetation is highly susceptible to wind erosion, thus leading to moderate impact significance.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Excavated soil should be placed on flat surfaces and away from water ways (at least 100 away);
- Ensure timely removal (reuse) of excavated materials from the project site to minimize soil exposure and erosion risk;
- Avoid excavation in floodplains, near stream banks, or other sensitive areas prone to erosion;
- Plan construction activities to minimize simultaneous disturbance of large areas, thereby reducing overall soil exposure and erosion risk;
- Earthworks shall be meticulously controlled to ensure the surrounding areas remain undisturbed and preserved in their natural state.
- Implement phased vegetation clearance to minimize the extent of exposed soil and maintain natural ground cover where possible;
- Utilize tracked or low-ground-pressure equipment to minimize soil compaction during construction activities;
- Where compaction occurs, implement soil aeration techniques post-construction to enhance soil structure and fertility.

Impact Significance after Mitigation

The significance of impact after mitigation is expected to reduce from moderate to minor as indicated in the table below.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

8.6.1.4 Impact on Local Air Quality (Dust Generation & Exhaust Emissions)

The construction activities often result in increased dust. These pollutants emanate from movement of construction machinery and trucks as well as dust generated during construction. Kangai pipeline route is located in a predominantly settled area where the main air pollution activities include vehicle movements along the road. While for Kiaga line vehicle movements (collecting Avocados and bananas) is the main activity contributing to air pollution in the area. During site visit activities, dust emissions by trucks were observed.

During the construction phase, the main sources of air pollution for the two pipeline will be soil excavations which raise particular particulate matter (dust) within the Project AoI. Moreover, transportation of Project materials and equipment will be associated with dust emissions along the access roads especially on murram roads. In addition, exhaust emissions from the construction equipment and machinery are expected to include CO2, NO2, SO2 and volatile organic compounds, since most of them will be powered by diesel/ petrol engines. However, these will be in very small quantities since light construction activities are expected, mainly associated with the pipeline excavation.

The main receptors of this impact will be the construction workers, other road users and some nearby settlements and institutions, including health centres and schools.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	Medium	Likely	Moderate	Temporary

Impact significance before mitigation

It is likely that air pollution will occur during the project lifespan, but there are communities leaving along the route. Additionally, workers at the project site will be exposed, and severity is predicted to be Medium hence moderate impact significance.

SIGNIFICANCE					
		LIKELIHOOD			
		Unlikely	Likely	Definite	
		1	2	3	
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Practice prevention measures such as dampening dust by use of water (sprinkling water on surfaces that produce dust or covering them);
- Provide PPEs such as nose masks to the workers on the construction site;
- Spraying water on soil before excavation and periodic access road wetting to reduce nuisance dust levels;
- Speed restriction of construction vehicles to a speed of 30 km/h or less on the site and on the access roads to the site;

- Ensure construction equipment and machinery are well-maintained to minimize emissions;
- Install and properly maintain exhaust emission control devices, such as diesel particulate filters (DPF) and selective catalytic reduction (SCR) systems, on diesel-powered machinery to minimize emissions of particulate matter and nitrogen oxides.

Impact Significance after Mitigation

The significance of impact after mitigation is expected to reduce from moderate to minor as indicated in the table below.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

8.6.1.5 Noise and Excessive Vibration Generation

Noise levels within the Project footprint vary, being low and insignificant in Kiamwenja pipeline area due to the rural set up of the area and relatively high around Kangai pipeline due to increased settlements and human activities. Construction activities, such as vehicular movements, operation of equipment and machinery, and excavation, will generate noise and vibrations. The primary sensitive receptors will include construction workers, nearby schools, health centers, road users, and settlements along access roads. The project is engaging an independent contractor who might opt to use excavators, back hoe and use of drill hammer for breaking hard surface. Consequently, this might generate noise and vibration. Nonetheless, such small-scaled construction is basically done by manual excavation, construction time is limited and therefore, abovementioned impact can be minimized.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	Medium	Likely	Moderate	Temporary

Impact significance before mitigation

It is likely that there will be noise pollution, movement of tracks and vibrations during excavation exercise (where the contractor opts to use heavy machineries) exercise. Severity will be Medium hence Moderate impact significance.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Use modern, well-maintained equipment designed to operate with minimal noise and vibrations;
- Prioritize manual excavation methods in areas close to sensitive receptors to minimize noise and vibration impact;
- Limit construction activities to daytime hours (e.g., 8 AM to 5 PM) to reduce the impact on nearby residents and sensitive institutions;
- Restrict the use of high-impact equipment, such as drill hammers, to specific times and durations to minimize disruption;
- Provide advance notice to local communities, schools, and health centers about the timing and duration of noisy activities;
- Provide construction workers with appropriate PPE, such as earplugs to protect against prolonged exposure to high noise levels;
- Ensure vehicles and construction machinery are serviced per the manufacturer's manual to minimize noise/vibration.

Impact Significance After Mitigation

The significance of impact after mitigation is expected to reduce from moderate to minor as demonstrated below.

SIGNIFICANCE					
			LIKELIHOOD		
MAGNITUDE			Unlikely	Likely	Definite
			1	2	3
	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

8.6.1.6 Waste Generation

During construction, solid waste will be generated from various project activities. This waste includes materials such as plastic wrapping, discarded packaging, broken pipe segments, excess soil, and spoil. To minimize pollution and visual intrusion, waste will be managed appropriately as outlined in this subsection.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	Medium	Likely	Moderate	Temporary

Impact significance before mitigation

Pollution of surface water sources and land could affect water quality and affect the health of local communities. It is likely that the impact will occur and severity will be Medium given size of operations and number of personnel that will be on site, hence leading to moderate impact significance.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Provide litter collection facilities such as bins and create awareness campaigns to segregate as early as possible, using the appropriate bins
- Temporary storage in stock piles for further use on site or removal;
- Evaluate the suitability of spoil for non-critical backfilling or landscaping within the project area where permissible;
- Ensure pipe cuts are returned to the store for future use;
- Develop a spoil management plan to identify opportunities for reuse, recycling, or proper disposal of excavated materials based on site-specific conditions;
- Store spoil in designated areas with secure covers or enclosures to prevent dispersion and minimize visual and environmental impacts;
- All personnel shall be instructed to dispose of all waste in a proper manner;
- Ensure spoil from excavations is arranged according to the various soil layers. This soil can then be returned during landscaping and then rehabilitation, in the correct order which they were removed that is top soil last.

Impact significance after mitigation

The significance of impact after mitigation is expected to reduce from moderate to minor as clearly indicated in the table below.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

8.6.1.7 Occupational Health and Safety Impacts Concerns

Health and Safety risks for the community and workers are often triggered by Project activities during Project implementation Phase. These risks often affect both workers on site as well as general community near the work site. Inherent occupational risks include muscular-skeletal injuries, falls into un-marked/ uncovered trenches and accidents from construction vehicles. During the construction of the proposed project, it is expected that construction workers are likely to have accidental injuries

because of accidental occurrences, neglect of the use of protective gears among others. Accidents may also occur to members of public, and livestock from trenches left open.

Dust and emission: Dust from excavation activities can irritate the eyes causing trachoma and respiratory problems and emissions from machinery can cause respiratory problems such as asthma, bronchitis, and other lung diseases. While the operation of construction equipment and handling of materials can result in injuries to the workers especially in the absence of appropriate protective devices. The health of the site workers may be further compromised by the food that is often supplied by mobile individuals with no licenses to handle food and some of the foodstuffs may be prepared in unhygienic manner.

Labour and working conditions: Labour and working conditions, including occupational health and safety, must be prioritized to prevent incidents or injuries. Key considerations include fair treatment, non-discrimination, equal opportunities, and providing safe and healthy working and living conditions for all workers, including those employed by the Proponent, Contractor, and sub-contractors. Without proper management, inadequate health and safety standards may expose the workforce to risks, potentially leading to injury or death.

Workers Accidents and Hazards: - Construction workers are likely to have injuries and hazards as the construction works unavoidably expose workers to occupational health and safety risks. The workers are also likely to be exposed to risk of accidents and injuries resulting from accidental falls and injuries from hand tools and construction equipment. Workers or bystanders may accidentally fall into open trenches, leading to injuries.

Musculoskeletal Injuries is possible: For manual works, repetitive tasks such as digging, lifting, and carrying heavy materials can lead to strains, sprains, and chronic musculoskeletal disorders. Further, continuous manual labor without adequate breaks can result in fatigue, increasing the risk of accidents and injuries.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	High	Likely	Major	Temporary

Impact Significance Before Mitigation

Considering hazard from construction activities and vehicles, the severity of the impact is therefore high as it could lead to loss of life and serious damage to community resources. It is likely for this impact to occur in normal operations due to the inherent technical controls. The impact significance is therefore graded is Major.

SIGNIFICANCE

			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- All workers to be trained and inducted on the requirement of the implementation of ESMPs before start working;
- Strict use of warning signage and tapes where the trenches are open and at other active construction sites;
- Ensure all workers including management staff are inducted on OHS
- Ensure there are sufficient, visible danger-sign posts put up at the site to warn passers-by or workers of potential accidents or incidents;
- Establish a safe working environment with an occupational health and safety (OHS) plan that addresses potential hazards, identifies preventive and protective measures, including training and use of personal protective equipment (PPE), and describes documentation and reporting of accidents, diseases and incidents;
- All construction workers will be required to wear Personal Protective Equipment (PPE) i.e. helmets, gloves and safety boots during the construction phase;
- Provide shaded rest areas and ensure workers have access to ample drinking water. Schedule work to avoid peak heat periods;
- Monitor workers for signs of heat stress and provide immediate medical attention if needed

Impact Significance After Mitigation

The significance of impact after mitigation is expected to reduce from Major to Moderate. The application of the above mitigation measures will reduce the likelihood of the impacts from occurring hence reducing the significance.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

8.6.1.8 Risks Associated with Traffic on Site

The construction of Kiaga, Kimicha, and Kabedoso pipeline extensions will be outsourced to an independent contractor who may use vehicles and machinery to save time and simplify tasks. Effective management of transport operations is crucial to prevent construction site incidents. Key measures include separating pedestrians and vehicles, minimizing site traffic, ensuring safe vehicle turning, maintaining visibility, and providing clear signs and instructions. Given the small-scale nature of the construction, with limited timelines and predominantly manual excavation, these impacts can be effectively minimized.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	Low	Likely	Medium	Temporary

Impact significance before mitigation

It is likely that there will be heavy tracks on the road o (where the contractor opts to use machineries/heavy vehicles). The severity of impacts associated with movement of tracks will be medium, hence leading to moderate significance of impact.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Install clear and prominent signage indicating speed limits, right of way, and site rules;
- Provide regular safety briefings and training sessions for all personnel on traffic management procedures and protocols;
- Limit the number of vehicles and personnel on-site to essential operations only;
- Recommend the contractor prioritize manual labourers for excavation and construction tasks where feasible, especially in areas where machinery may pose safety risks or environmental concerns;
- Use manual methods for digging trenches, backfilling, and handling smaller loads to minimize the use of heavy machinery on-site;
- Develop and implement a traffic management plan to ensure safe movement of construction vehicles and minimize disruptions to local traffic.

Impact significance after mitigation

The significance of impact after mitigation is expected to reduce from moderate to minor as illustrated in the table below.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

8.6.1.9 Community Health and Safety Concerns

In scenarios where the contractor will be using machineries, increased traffic and machinery use near schools and shops raise the risk of accidents involving children and other community members. This is possible for the case of Kimicha-Kangai pipeline which is fairly built and with learning institutions along the pipeline route. For Kabedoso-Kiamwenja pipeline which has rural set up, construction activities may

pose risks to livestock, including potential injuries from open trenches or machinery. Further, lack of proper barriers may allow livestock, school going children and the local populace to wander into construction areas, increasing the risk of accidents

Falls and trips: Open trenches pose safety risks; workers or community members can accidentally fall into open trenches, leading to injuries such as fractures, sprains, or head injuries. Further, inadequate lighting or poor visibility, especially during dawn or dusk, increases the risk of falls into trenches.

With increased construction activities, the community and livestock are exposed to accidents involving traffic and livestock tripping on the trenches. These includes: increased traffic and machinery use near schools and shops raise the risk of accidents involving children and other community members.

Noise and Vibration: where there will be use of machineries, noise and vibration disturbance will be issue of concern with high noise and vibration levels from construction activities disrupting daily activities and affect the well-being of nearby residents.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	High	Likely	Major	Temporary

Impact Significance Before Mitigation

Considering hazard from construction activities and vehicles, the severity of the impact is therefore high as it could lead to injuries and serious damage to community resources. It is likely for this impact to occur in normal operations due to the inherent technical controls. The impact significance is therefore graded is Major.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Inform the community in advance about construction schedules, road closures, and alternative routes through meetings, leaflets, and local media;
- Restrict noisy construction activities to daytime hours and avoid early mornings, late evenings, and weekends to reduce disturbance;
- Install clear and visible warning signs around the construction site indicating potential hazards, construction zones, and restricted areas;
- coordinate with nearby schools to schedule construction activities that avoid peak times for school arrivals and departures;
- Appoint community liaison officers to act as points of contact between the construction team and the community, addressing concerns and providing updates;

- Ensure that access routes for emergency vehicles are always kept clear and accessible;
- Conduct health campaigns to educate the community about the potential health impacts of construction activities and preventive measures they can take

Impact Significance After Mitigation

The significance of impact after mitigation is expected to reduce from Major to Moderate. The application of the above mitigation measures will reduce the likelihood of the impacts from occurring hence reducing the significance.

SIGNIFICANCE					
			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

SOCIAL IMPACTS

8.6.1.10 Loss of Crops

The pipes for this project will be laid along the side of the road reserve and where an existing line passes. It is noted that some residents have encroached into the road reserve for subsistence agriculture and gardening in certain sections. These encroachments, covering a small area, involve crops such as maize, napier grass. A total of 46 Project-Affected Persons (PAPs) (20 in Gatuto, 26 in Kangai) will be impacted, with 6 Napier grass plantations and other crops affected. While the impact is expected to be minimal, efforts will be made to minimize disruption. Compensation for affected crops will be provided based on current market rates, as outlined in the summary PAP/Assets register separately prepared.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Long-term	High	Definite	Moderate	Temporary

Impact Significance Before Mitigation

It is definite that loss of crops along the alignment will occur during the construction phase and at a local scale. Severity is considered Medium considering that crops will be cleared to pave way for the pipeline leading to moderate impact.

SIGNIFICANCE					
			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Provide fair and timely compensation to affected residents for the loss of crops as outlined in the Project Affected Persons (PAP) register;

- Inform persons affected well in advance about the construction schedule and the areas that will be affected. This allows them to harvest crops where possible before clearing begins;
- Engage with the affected persons through meetings and consultations to explain the necessity of the project and address their concerns. Ensure transparency in the communication process;
- Prioritize hiring affected residents for suitable roles in the project;
- Issue timely notices to affected persons regarding the duration and nature of the temporary displacement;
- Establish and implement a grievance redress mechanism to address complaints and concerns from affected residents promptly and fairly.

Impact Significance After Mitigation

The significance of the impact is expected to reduce from medium to Minor as shown below.

SIGNIFICANCE					
			LIKELIHOOD		
MAGNITUDE			Unlikely	Likely	Definite
			1	2	3
	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

8.6.1.11 Temporary Loss of Income (Disruption of Business)

The pipeline route follows the road reserve, running parallel to the existing pipeline. However, in sections of Nyaga, locals have established businesses (e.g., temporary makeshift structures) within the road reserve. Similarly, in the Kangai line area, a significant stretch of the route is encroached upon by these temporary business setups, such as makeshift structures. Construction activities may temporarily disrupt business activities. A total of 30 Project-Affected Persons (PAPs) will experience temporary loss of income due to business disruption (11 in Gatuto and 19 in Kangai). Compensation will be provided based on documented earnings, as outlined in the summary RAP, ensuring fair and transparent facilitation. Once construction is completed, businesses can resume operations. No permanent land acquisition will occur, as the land is part of the road reserve.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	High	Likely	Moderate	Temporary

Impact significance before mitigation:

It is likely that loss of income may arise from the disruption of businesses during construction. However, compensation will be provided to those affected based on the asset regitser separately prepared, ensuring that the impact is addressed and minimizing potential disputes. The severity of the impact is considered Medium, resulting in a Moderate significance of the impact before mitigation.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Compensate for temporarily loss of income from disruption during construction.; compensate based on earning from the goods and service;
- Engage affected persons in the compensation process; communicating criteria, timelines, and agreements clearly;
- Ensure prompt payment of compensation to mitigate financial hardship;
- Institute and maintain an active grievance redress mechanism on site during the construction phase to ensure that any arising issues are promptly and amicable addressed.

Impact significance after mitigation:

The significance of impact after mitigation is expected to reduce from Moderate to Minor. The application of the above mitigation measures will reduce the likelihood of the impacts from occurring hence reducing the significance.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

8.6.1.12 Spread of HIV/AIDS and STIs

Construction sites are potentially primary centres of HIV-AIDS. The project will attract new people to the project area seeking employment during the construction period and this can lead to increased transmission of HIV/AIDS and other sexually transmitted diseases (STDs) as they engage in sexual relationships amongst themselves and/or local community members. In the context of the Kangai and Kiaga water pipeline project, the increased employment opportunities for skilled and unskilled workers could lead to immigration and a labor influx. This may foster closer interactions between workers and the local community, potentially increasing the risk of HIV, gonorrhea, and other sexually transmitted infections. Such health challenges could raise HIV prevalence rates in the area and impact the productivity of the community's workforce.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	National	Long-term	High	Definite	Moderate	Permanent

Impact Significance Before Mitigation

It is probable that this impact may occur on a long-term scale based on evidence of other construction projects in other parts of the country where contractors fail to put in place controls to mitigate such impacts. The severity of impact is Medium considering the impact on affected individuals, their families and the social stigma associated with such impacts. The significance is Moderate.

SIGNIFICANCE

			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- The contractor will undertake sensitization of the HIV /AIDs AND STD awareness e.g. by use of posters etc.;
- Implement a comprehensive HIV/AIDS awareness program for workers, including mandatory sessions on voluntary counseling, testing, and referral services;
- Implement signing of a mandatory Code of Conduct to discourage inappropriate workplace relationships, defining acceptable behavior and promoting a respectful environment
- Contractor to institute HIV/AIDS awareness program and implemented as part of the Health and Safety Management Plan targeting both workers and the local community;
- The Contractor shall institute HIV/AIDS awareness and prevention campaign amongst his workers for the duration of the contract.

Impact Significance After Mitigation

Application of the above mitigation measures will reduce the likelihood of occurrence and severity of the impact to low. The significance of impact after mitigation is therefore expected to reduce from moderate to minor as indicated in the table below.

SIGNIFICANCE

			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

8.6.1.13 Increase in cases of Gender Based Violence

Gender Based Violence (GBV), Sexual Exploitation Abuse (SEA), and Sexual Harassment (SH) may be committed against the communities by the construction workers and among staff during the construction of the Project. Incidences of Sexual Harassment (SH) may occur among the staff during construction phase of the project. This may be experienced while the women are searching for jobs and those giving the jobs may ask for sexual favour. The community may also promote sexual exploitation cases by willingly involving themselves with workers.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Long-term	High	Likely	Major	Permanent

Impact Significance Before Mitigation

It is probable that this impact may occur on a long-term scale based on evidence of other construction projects in other parts of the country where contractors fail to put in place controls to mitigate such impacts. The severity of impact is Medium considering the impact on affected individuals, their families and the social stigma associated with such impacts. The significance is Major.

SIGNIFICANCE

			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Proponent to develop and enforce a comprehensive policy against GBV, SEA, and SH that includes zero-tolerance principles;
- Contractor will implement the approved code of conduct that has provisions in addressing GBV/SEA/SH;
- Conduct regular awareness sessions for all project staff, emphasizing respectful behavior, and the consequences of GBV, SEA, and SH;
- Implement transparent and fair recruitment practices to prevent instances where job seekers may be coerced into providing sexual favors;
- Ensure that recruitment processes are conducted in a gender-sensitive manner, promoting equal opportunities;
- Engage with community leaders, and local authorities to raise awareness about GBV, SEA, and SH;
- The contractor to prepare a GBV/SEA/SH action plan that will guide implementation of GBV mitigations;
- All workers will be inducted and sign the code of conduct before deployment to the work station;
- All GBV, SEA, and SH allegations and cases will be reported promptly to relevant authorities;

- The contractor will establish and maintain adequate referral mechanisms to address cases of Gender-Based Violence (GBV) reported at the community level related to project implementation.

Impact Significance After Mitigation

Significance after mitigation is expected to reduce from major to moderate level as shown overleaf.

SIGNIFICANCE					
			LIKELIHOOD		
MAGNITUDE			Unlikely	Likely	Definite
			1	2	3
	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

8.6.1.14 Child Labour/Exploitation

This involves employment and engagement of children in the project activities. Children are a vulnerable population in the community in reference to the project activities; poverty may prompt children to seek work for pay and complement the family income. This poses a risk of child exploitation and sexual abuse hindering holistic growth of the child. Nonetheless, children in the areas of Kangai and Kiaga attend school regularly and child labor is not prevalent, making the risk of child labor associated with the project to be low. However, it's essential to remain vigilant and have measures in place to prevent any potential risks.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Long-term	Low	Likely	Minor	Permanent

Impact Significance Before Mitigation

Children in the project area are fully engaged in schooling and child labor is not prevalent. There is likelihood of the impact happening on a local spatial scale. However, the severity of the impact is medium, hence minor impact significance.

SIGNIFICANCE					
			LIKELIHOOD		
MAGNITUDE			Unlikely	Likely	Definite
			1	2	3
	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Engage with local communities, schools, and parents to raise awareness about the importance of education and the risks of child labor;
- Establish mechanisms to monitor project activities for signs of child labor, such as age verification checks for workers;

- Collaborate with education authorities to monitor school attendance and identify any potential dropouts who may be at risk of child labor;
- Establish protocols for immediate response and support for children identified as victims of or at risk of child labor, including access to social services, counseling;
- Child abuse and labour will be prohibited; clear signages put up to clearly show that children are prohibited from works areas, including food vending

Impact Significance After Mitigation

The significance of impact after mitigation is expected to reduce from **minor** to **negligible** as indicated in the table below.

SIGNIFICANCE					
		LIKELIHOOD			
MAGNITUDE		Unlikely	Likely	Definite	
		1	2	3	
Negligible	1	Negligible 1	Negligible 2	Minor 3	
Low	2	Negligible 2	Minor 4	Minor 6	
Medium	3	Minor 3	Moderate 6	Moderate 9	
High	4	Moderate 4	Major 8	Major 12	

8.6.1.15 Influx of Workers from Other Areas

The project area might experience an influx of workers from other areas. This will directly affect the normal social set up of communities living in the project area thereby possible decay of morality, petty thieves and increased HIV/AIDS incidence and communicable diseases.

Emphasizing proactive community engagement and support initiatives to foster ethical behavior and discourage practices that could disrupt local norms is crucial. Further, through educational campaigns targeting the residents, highlighting responsible conduct and addressing risks such as HIV/AIDS and communicable diseases, any emerging challenges will be address. Additionally, the project's positive economic contributions, including job creation and local economic development, are expected to bolster community resilience and stability. Nonetheless, given the project's small-scale nature and limited workforce requirements, the likelihood of significant disruption to the community's social dynamics is minimized.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	Medium	Likely	Minor	Permanent

Impact Significance Before Mitigation

Children in the project area are fully engaged in schooling and child labor is not prevalent. There is likelihood of the impact happening on a local spatial scale. However, the severity of the impact is low, hence minor impact significance.

SIGNIFICANCE				
		LIKELIHOOD		
MAGNITUDE		Unlikely	Likely	Definite

			1	2	3
	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Ensure that unskilled labour is sourced locally;
- Contractor to develop an induction programme, including a Code of Conduct, for all workers (including contractors and their workers);
- Respect for local residents;
- Develop and implement a grievance procedure that is easily accessible to local communities

Impact significance after mitigation

The significance of impact after mitigation is expected to reduce from minor to negligible as indicated in the table below.

SIGNIFICANCE					
			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

8.6.1.16 Sexual Exploitation and Abuse (SEA) and Sexual Harassment

Sexual harassment against women might also happen because of mixing of women and men at the construction site. Further, there is possibility sexual exploitation of children, especially young girls. This impact may be 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.

Sexual exploitation and abuse (SEA) of community members by project workers and sexual harassment (SH) among project workers are forms of GBV that are a potential risk and impacts to this proposed project. GBV has serious and far-reaching negative effects including physical injuries resulting in death or disfigurement, psychological trauma, infection with HIV/AIDS, unwanted pregnancies, social stigmatization and exclusion and economic deprivation among others. Consequently, it is incumbent that preventive measures be mooted to prevent occurrence of such cases.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Long-term	High	Likely	Major	Permanent

Impact Significance Before Mitigation

It is probable that this impact may occur on a long-term scale based on evidence of other construction projects in other parts of the country where contractors fail to put in place controls to

mitigate such impacts. The severity of impact is Medium considering the impact on affected individuals, their families and the social stigma associated with such impacts. The significance is Major.

SIGNIFICANCE					
			LIKELIHOOD		
MAGNITUDE			Unlikely	Likely	Definite
			1	2	3
	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Community engagement to create awareness on SEA/SH risk/ issues
- Creating awareness to workers on the need to refrain from SEA/SH incidences
- Mandatory awareness creation for workers on required lawful conduct in the community and legal consequences for failure to comply with laws
- Develop and implement a SEA action plan with an Accountability and Response Framework as part of the C-ESMP;
- Integrate provisions related to sexual harassment in the employee COC;
- Mandatory signing and implementation of code of conduct for the workers
- Contractor to provide established referral pathway including police station with a gender desk for handling SEA/SH cases and also free toll numbers/hot lines for reporting GBV;
- Ensure prompt reporting of all SEA/SH incidences in the project;
- Develop and implement a grievance procedure that is easily accessible to local communities;
- Ensure all complaints on SEA/SH or harassment are reported directly through the WSP.

Impact Significance After Mitigation

Significance after mitigation is expected to reduce from major to moderate level as shown below.

SIGNIFICANCE					
			LIKELIHOOD		
MAGNITUDE			Unlikely	Likely	Definite
			1	2	3
	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

8.6.1.17 Impacts of Archaeological and cultural heritage

The construction phase of the water supply pipeline poses potential risks to archaeological and cultural heritage, despite no specific cultural sites or artifacts being identified within the project area. Precautionary measures are essential to mitigate impacts from activities like excavation and site works that could damage cultural remains or alter the landscape. The assessment considered sensitive features, including burial grounds, religious and ritual sites, archaeological artifacts, and intangible cultural heritage such as oral traditions, cultural landscapes, and indigenous values. Natural heritage elements like medicinal plants were also evaluated. The findings revealed no significant above-ground cultural sites, historical relevance, or cultural events within the area of influence (AOI). Consequently, the cultural heritage sensitivity is low, with minimal impact, and the project's cultural heritage impacts are not considered significant.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	Medium	Likely	Moderate	Temporary

Impact Significance Before Mitigation

The likelihood of the impact occurring is likely and at a local spatial scale, and severity is medium given the proximity of workers to settlement areas, thus leading to moderate impact significance.

SIGNIFICANCE					
		LIKELIHOOD			
MAGNITUDE		Unlikely	Likely	Definite	
		1	2	3	
Negligible	1	Negligible 1	Negligible 2	Minor 3	
Low	2	Negligible 2	Minor 4	Minor 6	
Medium	3	Minor 3	Moderate 6	Moderate 9	
High	4	Moderate 4	Major 8	Major 12	

Mitigation Measures

- Proper and thorough community stakeholder engagement;
- Sensitization of project workers on code of conduct;
- Implement the approved project Grievance Redress Mechanism (GRM);
- Implement Chance Find Procedure (Appendix 8).

Impact Significance After Mitigation

The significance of impact after mitigation is expected to reduce from moderate to minor as shown in the table below.

SIGNIFICANCE					
		LIKELIHOOD			
MAGNITUDE		Unlikely	Likely	Definite	
		1	2	3	
Negligible	1	Negligible 1	Negligible 2	Minor 3	
Low	2	Negligible 2	Minor 4	Minor 6	
Medium	3	Minor 3	Moderate 6	Moderate 9	

	High	4	Moderate	4	Major	8	Major	12

8.6.1.18 Interruption of Existing Infrastructure and Services

The Kangai pipeline route intersects the tarmacked Kangai-Kimicha Road, while the Kiamwenja line will cause traffic disruptions despite the road being unpaved. Construction activities will also disrupt existing water supply networks, leading to interruptions in services that could negatively impact daily activities, businesses, and community well-being. Mitigation measures, including scheduling work during off-peak hours, providing alternative water supplies, and ensuring clear communication with affected communities, should be implemented to minimize these disruptions and restore services promptly.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	High	Likely	Major	Temporary

Impact Significance Before Mitigation

The pipeline construction will cause local, short-term traffic disruptions and interruptions in water supply services, with high intensity and major significance. These impacts are likely but temporary, affecting daily activities and businesses. Mitigation measures are essential to minimize these disruptions and ensure prompt service restoration.

SIGNIFICANCE

			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Plan construction activities to minimize peak traffic hours. Only conduct major activities during off-peak times to reduce traffic congestion and disruptions;
- Maintain clear communication with local authorities, residents, and businesses about construction schedules, anticipated disruptions, and alternative routes;
- Consult and seek approvals from the road agencies (KeRRA and KeNHA) for the connection of pipelines within the road reserves.
- Provide alternative water supply solutions, such as temporary water tanks or connecting affected households to alternative sources, to mitigate interruptions in water supply;
- Engage with local communities to understand their concerns and incorporate feedback into mitigation strategies.

Impact Significance After Mitigation

Significance after mitigation is expected to reduce from major to moderate level as shown overleaf.

SIGNIFICANCE

		LIKELIHOOD

MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

8.6.1.19 Increased Vehicular Traffic

During the construction phase, the increased vehicular traffic for transporting construction materials could lead to damage to light-traffic roads and heighten the risk of transportation-related accidents.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	Medium	Likely	Moderate	Temporary

Impact Significance Before Mitigation

The pipeline construction will cause local, short-term traffic disruptions during transportation and delivering of materials to site, with medium intensity and moderate significance. These impacts are likely but temporary, affecting daily activities and businesses. Mitigation measures are essential to minimize these disruptions and ensure prompt service restoration.

SIGNIFICANCE

MAGNITUDE			LIKELIHOOD					
			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Transport construction materials using existing local roads, and repair any road damage caused by construction activities.
- Plan detours and diversions in consultation with local communities.
- Restrict vehicular and pedestrian traffic to designated road reserves.
- Enforce speed limits for all drivers and operators to reduce the risk of accidents.

Impact Significance After Mitigation

Significance after mitigation is expected to reduce from Moderate to Minor level as shown below.

SIGNIFICANCE

MAGNITUDE			LIKELIHOOD					
			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

8.6.1.20 Damage to Infrastructure and Structures

Construction activities could lead to damage or destruction of infrastructure and structures, such as temporary business structures and perimeter walls within or near the project area. These impacts are documented in the PAP list/assets register, and affected persons will be compensated accordingly. No public roads or major utilities are anticipated to be impacted .

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	Medium	Likely	Moderate	Temporary

Impact Significance Before Mitigation

The pipeline construction will cause local, short-term damage to infrastructure during laying of the pipeline and delivering of materials to site, with medium intensity and moderate significance. These impacts are likely but temporary, affecting daily activities and businesses. Mitigation measures are essential to minimize these disruptions and ensure prompt service restoration.

SIGNIFICANCE

			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Ensure continuous monitoring of the condition of infrastructure and structures during construction to promptly address any damage that may arise, based on the initial survey findings;
-Ensure timely and fair compensation to affected individuals or businesses, in line with local laws and regulations. Compensation to follow the developed PAP register, with allocated values ;
- Any damage to infrastructure or structures will be promptly restored to their original condition or alternative solutions will be provided to mitigate disruptions.

Impact Significance After Mitigation

Significance after mitigation is expected to reduce from Moderate to Minor level as shown below.

SIGNIFICANCE

			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

8.6.2 Operation Phase

ENVIRONMENTAL IMPACTS

8.6.2.1 Increased Abstraction on River Kiringa and Thiba

Kiringa and Thiba are the main source of water for Kirinyaga WSP. The river water supplies KICOWASCO and Irrigation scheme among other water users in Kirinyaga and its environs. With the installation of water pipelines, there will be an increase in volume of water abstracted from the river into, this will reduce the available residual flows on the river. Further, increased abstraction of water from the river may have impacts on allowable environmental flows, especially during dry seasons, and water availability for downstream users. Connection of new users will also increase demand which might increase the abstraction rate to meet demand.

It is also important to note that the Water Resources Authority (WRA) controls water uses specifically abstraction along rivers and is expected to consider all other water users before issuing a water abstraction permit for any water abstraction project to ensure that sufficient environmental flow is maintained.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	National	Long-term	High	Likely	Major	Permanent

Impact Significance Before Mitigation

The pipeline construction will cause National, Long-term disruptions and interruptions in downstream water users, with high intensity and major significance. These impacts are likely and permanent with increased water users and abstraction level. Mitigation measures are essential to minimize these disruptions and ensure prompt service restoration.

SIGNIFICANCE

			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Implement water-efficient technologies and practices e.g. smart metering to provide real time data and leak detection in the new water supply systems to minimize wastage and optimize water use efficiency;
- Launch public awareness campaigns and educational programs on water conservation practices for new and existing water users;
- Establish comprehensive monitoring programs to track water abstraction rates, river flows, and environmental conditions;
- Adjust abstraction rates seasonally to ensure sufficient environmental flows during dry seasons when water availability is typically lower;

- Collaborate closely with the Water Resources Authority (WRA) and other stakeholders to develop and implement sustainable water management plans;
- Apply for a variation of the existing water abstraction permit to increase the permitted water abstraction;
- The developer should observe the minimal legal environmental flows that will be included in the water abstraction permit while abstracting water for the project;
- The developer should continuously monitor the amount of water abstracted for the project as well as residue flow. Where necessary, the amount of water abstracted should be slightly reduced to ensure that the recommended minimum environmental flow.

Impact Significance After Mitigation

Significance after mitigation is expected to reduce from major to moderate level as shown overleaf.

SIGNIFICANCE					
		LIKELIHOOD			
MAGNITUDE		Unlikely	Likely	Definite	
		1	2	3	
Negligible	1	Negligible 1	Negligible 2	Minor 3	
Low	2	Negligible 2	Minor 4	Minor 6	
Medium	3	Minor 3	Moderate 6	Moderate 9	
High	4	Moderate 4	Major 8	Major 12	

8.6.2.2 Risk of Soil Erosion

During the operational phase, the project activity that will cause a reduction in water quality is periodic repairs which might result in soil spoil. Earth material excavated during repair and maintenance of the pipeline may be carried away by wind and surface water run-off. Excavated soils could be swept into surface water bodies by storm water floods during rains, potentially leading to sedimentation in nearby water bodies such as rivers and streams. This sedimentation can degrade water quality, disrupt aquatic ecosystems, and increase the operational burden on downstream water treatment facilities.

Additionally, erosion along the pipeline route, exacerbated by vegetation removal and soil disturbance during maintenance, can compromise the stability of the pipeline infrastructure. To mitigate these risks, it is crucial to implement robust erosion control measures

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	National	Long-term	High	Likely	Major	Permanent

Impact Significance Before Mitigation

The impact is likely to occur and would have high intensity if it occurs. Therefore, the overall significance of the impact, before any mitigation measures are implemented, is considered major.

SIGNIFICANCE				
		LIKELIHOOD		
MAGN		Unlikely	Likely	Definite
		1	2	3

	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Establish vegetative buffers along the pipeline route to stabilize soil, reduce erosion, and filter runoff before it reaches water bodies;
- Implement reseeding and replanting programs with native vegetation after construction activities to restore ground cover and reduce erosion risks;
- Conduct maintenance activities during dry periods when soil is less susceptible to erosion, and avoid operations during heavy rainfall or storm events;
- Implement a schedule for regular inspections of erosion control measures and pipeline integrity to promptly address any issues and ensure effectiveness.

Impact Significance After Mitigation

Significance after mitigation is expected to reduce from major to moderate level as shown below.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

8.6.2.3 Risk of Water Pipeline Bursts Leading to Water Wastages

Pipeline bursts during the operational phase lead to water wastage, higher Non-Revenue Water (NRW), and disruptions to communities, businesses, and public services reliant on uninterrupted water access. Causes include aging infrastructure, material defects, ground movement, or operational errors. Mitigation involves proactive measures like regular inspections, high-quality materials, leak detection systems, and rapid repair protocols to minimize bursts, reduce NRW, and maintain efficient, reliable water supply.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Long-term	High	Likely	Major	Permanent

Impact Significance Before Mitigation

The impact is likely to occur and would have high intensity if it occurs. Therefore, the overall significance of the impact, before any mitigation measures are implemented, is considered major.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3

	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Encourage community members to report suspected leaks or unusual water flow immediately;
- Implement comprehensive water loss management programs that include regular monitoring of NRW levels;
- Explore and adopt innovative technologies such as smart meters, remote sensing, and predictive analytics to enhance leak detection capabilities;
- Implement a proactive maintenance schedule to inspect pipelines regularly for signs of wear, corrosion, or potential weaknesses that could lead to bursts;
- Install and maintain advanced leak detection systems along the pipeline network;
- Optimize pressure levels within the pipeline system to reduce stress on pipes and fittings, thereby lowering the likelihood of bursts;
- Implement a leak detection and repair program (including records of past
- leaks and unaccounted- for water to identify potential problem areas

Impact Significance After Mitigation

Significance after mitigation is expected to reduce from major to moderate level as shown overleaf.

SIGNIFICANCE

			LIKELIHOOD					
			Unlikely		Likely		Definite	
			1		2		3	
MAGNITUDE	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

SOCIAL IMPACTS

8.6.2.4 Risk of illegal connection to the water pipeline

Illegal connections during the operational phase of a water pipeline result in water theft, revenue loss, increased Non-Revenue Water (NRW), and disruptions to distribution systems, compromising service reliability. They also cause infrastructure damage, safety risks, and regulatory non-compliance. Proactive measures are essential to protect infrastructure, uphold standards, ensure equitable access, and maintain stakeholder trust.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Long-term	High	Likely	Major	Permanent

Impact Significance Before Mitigation

The impact is likely to occur and would have high intensity if it occurs. Therefore, the overall significance of the impact, before any mitigation measures are implemented, is considered major.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Conduct public sensitization programs on importance not interfering with the water pipeline and the need to seek official water connection Implement robust monitoring and surveillance systems to detect unauthorized activities promptly.
- Regularly inspections of the water pipeline to identify illegal connections.
- Regularly engage community to educate users about the consequences of illegal connections and to foster compliance with water usage regulations.

Impact Significance After Mitigation

Significance after mitigation is expected to reduce from major to moderate level as shown below.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

8.6.2.5 Risk of Sexual Exploitation and Abuse of Community members by project workers

During the operation phase of a pipeline project, the risk of sexual exploitation and abuse by project workers against the community is a serious concern that requires careful consideration and proactive measures. This risk arises due to several factors inherent in water projects and the interactions between project personnel and local communities: Project workers, often in positions of authority or influence, may exploit power differentials between themselves and community members, particularly vulnerable groups such as women, children, and marginalized populations

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Long-term	High	Likely	Major	Permanent

Impact Significance Before Mitigation

The impact is likely to occur and would have high intensity if it occurs. Therefore, the overall significance of the impact, before any mitigation measures are implemented, is considered major.

SIGNIFICANCE

			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Implementing clear policies prohibiting sexual exploitation and abuse, alongside robust training programs for all project personnel;
- Identify and assess SEA risks at the community level;
- Establishing regular monitoring of project sites;
- Develop and enforce clear policies prohibiting SEA and SH within the project framework;
- Establish accessible and confidential reporting mechanisms for individuals to report incidents of SEA and SH without fear of retaliation.

Impact Significance After Mitigation

Significance after mitigation is expected to reduce from major to moderate level as shown below.

SIGNIFICANCE

			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

8.6.2.6 Wayleave Encroachment

Defined as the unauthorized use or occupation of designated infrastructure corridors, such activities pose significant risks to project integrity and community welfare. Encroachment not only violates legal and regulatory standards but also threatens the operational functionality of the water supply systems. Potential consequences include infrastructure damage, service disruptions, and environmental impacts such as soil erosion and water contamination. To mitigate these risks, the ESIA recommends robust monitoring protocols, community engagement initiatives to raise awareness, strict enforcement of legal agreements, and the development of contingency plans for rapid response to encroachment incidents. These measures aim to safeguard infrastructure integrity, ensure regulatory compliance, and maintain positive stakeholder relations throughout the project lifecycle.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Long-term	Moderate	Likely	Major	Permanent

Impact Significance Before Mitigation

The impact is likely to occur and would have High intensity if it occurs. Therefore, the overall significance of the impact, before any mitigation measures are implemented, is considered major.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Mapping and installation of beacons to which illustrate the width of the pipeline reserve.
- Regular patrol of the pipeline corridor for encroachment;
- Conduct outreach programs to educate local communities about the importance of preserving the designated corridor and the consequences of encroachment;
- Prosecution of encroachers as required by County By-Laws on wayleaves and road reserves maintenance;
- Provide marker posts along the pipeline corridor to clearly demarcate the boundaries and discourage encroachment;
- Conduct public sensitization programs on importance of not interfering with way leaves and public reserve land.

Impact Significance After Mitigation

Significance after mitigation is expected to reduce from major to moderate level as shown below.

SIGNIFICANCE								
			LIKELIHOOD					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

8.6.3 Decommissioning Phase

The decommissioning of water supply infrastructure requires a strategic and practical approach to ensure the continued provision of essential services to the community. It is crucial to recognize that the complete removal of a pipeline without a replacement or upgrade would not be feasible or sustainable. Instead, the decommissioning process will focus on rehabilitation through upgrading or replacing the existing pipeline infrastructure.

8.6.3.1 Utilization of Contaminated Sources

In the absence of a reliable potable water supply from the pipeline, communities may resort to using contaminated or untreated water sources. This poses significant health risks, particularly in areas where

waterborne diseases are prevalent. Access to safe drinking water is essential for public health, and the use of contaminated sources can lead to outbreaks of diseases such as cholera, typhoid, and dysentery, placing additional burdens on local healthcare systems.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	High	Likely	Major	Temporary

Impact Significance Before Mitigation

It is high likely that the local community will utilise contaminated water directly from the river. The intensity is graded high making the impact significance major.

SIGNIFICANCE					
		LIKELIHOOD			
		Unlikely	Likely	Definite	
		1	2	3	
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Establish temporary water supply points with safe water tanks or truck deliveries;
- Implement regular monitoring and testing of alternative water sources;
- Conduct public awareness campaigns on the risks of contaminated water;
- Upgrade existing water supply systems and repair communal water points;
- Distribute affordable household water treatment options (e.g., chlorine tablets, ceramic filters).

Impact Significance After Mitigation

The significant impact after mitigation is expected to reduce from major to moderate as indicated below

SIGNIFICANCE					
		LIKELIHOOD			
		Unlikely	Likely	Definite	
		1	2	3	
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

8.6.3.2 Impact on Livelihoods and Well-being

Access to reliable clean water is fundamental to sustaining livelihoods and ensuring communities well-being. Agriculture is heavily relied on adequate water supplies for irrigation and livestock. Reduced availability can jeopardize crop yields, livestock health, and overall food security. Additionally, inadequate water access affects sanitation, compromising hygiene and increasing risk of water-related illnesses.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	High	Likely	Major	Temporary

Impact Significance Before Mitigation

It is high likely that the local community will be greatly impacted due to effect on sanitation and overall health. The intensity is graded high making the impact significance major.

SIGNIFICANCE								
			LIKELIHOOD					
			Unlikely		Likely		Definite	
			1		2		3	
MAGNITUDE	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Implement water storage solutions like reservoirs or tanks to ensure continuous supply for irrigation.
- Provide community education on efficient water use practices for livestock watering;
- Mobilize resources to provide financial support for water infrastructure projects;
- Collaborate with stakeholders to implement long-term water management strategies and policies.

Impact Significance After Mitigation

The significant impact after mitigation is expected to reduce from major to moderate as indicated below.

SIGNIFICANCE								
			LIKELIHOOD					
			Unlikely		Likely		Definite	
			1		2		3	
MAGNITUDE	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

8.6.3.3 Increased Competition for Water Resources

When a water pipeline is decommissioned, communities that previously relied on it faces a sudden shortage of accessible, clean water. This scarcity can trigger heightened competition among residents, agricultural interests, and industrial users for alternative water sources. In densely populated areas Kangai and Kimicha, where the pipeline serves multiple sectors including schools, shops, and households, the cessation of supply can lead to immediate pressures on nearby water resources.

Further, the cessation of water supply from the pipeline often precipitates conflicts over water access and rights. Disputes may arise between different community groups, businesses, and even neighboring villages as they vie for limited water resources. In the rural setting of Ngaru, Gatuto and Kiamwenja, where water is crucial for agricultural activities and household use, disputes could potentially disrupt community cohesion and strain local governance structures.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Long-term	High	Likely	Major	Temporary

Impact Significance Before Mitigation

With Thiba river as the main source and small feeder stream, it is high likely that the local community will compete on use. The intensity is graded high making the impact significance major.

SIGNIFICANCE					
			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Develop and implement comprehensive water management plans that prioritize equitable distribution of water among different users, including households, agriculture, and industry;
- Identify and develop alternative water sources such as groundwater wells, desalination plants (if feasible), and treated wastewater reuse systems;
- Implement emergency water supply measures, such as mobile water tanks or truck deliveries, to mitigate immediate shortages during the transition phase;
- Conduct outreach programs to educate communities about water conservation, sustainable use practices, and the importance of equitable water sharing.
- Facilitate inclusive dialogue and consultation among all affected stakeholders, including community groups, businesses, and local authorities;
- Establish transparent and fair water allocation systems that prioritize essential needs such as drinking water, agriculture, and sanitation;
- Promote community-based water management initiatives that empower local communities to participate in water resource planning and governance;
- Develop formal and informal mechanisms for resolving water-related disputes, including mediation, arbitration, and community-led conflict resolution processes.

Impact Significance After Mitigation

The significant impact after mitigation is expected to reduce from major to moderate as indicated in the Table below.

SIGNIFICANCE					
			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

8.6.3.4 Loss of Revenue for the WSP

Kimicha-Kangai pipeline extension is the mainline, which relies on water supply services as a primary revenue stream, the decommissioning of a pipeline can lead to a sudden loss of income. Revenue typically

generated from water tariffs and service fees may decrease or cease entirely, impacting the financial sustainability of the WSP. This loss can disrupt operational budgets, hinder investment in infrastructure upgrades, and potentially affect the WSP's ability to maintain service quality and expand coverage to underserved areas.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Long-term	High	Likely	Major	Permanent

Impact Significance Before Mitigation

With decommissioning of these pipelines will lose revenue generated from water service provision. The intensity is graded high making the impact significance major.

SIGNIFICANCE

			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

Mitigation Measures

- Review and adjust water tariffs or service fees to reflect the actual cost of service provision and ensure financial sustainability;
- Allocate funds for essential infrastructure upgrades, repairs, and maintenance to enhance service reliability and operational efficiency;
- Prioritize essential expenditures and explore cost-saving measures to optimize operational efficiency'.

Impact Significance After Mitigation

The significant impact after mitigation is expected to reduce from major to moderate as indicated in the Table below.

SIGNIFICANCE

			LIKELIHOOD		
			Unlikely	Likely	Definite
			1	2	3
MAGNITUDE	Negligible	1	Negligible 1	Negligible 2	Minor 3
	Low	2	Negligible 2	Minor 4	Minor 6
	Medium	3	Minor 3	Moderate 6	Moderate 9
	High	4	Moderate 4	Major 8	Major 12

8.6.3.5 Loss of Employment Opportunities

Water pipeline projects often support local employment opportunities through various roles such as maintenance technicians, meter readers, customer service representatives, and administrative staff. The decommissioning phase may result in job losses or reduced employment opportunities within the WSP

and associated service industries. This can have broader socio-economic consequences, particularly in communities where the WSP is a major employer or where job opportunities are limited.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	High	Definite	Major	Permanent

Impact Significance Before Mitigation

With decommissioning of the three pipelines extensions will highly see many people rendered unemployed. The intensity is graded high making the impact significance major.

SIGNIFICANCE					
		LIKELIHOOD			
MAGNITUDE		Unlikely	Likely	Definite	
		1	2	3	
Negligible	1	Negligible 1	Negligible 2	Minor 3	
Low	2	Negligible 2	Minor 4	Minor 6	
Medium	3	Minor 3	Moderate 6	Moderate 9	
High	4	Moderate 4	Major 8	Major 12	

Mitigation Measures

- Offer retraining programs and skill development initiatives to enhance the employability of affected workers in new sectors or emerging industries;
- Facilitate job placement services, career counseling, and networking opportunities to assist displaced workers in finding new employment opportunities.

Impact significance after mitigation

The significant impact after mitigation is expected to reduce from major to moderate as indicated below.

SIGNIFICANCE					
		LIKELIHOOD			
MAGNITUDE		Unlikely	Likely	Definite	
		1	2	3	
Negligible	1	Negligible 1	Negligible 2	Minor 3	
Low	2	Negligible 2	Minor 4	Minor 6	
Medium	3	Minor 3	Moderate 6	Moderate 9	
High	4	Moderate 4	Major 8	Major 12	

8.6.3.6 Waste Generation

The decommissioning process typically involves the removal of pipelines, fittings, and associated infrastructure that are no longer in use. These materials, predominantly composed of non-corrosive materials such as HDPE (High-Density Polyethylene), contribute to the overall waste generated. Depending on the project scale, this can range from a few tons to substantial amounts of material. Additionally, excavation activities during decommissioning generate spoil—earth, rocks, and other

materials—that must be managed responsibly. Proper handling and disposal are crucial to prevent soil erosion, contamination of water sources, or impacts on local ecosystems.

Analysis of Impact

Type/Nature	Extent	Duration	Intensity	Likelihood	Significance	Persistence
Negative	Local	Short-term	Medium	Definite	Moderate	Permanent

Impact Significance Before Mitigation

With decommissioning of the two pipelines (Kangai Kiamwenja Kimicha and Kiaga) It is high likely that waste will be generated from retrieved pipes, fittings, spoil materials etc. The intensity is graded high making the impact significance major.

SIGNIFICANCE					
		LIKELIHOOD			
MAGNITUDE		Unlikely	Likely	Definite	
		1	2	3	
Negligible	1	Negligible 1	Negligible 2	Minor 3	
Low	2	Negligible 2	Minor 4	Minor 6	
Medium	3	Minor 3	Moderate 6	Moderate 9	
High	4	Moderate 4	Major 8	Major 12	

Mitigation Measures

- Careful dismantling to ensure materials remain as re-usable as possible;
- Prioritize the recovery and recycling of decommissioned materials such as HDPE pipes and fittings;
- Assess the feasibility of reusing decommissioned infrastructure components, such as pipelines or fittings, in other construction projects or applications;
- Plan excavation activities carefully to minimize the amount of spoil generated during decommissioning;
- Cleaning and proper site rehabilitation by adhering to a NEMA approved Decommissioning plan.

Impact significance after mitigation

The significant impact after mitigation is expected to reduce from moderate to minor as indicated in table below

SIGNIFICANCE					
		LIKELIHOOD			
MAGNITUDE		Unlikely	Likely	Definite	
		1	2	3	
Negligible	1	Negligible 1	Negligible 2	Minor 3	
Low	2	Negligible 2	Minor 4	Minor 6	
Medium	3	Minor 3	Moderate 6	Moderate 9	
High	4	Moderate 4	Major 8	Major 12	

8.6.3.7 Visual Intrusion

The decommissioning phase of a water pipeline project can significantly impact the visual landscape of the affected area. Activities such as the excavation of old pipelines, removal of infrastructure, and presence of heavy machinery can create a temporary eyesore, disrupting the natural and built environment's aesthetics. In areas like Kiaga and Komboini sub-locations where the community takes pride in their surroundings, such visual disturbances can be particularly concerning. The presence of debris, spoil heaps, and construction barriers can detract from the local scenery, potentially affecting tourism, local businesses, and overall community satisfaction. Moreover, the visual disruption can lead to negative perceptions of the project, causing unrest among residents and stakeholders. Addressing these concerns through effective mitigation measures is essential to maintain community relations and ensure minimal long-term visual impact.

Mitigation Measures

- Plan decommissioning in stages to limit the area affected at any one time;
- Restore each section promptly after decommissioning activities are completed;
- Implement comprehensive landscaping plans that include replanting native vegetation and restoring the natural contour of the land;
- Ensure that waste materials and debris are promptly removed after decommissioning activities.

8.6.4 Cumulative Impacts

Cumulative impacts refer to the combined effects of the proposed project and other past, ongoing, or future activities that affect the same resources or receptors. While an individual impact may not be significant, it can become considerable when combined with other similar or diverse developments in the area. For evaluating cumulative impacts, the following key environmental components were identified:

- Water Resources: surface water quality
- Soils: Stability and erosion
- Physical wellbeing: health and safety of the local community/workers
- Over abstraction of water resources
- Competition for water resources

A 7km zone around the project area was defined for the cumulative impact assessment, considering past, present, and future activities within a 10–20 year range. Projects potentially contributing to cumulative impacts, identified through public consultations and discussions with local authorities, include:

- Ongoing agricultural activities
- Development of small-scale commercial activities, improvements in community water supply systems.
- Construction of ECDE Centres in Kiaga
- Construction of spencer Nyaga Road

Since some projects lack official schedules, they were included in the assessment due to their proximity to the project's right-of-way. Continuous communication with stakeholders of these projects will ensure updates to the cumulative impact assessment, allowing for the adjustment of mitigation measures in collaboration with other developers. The cumulative impacts of the combined activities of the proposed project and future developments are presented in the subsequent table.

Table 23: Evaluation of Cumulative Effects on VECs

Potentially Affected VECs	Environmental/Social Impacts
Water Resources (quantity)	The cumulative impacts could significantly reduce groundwater levels and affect the flow and quality of local rivers. This reduction could lead to potential water shortages, especially during dry periods, impacting both human consumption and agricultural needs
Soil	The combined effects of multiple projects, including land clearing and excavation activities, could lead to increased soil erosion, particularly on sloped areas. This could result in loss of topsoil, reduced soil fertility, and sedimentation of water bodies.
	Construction activities and agricultural runoff may lead to soil contamination from chemicals and pollutants, affecting soil health and productivity
	Heavy machinery used in construction and agricultural activities can cause soil compaction, reducing soil aeration, permeability, and root penetration, thereby affecting plant growth and crop yields.
Water quality	Construction activities and land clearing for these projects can increase soil erosion, leading to sedimentation in nearby water bodies. This can reduce water quality by increasing turbidity, which affects aquatic life and water treatment processes.
	The use of fertilizers and pesticides in agricultural activities, can lead to runoff into water bodies. This can result in nutrient pollution (eutrophication) and contamination of water resources, posing risks to human health and ecosystems.
Resource Conflict	Competition for water and land resources may lead to conflicts between agricultural users, domestic users, and industrial users. Equitable resource distribution is crucial to mitigate these conflicts.
	On the positive side, improved water infrastructure and irrigation could boost agricultural productivity and create new business opportunities.

Cumulative Impacts Synergies and Conflicts:

Synergies:

- Enhanced Agricultural Productivity: Improved water infrastructure can lead to better irrigation, enhancing agricultural productivity and supporting local businesses, including macadamia farming in Kangai.
- Collaborative Resource Management: Projects can collaborate to manage water resources more effectively, sharing benefits and reducing competition.

Conflicts:

- Resource Conflicts: Competition for water and land resources may lead to conflicts between agricultural users, domestic users, and industrial users. Equitable resource distribution is crucial to mitigate these conflicts. Infrastructure Overload: Increased demand on existing infrastructure could lead to deterioration of services, impacting the quality of life for residents.

Mitigation Measures

a) Water Resources:

- Implement water-saving technologies and promote efficient water use practices.
- Develop a regional water management plan to ensure sustainable water use among all projects.

b) Water Quality:

- Implement erosion control measures, such as terracing, contour plowing, and vegetation cover to prevent soil erosion and reduce sedimentation.
- Promote the use of environmentally friendly agricultural practices to reduce the use of harmful chemicals. Implement buffer zones along water bodies to filter runoff.
- Regularly monitor water quality to detect and address contamination from sedimentation and agricultural runoff.

c) Soil:

- Implement erosion control measures to prevent soil erosion and maintain soil health.
- Promote sustainable agricultural practices to maintain soil health, including crop rotation, reduced use of chemicals, and organic farming methods.
- Use lighter machinery and limit heavy machinery operation to designated areas to prevent soil compaction.

d) Infrastructure and Services:

- Upgrade and expand existing infrastructure to accommodate increased demand.
- Coordinate with local authorities to ensure services are evenly distributed.

e) Community Engagement:

- Engage local communities in decision-making processes and provide regular updates on project progress.

f) Conflict Resolution:

- Establish conflict resolution mechanisms to address disputes over resource use.

Monitoring and Follow-Up

Water Quality and Quantity:

- Regularly monitor groundwater and surface water levels, as well as water quality, to assess cumulative impacts on water resources.

Soil Health:

- Soil Monitoring: Regularly monitor soil quality and erosion rates to ensure the effectiveness of soil conservation measures.

Social Infrastructure:

- Monitor the usage and condition of local infrastructure and services to ensure they meet the needs of the growing population.

Community Feedback:

- Establish a feedback mechanism for residents to report issues and provide input on project management.

Conclusion

The cumulative impacts of the Kiaga and Kimicha – Kangai and Kabedoso -Kiamwenja water pipeline projects, along with the Water Systems Reinstatement works and other developments, have the potential to significantly affect environmental and social components in the region. Proactive management and

continuous monitoring are essential to mitigate negative impacts and enhance positive synergies, ensuring sustainable development over the next 10-20 years.

8.7 Climate Change Vulnerability

KICOWASCO Water Service Provider (WSP) project aims to improve water supply and infrastructure in Kiaga, Kimicha and Kangai within Kirinyaga County. As part of the Environmental and Social Impact Assessment (ESIA), a Climate Risk Vulnerability Assessment (CRVA) has been conducted to identify, assess, and describe potential risks posed by climate change. This assessment evaluates the effects on project baselines and outlines impacts on project activities, focusing on adaptation and resilience. Given Kirinyaga County's susceptibility to climate variability and projected climate change impacts, this assessment is crucial.

To complete the exposure assessment, climate data for the region of Kirinyaga was obtained from World Bank's Climate Change Knowledge Portal (CCKP; The World Bank Group, 2021). The CCKP is an online database that provides scientific information related to climate change and disaster risk, helping decision makers evaluate climate-related vulnerabilities and risks related to specific projects and regions. Climate data from the CCKP is processed by the National Center for Atmospheric Research, the International Research Institute of Columbia University, and the European Space Agency.

8.7.1 Climate Change Context

Climate Risks Identified

- **Droughts: -** Drought conditions are usually triggered by a lack of precipitation and high temperatures facilitating evapotranspiration. Extreme weather events especially those associated with drought and erratic rainfall have disrupted livelihood patterns triggering major socio-economic and environmental upheavals. In Kirinyaga County these disruptions have been the key source of vulnerability for different categories of community members, their lives and livelihoods.
- **Extreme Precipitation and Pluvial Flooding:** - Under the influence of climate change, precipitation regimes are likely to change overall, but a great variability remains among the different climate models. Increased frequency and intensity of extreme weather events (e.g., floods, storms) could impact pipeline infrastructure consequently, designing infrastructure to withstand extreme weather events and changing hydrological conditions.

  The amount of daily sunlight received in Kirinyaga varies seasonally, ranging from 6.6 kWh to 7.5 kWh due to factors such as day length, sun elevation, and cloud cover. According to the climate change assessment for Kirinyaga County, temperatures are expected to rise by 0.4°C by the early 2040s. Significant changes are also projected for rainfall patterns: a decrease of 0.7% is anticipated during the first wet season, while the second wet season could see a notable increase of 19%. This information is illustrated in Figure 10 overleaf, depicting the geographic distribution of rainfall across the county[5].

[5] MoALF. (2016). Climate Risk Profile for Kirinyaga. Kenya County Climate Risk Profile Series. The Kenya Ministry of Agriculture, Livestock and Fisheries (MoALF), Nairobi, Kenya

8.7.1.1 Historical Climate Data

- **Temperature:** Over the past 50 years, Kirinyaga County has experienced an average temperature increase of approximately 1.5°C. This rise is consistent with global trends, with the hottest months being February and March (up to 30°C) and the coolest months being July and August (around 15°C).
- **Precipitation:** Annual rainfall has decreased by around 10%, with increased variability. The county experiences bimodal rainfall patterns, with reduced rainfall amounts during both the long rains (March-May) and short rains (October-December).
- **Extreme Events:** There has been an increase in extreme weather events, including droughts and heavy rainfall. Droughts have become more frequent and severe, particularly in the early 2000s and 2010s, leading to significant water shortages. Heavy rainfall events, especially during the short rainy season, have caused flash floods and infrastructure damage, including to roads and water systems.
    - There has been an increase in the occurrence of heavy rainfall events, leading to flash floods. In some cases, heavy rainfall results in flooding, which leads to the destruction of farm structures.

8.7.1.2 Future Climate Projections

- **Temperature:** By 2050, temperatures are projected to rise by 2-3°C, particularly during the dry seasons (June-August and December-February). This will likely exacerbate heat stress and increase evapotranspiration, impacting agriculture and water resources.
- **Precipitation:** Rainfall is expected to become more variable. While some models predict a slight increase in annual rainfall, the distribution may be irregular, with potential reductions in long rains (March-May) and intensification of short rains (October-December). This variability could challenge agricultural planning and water management.
- **Extreme Events:** There is a likelihood of increased frequency and intensity of extreme weather events, including droughts and heavy rainfall, which could lead to more severe impacts on infrastructure and livelihoods.

8.7.2 Vulnerability Assessment

8.7.2.1 Key Project Components Affected by Climate Change

- **Water Sources:** Dependence on surface and groundwater, sensitive to changes in precipitation and temperature. Rivers and streams in Kirinyaga have shown reduced flow rates during dry seasons and increased turbidity during heavy rainfall events. The reduced base flow and erratic runoff patterns have impacted water supply reliability. Flash floods have caused significant damage to water systems
- **Infrastructure:** Pipelines, storage tanks, and treatment facilities vulnerable to extreme weather and temperature fluctuations.

8.7.2.2 Sensitivity and Exposure

- **Water Sources:** High sensitivity to reduced rainfall and increased evaporation.
- **Infrastructure:** Moderate sensitivity to extreme weather; high exposure in flood-prone areas.

- ✓ **Flood-Prone Areas:** Infrastructure located in flood-prone areas is highly exposed to flooding risks. Floods can damage pipelines, storage facilities, and treatment plants, leading to service disruptions and increased repair costs
- ✓ **Flooding and Erosion:** Heavy rainfall can trigger flooding and soil erosion, which can undermine the stability of infrastructure. Pipelines buried in unstable soil may be at risk of displacement or damage
- ✓ **Heat Waves:** Prolonged heat waves can increase the exposure of infrastructure to thermal stress, affecting the performance and lifespan of materials used in construction.

8.7.3 Risk Identification and Analysis

8.7.3.1 Potential Risks

- **Water Shortages:** Reduced rainfall and increased evaporation may lead to water shortages, affecting supply reliability.
  - ✓ The water sources in Kirinyaga County, including rivers, streams, and groundwater, are highly sensitive to changes in rainfall patterns. Reduced rainfall directly affects the recharge rates of these sources, leading to lower water availability during dry periods.
  - ✓ Higher temperatures increase the rate of evaporation from surface water bodies, further reducing the available water. This is particularly critical during dry spells when water demand is high but supply is limited
- **Infrastructure Damage:** Heavy rainfall and floods could damage pipelines and treatment facilities.
  - ✓ Infrastructure such as water pipelines, storage tanks, and treatment plants are moderately sensitive to extreme weather events. Heavy rainfall and floods can cause physical damage, while prolonged dry spells can lead to increased demand and strain on infrastructure.
  - ✓ Climate change can exacerbate maintenance challenges by increasing the frequency of extreme weather events that damage infrastructure, requiring more frequent repairs and upgrades

8.7.3.2 Risk Analysis

Likelihood and Severity:

- Water shortages: Likely (4/5), Severe (4/5)
  - ✓ The region of Kirinyaga County has already experienced a significant decrease in average annual rainfall and an increase in the frequency of droughts. With future climate projections indicating more variable rainfall and higher temperatures leading to increased evaporation, the likelihood of water shortages is high. The dependency on rainfall for water sources such as rivers, streams, and groundwater make the region particularly vulnerable to fluctuations in precipitation. Consequently, water shortages have severe implications for the Kirinyaga WSP project and the communities it serves. Reduced water availability can lead to insufficient water for household use, impacting hygiene and health and potential conflicts over water resources.
- Infrastructure damage: Possible (3/5), Moderate (3/5)
  - ✓ The infrastructure associated with the Kirinyaga WSP project, including pipelines, storage tanks, and treatment facilities, is exposed to various climate risks. The likelihood of damage is moderate, given the current frequency and intensity of extreme weather events. Future projections indicate an increase in the severity and frequency of such events, which raises the

risk of infrastructure damage. Consequently, the severity of potential infrastructure damage is considered moderate, but it can still have significant impacts

8.7.4 Impact Assessment

8.7.4.1 Effects on Baseline

- **Water Availability:** Decreased water availability during dry periods, affecting households and agricultural needs.
  - ✓ Reduced rainfall and higher evaporation rates lead to lower water levels in rivers, streams, and groundwater. This directly impacts households, especially those relying on surface water and shallow wells. Insufficient water supply can lead to water rationing, decreased hygiene, and sanitation issues
- **Public Health:** Potential increase in waterborne diseases due to compromised water quality during extreme events.
  - ✓ Heavy rainfall and flooding can overwhelm sanitation systems, leading to contamination of water sources with pathogens and pollutants. This increases the risk of waterborne diseases such as cholera, dysentery, and typhoid fever.
  - ✓ During droughts, water scarcity can force communities to use unsafe water sources. Limited access to clean water exacerbates the spread of diseases, as hygiene practices may be compromised.
- **Economic Impacts:** decreased water availability can greatly increase expenditure on alternative sources
  - ✓ Water shortages and compromised water quality can lead to increased household expenditure on alternative water sources, medical treatments, and coping mechanisms, reducing disposable income

8.7.4.2 Impacts on Project Activities

- **Operational Disruptions:** Intermittent water supply and damage to infrastructure could disrupt project operations.
  - ✓ Fluctuations in water availability can lead to inconsistent water supply, impacting the ability of the WSP project to provide reliable water services to the community.
  - ✓ The unpredictability of water availability necessitates more complex and adaptive operational planning. This includes adjusting water distribution schedules and possibly implementing water rationing during dry periods, which can complicate management and logistics
- **Increased Costs**: Higher maintenance and repair costs due to climate-induced damages.
  - ✓ Extreme weather events such as floods can cause physical damage to pipelines, resulting in leaks or bursts. Repairing such damages requires time and resources, disrupting water distribution
  - ✓ Heavy rains and floods can cause soil erosion, which may undermine the foundations of water infrastructure. Sedimentation can clog pipes and reduce the efficiency of water treatment facilities, leading to operational delays and increased maintenance requirements
- **Community Relations:** Potential conflicts over water resources during shortages.

- ✓ Inconsistency can result in dissatisfaction among beneficiaries and undermine the project's objectives

8.7.5 Adaptation and Resilience Measures

8.7.5.1 Adaptation Strategies

- **Water Management:** Implement water-saving technologies, rainwater harvesting, and efficient irrigation systems.
  - ✓ Create awareness among the community members to install low-flow faucets, showerheads, and toilets to reduce water consumption
  - ✓ Implement advanced leak detection systems in the pipeline network to quickly identify and repair leaks, minimizing water loss
  - ✓ Encourage households and community buildings to install rainwater harvesting systems, such as rooftop catchment systems, to collect and store rainwater for domestic use
  - ✓ Use smart water meters to monitor and manage water usage, allowing for better control and reduction of wastage
- **Infrastructure Resilience:** Design infrastructure to withstand extreme weather, including flood protection and temperature-resistant materials.
  - ✓ Design and construct water treatment plants, pump stations, and other critical infrastructure on elevated platforms to protect them from floodwaters.

8.7.5.2 Resilience Measures

- **Community Engagement:** Educate and involve local communities in water management and conservation efforts.
- **Monitoring and Early Warning Systems:** Establish systems to monitor climate risks and provide early warnings for extreme events.
- **Policy and Planning:** Working with the Kirinyaga County, integrate climate risk management into local development plans and policies.

In conclusion, the Kirinyaga WSP project faces significant climate risks that could impact water availability and infrastructure integrity. By implementing adaptive strategies and resilience measures, the project can mitigate these risks and ensure sustainable water supply and community resilience in the face of climate change.

9 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

This section of the ESIA presents the Environmental and Social Management and Monitoring Plan (ESMMP) proposed for the construction and operation activities of the KICOWASCO WSP Project.

9.1 Objectives

The Environmental and Social Management and Monitoring Plan (ESMMP) is developed to ensure that the social and environmental impacts and risks identified during the ESIA process are effectively managed throughout both the construction and operational phases of the Project. The ESMMP specifies the mitigation and management measures to which KICOWASCO and the Contractor are committed and shows how the Project will mobilize organizational capacity and resources to implement these measures. The ESMMP also shows how mitigation and management measures will be scheduled and will ensure that the Project complies with the applicable laws and regulations of Kenya, as well as the requirements of World Bank Safeguards Policies and Environmental Health Safety Guidelines (EHSG).

The key objectives of the ESMMP are to:

- Outline mitigation measures developed for the KICOWASCO water Project that must be included in the selected Contractor's contract and procedures;
- Define financing responsibility for the implementation and the supervision of these measures;
- Provide a framework for the implementation of environmental and social management initiatives;
- Formalize and disclose the programme for environmental and social management; and

Best practice principles require that every reasonable effort is made to reduce, and preferably to prevent, negative impacts while enhancing the Project benefits. These principles have guided the ESIA process.

The Contracting Authority (KICOWASCO through WSTF) is required to procure for works. Consequently, overall responsibility for the ESMMP lies with the Contractor, who will be responsible for carrying out the specific Project activities. However, the Contractor's activities will be supervised by KICOWASCO to ensure the Project implementation is performed as planned, and as per this ESSMP.

9.2 ESMMP Responsibilities

9.2.1 The Contractor

The Contractor is obliged under the contract to observe all the national and county Environmental and social laws and regulations. The provisions of these laws apply to the Contractor, sub-contractors and their employees working in the project. The contractor shall: -

- Comply with the statutory regulations in force in Kenya regarding environmental protection and shall liaise with NEMA throughout the lifetime of the project;
- Ensure sufficient resources are allocated on an on-going basis to achieve effective implementation of the Environment Management Plan;
- Maintain appropriate documentation to demonstrate compliance with local and international standards;
- Implement instructions from the WSP with regard to Environmental issues;
- Ensure continual improvement in environmental management on site through measuring and evaluating environmental performance;
- Monitoring that the health and hygiene of the community near the construction sites is not adversely affected by the Contractor's operation;

- Induct workers on safety and health risks and management.
- To keep communities informed about upcoming construction activities and progress with construction.

9.2.2 NEMA

The responsibility of the National Environmental Management Authority (NEMA) is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of Government in the implementation of all policies relating to the environment and to ensure that all mitigation measures proposed are implemented.

9.2.3 KICOWASCO

The water project will be responsible for overall implementation of the project. The specific responsibilities include:

- Ensure including all standard and specific mitigation measures from the ESMMP in contract and ensure the contractor adheres to them throughout the project;
- Regularly supervising and overseeing the contractor's activities to ensure compliance with the ESMMP and environmental and social regulations;
- Facilitating communication between the contractor and local communities, stakeholders, and affected parties to address any concerns and keep them informed about the project's progress and impacts;
- Conducting environmental monitoring to ensure that the contractor's activities do not negatively impact the environment and that mitigation measures are effectively implemented;
- Ensuring that the contractor implements health and safety measures to protect workers and the public, including the use of personal protective equipment (PPE) and adherence to safety protocols;
- Requiring the contractor to maintain detailed records of all ESMMP activities, including monitoring data, incidents, and corrective actions, and submitting regular reports to WSP;
- Overseeing the contractor's site restoration activities post-construction to ensure that affected areas are restored to their natural state or as agreed with stakeholders.

9.2.4 Water Sector Trust Fund

The Water Sector Trust Fund (WaterFund) plays a crucial role in financing and supporting water, sanitation, and water resource management projects in underserved and marginalized areas of Kenya. In the context of ESMMP implementation, WaterFund's responsibilities can be outlined as follows:

- Overseeing the compliance of projects with environmental and social standards as outlined in the ESMMP and ensuring adherence to national and international regulations;
- Providing technical and financial support for capacity-building initiatives to enhance the ability of project implementers to effectively manage environmental and social impacts;
- Acquiring detailed documentation and regular reporting on ESMMP activities, compliance records, and any incidents related to environmental and social management.
- Assessment of the WSP's capacity to monitor (construction Phase and implement (operation phase) the ESMP, and any recommendations.

9.3 The ESMMP

The Environmental and Social Management and Monitoring Plan (ESMMP) for the proposed project outlines comprehensive details regarding project activities, anticipated impacts, mitigation measures, time

schedules, costs, responsibilities, and commitments aimed at minimizing environmental impacts. Table 33 provides a detailed overview of the ESMMP.

9.4 Monitoring

Monitoring denotes a systematic process of collecting, analyzing, and using information to track the progress of ESMMP implementation, including developing measures to address any emerging issues. Monitoring the ESMMP involves recording information to track performance and making recommendations to keep the implementation on track. Reporting is a key component of the monitoring exercise.

The proposed ESMMP will be subjected to monitoring, which includes two elements: routine monitoring against standards or performance criteria and periodic review or evaluation. Monitoring will often focus on the overall effectiveness and impact of the ESMMP.

During the construction phase, the Implementing Agency will monitor the contractor's activities to verify that the management measures, procedures, and specifications are implemented as contained in the ESMMP. Compliance will indicate that the contractor is fulfilling their contractual obligations.

During the operation phase, will monitor the facility's operations to ensure compliance with the management measures in the ESMMP and operational procedures. As part of this monitoring, will undertake the statutory initial environmental audit as required by the ESIA/EA Regulations, 2003, and subsequent annual environmental audits.

Table 24: Environmental and Social Management and Monitoring Plan (ESMMP)

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
Construction Phase					
Loss of crops (damaged crops along the alignment)	- Provide fair and timely compensation to affected residents for the loss of crops. Compensation should be based on current market rates and the type of crops affected; - Inform affected persons well in advance about the construction schedule and the areas that will be affected. This is to allow for harvest crops where possible before clearing begins; - Engage with the affected persons through meetings and consultations to explain the necessity of the project and address their concerns. Ensure transparency in the communication process; - Prioritize hiring affected residents for suitable roles in the project; - Carry out fair and adequate compensation as per the summary RAP/asset regitser - Establish and implement a grievance redress mechanism to address complaints and concerns from affected residents promptly and fairly.	- No. of compensated PAPs - No. affected farms - Residents informed about construction schedules - No. grievance received	Prior to construction	Proponent	86,600
Damage to Infrastructure and Structures	- Ensure continuous monitoring of the condition of infrastructure and structures during construction to promptly address any damage that may arise, based on the initial survey findings; Ensure timely and fair compensation to affected individuals or businesses, in line with local laws and regulations. Compensation to follow the developed PAP register, with allocated values; - Any damage to infrastructure or structures will be promptly restored to their original condition or alternative solutions will be provided to mitigate disruptions.	- No. of compensated PAPs - No. affected farms - Residents informed about construction schedules - No. grievance received	Prior to construction	Proponent	192,094
Impacts on Vegetation (clearance)	- Clearly demarcate construction zones to restrict vegetation clearance to only those areas essential for the pipeline installation; - Implement selective clearing to avoid the unnecessary removal	- Area of vegetation cleared - Landscaped area cleared/replanted	Throughout the construction period	- Contractor - proponent	50,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	of significant or mature vegetation; - Replant native vegetation in disturbed areas immediately after construction to facilitate rapid ecological recovery; - Give chance to affected community to harvest the targeted vegetation that are within the raw water mains if they so wish				
Impacts on Water Quality	- Use mulching, hydro seeding, or other ground cover methods to stabilize exposed soil and prevent erosion; - Regularly inspect and maintain construction machinery and equipment to prevent leaks of petroleum products; - Limit the movement of heavy machinery to designated paths to reduce the overall area of soil compaction; - Where possible construction activities close to these rivers should be scheduled for the dry seasons; - The removal of vegetation and soil cover will be restricted to only those areas necessary for excavation work. Particularly, the unnecessary removal of groundcover vegetation from the AoI will be avoided.	- Spills and leakages on the ground - Signs of soil erosion (soil washed down to water bodies) - Spoil material storage	Throughout the construction period	- Contractor	100,000
Soils and geological disturbance	- Avoid excavation in floodplains, near stream banks, or other sensitive areas prone to erosion; - Plan construction activities to minimize simultaneous disturbance of large areas, thereby reducing overall soil exposure and erosion risk; Excavated soil should be placed on flat surfaces and away from water ways (at least 100 away); - Ensure timely removal (reuse) of excavated materials from the project site to minimize soil exposure and erosion risk; - Earthworks shall be meticulously controlled to ensure the surrounding areas remain undisturbed and preserved in their natural state. - Implement phased vegetation clearance to minimize the extent of exposed soil and maintain natural ground cover where possible; - Utilize tracked or low-ground-pressure equipment to minimize	- Placement area of excavated soil/spoil - Area of soil disturbed	Monthly	Contractor	50,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	soil compaction during construction activities; - Where compaction occurs, implement soil aeration techniques post-construction to enhance soil structure and fertility.				
Impact on Local Air Quality (Dust Generation & Exhaust Emissions)	- Practice prevention measures such as dampening dust by use of water (sprinkling water on surfaces that produce dust or covering them); - Provide PPEs such as nose masks to the workers on the construction site; - Spraying water on soil before excavation and periodic access road wetting to reduce nuisance dust levels; - Speed restriction of construction vehicles to a speed of 30 km/h or less on the site and on the access roads to the site; - Ensure construction equipment and machinery are well-maintained to minimize emissions; - Install and properly maintain exhaust emission control devices, such as diesel particulate filters (DPF) and selective catalytic reduction (SCR) systems, on diesel-powered machinery to minimize emissions of particulate matter and nitrogen oxides.	- Frequency of dust suppression activities - PPE Provided to workers - Maintenance checks of construction equipment	Throughout the construction period	Contractor	70,000 Dust masks @ Ksh 250 each
Noise and Excessive Vibration Generation	- Use modern, well-maintained equipment designed to operate with minimal noise and vibrations; - Prioritize manual excavation methods in areas close to sensitive receptors to minimize noise and vibration impact; - Limit construction activities to daytime hours (e.g., 8 AM to 5 PM) to reduce the impact on nearby residents and sensitive institutions; - Restrict the use of high-impact equipment, such as drill hammers, to specific times and durations to minimize disruption; - Provide advance notice to local communities, schools, and health centers about the timing and duration of noisy activities; - Provide construction workers with appropriate PPE, such as earplugs to protect against prolonged exposure to high noise levels;	- Compliance with construction activity time restrictions - Number of advance notices provided to local communities, schools, and health centers - Percentage of construction workers provided with and using appropriate PPE (e.g., earplugs)	Throughout the construction period	Contractor	60,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- Ensure vehicles and construction machinery are serviced per the manufacturer's manual to minimize noise/vibration.				
Waste Generation	- Provide litter collection facilities such as bins and create awareness campaigns to segregate as early as possible, using the appropriate bins - Temporary storage in stock piles for further use on site or removal; - Evaluate the suitability of spoil for non-critical backfilling or landscaping within the project area where permissible; - Ensure pipe cuts are returned to the store for future use; - Develop a spoil management plan to identify opportunities for reuse, recycling, or proper disposal of excavated materials based on site-specific conditions; - Store spoil in designated areas with secure covers or enclosures to prevent dispersion and minimize visual and environmental impacts; - All personnel shall be instructed to dispose of all waste in a proper manner; - Ensure spoil from excavations is arranged according to the various soil layers. This soil can then be returned during landscaping and then rehabilitation, in the correct order which they were removed that is top soil last.	- Waste receptacles provided at the construction site - Volume of waste temporarily stored in spoil/stockpiles - Status of housekeeping on site e.g., Absence of solid wastes such as plastic containers, used papers etc. on site - Availability of sensitization records of waste management	Throughout the construction period	Contractor	65,000
Occupational Health and Safety Impacts Concerns	- All workers to be trained and inducted on the requirement of the implementation of ESMPs before start working; - Strict use of warning signage and tapes where the trenches are open and at other active construction sites; - Ensure all workers including management staff are inducted on OHS; - Ensure there are sufficient, visible danger-sign posts put up at the site to warn passers-by or workers of potential accidents or incidents; - Establish a safe working environment with an occupational health and safety (OHS) plan that addresses potential hazards, identifies preventive and protective measures, including training	- Workers' induction/tool box records - Number of warning signs and tapes placed around open trenches and active construction sites - Number of visible danger-sign posts installed at the site - Presence of a documented OHS plan addressing potential hazards, preventive	Throughout the construction period	Contractor	100,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	and use of personal protective equipment (PPE), and describes documentation and reporting of accidents, diseases and incidents; - All construction workers will be required to wear Personal Protective Equipment (PPE) i.e. helmets, gloves and safety boots during the construction phase; - Provide shaded rest areas and ensure workers have access to ample drinking water. Schedule work to avoid peak heat periods; - Monitor workers for signs of heat stress and provide immediate medical attention if needed	measures, and reporting procedures - Percentage of workers wearing PPE (helmets, gloves, safety boots) during construction.			
Risks Associated with Traffic on Site	- Install clear and prominent signage indicating speed limits, right of way, and site rules; - Provide regular safety briefings and training sessions for all personnel on traffic management procedures and protocols; - Limit the number of vehicles and personnel on-site to essential operations only; - Recommend the contractor prioritize manual laborers for excavation and construction tasks where feasible, especially in areas where machinery may pose safety risks or environmental concerns;	- Number of clear and prominent signs installed indicating speed limits, right of way, and site rules - Number of safety briefings and training sessions conducted on traffic management procedures and protocols - Number of vehicles and personnel present on-site compared to the number of essential operations - Percentage of excavation and construction tasks performed by manual laborers in areas where machinery poses safety risks	Throughout the construction period	Contractor	Costs are under the responsibility of the contractor
Community Health and Safety Concerns	- Inform the community in advance about construction schedules, road closures, and alternative routes through meetings, leaflets, and local media; - Restrict noisy construction activities to daytime hours and avoid early mornings, late evenings, and weekends to reduce disturbance;	- Number of meetings held and leaflets distributed to inform the community about construction schedules, road closures, and alternative routes	Throughout the construction period	Contractor	40,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- Install clear and visible warning signs around the construction site indicating potential hazards, construction zones, and restricted areas; - For Kangai pipeline, coordinate with nearby schools to schedule construction activities that avoid peak times for school arrivals and departures; - Appoint community liaison officers to act as points of contact between the construction team and the community, addressing concerns and providing updates; - Ensure that access routes for emergency vehicles are always kept clear and accessible; -Conduct health campaigns to educate the community about the potential health impacts of construction activities and preventive measures they can take	- Compliance with construction activity time restrictions (daytime hours, avoiding early mornings, late evenings, and weekends - Number of clear and visible warning signs installed around the construction site - Number of construction activities scheduled outside peak times for school arrivals and departures - Community liaison officers appointed and the frequency of their interactions with the community - Number of health campaigns conducted and the level of community participation			
Increased Vehicular Traffic	- Transport construction materials using existing local roads, and repair any road damage caused by construction activities. - Plan detours and diversions in consultation with local communities. - Restrict vehicular and pedestrian traffic to designated road reserves. - Enforce speed limits for all drivers and operators to reduce the risk of accidents.	- Number of road damages reported - Number of speed-related incidents or violations	Throughout the construction period	Contractor	No addition al cost
Temporary Loss of income (from business disruption during construction)	- Compensate for loss of income during construction based on earnings from the goods/services; - Engage affected persons in the compensation process; communicating criteria, timelines, and agreements clearly; - Implement the stand-alone summary of RAP to guide in compensation	- Number of compensated cases for temporarily or permanently damaged crops - Number of written consents obtained from affected property owners	Throughout the construction period	Proponent	72,060

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- Ensure prompt payment of compensation to mitigate financial hardship	and Board of Management of institutions (schools, religious centers, etc.) - Number of meetings held with affected farmers and communities to discuss compensation criteria, timelines, and agreements - Number of compensation payments made within the agreed timelines			
Spread of HIV/AIDS and STIs	- The contractor will undertake sensitization of the HIV /AIDs AND STD awareness e.g. by use of posters etc.; - Encourage workers to go for HIV voluntary counselling, testing and referral services; - Contractor to institute HIV/AIDS awareness program and implemented as part of the Health and Safety Management Plan targeting both workers and the local community; - The Contractor shall institute HIV/AIDS awareness and prevention campaign amongst his workers for the duration of the contract.	- Number of HIV/AIDS and STI awareness sessions conducted (e.g., through posters, workshops) - Number of workers participating in HIV voluntary counselling and testing services - Completion and implementation of an HIV/AIDS awareness program as part of the Health and Safety Management Plan	Throughout the construction period	Contractor	58,500
Increase in cases of Gender Based Violence	- Proponent to develop and enforce a comprehensive policy against GBV, SEA, and SH that includes zero-tolerance principles; - Contractor will implement the approved code of conduct that has provisions in addressing GBV/SEA/SH; - Conduct regular awareness sessions for all project staff, emphasizing respectful behavior, and the consequences of GBV, SEA, and SH; - Implement transparent and fair recruitment practices to	- Presence and enforcement of a comprehensive policy against GBV, SEA, and SH, including zero-tolerance principles. - Number of project staff who have signed and adhere to the code of conduct addressing GBV/SEA/SH - Number of awareness	Throughout the construction period	Contractor	30,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	prevent instances where job seekers may be coerced into providing sexual favors; - Ensure that recruitment processes are conducted in a gender-sensitive manner, promoting equal opportunities; - Engage with community leaders, women's groups, and local authorities to raise awareness about GBV, SEA, and SH; - The contractor to prepare a GBV/SEA/SH action plan that will guide implementation of GBV mitigations; - All workers will be inducted and sign the code of conduct before deployment to the work station; - All GBV, SEA, and SH allegations and cases will be reported promptly to relevant authorities; - The contractor will establish and maintain adequate referral mechanisms to address cases of Gender-Based Violence (GBV) reported at the community level related to project implementation.	sessions conducted for project staff on respectful behavior and consequences of GBV, SEA, and SH - Number of engagement sessions with community leaders, women's groups, and local authorities on GBV, SEA, and SH			
Child Labour/Exploitation	- Engage with local communities, schools, and parents to raise awareness about the importance of education and the risks of child labor; - Establish mechanisms to monitor project activities for signs of child labor, such as age verification checks for workers; - Collaborate with education authorities to monitor school attendance and identify any potential dropouts who may be at risk of child labor; - Establish protocols for immediate response and support for children identified as victims of or at risk of child labor, including access to social services, counseling; - Child abuse and labour will be prohibited; clear signages put up to clearly show that children are prohibited from works areas, including food vending	- Number of awareness sessions conducted with local communities, schools, and parents about the importance of education and the risks of child labor - Records of employees inducted and signed CoC on child Protections - No of Grievances received on Child protection issues	Throughout the construction period	Contractor	20,000
Influx of Workers from Other Areas	- Ensure that unskilled labour is sourced locally; - Contractor to develop an induction programme, including a	- Proportion of workers hired from the local area	Continuous	Contactor Proponent	50,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	Code of Conduct, for all workers (including contractors and their workers); - Respect for local residents; - Develop and implement a grievance procedure that is easily accessible to local communities	- Records of Nonlocal workers - Grievances received and resolved related to Labour Influx - No of worker's sensitized on Code of Conduct and Social cultural environment			
Sexual Exploitation and Abuse (SEA) and Sexual Harassment	- Community engagement to create awareness on SEA/SH risk/ issues - Creating awareness to workers on the need to refrain from SEA/SH incidences - Mandatory awareness creation for workers on required lawful conduct in the community and legal consequences for failure to comply with laws - Develop and implement a SEA action plan with an Accountability and Response Framework as part of the C-ESMP; - Integrate provisions related to sexual harassment in the employee COC; - Mandatory signing and implementation of code of conduct for the workers - Contractor to provide established referral pathway including police station with a gender desk for handling SEA/SH cases and also free toll numbers/hot lines for reporting GBV; - Ensure prompt reporting of all SEA/SH incidences in the project; - Develop and implement a grievance procedure that is easily accessible to local communities; - Ensure all complaints on SEA/SH or harassment are reported directly through the WSP.	- Number of SEA and SH cases reported - Code of Conduct that govern sexual Behavior - No of Workers inducted On the Code of Conduct	Continuous	Contactor proponent	20,000
Impacts of Archaeological and cultural heritage	- Implement a Chance Find Procedure to address the discovery of any archaeological or cultural heritage during construction, as outlined in Annex 8; - Sensitize project workers on the code of conduct, emphasizing the importance of respecting cultural heritage.;	- No of grievances reported - Records of workers trainings on COCs - Records of chance finds	Throughout the construction phase	Contractor	No additional cost

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- Implement the approved Grievance Redress Mechanism (GRM) to address any concerns or complaints related to cultural heritage during the project.				
Interruption of Existing Infrastructure and Services	- Plan construction activities to minimize peak traffic hours. Only conduct major activities during off peak times to reduce traffic congestion and disruptions; - Maintain clear communication with local authorities, residents, and businesses about construction schedules, anticipated disruptions, and alternative routes; - Provide alternative water supply solutions, such as temporary water tanks or connecting affected households to alternative sources, to mitigate interruptions in water supply; - Engage with local communities to understand their concerns and incorporate feedback into mitigation strategies.	- Number of communications (meetings, notices, newsletters) with local authorities, residents, and businesses regarding construction schedules, disruptions, and alternative routes - Alternative water supply solutions during construction - No. of grievances received on interruption	Continuous	Contactor proponent	No additional Costs
TOTAL COST (CONSTRCUCTION PHASE)					**1,064,254**
Operation Phase					
Risk of Soil Erosion	⁻ Establish vegetative buffers along the pipeline route to stabilize soil, reduce erosion, and filter runoff before it reaches water bodies; ⁻ Implement reseeding and replanting programs with native vegetation after construction activities to restore ground cover and reduce erosion risks; ⁻ Conduct maintenance activities during dry periods when soil is less susceptible to erosion, and avoid operations during heavy rainfall or storm events; ⁻ Implement a schedule for regular inspections of erosion control measures and pipeline integrity to promptly address any issues and ensure effectiveness.	- Area reseeded or replanted with native vegetation after construction - Frequency and outcomes of inspections for erosion control measures and pipeline integrity	Monthly	KICOWASCO	Costs are under the responsibility of Proponent
Risk of Water Pipeline Bursts Leading to Water Wastages	- Implement a proactive maintenance schedule to inspect pipelines regularly for signs of wear, corrosion, or potential weaknesses that could lead to bursts; - Install and maintain advanced leak detection systems along the pipeline network; - Optimize pressure levels within the pipeline system to reduce	- No. of detected leaks, time taken to repair, and records of past leaks and unaccounted-for water - No. of leak reports received from community members	Continuous	Proponent	100,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	stress on pipes and fittings, thereby lowering the likelihood of bursts; - Encourage community members to report suspected leaks or unusual water flow immediately; - Implement comprehensive water loss management programs that include regular monitoring of NRW levels; - Explore and adopt innovative technologies such as smart meters, remote sensing, and predictive analytics to enhance leak detection capabilities; - Implement a leak detection and repair program (including records of past - leaks and unaccounted- for water to identify potential problem areas	and the response time to address them			
Risk of illegal connection to the water pipeline	- Implement robust monitoring and surveillance systems to detect unauthorized activities promptly; - Regularly inspections of the water pipeline to identify illegal connections; - Regularly engage community to educate users about the consequences of illegal connections and to foster compliance with water usage regulations; - Conduct public sensitization programs on importance not interfering with the water pipeline and the need to seek official water connection.	- Frequency and thoroughness of pipeline inspections specifically targeting illegal connections - No. of community engagement sessions conducted and the level of community participation - No. of unauthorized activities detected and addressed - No. of community reports or tips about suspected illegal connections.	Continuous	Proponent	Costs are under the responsibility of Proponent
Risk of Sexual Exploitation and Abuse by project workers	- Implementing clear policies prohibiting sexual exploitation and abuse, alongside robust training programs for all project personnel; - Identify and assess SEA risks at the community level; - Establishing regular monitoring of project sites; - Develop and enforce clear policies prohibiting SEA and SH within the project framework; - Establish accessible and confidential reporting mechanisms for	- No. of SEA and SH policies developed, communicated, and enforced - No. of training sessions conducted on SEA and SH prevention and the percentage of project personnel trained	Continuous	Proponent	50,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	individuals to report incidents of SEA and SH without fear of retaliation;	- No. of SEA risk assessments conducted at the community level - No. of SEA and SH incidents reported, investigated, and resolved			
Wayleave Encroachment	- Mapping and installation of beacons to which illustrate the width of the pipeline reserve in consultation with the relevant road Agency. - Regular patrol of the pipeline corridor for encroachment; - Conduct outreach programs to educate local communities about the importance of preserving the designated corridor and the consequences of encroachment; - Prosecution of encroachers as required by County By-Laws on wayleaves and road reserves maintenance; - Provide marker posts along the pipeline corridor to clearly demarcate the boundaries and discourage encroachment; - Conduct public sensitization programs on importance of not interfering with way leaves and public reserve land.	- No. of public sensitization programs conducted and their reach (e.g., number of people informed, materials distributed) - No. of marker posts installed along the pipeline corridor - No. of encroachment cases prosecuted and resolved.	Continuous	Proponent	100,000
TOTAL COST (OPERATION PHASE)					**250,000**
Decommissioning Phase					
Utilization of Contaminated Sources	- Establish temporary water supply points with safe water tanks or truck deliveries; - Implement regular monitoring and testing of alternative water sources; - Conduct public awareness campaigns on the risks of contaminated water; - Upgrade existing water supply systems and repair communal water points; - Distribute affordable household water treatment options (e.g., chlorine tablets, ceramic filters).	- No. of temporary water supply points established with safe water tanks or truck deliveries. - Frequency and results of water quality tests conducted on alternative water sources No. of public awareness campaigns conducted on the risks of contaminated water and the level of community participation No. of existing water supply systems upgraded and	Continuous	Contractor	Costs are under the responsibility of Proponent

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
		communal water points repaired			
Impact on Livelihoods and Well-being	⁻ Implement water storage solutions like reservoirs or tanks to ensure continuous supply for irrigation; ⁻ Provide community education on efficient water use practices for livestock watering; ⁻ Mobilize government and NGO resources to provide financial support for water infrastructure projects; ⁻ Collaborate with local stakeholders to implement long-term water management strategies and Policies	- No. and capacity of water storage solutions (e.g., reservoirs, tanks) implemented - No. of community education sessions conducted on efficient water use practices for livestock watering	Continuous	Contractor	Costs are under the responsibility of Proponent
Increased Competition for Water Resources	⁻ Develop and implement water management plans that prioritize equitable distribution of water among different users; ⁻ Identify and develop alternative water sources such as groundwater wells, desalination plants (if feasible), and treated wastewater reuse systems; ⁻ Implement emergency water supply measures, such as mobile water tanks or truck deliveries, to mitigate immediate shortages during the transition phase; ⁻ Conduct outreach programs to educate communities about water conservation, sustainable use practices, and the importance of equitable water sharing. ⁻ Facilitate inclusive dialogue and consultation among all affected stakeholders, including community groups, businesses, and local authorities; ⁻ Establish transparent and fair water allocation systems that prioritize essential needs such as drinking water, agriculture, and sanitation; ⁻ Promote community-based water management initiatives that empower local communities to participate in water resource planning and governance;	- No. of emergency water supply measures implemented (e.g., mobile water tanks, truck deliveries). - No. and impact of community-based water management initiatives implemented.	Continuous	Contractor	No additional cost
Loss of Revenue for the WSP	⁻ Engage WASREB to review and adjust water tariffs to reflect the actual cost of service provision and ensure financial sustainability;	- Completion and implementation of a tariff review process	Continuous	Contractor	No additional cost

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	⁻ Allocate funds for essential infrastructure upgrades, repairs, and maintenance to enhance service reliability and operational efficiency; ⁻ Prioritize essential expenditures and explore cost-saving measures to optimize operational efficiency'.	- Implementation and impact of identified cost-saving measures			
Loss of Employment Opportunities	⁻ Offer retraining programs and skill development initiatives to enhance the employability of affected workers in new sectors or emerging industries; ⁻ Facilitate job placement services, career counseling, and networking opportunities to assist displaced workers in finding new employment opportunities.	- No. of retraining programs and skill development initiatives implemented - No. of career counseling sessions conducted.	During decommissioning	Contractor	No additional costs
Waste Generation	- Careful dismantling to ensure materials remain as re-usable as possible; - Prioritize the recovery and recycling of decommissioned materials such as HDPE pipes and fittings; - Assess the feasibility of reusing decommissioned infrastructure components, such as pipelines or fittings, in other construction projects or applications; - Cleaning and proper site rehabilitation by adhering to a NEMA approved Decommissioning plan.	- Quantity and percentage of decommissioned materials. - Compliance with the approved Decommissioning Plan. - Volume of spoil generated during excavation activities	During decommissioning	Contractor	50,000
Visual Intrusion	- Plan decommissioning in stages to limit the area affected at any one time; - Restore each section promptly after decommissioning activities are completed; - Implement comprehensive landscaping plans that include replanting native vegetation and restoring the affected land; - Ensure that waste materials and debris are promptly removed after decommissioning activities.	- Restoration after activities are completed - Completion and effectiveness of landscaping plans, including native vegetation replanting and land contour restoration - Efficiency of waste removal post-decommissioning	During decommissioning	Contractor	100,000
TOTAL COST (DECOMMISSIONING PHASE)					**150,000**
				GRAND TOTAL	**1,464,254**

9.5 Topic Specific Management Plans

The contractor will develop targeted management plans to address specific environmental and social aspects, guided by the ESMMP and any emerging issues on the ground. These plans must be prepared and approved by both the proponent and the Bank before the contractor mobilizes to the site. The following Sections present the specific management plans foreseen for construction and operation, based on the outcomes of the impact assessment.

9.5.1 Waste Management Plan

The Waste Management Plan (WMP) will be developed to manage solid and liquid wastes generated during the water pipeline project. It establishes procedures for the storage, collection, and disposal of waste. The WMP provides for the following:

- Compliance with Kenyan waste policy;
- Outline of waste characteristics and sufficient capacity for managing waste: waste streams and quantities to be managed; and
- The WMP will be developed considering guidelines provided under Waste Management Regulations, 2006, Sustainable Waste Management Act, 2022.

Furthermore, it contributes to ensuring that the capacity and the nature of collection and treatment systems are in line with the waste to be managed. The overall objective is to minimize the impact of waste generated during the construction phase of the water pipeline project through the following:

- Minimize the amount of waste that is generated;
- Maximize the amount of waste that is recovered for recycling – including segregation of recyclable wastes at source;
- Minimize the amount of waste that is deposited at landfill;
- Manage spoil material generated from trench excavation by reusing it for backfilling where possible;
- Avoid dust impacts from the handling of construction wastes;
- Ensure all wastes are properly contained, labeled, and disposed of in accordance with local regulations; and
- Ensure waste is disposed of in accordance with the waste management hierarchy.

9.5.2 Emergency Response Plan

The Emergency Response Plan (ERP) assembles and describes in one document the site-specific actions and procedures to be taken in emergency situations occurring during construction and operations.

The objective of the ERP is to be prepared to respond to process upset, accidental, and emergency situations in a manner appropriate to the operational risks and to prevent their potential negative consequences. The ERP will clearly make a distinction between all the project phases, since the actions to be undertaken will be different during the construction, operation and decommissioning phases.

9.5.3 Traffic Management Plan

In a scenario where the contractor opts to use machinery, a Traffic Management Plan (TMP) will be developed to manage construction traffic generated by the project, minimize traffic disruption and road user delay and provide for the on-going safety of road users, including pedestrians and cyclists. All of the

traffic related impacts described previously can be mitigated very effectively by the implementation of standard best practices in terms of environmental controls and management practices during construction. These measures will be detailed in the TMP, which will describe in detail the measures that the Contractor will implement during the construction of the project.

9.5.4 Health and Safety Management Plan

The Health and Safety (H&S) Management Plan will be a tool that will provide a framework for the following:

- Planning for Health and Safety;
- Accident and Incident Investigation; and
- Health and Safety Auditing.

The H&S Plan will be developed following all the relevant Kenya's national legislation and World Bank policies and EHSG.

9.5.5 Rehabilitation and Site Closure Plan

After the completion of construction activities, the contractor shall develop and implement a comprehensive Rehabilitation and Site Closure Plan. The plan will include the following steps:

- After completion of construction activities, the contractor shall clear the site of construction materials and dispose wastes in appropriate disposal sites.
- The contractor shall remove all temporary works on the construction site and grow grass on areas that are not covered by the installations to control erosion

9.5.6 SEA/SH Prevention and Response Action Plan

The contractor will develop a SEA/SH (Sexual Exploitation and Abuse/Sexual Harassment) Prevention and Response Action Plan tailored for the water pipeline project. This plan will include a Grievance Redress Mechanism (GRM) that ensures confidentiality and incorporates an Accountability and Response Framework. The plan will outline essential measures for preventing and responding to Gender-Based Violence (GBV) impacts.

9.5.7 Communication Procedures and Stakeholder Engagement Plan

The proponent will be required to come up with this plan, which includes directions to conduct internal and external communication. Identifies key Stakeholders, defines their relation/sensitivity to the Projects and the communication modalities to favor when engaging with them, establishes a meeting calendar and keeps track of engagements completed.

9.5.8 Local Recruitment Plan

Defines the actions that will be implemented to favor local recruitment. The contractor will prepare a local recruitment plan to guide on recruitment of locals. The plan shall pay attention or adhere to Employment Act. In designing the local recruitment plan the contractor shall comply with the provisions of Employment Act, 2007 and wherever possible, give priority to qualified local people when hiring employees.

9.5.9 Stakeholder Engagement Plan

The Stakeholder Engagement Plan (SEP) outlines the strategy for engaging stakeholders throughout the lifecycle of the Kirinyaga water project. Effective engagement ensures that stakeholders are informed, consulted, and involved in the decision-making processes, thereby promoting transparency, building trust, and fostering community support for the project. According to the World Bank standards, the developer should develop a Stakeholder Engagement Plan (SEP) proportionate to the nature and scale of the project and its potential risks and impacts. The elements of the SEP may be included as part of the Environmental and Social Commitment Plan and preparation of a stand-alone SEP may not be necessary. The SEP will describe the timing and methods of engagement among stakeholders throughout the lifecycle of the project.

9.6 Capacity Requirements

To ensure the effective implementation of the ESMMP for the proposed water project, the following is an outline of the capacity requirements:

a) KICOWASCO

- Environmental and Social Safeguards Team: KICOWASCO WSP should establish or strengthen a team responsible for overseeing the implementation of the ESMMP, including dedicated E&S specialists, an OHS officer, and a Community Engagement Officer.
- Capacity Building: KICOWASO WSP should ensure continuous training for its staff on environmental and social standards, monitoring tools, and compliance with national regulations and international best practices.

The WSP lacks a dedicated Environmental and Social (E&S) specialist but recruits one on a need basis. For this project under CLSG-II, an E&S specialist shall be recruited to oversee the implementation of the ESMMP and enhance the capacity of the team to effectively manage E&S aspects in future projects.

Contractor

- **Environmental, Health, Safety and Social Officer:** The contractor must have a dedicated Environmental, Health, Safety and Social Officer with relevant qualifications and experience to oversee compliance with environmental and social safeguards; and workplace safety, risk assessments, and adherence to safety protocols ensuring all site activities align with the ESMMP.
- **Community Liaison Officer:** To facilitate communication and engagement with local communities and stakeholders, addressing any grievances and ensuring effective information flow.

In order to ensure the mandatory implementation of the ESMMP for the proposed water project, the following should be embedded within the project's contractual and financial frameworks:

- Incorporating C-ESMP Implementation Costs in the BoQ. This ensures that the contractor has a dedicated budget to execute all environmental and social mitigation measures
- Including ESMP Compliance in Contract Documents. The contract should clearly state that the contractor is obligated to fully comply with all ESMP requirements throughout the project cycle.
- Clear Implementation and Enforcement Mechanisms. The contractor to submit monthly Environmental and Social Compliance Reports, documenting the implementation of the ESMMP.
- Linking Payments to ESMP Performance. Structure contractor payments in such a way that certain percentages are linked to the satisfactory completion of environmental and social management activities.

10. SUMMARY ASSET REGISTER

10. 1 Overview

The summary asset register has been developed as part of the Environmental and Social Impact Assessment (ESIA) for the Water Sanitation Development Project under the Conditional Liquidity Support Grant II. This was necessitated by impacts identified along the project's wayleave, which include loss of structures (staircases/veranda), business disruptions, and impacts on crops. This summary aligns with local legislation, such as the Land Act No. 6 of 2012 (Revised 2019), and World Bank standard OP 4.12 - Involuntary Resettlement touching on Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement. The summary of asset register provides a framework for mitigating impacts on Project-Affected Persons (PAPs) by ensuring equitable and transparent compensation for losses incurred. The approach adopted minimizes resettlement impacts and facilitates the restoration of affected livelihoods and living standards.

The cut-off date for identifying Project-Affected Persons (PAPs) and valuing affected assets was agreed upon with community members and PAPs during stakeholder consultations. Based on the valuation exercise conducted on first week of December, 2024, the official cut-off date was set as December 20, 2024. Any new claims or developments after this date will not be eligible for compensation

The valuation of affected assets and livelihoods was guided by the principles of Open Market Value and adhered to local legislative requirements and international standards. The methodologies applied include:

- **Structures:** Valuation based on the construction cost approach, accounting for regional differences in material costs, age, and condition.
- **Businesses:** Compensation for loss of income was calculated using daily profits for a maximum of seven days, representing the time required to restore accessibility.
- **Crops:** Valuation based on current market rates for mature and young plants, considering crop type and condition.

The project affects 46 PAPs, distributed as: 20 in Gatuto and 26 in Kangai. The key impacts include:

- **Structures:** Temporary business sheds and perimeter walls located within the wayleave.
- **Crops:** Coffee bushes, bananas, and nappier grass, among other agricultural produce.
- **Businesses:** Temporary disruption of business operations leading to income loss.

The total compensation for KICOWASCO WSP lines is Kshs. 413,223, with allocations of Kshs. 171,808 for Gatuto and Kshs. 241,415 for Kangai. The compensation rates as derived by a registered and licensed valuer, provides a standardized basis for assessing losses. Key rates are as presented in Table 25 below.

Table 25: Compensation schedule

Item of Compensation	Unit of Compensation	Rate (Kshs.)	Item of Compensation	Unit of Compensation	Rate (Kshs.)
Business shed	Per Square Feet	100	Flowers	Medium	100
				Mature	200
Business stall/GCI sheet structure	Per Square Feet	150	Coffee Bushes	Per stem mature	1200
Business stall Polythene roof timber structure	Per Square Feet	120	Banana	Medium	200
				Mature	400

Permanent structure- screed floor, stone wall, concrete slab	Per square foot	2500	Live fence	Young	50
Perimeter wall	Per Linear metre	7,500	Loss of Livelihood	Per Day	630
Nappier grass	Per metre square	100			

10.2 Grievance Redress

Involuntary resettlement and the acquisition of wayleave often lead to grievances among the affected population, making timely redress crucial for the successful implementation of resettlement and project completion. To address these concerns, a grievance redress mechanism (GRM) has been established, outlined in Chapter 6, Section 6.6, to manage the grievance submission, review, and escalation process for unresolved issues. Potential grievances during the implementation of the summary asset register may include disputes over valuation, inventory errors, boundary disagreements, crop compensation values, family-related ownership conflicts, and contested land ownership. To resolve these issues, KICOWASCO will implement a standard operating procedure through local chiefs, ensuring systematic and efficient management of complaints, fostering trust, and maintaining positive relations with the Project Affected Persons (PAPs).

10.3 Summary of Affected Properties

A total of sixty-two (**62**) items/properties belonging to the affected persons were identified along the Gatuto and Kangai line. For Gatuto area, nine (**9**) structures (kiosks, staircases/veranda), eleven (**11**) Business Disruption, and eight (**8**) plantations [(Crops/trees/flowers) (Nappier grass 6, flower trees 1, Coffee bush 1]. For Kangai area, nineteen (**19**) business disruption, three (**3**) trees and twelve (**12**) structures affected.

The size of the properties affected ranges between 8 to 180 square feet with majority of owners being men. In Gatuto, properties owned by men are 12, which accounts for 60% of the total, while properties owned by women are 8, accounting for 40%. In Kangai, properties owned by men are 15, which accounts for approximately 57.7%, and properties owned by women are 11, which accounts for approximately 42.3%. The sum compensation, inclusive of 15% contingencies on the affected properties, is as presented in Table 34 below for Gatuto and Kangai.

Table 26: Summary table of Asset Register

	Gender		Cost of structure (kiosks, Stairs, Veranda) (Ksh)	Cost of Business Disruption (Income Loss (Ksh)	Cost of plantations affected (Ksh	Total cost (Ksh)
	Male	Female				
GATUTO	12	8	38,766	27,540	77,600	**143,906**
	15% disturbance fees		21,586	**Transport facilitation**	5,700	**27,902**
	Vulnerable PAP support		616			
	GRAND TOTAL FOR GATUTO					171,808
KANGAI	Male	Female	**Cost of structure (kiosks, Stairs, Veranda) (Ksh)**	**Cost of Business Disruption (Income Loss (Ksh)**	**Cost of plantations affected (Ksh**	
	15	11	153,328	44,520	9,000	206,848
	15% disturbance fees		31,027.2	**Transport facilitation**	3,400	34,567
	Vulnerable PAP support		139.5			
	TOTAL FOR KANGAI					241,415
				GRAND TOTAL		413, 223

11. CONCLUSIONS AND RECOMMENDATIONS

11.1 Introduction

The ESIA process identified and assessed potential impacts on the physical, biological, and socio-economic environments, with corresponding mitigation measures. With proper precautions during construction, the project is expected to have minor impacts, and the operational phase's clean water discharge will have negligible effects. The identified impacts, both positive and negative, should be considered in the context of the project rationale and cumulative impacts discussed earlier.

Construction Phase Impacts: - Potential impacts during construction include land loss, vegetation clearance, soil compaction, erosion, dust, air quality degradation, noise, and vibration. Social concerns, such as gender-based violence, substance abuse, and the spread of diseases like HIV/AIDS, may also arise due to the influx of workers. However, positive impacts like employment creation, skills transfer, and local economic growth are anticipated.

Operation Impacts: - Site maintenance activities could cause soil compaction, erosion, and increased water abstraction from Thiba and Kiringa Rivers. While sediment loading may impact surface and groundwater, it is considered manageable. Risks like pipeline bursts and social concerns such as SEA/SH are deemed minor, with mitigation measures in place. Positive impacts include job creation and economic benefits from increased income.

Decommissioning Phase: - The decommissioning phase could present significant challenges, such as health risks from contaminated water, loss of employment, and economic strain on local communities. Waste management and visual impacts from decommissioned infrastructure will need attention. Comprehensive planning and mitigation strategies are necessary to address these challenges effectively.

All negative impacts associated with the construction, operation and decommissioning phase of the Project have been mitigated to a level which is deemed appropriate.

11.2 Recommendations

KICOWASCO is committed to diligently incorporating the mitigation measures fully identified during the ESIA process feasible, while ensuring the economic viability of the Project remains intact. The implementation of these measures, detailed in Chapter 8 and listed in the Environmental and Social Management and Monitoring Plan (ESMMP) in Chapter 9, will serve as the foundation for managing both positive and negative impacts associated with the project's establishment.

In conclusion, following this assessment, the consultant finds no impediment to authorizing the proposed water pipeline project, contingent upon the rigorous application of the outlined mitigations and the establishment of robust monitoring frameworks to address potential environmental and socio-economic impacts.

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13.APPENDICES:

Annex	Description
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Annex 1: Certificate of Incorporation

Annex 2: Photographic Presentation



Plate 22: Ngaru market



Plate 23: Holy family Kangai catholic church along Ndaba road.



Plate 24: Tarmac road within Kangai market



Plate 25: Ngaru Girls high school.



Plate 26: Drying rice at Kiaga town



Plate 27: Consultation and Public Participation Baraza at St. Bartholomew church Nyaga Village



Plate 28: Consultation and Public Participation Baraza at Kangai Village



Plate 29: consultative meeting at Ngaru Market



Plate 30: Kangai pipeline route Transect Walk with Elder.



Plate 31: Existing water line along Gatuto Kangai road. -



Plate 32: Temporary structures along the pipeline route

Source: Consultant's Field Assessment between 6-11th June 2024

Annex 3: Pipeline Layout Maps

Annex 4: Proposed Lines Topographical Profile

Annex 5: Bill of Quantities

Annex 6: Minutes of Meetings and List of Participants

Annex 7: Sample Filled Questionnaires

Annex 8: Chance Find Procedures

Regulatory and Other Requirements

The primary legislation on cultural heritage issues is the National Museums Heritage Act, 2006 (which updated and replaced the National Museums Act, 1983), the Antiquities Monuments Act 1983 and is enshrined in the requirements of the provisions of the Environmental Management and Co-ordination Act, 1999; (amendment) Act, 2015 which defines the Environmental and Social Impact Assessment (ESIA) process.

The National Museums Heritage Act sets out the overarching administrative processes for protecting and preserving cultural heritage and management by the National Museums of Kenya (NMK). As there are no designated monuments or sites within the immediate Project's area of influence, the heritage legislation only has a limited bearing on the Project's activities. However, the water pipeline project will take precautionary measures for handling any potentially significant chance finds through its implementation of the chance find procedure and requirement presented in subsequent sections of this procedure.

Physical and Cultural Resources OP/BP 4.11 For purposes of this policy, "physical cultural resources" are defined as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above ground, underground, or underwater. During the excavation process, any chance finds encountered, chance find procedures will be followed to avoid damage and ensure suitable preventive or mitigation measures are executed.

The national agency responsible for cultural matters in Kenya is the National Museums of Kenya (NMK). Prior to commencement of excavation process, the KICOWASCO (who is the Proponent) will contact NMK who would send representatives to review the site and prepare a report. The report will entail advice on professional approach to the proposed works to ensure minimal damage to any of the encountered items. In the event that chance finds are encountered the following procedure shall apply:

Procedures to Address Chance Finds

With the aim to avoid damaging cultural resources during project activities the following will be followed;

- Project personnel must take total care to any unfamiliar materials encountered during project activities. Upon establishing a discovery, the personnel must immediately report the case to their immediate supervisor;
- The contractor or supervising engineer would report the finds to the local administration such as the local chief or the Assistant County Commissioner (ACC);
- The local administration would then report the find to NMK;
- The contractor must stop work immediately after discovering evidence of possible scientific, historical, prehistoric, or archaeological data and notify the Supervision team/Engineer giving the location and nature of the finds;
- The proponent will then notify the NMK which will have to send qualified personnel to assess the material for further steps

- NMK would temporarily stop the works to conduct an assessment and prepare a report. The period of stoppage is from 10 days to 21 days depending on the complexity of the project; Retrieve movable artifacts and preserve immovable ones;
- NMK would also map out the area to be preserved during the investigation period and arbitrate between the community and developers in the event of dispute;
- NMK to circulate the cultural impact assessment report to the Contractor, NEMA, relevant lead agencies and the community.

Measures for Care of Chance Finds

Upon retrieval of movable artifacts and conservation of immovable ones, NMK would proceed with segregation and dating of the artifacts and determination of their significance; Segregated artifacts would be stored in the NMK archeological stores according to their size and dates, and labeled with the geographical area where found; The artifacts may be displayed in an exhibition when required or published to enrich the cultural heritage.

Chance Find Report

Chance Find Report				
Date (DD/MM/YYYY)	**Time (xx: xx)**	**Site Name**	**GPS Coordinates (Northing)**	**GPS Coordinates (Easting**
Description of Find				
Proximity to Contractor Activity				
Sensitivity				
Vulnerability				
Recommended Action Description				
Site Checklist		**Yes / No**	**Comment**	
Responsible persons notified				
Coordinates verified				
Site Marked				
Site Secured				
Photograph(s)				
Impacts Assessed				
Actions Agreed				
Authorized Instruction				
National Museums Kenya Representative		**Position**	**Signed (Name**	
Contractor Representative		**Position**	**Signed (Name)**	

Annex 9: Environmental and Social screening Forms

Annex 10: Notice Letter Sent Out Prior to Meeting

Annex 11: Water Abstraction Permit

Annex 12: Authorization Letter from Road Agencies

Annex 13: Sample Complaint/Grievance Form

GRIEVANCE REGISTRATION	
CASE No.	**DATE**
Name of Complainant:	
Complainant's contact address:	
Phone Number:	
E-mail:	
DETAILS OF COMPLAINT/GRIEVANCE (What happened? Where did it happen? Who did it happen to? What is the result of the problem?)	
Date of Incident/Grievance:	
Complaint received by:	
Designation of Person Recording Grievance	
Proposed Date of Response to Grievance	
Signature of Recording Person	Signature of Complainant
GRIEVANCE REDRESSAL RESPONSE	
Date of Redress	
Decision of Grievance Officer	

Grievance Follow-up Template

Follow-up Action/Review	
Action:	
Action taken by: (Name):	
Results:	
Date action/review completed:	
Signature:	

Annex 14: NEMA Lead EIA/EA Practicing License