MINISTRY OF WATER, SANITATION & IRRIGATION
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 Murang'a West Water and Sanitation Company Ltd

Contract Reference No. KE-WSTF-406018-CS-INDV-ESIA-01

Comprehensive Project Report (CPR) for the Proposed Extension and Rehabilitation of MWEWASCO's Water Supply Network

FINAL REPORT

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QUALITY MANAGEMENT

Project	Water and Sanitation Development Project (WSDP)		**Financed By**
Program	Conditional Liquidity Support Grant (CLSG) -II Program		**World Bank (IDA)**
WATER SERVICE PROVIDER (WSP)			
WSP	Murang'a West Water and Sanitation Company - Extension of the reticulation network by 15 Km of DN 63 mm HDPE; 28.7 Km of DN 50mm HDPE last mile lines and Supply and installation of 3,000nr DN15 water meters for last mile connectivity		
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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 Muranga West Water and Sanitation Company (MWEWASCO) Water Service Providers (WSP) (Ref No. WSTF/7/PR/VOL VII/72 (83)) 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 considering 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 WSPs.

CERTIFICATION

ESIA /EA Lead Expert Mr. Bubicha Mohamed (Reg. No. 7683) has prepared this Comprehensive Project Report (CPR) for the proposed Extension and Rehabilitation of MWEWASCO's Water Supply Network in Murang'a County. The report adheres to the World Bank Operational Procedures (OPs), Environmental Safeguards Standards (ESS), 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 Kangema and Kahuro Sub-counties in Murang'a 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 9 of the Environmental (Impact Assessment and Audit) Regulations, 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
CoC	Code of Conduct
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
ERP	Emergency Response Plan
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
ESS	Environmental and Social Safeguards
FGD	Focused Group Discussion
GBV	Gender Based Violence
GI	Galvanized Iron
GoK	Government of Kenya
GPS	Global Positioning System
GRM	Grievance Redress Mechanism
H&S	Health and Safety
HDPE	High Density Polyethylene
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
IEC	Information, Education and Communication
JICA	Japan International Cooperation Agency
KeRRA	Kenya Rural Road Authority
KESHP	Kenya Environmental Sanitation and Hygiene Policy
KII	Key Informants Interview
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
MWEWASCO	Murang'a West Water and Sanitation Company
NCCRS	National Climate Change Response Strategy
NECC	National Environmental Complaints Committee
NEMA	National Environment Management Authority
NGEC	National Gender and Equality Commission
NGO	Non-Governmental Organisation
NRW	Non-Revenue Water
OHS	Occupational Health and Safety
OP	Operational Policies
OSHA	Occupational Safety and Health Act
PAD	Project Appraisal Document
PDA	Project Development Area
PLWD	Persons Living with Disability
PPE	Personal Protective Clothing
SCR	selective catalytic reduction
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SH	Sexual Harassment
STD	Sexually Transmitted Disease
TMP	Traffic Management Plan
TOR	Terms of Reference
TVET	Technical Vocational and Educational Training
UPVC	unplasticized polyvinyl chloride
VECs	Valued Environmental Components
WB	World Bank
WBG	World Bank Group
WHO	World Health Organisation
WMP	Waste Management Plan
WRA	Water Resources Authority
WSDP	Water and Sanitation Development Programme
WSP	Water Service Provider
WSTF	Water Sector Trust Fund

EXECUTIVE SUMMARY

E.1 Introduction

The Government of Kenya (GoK) secured financing from the World Bank (WB). The rehabilitation, improvement and extension of select water pipelines in Kangema and Kahuro Sub-counties is targeted as the priority project. The project proponent is Murang'a West Water and Sanitation Company (MWEWASCO), which was selected for support under CLSG-II cluster 1 by the Water Sector Trust Fund (WSTF). WSTF on behalf of MWEWASCO commissioned individual consultant "Bubicha Mohamed" to conduct project's ESIA in compliance with the laws of Kenya and the World Bank Safeguards Policies.

E.2 Project Description

The proposed project by MWEWASCO aims to develop a comprehensive potable water supply system that will serve the growing population in the Karurumo and Karugia centers, by implementing key infrastructure projects, specifically the extension and rehabilitation of MWEWASCO's water supply network in Kangema and Kahuro Sub-counties in Murang'a County, Kenya. This will entail extension of the reticulation network by 15 Km of DN 63 mm and 28.7 Km of DN 50mm last mile water pipelines. A social screening was conducted along the 15 km DN 63 mm and 28.7 km DN 50 mm reticulation lines to assess potential displacement impacts. The screening confirmed that the pipelines will be installed within existing road reserves, with no physical or economic displacement anticipated. No businesses, farming activities, or private structures will be affected along the proposed alignment These projects are part of a broader initiative to address water scarcity and improve the overall water distribution network in the area. The pipelines are designed to increase water availability to the communities, ensuring a consistent and adequate supply to meet the growing demands of the population and to reduce cases of illegal connections and water theft (for details see chapter 2).

E.3 Legal, Regulatory and Policy Framework

Relevant Kenyan policies and statutes and the Institutional framework have been analysed in detail (see chapter 3). The project complies with various legal and policy frameworks, ensuring alignment with national and international standards. Key statutes include the Constitution of Kenya, 2010, which mandates sustainable environmental management, and the Environmental Management and Coordination Act (EMCA), 1999, which requires an ESIA for listed projects. Other relevant laws include the Water Act, 2016, regulating water resource management, and the Occupational Safety and Health Act (OSHA), 2007, ensuring worker safety. Policies such as the National Environment Policy, 2013, and the Climate Change Act, 2016, emphasize sustainable resource use and climate resilience. Internationally, the project adheres to World Bank Operational Policies, including Environmental Assessment OP/BP 4.01, categorizing the project as having minimal adverse impacts, and OP 4.11 on Physical Cultural Resources, with chance find procedures for cultural artifacts.

E.4 Stakeholder Engagement and Consultation

The ESIA process for the project involved thorough dissemination of project information and stakeholder engagement. The open and inclusive consultation process was conducted on 3rd and 4th of June 2024 (Reconnaissance) as well as between 19th June and 21st June 2024 (field surveys and meetings). During the stakeholder engagement process, meetings were separately held for the proposed lines in Gatuya, Muringa-ini, Kiria and Gatheru Locations. Men, women and youth from the proposed project area were consulted

and their comments and concerns were recorded and incorporated into the ESIA Report. A total of four meetings were conducted during the ESIA engagement phase at Gatuya, Muringa'ini, Kiria and Gathamba locations with members of the targeted communities to benefit from the proposed water project (*Annex 4*). A summary of concerns raised by participants are provided in the table below (for details see chapter 6).

Table 1: Summary of concerns raised during the public participation

Subject	Question/Concern	Response
Water Use	Can the beneficiaries use the water for both domestic and agricultural use?	Water to be supplied is treated and intended for drinking. It is not fit for farming due to chlorine and other additives used for treating water.
Water pressure challenges	Water pressure is low and prevents Ngaru area residents to get treated water yet they have water connection from a nearby river.	There has been a challenge connecting that area but a new line is proposed under this project that will solve the water pressure issues.
Repair delays	There is a delay in attending to repairs	The representative shared the technical team's phone number for reporting water pipe damages.

E.6 Environmental and Social Impact Assessment and Mitigation Measures

The implementation of the water pipeline project by MWEWASCO is anticipated to result in both positive and/or negative impacts on the physical, social, economic, and biophysical environment of the project site area.

Cumulative Impacts: Several past, ongoing, and upcoming projects have been identified as potentially contributing to cumulative impacts. These include ongoing agricultural activities, Irrigation Schemes, expanding tea farming and other agricultural practices, small-scale commercial developments, improvements in community water supply systems, and the construction of roads in the area. Projects without official schedules were also included due to their proximity to the project's right-of-way. Efforts will be made to maintain communication with these projects to update information and adjust mitigation measures as needed in collaboration with other project instigators.

The biophysical and socio-economic impacts during the construction phase that have been identified and assessed in the ESIA include the following:

Positive Impacts:

- Employment Creation
- Injection of Money into Local Economy
- Skills Transfer
- Increased Revenue Generation for National/County
- Improved and reliable water supply for the beneficiary residents under MWEWASCO jurisdiction
- Improved sanitation due to increase supply of water
- Reduced Water and Sanitation Burden to Women
- Reduced Non-Revenue Water
- Improved Service Delivery.

Negative Impacts

There are also various negative impacts anticipated. These impacts were ranked and analyzed in detail as presented in Chapter 8. The ESIA identifies a range of anticipated negative impacts associated with the

construction and operation of the proposed water pipeline project. These include vegetation loss, soil disturbance, dust generation, waste production, occupational and community health and safety risks, and interruptions to existing infrastructure and services. Social risks such as the spread of HIV/AIDS and other STIs, Gender-Based Violence (GBV), Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH), labour influx, and child labour have also been identified. These risks may arise due to the presence of a temporary workforce and interactions with local communities.

Mitigation measures are proposed for each impact, emphasizing ecosystem restoration, safe construction practices, community engagement, adherence to labour laws, enforcement of codes of conduct, and proactive maintenance. These measures aim to minimize adverse effects while ensuring compliance with regulatory standards and safeguarding community and environmental well-being. .

E.9 Environmental and Social Management and Monitoring Plan

To address the identified negative impacts of the project, an Environmental and Social Management and Monitoring Plan (ESMMP) has been meticulously formulated. The ESMMP summarizes important information that will be required for the construction, operation and decommissioning phases of the Project. Finally, the ESMMP details the monitoring and follow-up requirements for the Project that are respectively associated with the activities to be conducted to ensure implementation of all mitigation measures. The total estimated cost for implementing this plan is Ksh. 1,471,000 with Ksh. 200,000 for the pre-operational, Ksh. 536,000 for construction phase and Ksh. 420,000 for operational phase, with an additional Ksh. 315,000 allocated for the decommissioning phase.

MWEWASCO Technical Manager will ensure stringent oversight of the plan's execution on-site. The proponent's capacity requirements will include: Environmental and Social Safeguards Team; Grievance Redress Mechanism (GRM) Specialist; Capacity Building; and Resource Mobilization for Monitoring. The contractor will ensure the ESMMP implementation. The contractor's capacity requirements include: Environmental, Health, Safety and Social Officer; Community Liaison Officer and Resource Mobilization for implementation of the management and monitoring plans during the construction phase. 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 Bill of Quantities; Including ESMP Compliance in Contract Documents; Clear Implementation and Enforcement Mechanisms; and Linking Payments to ESMP Performance.

E.10 Conclusion and Recommendation

The ESIA for the MWEWASCO water project identifies potential impacts across the construction, operation, and decommissioning phases. MWEWASCO commits to incorporating the mitigation measures fully identified during the ESIA process while ensuring the economic viability of the Project remains intact. The implementation of these measures detailed in Chapter 8 and listed in the ESMMP 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 recommend authorisation of 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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1. INTRODUCTION

1.1 Project Background

Kenya is classified as a chronically 'water scarce' country both in absolute and relative terms. With an annual freshwater availability of only 526 cubic meters per capita, Kenya ranks among the lowest 8 percent of countries worldwide. Furthermore, over 80 percent of Kenya's land is categorized as arid or semiarid. Severe degradation of the country's key water catchment areas, primarily due to deforestation and unsuitable agricultural practices, has exacerbated the situation. The Government of Kenya's Vision 2030 acknowledges the fact that Kenya is a water scarce country and underscores the central role water plays in the performance of key sectors of the economy and the livelihoods of Kenyans. Consequently, under the economic and social pillars of the Vision, improved access to safe water and sanitation in both rural and urban areas and increasing the area under irrigation have been given prominence with the rehabilitation and expansion of water supply and sanitation services in urban centres and construction of water storage dams identified as some of the flagship projects.

The GoK collaborated with the World Bank and conceptualized a project by the name Water and Sanitation Development Project (WSDP). The objective of the project is to improve water supply and sanitation services in select Coastal and Northeastern regions in Kenya and improve the financial performance of Water Service Providers (WSPs) affected by the COVID-19 pandemic. The Ministry of Water, Sanitation and Irrigation (MoWS&I) through Water Sector Trust Fund- Water Fund (WSTF) is implementing WSDP with the aim of improving water supply and sanitation services in selected regions in Kenya through the WSPs. Following conclusion on allocation of grants to WSPs under the CLSG-1 program, WaterFund through the MoWS&I prepared documentation for the second phase of the CLSG program now referred to as CLSG-II program. The focus of CLSG-II is to support financial recovery of WSPs to pre-COVID levels or better.

A total of 31 WSPs with 77 interventions costing KES 2.198 billion were pre-qualified to implement the CLSG II programme. During this phase, only WSPs with potential to achieve financial recovery within a period of less than 12 months are eligible to receive the support. 16 WSPs will have significant interventions and are clustered into four groups based on their location within the county. WSTF is committed to execute projects in an environmentally responsible manner. The organisation is ensuring that its new projects is compliant with the legal requirement of the GoK and World Bank. Consequently, WSTF as the Contracting Authority for the GoK through MoWS&I initiated tender and completed a fair and transparent process to select a consultant to undertake Environmental and Social Impact Assessments (ESIA) for select WSP. NEMA registered Lead EIA/EA Expert (NEMA Reg. No. 7683) was commissioned to carry out an Environmental Impact Assessment for the proposed Cluster I Interventions. Cluster I interventions include the WSPS of Kirinyaga, Kahuti, Othaya_Mukurwe-ini and Ngandori_Nginda.

The current water system in Murang'a West was developed in the 1970s and has been serving Kangema and Kahuro Sub-counties up to date. Over time the material used for pipe work has degraded leading to numerous waters lose, also fewer extension lines have been done during the period. Some Galvanised Iron (GI) pipes are also corroded hence affecting water quality. It is for this reason Murang'a West Water and Sanitation Company (MWEWASCO) conceptualized to seek for funding for the extension and rehabilitation of water distribution network to provide sufficient and safe drinking water, and sustainably operate, manage and maintain the water supply infrastructure as well as eliminate non-revenue water, increase water coverage and reduce customer complaints.

According to the Environmental (Impact Assessment and Audit) Regulations, 2003, the proposed intervention is classified under medium risk project and will require a Comprehensive Project Report (CPR) to be completed in accordance with the requirements provided. Additionally, the assessment is expected to be in accordance with the World Bank Operational Policies (OPs), this is to meet the lender's (WB) requirements.

GOK through the MoWS&I developed an Environmental and Social Management Framework (ESMF) for the programme to establish a process of environmental and social screening which will permit the institutions in charge of the implementation of the sub projects to identify, assess and mitigate the environmental and social impacts of sub project investments. These documents have been consulted upon, approved by the World Bank and disclosed in February 2017 on the World Bank's external website.

This ESIA Project Report has been compiled as part of the Kenyan Environment Impact Assessment process, adhering to the regulatory requirements outlined in EMCA Cap 387, along with the Environmental (Impact Assessment and Audit) Regulations of 2003. Further, this ESIA has also been undertaken in line with the requirements of the World Bank safeguards policies.

The proposed project comprises expansion of water supply services in the areas of Murarandia, Muguru, Mugoiri, Wangu and Kanyenyaini, which falls within the areas served by MWEWASCO; specifically, the component includes extension of the reticulation network by 15 Km of DN 63 mm and 28.7 Km of DN 50mm last mile lines; and Conversion of 1200 no. flat rate connections, 700 new Connections, and 1100 replacements with Multijet meters of Dn 15 mm c/w non -return valve conforming to ISO 4064-5;2014 standard. The project is located in Kahuro and Kangema Sub Counties.

1.2 Project Objectives

The overall objective of the proposed project is to improve water supply and sanitation services; and improve the financial performance of MWEWASCO by establishing (cumulative) 43.7km (15 Km of DN 63 mm HDPE and 28.7 Km of DN 50mm) of HDPE pipelines of HDPE pipelines. With a key focus to support financial recovery of WSPs to pre-COVID levels or better. The key project related benefits include:

- Expansion in water services: ensures reliable water supply to Kangema, Kahuro and surrounding areas.
- Enhanced Water Quality: HDPE material maintains water quality without corrosion or contamination.
- Durability and Longevity: HDPE's durability ensures a long operational life with minimal maintenance.
- Reduction of non-revenue water: HDPE pipelines are less prone to leaks and losses compared to other materials, thereby reducing non-revenue water and improving overall water distribution efficiency.
- Reduce cases of illegal connections and water theft: by reducing unauthorized access to water, the project promotes fair distribution and accountability in water usage.

1.3 Project Proponent

MWEWASCO is a limited Company which was incorporated in the year 2006, under Section 51 of the Companies Act as a public Company Limited by guarantee. The Company is owned by stakeholders while

its assets holder and licensor is Tana Water Works Development Authority (TWWDA) and Athi Water Works and Development Authority (AWWDA). Its operations are regulated by the Water Services Regulatory Board (WASREB). MWEWASCO is mandated to utilize and maintain the assets previously under the National Water Conservation and Pipeline Corporation (NWCPC) as Kahuti Water Project. MWEWASCO has a mission to be a Provider of Accessible, Affordable, Efficient, Adequate and Quality Water Services while conserving the environment in Kangema and Kahuro sub counties. MWEWASCO's area of jurisdiction includes Wangu, Muguru, Kanyenyaini, Mugoiri and Murarandia Wards. The license area of service is 250 Km^2 with an estimated population of 154,560 (2019 census).

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 II WSPs Project dated February 9th, 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 a Sociologist and Environmentalist (assistants), the consultant will carry out the ESIA for the proposed interventions by MWEWASCO. This section outlines the team composition and qualification; tailored for the expedited ESIA for the MWEWASCO Water Supply Project, demonstrating expertise and commitment to delivering a comprehensive assessment within accelerated timelines. The ESIA team is presented in Table 2.

Table 2: 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.	Gearoid Kieti	B.Sc. Environmental Science	Assistant Environmentalist	Lead Expert - Reg. No 7818
3.	Hottensia Kabuki	Bachelor's Degree Sociology	Sociologist	Associate - Reg. No. 8229
4.	Priscillah Wanjiru	Bachelor of Arts Sociology, Gender and Development Studies, Sociology, Gender	Assistant Sociologist	N/A

1.6 Report Structure

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

Non-Technical Executive summary

Chapter 1 - Introduction

Chapter 2 - Project Description

Chapter 3 - Policy, Legal, Regulatory and Institutional Framework

Chapter 4 – Approach and Methodology

Chapter 5- Baseline of Environmental and Social Conditions

Chapter 6 - Stakeholder consultations

Chapter 7 - Alternatives Analysis

Chapter 8 - Impact Assessment and Mitigation

Chapter 9 - Environmental & Social Management Plan Environmental & social Monitoring plan

Chapter 10 - Conclusions and recommendations

References

Annexes:

- Certificate of Incorporation
- Pipeline Layout Maps
- Bill of Quantities
- Minutes of meetings and List of Participant
- Sample Filled Questionnaires
- Chance Find Procedures
- Environmental and Social screening Form
- Authorization Letter from Road Agencies
- Water Abstraction Permit
- NEMA Lead EIA/EA Practicing License

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

MWEWASCO aims to enhance water supply reliability and quality in Kangema and Kahuro Sub-counties, Murang'a County, Kenya, through the extension and rehabilitation of its water supply network. These projects address water scarcity, improve distribution, and reduce illegal connections while meeting the growing demands of the population. The initiative aligns with Kenya's Vision 2030, which prioritizes water as a critical resource for national development. Funded by the World Bank through the Water Sector Trust Fund (WSTF), the projects aim to strengthen water infrastructure, address supply deficits, and ensure safe, accessible water for households and institutions.

By improving access to clean water, the projects will enhance public health, reduce waterborne diseases, and promote better hygiene and sanitation. This will particularly benefit vulnerable populations, easing the burden on women and children and enabling them to pursue education and livelihoods. The design incorporates environmental sustainability, employing best practices to preserve ecosystems and ensure the longevity of local water resources, ultimately improving the quality of life and supporting sustainable development in the region.

2.2 Project Location

The proposed extension and rehabilitation of MWEWASCO's Water Supply networks is in Kangema and Kahuro Sub-counties in Murang'a County, Kenya.

2.3 Existing Water Supply

MWEWASCO has its water system constructed dating back from late 1970s and covers the following zones.

- ✓ Kanyenyaini scheme has the following Zones: Kiruri, Ngoeini, Township, Kibutha, Mutaro, and Githiga.
- ✓ Kangema scheme has: Gitugu, Kiairathe, Urban, Watuha, Mukarara, Kanorero, Gikui, G3, Kiamara, Kirogo, Koimbi, Kahuti and Gitweku.
- ✓ Kahuro scheme has: Kahuro town, Kiaguthu, Mirichu, Kianjogu, Gathaithi, Kahatia, Murarandia, Kionjoini, Gatara, Githambo and Matharite.

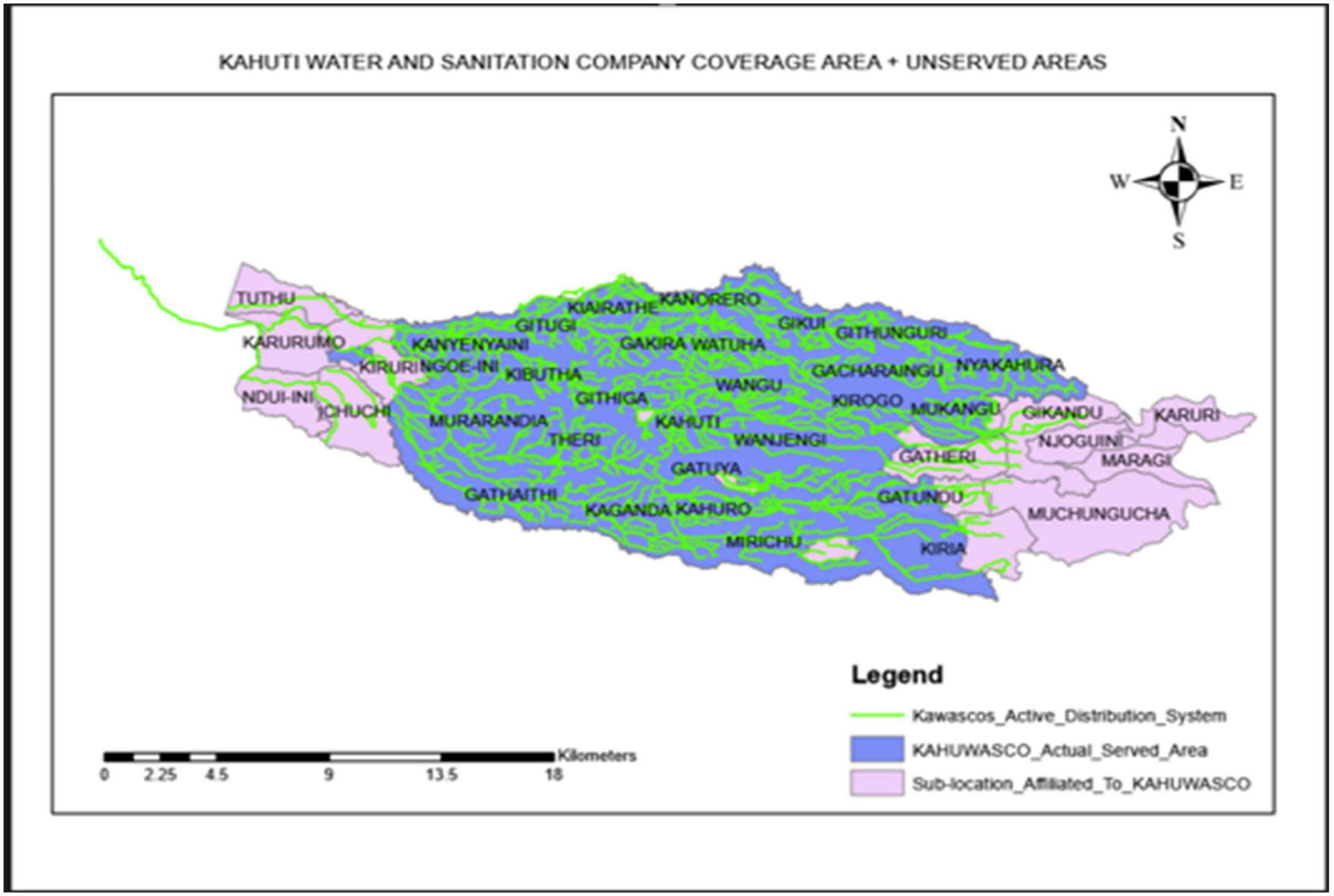


Figure 1: Existing Water Supply network

2.4 Project Scope

The objective of the proposed project is to establish a reliable potable water supply system for the growing centres of Karurumo and Karugia, while also extending last-mile connectivity to residents in Kangema and Kahuro Sub-Counties. Additionally, the project will focus on the rehabilitation of the existing dilapidated Kagiko B and Gathanji water pipelines to enhance water distribution and service reliability across the region.T.

2.5 Project Objectives

The design has been undertaken with the aim of addressing the existing water challenges by assessing the current water situation, computing the water demand for the target community and eventually developing a sustainable water distribution system that is technically and economically viable. The implementation of the proposed project will have the following impacts:

- Enhance the reliability and quality of water supply by improving infrastructure and eliminating old networks.
- Expand service coverage and reduce non-revenue water through efficient distribution systems.
- Promote economic development by creating local employment opportunities and improving water access.

2.6 Design period.

A design period of 20 years was considered from the initial year (2023). The ultimate year was therefore taken to be 2043 for which the ultimate human water demand was computed in this section.

2.7 Water Demand

Water demand calculations for the project area consider urban and rural population dynamics, livestock water needs, and specific requirements for schools, health facilities, and businesses. Key interventions, including pipeline extensions and rehabilitations across various wards, are designed to meet these demands efficiently. Domestic water demand values vary, ranging from approximately 10.8 m^3/day to 53.1 m^3/day, depending on population size and connection type. Livestock water demand ranges from 1.5 m^3/day to 5.4 m^3/day, with higher volumes required in regions supporting larger livestock populations. The water demand for schools' ranges from 2.4 m^3/day for primary schools to 27.3 m^3/day for secondary schools.

Health facilities, including Karurumo, Gikui, Gatangara, and Matharite Dispensaries, each require 5 m^3/day. Commercial establishments have varying needs, with small hotels requiring 3.4 m^3/day, shops 8.5 m^3/day, and bars and restaurants 17.4 m^3/day. The approach ensures a balanced, equitable, and sustainable water supply that supports domestic use, economic activities, and public services, addressing the needs of all sectors in the project area. In general. the total water demand for each proposed extension or rehabilitation pipeline across the various wards ranges from 12.67 m^3/day (Gitui Secondary Line) to 60.49 m^3/day (Gatuya), with varying demands for each route in Muguru, Kanyenyaini, Wangu, Mugoiri, and Murarandia wards.

2.8 Proposed last mile project to increase coverage in Murang'a West

The project will utilize the following existing components: intakes, raw water gravity main, treatment works units, main distribution lines, and storage tanks.

2.8.1 Intake

The System will acquire water from the existing intakes at Ichichi, Manguyo, Tuthu and Rwathia. The capacity of the existing supply system is 45,000m^3/day. With the actual production at 12,000m^3/day.

2.8.2 Raw Water Gravity Main Pipeline.

The existing system includes raw water gravity mains from the intakes to the treatment works, with pipelines of 11 km from Manguyo, 12 km from Ichichi, and 300 m from Rwathia, all made of UPVC pipes. Water treatment is directly conducted at the Tuthu intake.

2.8.3 Treatment Works

The existing water supply system has two treatment plants with capacities of 5,000 m^3/day and 7,000 m^3/day. The treatment process includes chemical dosing for flocculation, sedimentation in Horizontal Flow Sedimentation Tanks, filtration via Rapid Gravity Sand Filters, and disinfection with chlorination and pH correction. Water used for backwashing filters is collected in a tank to allow sediment settlement, with the supernatant recycled into the system.

2.8.4 Mainlines and Distribution lines.

The treated water is delivered to end users through six mainlines with varying diameters, as outlined below.

Table 3: Existing Mainlines and their sizes

S.No.	Mainline Name	Size
1	Phase I	Dn 220mm
2	Phase II	Dn 315-Dn 160mm
3	Phase III	Dn 280-Dn 160mm
4	Phase IV	Dn 315-Dn 160mm
5	Phase V	Dn 315-Dn 160mm
6	Phase VI	Dn 200-Dn 160mm

A layout map of the main lines and distribution system, along with planned interventions is provided in. Annex 2

2.9 Distribution Pipeline

The pipeline design considers the maximum water flow for each section, with HDPE pipes chosen for their cost-effectiveness, ease of installation, durability, corrosion resistance, and availability. The selection of pipe material is based on hydraulic design, resistance to corrosion and abrasion, and joint type for water tightness. The pipeline class is determined by static pressure, with PN 16 for pressures between 125m and 160m, and PN 20 for pressures between 160m and 200m. Most pipelines operate with working pressures ranging from PN 12.5 to PN 16. A design flow velocity of 0.6m/s to 1.7m/s was maintained to prevent siltation and scouring.

Hydraulic analysis was performed using the Hazen-Williams equation to determine friction losses, dynamic pressure, optimal pipe size, and flow rate. The pressure variations were calculated based on static head, friction losses, and velocity head, using standard formulas for energy and hydraulic grade lines. Pipe diameters were determined according to the projected daily water demand, with sizes and lengths specified accordingly. The list of the pipe sizes and the length of the pipeline is presented in Table 4 overleaf.

Table 4: MWEWASCO Intervention Pipe Details

Name of proposed extension/Rehabilitation pipe line	Pipeline length(m)	Pipe diameter(M)
MUGURU WARD INTERVENTION		
Kihutiini-gitweku	1,000	0.020629634
Sera	500	0.019297256
Rwathia mihuti	500	0.018949529
Kihuutiini	1,300	0.027045679
Gikandu	1,000	0.027290441
Mundika	1,400	0.027773495
Mundinja	1,000	0.027773495
Boyo	1,000	0.027045679
KANYENYAINI WARD INTERVENTION		
Kiruri	1,000	0.019974557
Karurumo	600	0.019297256
Kanjuku	400	0.017105189
Kiruri Center	1,000	0.024734063
Mwembe	1,000	0.025266039
Eden Brook	1,000	0.024734063
WANGU WARD INTERVENTION		
South africa gathare	500	0.017489623
wanjemgi gatheru	2,000	0.02335116
Gitui secondary line	500	0.016309158
Gitige Secondary line	1,000	0.02126454
Gikandu	1,000	0.020304738
Karindundu	2,500	0.031582548
Kiangage	1,200	0.026297727
Rural Wanjengi	1,200	0.024734063
Wanjengi	800	0.025266039
Gitie	800	0.024734063
Kianduma	500	0.024463737
MUGOIRI WARD INTERVENTION		
Mugumoini	1,000	0.019974557
Munyutha 2	1,000	0.020304738
Githioro-Kiria tarmack	1,200	0.0227745
Gathiru	1,000	0.020949493
Mwea	800	0.019297256
Sheet 1	2,500	0.034210378
Gititu	1,000	0.027533027
Mugwanyoni giaicembe	500	0.023634215
Kahithe	2,000	0.03241381
Gatuya Kahithe	1,000	0.029174709

Name of proposed extension/Rehabilitation pipe line	Pipeline length(m)	Pipe diameter(M)
MURARANDIA WARD INTERVENTION		
Gatara	1,000	0.020304738
Thengeini	1,000	0.019974557
Mutuango	1,000	0.020949493
Gatuya	2,000	0.03610186
Kambara	1,300	0.031582548
Kariii	1,200	0.030292916

2.10 Project Stages and Activities

2.10.1 Preconstruction Phase

During the preconstruction phase, a detailed proposal was developed to assess the project's suitability in meeting the water demand for Kangema and Kahuro Sub-Counties under MWEWASCO's jurisdiction. The ESIA plays a key role in identifying environmental and social concerns, recommending mitigation measures for all project phases. The design process included surveys, hydrological analysis, water demand identification, and preparation of the design layout, Bills of Quantities, and tender documents. Community engagement was also conducted to gather local input. Additionally, implementation schedules were prepared, and the ESIA used design outputs to evaluate potential impacts and recommend management plans.

2.10.2 Construction Phase

The pipeline will be laid entirely within the established road reserve, avoiding private land and involuntary resettlement.

Site Clearing and Trenching - will involve removing vegetation, mainly grass and short bushes, and disturbing the topsoil, which will be stored separately for future rehabilitation. The WSP has obtained authorization letter (see annex 8) for use of the road reserve.

Public Amenities - Public amenities, including unpaved and paved roads and existing utilities like power lines and water pipelines, will not be disrupted during construction, with measures in place to protect them in collaboration with relevant authorities.

Pipe Laying - This stage will involve will involve transporting and placing pipes in trenches, joining them, and backfilling, with casual workers, preferably from the local community, involved.

Restoration Activities - Upon completion of the project construction, restoration activities will include repairing damaged roads, restoring the road reserve, and re-vegetating or leveling backfilled areas to encourage natural grass growth and support environmental conservation.

2.10.3 Operation Phase

The operation phase begins with the formal hand-over of the pipeline after contractor completion. The proponent will ensure all social concerns are addressed, the facility meets design specifications, affected sites are rehabilitated, and all components are operational. A physical evaluation with the contractor will be conducted, and a final report will be submitted to WSTF and relevant County Executive Members.

Continuous monitoring will ensure the pipeline conveys designed flows, maintains allowable volumes from abstraction sources, and detects issues like leakages or illegal connections. The pipeline is expected to have a lifespan of at least 50 years, with HDPE pipes offering superior longevity compared to traditional materials.

Pipeline Maintenance – In order to preserve the project, the pipeline will be maintained regularly to ensure that it remains in good condition and continues to operate safely and efficiently. The maintenance schedule will include regular inspections, cleaning, and testing of the pipeline. Maintenance works will include:

1. Operation & Routine Maintenance - Regular inspections, cleaning, and testing as per the maintenance schedule.
2. Emergency Works and Response - Trained staff will respond to failures, with frequent patrols by MWEWASCO for swift action.

2.10.4 Decommissioning Phase

The decommissioning phase involves the cessation of operations and closure activities aimed at minimizing environmental and social impacts. If decommissioning occurs, it will include the safe removal of equipment, restoration of affected areas, and monitoring to verify the effectiveness of the restoration. While decommissioning is not expected in the near future, planning for this phase ensures that any potential environmental and social impacts are carefully managed, adhering to regulatory requirements and best practices, and demonstrating responsible stewardship of resources throughout the project lifecycle.

2.11 Input and Materials

Various materials and inputs will be required for a water pipeline project. Table 5 below provides an estimate as well as projected sources of each.

Table 5: Materials Required for the Pipeline Installation

Material/Input	Quantity	Source
HDPE Pipes	Based on proposed project length (15 Km of DN 63 mm and 28.7 Km of DN 50mm)- 43.7km, cumulatively)	Local suppliers or manufacturers of HDPE pipes
Fittings	Based on pipe joints	
Valves	Several types as needed	
Jointing Materials	Depending on joint type	
DN15 water meters	3,000nr	Local suppliers
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
Cement/concrete	depend on the extent of damage and the area needing repair	Local suppliers of cement or concrete products
Bedding materials	4200m^3	Suppliers of crushed stone or graded materials
Backfill material	25200m3	Excavated soil from the trenches

2.11.1 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.

2.12 Output and Wastes

The project will generate various types of waste, including excavated soil, pipe cuttings, unused pipe segments, packaging waste, debris, and concrete/cement waste from repairs or adjustments to affected properties and infrastructure. These wastes must be managed and disposed of in accordance with environmental regulations to minimize potential impacts on the environment and human health. Although the estimated waste quantities are provided, these values may change as the project details are finalized. Proper waste management will ensure minimal environmental impact and efficient project execution, in line with project-specific requirements. Table 6 outlines the potential waste streams, their sources, and management strategies.

Table 6: Potential Wastes, sources and Management Measures

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

2.13 Equipment and Machinery

Pipeline construction for this project will rely exclusively on manual excavation methods due to the small diameter (DN63 to DN50 mm) of the water pipeline, ensuring precision and minimal disturbance. This approach aligns with environmental and project-specific requirements. Local expertise in Murang'a County, particularly from MWEWASCO, supports the use of labor-intensive methods over heavy machinery, as demonstrated in previous water supply projects. While local labor availability is not an issue, the project contractor may still choose to use light machinery, such as excavators or backhoes, for specific tasks like breaking hard surfaces (as encountered).

2.14 Workforce

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

- Approximately 100-150 manual laborers will be assigned to handle excavation duties pipe, handling, laying, and backfilling, if the excavation is to take 1 month.
- 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 employment of local labour, 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.

2.15 Access and Land Requirement

The proposed water pipeline will be installed entirely within existing road reserves and utilizing already established access routes for transporting materials, and personnel to construction sites. This approach eliminates the need for land acquisition and ensures minimal disruption. The proponent has obtained the necessary authorizations from relevant road agencies (see annex 8) to proceed with the revised plan.

2.16 Road Crossings

The proposed pipeline route primarily traverses a less built-up environment with minimal road crossings. Where crossings are necessary, trenchless methods will be used for major roads, such as the Kangema-Gacharage Road (C70) at GPS coordinates -0.739854, 36.965409, to avoid road disruption and preserve road integrity. Existing micro-tunnels on the rehabilitation pipeline, located at GPS coordinates -0.684905, 36.957513 (Kagiko B line) and -0.679397, 36.937995 (Gathanji line), will be utilized during implementation. For unpaved or minor roads, open cutting and reinstatement will be used. The proponent has obtained necessary authorizations from road agencies for the use of road reserves (see annex 8).

2.17 Project Cost

The estimated total cost of the project is Ksh. 30,317,973 (Thirty Million, three hundred and seventeen thousand, and nine hundred and seventy-three) and a summary breakdown of the costs is presented in the following tables:

Table 7: Extension Project cost breakdown

S/No.	DESCRIPTION	UNIT	QUANTITY	RATE (KSH)	AMOUNT
	Pipes				
1	HDPE Pipes DN63mm PN16	m	15,000	332	4,980,000
2	HDPE Pipes DN50mm PN16	m	28,700	212	6,084,400
	Sub Total				**11,064,400**
	Fittings				
1	HDPE saddle clamp 315mmx1/1/2" PN16	No.	14	9,300	130,200
2	HDPE saddle clamp 280mmx11/2" PN16	No.	12	9,163	109,950
3	HDPE saddle clamp 200mmx2" PN16	No.	5	4,700	23,500
4	HDPE saddle clamp 200mmx11/2" PN16	No.	6	4,700	28,200
5	HDPE saddle clamp 160mmx2" PN16	No.	6	3,400	20,400
6	HDPE saddle clamp 160mmx11/2" PN16	No.	5	3,400	17,000
7	HDPE saddle clamp 110mmx2" PN16	No.	4	850	3,400
8	HDPE saddle clamp 110mmx11/2" PN16	No.	3	850	2,550
9	HDPE saddle clamp 90mmx2" PN16	No.	3	650	1,950
10	HDPE saddle clamp 90mmx11/2" PN16	No.	4	650	2,600
11	HDPE male adaptor 63mm PN 16	No.	19	470	8,930
12	HDPE male adaptor 50mm PN 16	No.	23	250	5,750
13	Gate valves 50mm dia	No.	19	4,000	76,000
14	Gate valves 40mm dia	No.	23	3,000	69,000
15	HDPE Couplers DN63mm PN 16	No.	150	928	139,200
16	HDPE Couplers DN50mm PN 16	No.	287	668	191,762

17	HDPE End plug DN63mm PN 16	No.	17	550	9,350
18	HDPE End plug DN50mm PN 16	No.	23	410	9,430
	Sub Total				**849,172**
	Motorbikes				
1	Boxer Bajaj 150 CC (including registration, tracking, and toolbox)	No.	10	272,340	2,723,401
	Sub Total				**2,723,401**
	Labour				
1	Pipe Transportation, Excavation, Pipe Laying, and Backfilling (for 63mm pipe).	m	15,000	130	1,950,000
2	Pipe Transportation, Excavation, Pipe Laying, and Backfilling (for 50mm pipe).	m	28,700	130	3,731,000
	Sub Total				5,681,000
	GRAND TOTAL				**20,317,973**

Table 8: Proposed meter Intervention costs

Item	UNIT	QUANTITY	RATE (KSH)	AMOUNT
Cold Water Meters				
MultiJet meters (for Conversion)	No	1,200	2,500	3,000,000
MultiJet meters (for New Connection)	No	700	2,500	1,750,000
MultiJet meters (for Replacement)	No	1,100	2,500	2,750,000
Sub total				**7,500,000**
Pipe				
PPR Pipes DN15mm PN16	m	1,668	70	116,760
Sub total				**116,760**
Fittings and other materials				
Gate valves 15mm dia	No.	500	700	350,000
PPR female adaptor Dn 15mm Pn 16	No.	500	23	11,500
PPR male adaptor Dn 15mm Pn 16	No.	500	26	12,820
PPR Meter Stand DN 15mm	No.	500	150	75,000
PPR Meter Stand DN 15mm (With elbow)	No.	500	180	90,000
Upvc Sockets Pn 16 Dn 15mm	No.	500	20	10,000
Gi Socket 15mm	No.	500	30	15,000
Gi Nipples 15mm	No.	500	21	10,380
Tangit	Liters	80	1,500	120,000
Hacksaw blade	No	197	100	19,700
Sub total				**714,400**
Labour				
Installation cost per meter (3,000 meters)	Meters	3,000	484	**1,452,000**
Labour for excavation and backfilling (1,668 meters trench)	Length	1,668	130	**216,840**
Sub Total				**1,668,840.0**
Grand total				**10,000,000**

2.17.1 The ESMMP Cost

The total estimated cost for implementing the ESMMP is Ksh. 1,471,000 with Ksh. 200,000 for the pre-operational, Ksh. 536,000 for construction phase and Ksh. 420,000 for operational phase, with an additional Ksh. 315,000 allocated for the decommissioning phase. The contractor will ensure the ESMMP implementation. In tandem, MWEWASCO Technical Manager to ensure stringent oversight of the plan's execution on-site.

3. POLICY, LEGAL, REGULATORY AND INSTITUTIONAL FRAMEWORK

This chapter outlines the legal, policy, and administrative framework for the proposed water project, identifying applicable national standards and lender requirements. It follows Kenyan laws and policies, which comprehensively address environmental and social risks, and aligns with World Bank Safeguard Policies. In cases of discrepancies between national standards and World Bank policies, the more stringent standard will apply to ensure compliance and mitigate risks effectively.

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, protected for the benefit of present and future generations.' Article 43 Guarantees the right to clean and safe water in adequate quantities. Article Requires the State to ensure minorities and marginalized 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. Ensures sustainable management, exploitation, and conservation of the environment and natural resources.;
ii. Mandates the equitable sharing of environmental benefits.
iii. Promotes a tree cover of at least 10% of Kenya's land area.
iv. Protects biodiversity, genetic resources, and indigenous knowledge.
v. Encourages public participation in environmental management.
vi. Establishes environmental impact assessments, audits, and monitoring.
vii. Calls for the elimination of activities harmful to the environment.

Additionally, part 1, Chapter 5 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 Allows individuals to seek redress in court if their right to a clean and healthy environment is being violated or threatened.

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. MWEWASCO 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

The Vision for the water and sanitation sector is "to ensure water and improved sanitation availability and access to all by 2030". Kenya is a water-scarce country with renewable fresh water per capita at 647 m3 against the United Nations recommended minimum of 1,000 m3. The water strategy aims to intensify Kenya's access to safe water and better sanitation using the national network of water services boards, and the private sector, where necessary. In the vision, specific strategies will be introduced to raise standards of the country's overall water, resource management, storage and harvesting capability. Some of the flagship projects for water and sanitation include the rehabilitation and expansion of urban water supply and sanitation in the key satellite towns identified under the economic pillar. The proposed project will directly contribute towards achievement of objectives of vision under the environment and social pillar through provision of the planned Water Distribution Network Investments.

3.3 Relevant Policies

3.3.1 National Environment Policy, 2013

The National Environment Policy, 2013 focuses on the sustainable management of ecosystems and natural resources, acknowledging the pressures from human activities on critical ecosystems like forests, grasslands, and arid lands. The policy advocates for an integrated environmental management approach and strengthening the legal and institutional framework for coordination. The objectives of the Policy are inter alia to:

- Providing a framework for integrated planning and sustainable management of Kenya's environment and natural resources;
- Strengthening governance, coordination, and management of environmental resources; and
- Ensuring sustainable management of 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 proposed project such that sensitive ecosystems are not destabilized by the subsequent project activities

3.3.2 National Water Policy, 2021

The National Water Policy (Sessional Paper No. 01 of 2021) builds on past water sector reforms and aims to elevate the sector's development to contribute to Kenya's national goals and the achievement of Sustainable Development Goals (SDGs). Developed within the constitutional framework respecting human rights to water, sanitation, and a clean environment, the policy focuses on. This Policy focuses on the following objectives:

- Strengthening sustainable water resource management;
- Improving water supply services and ensuring universal access to water and sanitation;
- Promoting the development of water harvesting and storage infrastructure;
- realizing the delivery of sewerage and non-sewerage sanitation services;
- Implementing a harmonised and constitutionally compliant regulatory framework for devolution of water functions and for the management of intergovernmental relations;
- Strengthening water education, training, research and innovation;
- Mainstreaming climate change considerations and disaster risk reduction within the water sector;
- Mainstreaming gender and youth considerations to achieve gender equality in the sector;
- Encouraging alternative dispute resolution methods, including the Water Tribunal, to resolve conflicts;
- Applying governance principles such as the precautionary principle, polluter-pays principle, consumer protection, and public participation.

The Policy outlines specific strategies for water resource management, conservation of riparian land and wetlands, integrated land-use and water resources management, transboundary water resources management, water quality and pollution control, rainwater harvesting, drought and flood mitigation, infrastructure development for water harvesting, and 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 the residents of Murarandia, Muguru, Mugoiri, Wangu and Kanyenyaini Wards. 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 most of the project area lacks a sewerage system coverage.

3.3.3 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.

3.3.4 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.

3.3.5 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 environmentally 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 will be located entirely within the existing road reserve, and no private land will be used. As such, the proponent is required to ensure environmental protection within the road reserve and respect land rights in the proposed project area, in line with the National Land Policy.

3.3.6 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 to ensure that both men and women are accorded equal opportunities in staff hiring, procurement of suppliers, sub-consultants, and subcontractor.

3.3.7 HIV and AIDS Policy, 2009

The policy provides a mechanism for:

- Setting Minimum Internal Requirements (MIR) for managing HIV and AIDS
- Establishing and promoting programmes to ensure nondiscrimination and no stigmatization of the infected;
- Contributing to national efforts to minimize the spread and mitigate against the impact of HIV and AIDS;
- Ensuring adequate allocation of resources to HIV and AIDS interventions;

- Guiding human resource managers and employees on their rights and obligations regarding 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.

3.3.8 Kenya Youth Development Policy 2019

This policy provides the framework for addressing issues affecting the youth, notably employment creation, health, education, sports and recreation, environment, art and culture, partnership and empowerment. It promotes youth participation in economic development and decision-making.

Relevance

By integrating the policy's objectives, the proposed water project can engage the youth in Murang'a County in employment and skill-building opportunities during the construction, operations, and maintenance. Engaging the youth in the project through community outreach and stakeholder consultations ensures their inclusion in decision-making processes, fostering a sense of ownership and empowerment. Incorporating these aspects supports the policy's broader aims of reducing youth unemployment and involving young people in the country's development, while contributing to the long-term sustainability of the proposed water project.

3.4 Legal Framework

There exists national statutes and regulations that MWEWASCO 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 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, Cap 387

The Environmental Management and Coordination Act (EMCA), Cap 387, establishes the legal and institutional framework for environmental management in Kenya, granting every person the right to a clean and healthy environment and placing the responsibility on citizens to safeguard it. The Act mandates that any new project or activity undergo an Environmental Impact Assessment (EIA) to be submitted to the National Environment Management Authority (NEMA) for approval. Water resource infrastructure is specifically listed in the Act's second schedule as requiring an EIA. The Act also provides protections for rivers, lakes, wetlands, and other water bodies, requiring permission from NEMA for any interference, and empowers the Minister of Environment to designate protected areas to prevent 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 9 below:

Table 9: Regulations under EMCA relevant to the proposed water project

S.N.	Subsidiary Legislation	Description	Relevance
1.	The Environmental (Impact Assessment and Audit) Regulations, 2003	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 Co-ordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulation, 2009.	These Regulations apply to the protection, conservation and management of Inland, coastal and marine, lake basin and river basin wetlands, whether occurring on private, public or community land, both natural and man-made.	The proposed project will be part of water transmission from Mathioya South River and Maragua River in the project area and hence the regulation is relevant. The proponent has taken measures to ensure that the ecology of the rivers 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 proponent will have to adhere to these regulations because 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 vehicles. -Dust from Site clearance and excavation of foundations. -Dust and exhaust emissions from transportation and disposal of spoil.

S.N.	Subsidiary Legislation	Description	Relevance
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 to promote a healthy and safe working environment throughout the Construction Phase.

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 because of the act. MWEWASCO intends to increase the water supply in Murarandia, Muguru, Mugoiri, Wangu and Kanyenyaini areas through tapping of the water from the existing intakes at Ichichi, Manguyo, Tuthu and Rwathia, 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 water project will be located within the road reserve, and no private land acquisition is involved. Therefore, provisions of the Land Act 2012 related to land acquisition, compensation, and landowner agreements do not apply. The project will follow legal guidelines for land use in the road reserve, with relevant authority consultations and authorizations obtained. No easement agreements or compensation for landowners will be necessary.

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 oversee 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.

Relevance

The Project, once commissioned, shall be handed over to MWEWASCO, a water utility company under Murang'a County Government, for operation and maintenance in accordance with the Act. Additionally, the County Government Act, 2012, emphasizes public participation in decision-making processes, ensuring that local communities are engaged in project planning, implementation, and management to enhance transparency and inclusivity.

3.4.5 Kenya Roads Act Of 2007

The Kenya Roads Act of 2007 outlines the legal and institutional framework for the road sector in Kenya. It establishes three independent Road Authorities: the Kenya National Highways Authority (KeNHA), responsible for class A, B, and C roads; the Kenya Rural Roads Authority (KeRRA), responsible for rural and small-town roads; and the Kenya Urban Roads Authority (KURA), which oversees city and municipal roads. These authorities operate under the Ministry of Transport and Infrastructure, which is responsible for policy formulation and regulatory oversight. Section 22 of the Act outlines the procedure for acquiring land needed for road development.

Relevance

The water supply pipeline shall traverse along and cross some sections of project area roads. The proponent has already obtained the necessary permits and authorizations from the relevant road authority for the use of the road reserve and road crossings, ensuring compliance with the Kenya Roads Act, 2007.

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 Murang'a 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 realisation 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

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 to ensure gender equity and the prevention of discrimination against vulnerable groups.

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 expedient 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.

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 Murarandia, Muguru, Mugoiri, Wangu and Kanyenyaini residents. The proponent is tasked to always provide clean water free from any contamination during the operation phase

3.4.17 Climate Change Act, 2016

The Climate Change Act, 2016 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. It mandates integrating robust adaptation measures into project design, ensuring resilience against extreme weather events and sustainable water resource management practices. Projects must mitigate greenhouse gas emissions, engage stakeholders for community input, and adhere to stringent monitoring and reporting requirements. By aligning with these regulations, projects can enhance climate resilience, minimize environmental impact, and contribute to sustainable development goals through proactive adaptation strategies and responsible resource management practices.

Relevance

Water infrastructure projects are crucial under the Climate Change Act, 2016 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.

3.4.18 National Museums and Heritage Act, 2006

This Act consolidates the law relating to national museums and heritage; to provide for the establishment, control, management and development of national museums and the identification, protection, conservation and transmission of the cultural and natural heritage of Kenya.

Relevance

This act ensures the protection of Kenya's cultural and historical heritage during development projects. Under this Act, any excavation or construction activities that might impact heritage sites, archaeological artifacts, or culturally significant areas must be conducted with caution. The Act requires that developers, such as MWEWASCO, engage the National Museums of Kenya to conduct heritage assessments prior to the start of construction to avoid damaging any heritage sites. This helps ensure that any significant cultural resources are identified, preserved, or documented as part of the environmental and social safeguards for the project. Additionally, in the event of a chance find during excavation, the project shall adhere to the established Chance Finds Procedure.

3.5 National Water Quality Standards

In supplying water to the consumers, MWEWASCO will comply with the following national regulatory drinking water quality standards and WBG water quality guidelines, whichever is stringent. Regular monitoring to determine compliance will be done by the WSP and corrective/ mitigation measures applied where necessary. For detailed information on the water quality standards, the following sources can be referred to: the Environmental Management and Coordination (Water Quality) Regulations 2006, available on the Kenya Law website; the World Health Organization (WHO) Guidelines for Drinking Water Quality,

available on the WHO website; and the World Bank Group (WBG) Water Quality Guidelines, available on the World Bank website. Regular monitoring will ensure compliance with these standards, and corrective actions will be applied where necessary.

3.6 Institutional Framework for Environmental Management and the Water Sector

The key administrative agencies that regulate water development and its environmental implications in Kenya, and which play a critical role in the ESIA authorization process, include:

3.6.1 Ministry of Water, Sanitation and Irrigation

The Ministry is responsible for policy development, sector coordination, and monitoring to ensure effective water and sewerage services. It promotes integrated water resource management to enhance water availability and accessibility for various uses, including irrigation, industrial, and power generation.

3.6.2 National Environment Management Authority

National Environment Management Authority (NEMA) NEMA is responsible for coordinating environmental management activities in Kenya and is the principal authority for implementing environmental policies. NEMA grants ESIA approvals and monitors projects to prevent environmental degradation, ensuring compliance with environmental management objectives.

3.6.3 Water Resources Authority

WRA is mandated to regulate the management and use of water resources to ensure sustainable water availability for all uses, safeguarding the right to clean water. It operates under delegated authority from the National government.

3.6.4 The Water Services Regulatory Board

WSRB protects consumers' interests in the provision of water services. It sets national standards, monitors compliance, evaluates tariffs, and accredits water service providers. It also advises the government on financial support to water services providers.

3.6.5 Water Service Providers

WSPs, like MWEWASCO, are licensed by WSRB and are responsible for providing water services within their designated areas. They manage and develop water service assets as per the licensing agreement.

3.6.6 Water Sector Trust Fund

The Fund provides grants to counties, focusing on underserved and marginalized areas. It finances the development of sustainable water services, research, and community-level water resource management initiatives.

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 10 below.

Table 10: 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 4.11 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 6) 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 Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry- specific examples of Good International Industry Practice. When one or more members of the World Bank Group are involved in a project, these EHS Guidelines[1] are applied as required by their respective policies and standards. 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 project design has incorporated measures to mitigate environmental risks associated with water distribution systems, such as water system leaks, loss of pressure, and water discharges.

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

The World Bank Group's Environmental, Health, and Safety (EHS) Guidelines are technical reference documents providing examples of Good International Industry Practice (GIIP). These guidelines are applied alongside local regulations when World Bank Group members are involved in a project. They serve to mitigate environmental and social impacts identified in the report. In cases where there is a conflict between Kenyan regulations and the World Bank Group's EHS Guidelines, the stricter regulation will apply. Key guidelines used in this project include:

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

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

The World Bank's Good Practice Note helps identify and address risks of Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH) in projects involving major civil works and contracts. The guidelines focus on:

- Identifying and assessing SEA/SH risks and response capacity before the project.
- Establishing mitigation and monitoring measures.
- Providing a response strategy for Gender-Based Violence (GBV) during project implementation.
- Offering tools and ethical considerations for SEA/SH risk assessments and contextualizing these risks in the project.

[1] https://www.ifc.org/content/dam/ifc/doc/2000/2007-water-and-sanitation-ehs-guidelines-en.pdf

Table 11: 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 to meet 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 Kenya	The World Bank policy offers more detail on the physical and cultural resources other than archaeological finds identified in the Kenyan Policy	Use of the World Bank policy in handling any physical and cultural site, while making use of the Kenyan institutional framework
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 to are listed below:

Relevant International Convention	Relevance
Vienna Convention for the Protection of the Ozone Layer (1985)	Ensure that construction and operational processes do not involve or release ozone-depleting substances.
Convention on Wetlands of International Importance (Ramsar Convention 1971)	Implement measures to avoid disrupting wetland ecosystems where the pipeline route intersects or is near wetland areas.
Convention on the Elimination of All Forms of Discrimination against Women	Promote gender equality, ensuring equal employment opportunities and addressing women's specific needs in community engagement and project implementation.
The Protocol to the African Charter on the Rights of Women in Africa (Maputo Protocol)	Ensure equitable access to water resources for women and girls and include them in decision-making processes.
Convention on the Rights of the Child	Protect the health, education, and well-being of children, ensuring construction activities do not adversely affect them.
The African Charter on the Rights and Welfare of the Child	Ensure safe water access for children and implement measures to protect them from construction-related hazards.
Convention on the Rights of Persons with Disabilities	Ensure accessibility for persons with disabilities in project areas and provide equal employment opportunities.
The African Charter on Human and Peoples" Rights (African Charter)	Uphold the human rights of local communities, including the right to a healthy environment and participation in decision-making
Convention on Biological Diversity (2006)	Minimize impact on local biodiversity and protect plant and animal species during construction and operation of the pipeline.
Paris Agreement, 2015	Align with global climate action goals, focusing on minimizing greenhouse gas emissions and climate adaptation in the project.

3.9 Permits/Licenses

The Project must comply with the requirements of national legislation that requires certain permits that the proponent will need to put in place. Some permits may be obtained during the operation stage of the proposed water distribution network since they will be determined as need arises. Table 12 below lists permits/Licenses required for this project.

Table 12: Relevant Permit/Licenses Required

S/No	Requirement	Issuing Authority	Remarks
1.	ESIA License for the project	NEMA	This ESIA is part of acquisition of this license
2.	Water Abstraction Permit	WRA	The WSP has an existing permit- See Annex 9
3.	Requisite permissions from Road Authorities	The County Government of Murang'a (to lay the pipes within the road reserves	Authorization on use of road reserve obtained

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, a distance of 500 m 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 as a result 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 CAP 387 as well as the Environmental Management and Coordination (Impact Assessment and Audit) Regulations 2003, 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 water 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:

- Second Schedule of EMCA CAP 387 lists water resources infrastructures as project that must undergo ESIA. Further, as specified under the Second Schedule, the proposed water Project is classified as a **Medium Risk project** (3 (c) water supply and distribution infrastructures). Completed screening form has been attached in Appendix 11.
- The nature and extent of the potential impacts of the Project. Considering the nature and extent, it is recommended that a 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, prioritising 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

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;
- Baseline information of the project area;
- 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.

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 on 3rd and 4th 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 MWEWASCO technicians so that any environmental, social or technical constraints could be discussed.

A Detailed site investigations visit was undertaken starting the 19th to 21st of June 2024, during which time a site walkover was undertaken including consideration of the proposed wayleave and meetings 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 interested 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 through public barazas organized at appropriate locations near each of the proposed water pipeline. Key stakeholder's views on the project were solicited through interviews and discussions with County officials, technical teams at Murang'a County Department of health and MWEWASCO.

a) Stakeholder Identification and Mapping

Stakeholder engagement and participation was carried out at different levels and with different stakeholders. Stakeholder identification and mapping was done based on the following criteria:

- Interested persons or parties include: These include individuals, groups, or organizations with a vested interest in the project's implementation and outcomes.

The stakeholders identified include:

- **Community members** living within a 2 km radius of the proposed project. These individuals are considered key stakeholders due to their proximity to the project area and potential interest in its outcomes
- **Local authorities and administrative bodies:** These include representatives from county and sub-county governments, village elders, and area administrators who provide governance and oversight within the project area
- **Sector-specific representatives:** These include officials from water, health, and environmental departments, as well as other relevant regulatory bodies.

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 MWEWASCO Technical Manager who sent out to the notices to the respective chiefs for Kiria, Gatheru, Gatuya and

Muringa-ini location respectively, the chief's cascaded down to their respective Assistant Chiefs and Village Elders to inform the community members of the meeting. The mobilisation 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 the proposed water project. The message was announced by word of mouth at public social gatherings and churches. The DCC was given a courtesy call by the consultant who from the working relationship with MWEWASCO advised on using the chiefs.

- **Meeting with Murang'a County Key Stakeholders**

Meetings were held to explain the project to them and solicit their views on the project. Further, the county officer was also briefed on the need for carrying out consultations with the target communities.

- **Public Forum/Meeting**

The consultant's team undertook community engagement forums with the target 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 at Murarandia, Muguru, Mugoiri, and Wangu Wards 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 the 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**

After the meetings the community members were told of the need to have focus group discussions to discuss the project further and allow the different 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**

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

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 Murang'a, Kenya National Bureau

of Statistics Reports, and 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

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. This section describes the step-by-step impact assessment process that leads to the final assessment of the significance of the residual impact. 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 MWEWASCO water 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), in order 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 MWEWASCO 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 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 13 and Table 14 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 overleaf 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 13: 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 14: 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) was 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 MWEWASCO 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 both formal and informal meeting with the interested parties, and encounters during biophysical survey activities, provided ongoing insights into social acceptability.

— Public Consultations: Public consultations were held separately for each targeted area 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 connectivity requirements, access to water, and social risks associated with construction activities.

Therefore, the assessment of social acceptability for the MWEWASCO 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). 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. Experience has shown that community trust is the most important factor contributing to social acceptability.

4.2.3.7 Cumulative Impacts Assessment

Cumulative impact refers to the environmental changes that occur when a project's effects combine with those of past, present, and future human activities[2]. 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 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.

[2] 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.

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 summarises 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 machinery will be required during the construction phase.

- Lack of Recently Collected 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 Murang'a 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 engagements to collect additional socio-economic data.

5. BASELINE OF ENVIRONMENTAL AND SOCIAL CONDITIONS

5.1 General Overview and Approach

This chapter 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 project. 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. The collection of baseline data focused on providing information to support the assessment of any potential impact of the Project. 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 Murang'a County.
- ***Project Site:*** Secondary and primary information was collected along the Project Sites, specifically along Kagiko B and Gathanji rehabilitation line in Kiairathe area; Kayahwe and Kahithe line in Gatuya area along Buffalo line where the Project is located. This included a 3km radius (Area of Influence) within the pipeline route.

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 Murang'a 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 3rd and 4th June 2024, as well as between 19th and 21st 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

Murang'a County is one of the 47 counties created under the Kenya Constitution 2010. The county is located in the central region of the Republic of Kenya and lies between latitudes 0o 34'; 107'South and Longitudes 36°; 37° 27' East. The county covers a total area of 2,558.8Km^2 and borders Nyeri to the North, Kiambu to the South, Nyandarua to the West and Kirinyaga, Embu and Machakos counties to the East as shown in Figure 2 and 3 overleaf.



Figure 2: Map Showing the Counties of Kenya

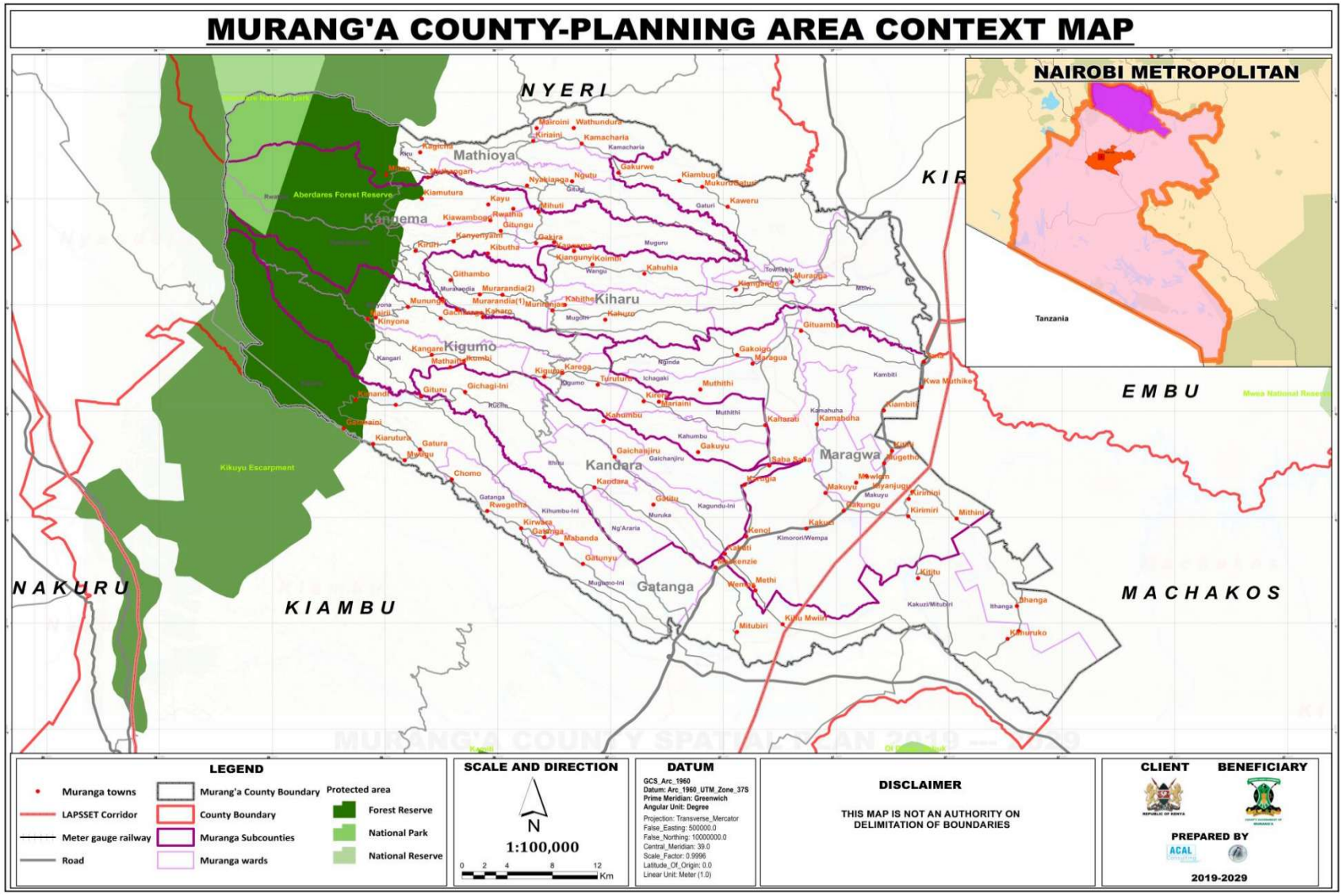


Figure 3: General view of Murang'a County
Source: Murang'a CIDP 2023-2027

5.3 Administrative Function

Murang'a County is divided into nine sub-counties: Gatanga, Ithanga, Kahuro, Kandara, Kangema, Kigumo, Mathioya, Murang'a East, and Murang'a South. The county has 7 constituencies—Kiharu, Kangema, Mathioya, Gatanga, Kigumo, Kandara, and Maragua—comprising 35 wards, 32 divisions, 118 locations, 294 sub-locations, and 2,478 villages. Kangema and Kahuro serve as sub-county headquarters, hosting offices for the Deputy County Commissioner and various national and county government departments, including public health, trade, revenue, agriculture, and physical planning.

Table 15: Murang'a County Sub-Counties

S/No.	Sub-County	No. of Divisions	No. of Locations	No. of Sub-locations	Area (Km2)
1.	Gatanga	5	19	51	313.30
2.	Ithanga	2	6	14	285.70
3.	Kahuro	3	12	32	169.00
4.	Kandara	3	11	29	235.90
5.	Kangema	4	11	33	173.46
6.	Kigumo	3	16	36	242.10
7.	Mathioya	5	15	31	351.30
8.	Murang'a East	4	14	29	241.00
9.	Murang'a South	3	12	37	547.20
	Total	**32**	**118**	**294**	**2,558.96**

Source: County Commissioner, Murang'a County

Table 16: County Government Administrative Wards

S/No/	Constituency	No. Wards	No. of Villages
1.	Gatanga	6	508
2.	Kandara	6	273
3.	Kangema	3	203
4.	Kigumo	5	359
5.	Kiharu	6	513
6.	Maragua	6	324
7.	Mathioya	3	298
	Total	35	2,478

Source: Murang'a CIDP 2023-2027

5.4 Physical Environment

5.4.1 Climatic Conditions

The County has three climatic regions: the western region, is characterized by upper highland humid and upper highland perhumid agro ecological zones and covers the Kangema, Gatanga, and higher Kigumo and Kandara sub-counties (Figure 3). The central region is characterized by lower highland humid, upper midland sub humid and humid agro ecological zones covering, lower Kigumo, and Lower Gatanga sub-counties. The eastern region is characterized by lower midland semi humid, transitional and semi-arid agro ecological zones. This region covers the lower parts of the Kandara, Kiharu and Maragua sub-counties (Murang'a County Government, 2018).

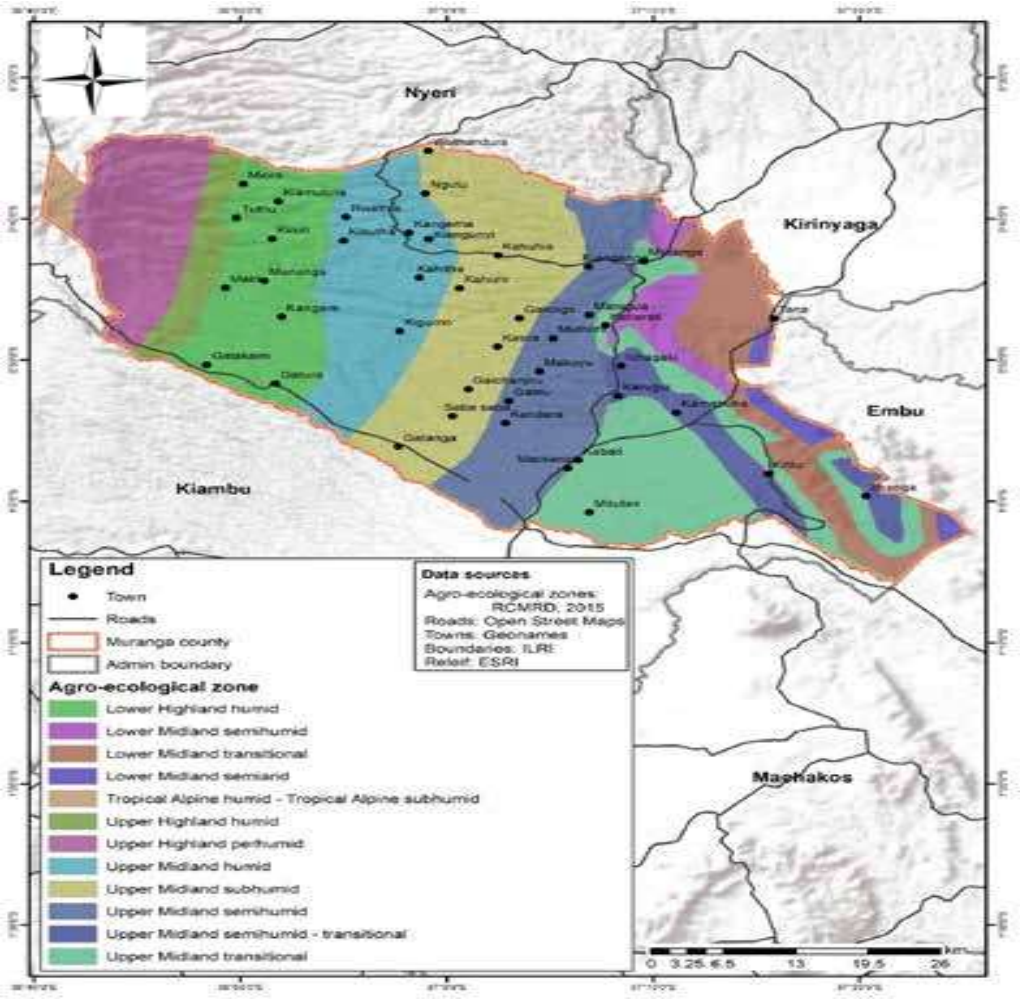


Figure 4: Climatic regions in Murang'a
Source: Kenya County Climate Risk Profile Series

5.4.1.1 Rainfall

The average annual rainfall received in Kangema and Kahuro Sub Counties is 1,427mm; April and May are the wettest months receiving 270mm and 254mm of rainfall respectively. This forms the long rains season within the Sub-County. The month of October receives 138mm while November receives 125mm of rainfall forming the short rains period. The months of January and February receive 24mm and 58mm of rainfall on average. These are the two driest months within the sub-county. (https://weather.co.ke/). In the driest months, the average rainfall is above 40mm (Kangema Climate, n/d). The high rainfall amounts favor agricultural activities for crops such as tea and coffee.

Kangema is considered sub-humid, the vegetation consists of moist and dry forests, Whereas, Kahuro is considered drier in the lower parts of Mugoiri and Wangu ward.

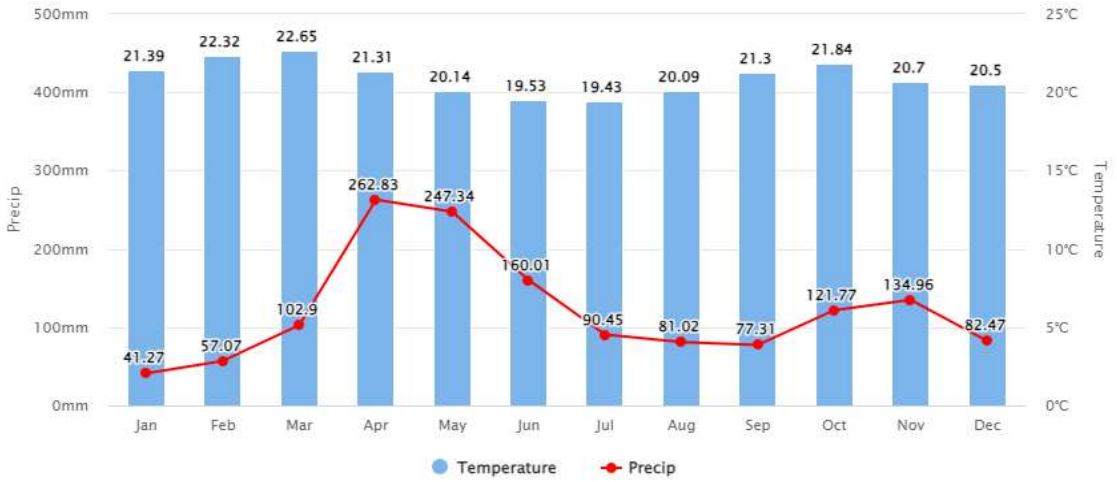


Figure 5: The mean monthly temperature and precipitation of Murang'a in recent years.
Source: https://weatherandclimate.com/kenya/murang-a (31st July 2024)

5.4.1.2 Temperature

The average annual temperature received within Kangema and Kahuro is 20.43C with the highest temperature recorded at 33.94C within the months of January and February. The least recorded temperature is 8.23C during the months of June and July. The elevation in Karurumo is 2340 meters above sea level, and due to its high altitudes, the temperature is stable with an average temperature of 16.8 degrees C. The low temperatures favor the growth of cash crops like coffee.

5.4.2 Topography and Hydrology

The western part of the county, which is along the slopes of the Aberdare Forest, is 3353m above sea level. On the other hand, the eastern part is 914m above sea level. The western highlands have deep dissected topography and drain into various rivers. These rivers flow from Aberdare ranges to the west, south eastward and drain into the Tana River. The county's rugged, dissected topography and geology are both an asset and liability to the county's development. The highest parts bordering Aberdare ranges form the rain catchment areas, from where most of the rivers passing through the county originate. However, this dissected topography causes gulley erosion and landslides, making the construction and maintenance of bridges and roads are very expensive. The topography of Murang'a County is shown in figure 5.

The urban area is characteristic of high ridges and steep escarpments. The top of these ridges are generally flat and can support urban development while most escarpments dip at angles greater than 150 which is unsuitable for sustaining urban development as well as intense agricultural activities. The general landform of the Area has affected the development patterns in the town with people settling on high grounds only. Settling on lower grounds has exposed some residents to frequent landslides and flooding exposing their lives to danger. This forms a clear indication on the structuring of the town along ridges and protection of the steep escarpments in the future.

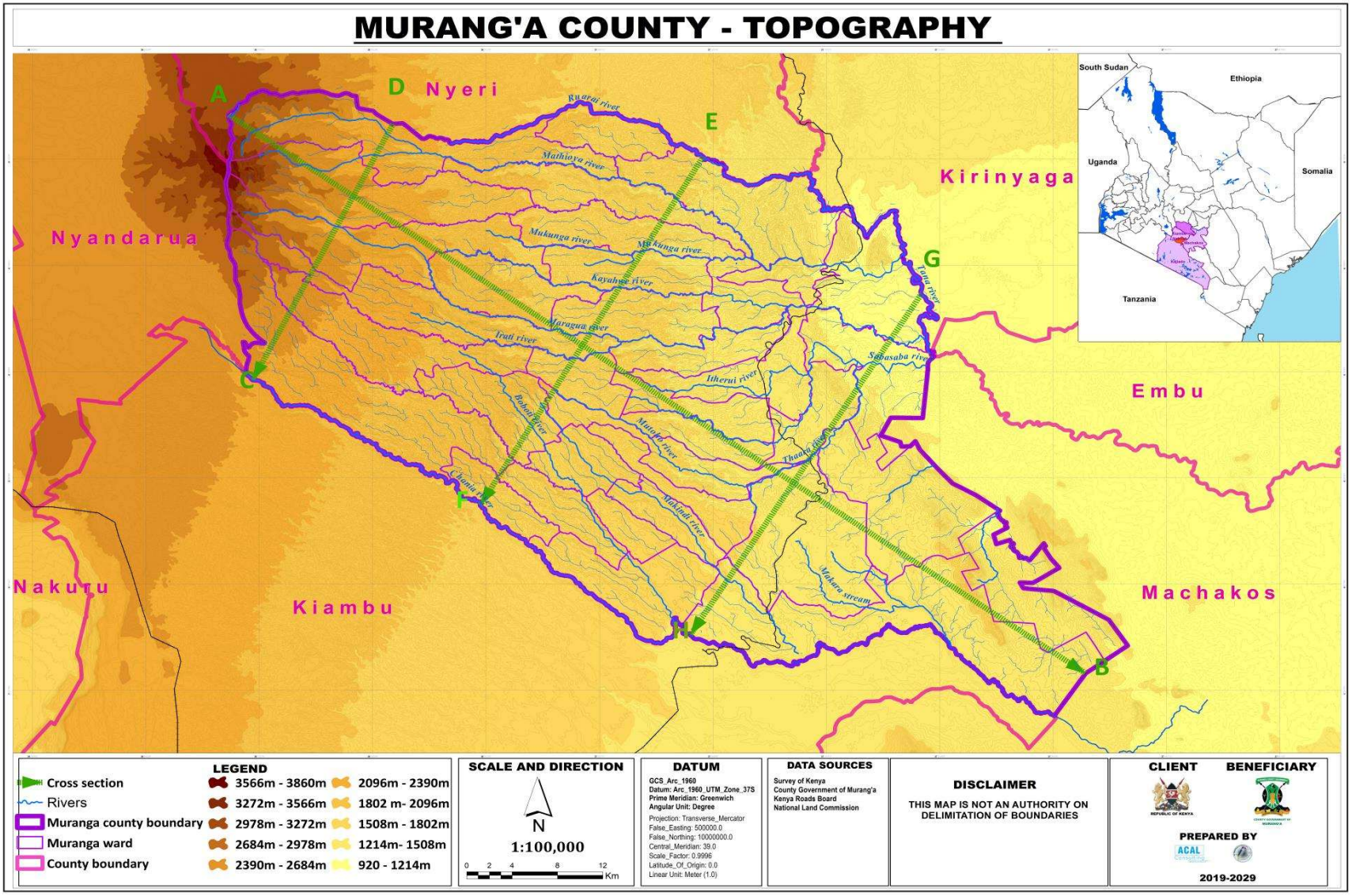


Figure 6: Topography of Murang'a County
Source: Murang'a CIDP 2023-2027



Plate 1: Typical landscape at Kiairathe

5.4.3 Geology and Soils

Kangema and Kahuro is mainly characteristic of basalt type of rocks. These rocks are essential in road construction and may significantly reduce the cost of road construction in the urban area. The rock structure is also favorable in the construction industry as it can serve as a strong base for setting foundations. Kangema is dominated by Nitisols and Kahuro its Cambisols. Nitisols are formed within volcanic footbridges. The soils are fertile but very erodible. These soils cover approximately 98% of the planning area. Cambisols on the other hand are hill soils that are stony and shallow and must be covered by dense vegetation. The soils are excessively drained, moderately deep, red, very friable, sandy clay loam to sand clay, in places rocky. These soils are good for large scale coffee production due to the altitude of the area as well the average annual temperatures and rainfall received within the sub-county.

Kanyenyaini and Murarandia wards have deep red soils with high fertility. The soil is mainly nitisols and andosols, andic and chromo-luvic Phaeozems; andic and nito-chromic Cambisols. Nitisols are found mainly in highlands and on steep volcanic slopes. They develop from volcanic rocks and have good moisture-storage capacity, good aeration, organic matter content, CEC (cation exchange capacity), and percent base saturation all range from low to high, mostly acidic (pH <5.5) due to leaching of soluble bases. Nitisols for optimal agriculture production and use manure and inorganic fertilizer. Andosols are found in areas with steep slopes and high rainfall and is porous with high water storage capacity, low bulk density. Usually has low pH due to leaching of soluble bases and aluminum. Conditions favor high phosphorus fixation-therefore it is not available to plants. For optimal agriculture production, liming and fertilizer is necessary. Phaeozems have a surface layer that is high in humus and are good for growing wheat, soybeans and pasturing cattle. Cambisols make good agricultural land and tend to be very productive.

5.4.4 Ecological Conditions

The county is composed of six agro-ecological zones as shown in figure 6. Zone 1 consists of the highest potential areas where forestry, tea and tourism industry are the major economic activities. Zones 2 and 3 are the lowlands lying to the east of Aberdares, which are generally suitable for both coffee and dairy

farming. The flat area of Makuyu division in Maragua constituency is characterized by arid and semi-arid conditions. This forms the agro-ecological zones 4, 5, and 6. In these zones, coffee and pineapple plantations thrive under irrigation.

The six agro-ecological zones provide ideal and conducive climate for production of tea, coffee and dairy in the upper and mid regions that have an equatorial and sub-tropical climate. The flatter eastern areas, characterized by arid and semi-arid conditions, provide suitable environment for coffee and pineapple plantations. The highest areas in the west have deeply dissected topography, and are drained by several rivers.

All the rivers flow from the Aberdare ranges to the West, South Eastward to join Tana River. This provides the necessary topography and gradient for irrigation. The geology consisting of volcanic rocks of the Pleistocene age and basement system rock of Achaean type occupying the western part of the county bordering the Aberdares provide porous beds and disconformities within the volcanic rock system form important aquifers, collecting and moving ground water, thus regulating water supply from wells and boreholes. Soils emanating from the volcanic activity are generally fertile and important for agriculture with the slopes in the rich volcanic soils on the higher altitudes particularly suitable for tea growing.



Figure 7: Murang'a agro-ecological zones
Source: CIDP (2023-2027)

5.4.5 Water Resources and Water Quality

The company currently has five major transmission lines as follows:

Phase 1: Abstracts water from the Mathioya South River at Tuthu, near Abedare Forest. It serves Kanyenya-ini, Kibutha, Githiga, and parts of Kahuti, with chlorination only for treatment.

Phase 2: Draws water from Mathioya South at Rwathia, 8 km from Kangema, with a full treatment plant. It serves Kiairathe, Kanorero, Gikui, G3, Kiamara, and other areas.

Phase 3: Shares an intake with Phase 1, serving Gitugu, Mukarara, Gacharaigu, Watuha, and parts of Kangema Urban, with chlorination treatment.

Phase 4: Abstracts water from Maragua River at Ichichi in Kanyenya-ini, serving Gatara, Murarandia, Kahatia, and other areas, with chlorination only.

Phase 5: Draws water from Rwathia intake, serving Kanorero, Gitweku, Koimbi, Kirogo, and Mukangu, with full treatment.

5.5 Biological Conditions

5.5.1 Flora and Fauna

Because of its varied temperature and topography, Murang'a County is home to a wide variety of flora and fauna. 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 project areas are common with most of their land under agriculture production. The local farm produce entails coffee, tea bushes, avocadoes, bananas, macadamia nuts, vegetables, maize and beans. Farmlands have significantly changed the vegetation types in the project area. Only small pockets of natural vegetation still exist in the project.

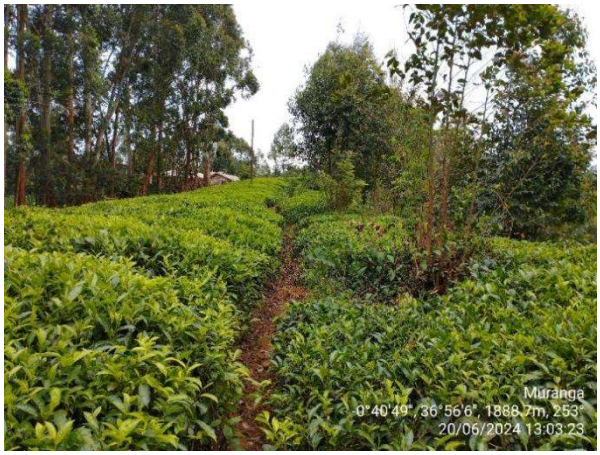


Plate 2: A tea plantation bordered with Eucalyptus trees.



Plate 3: A homestead with a banana plantation and Grevillea robusta trees



Plate 4: Grevillea robusta plantation in Kanyenyaini Ward

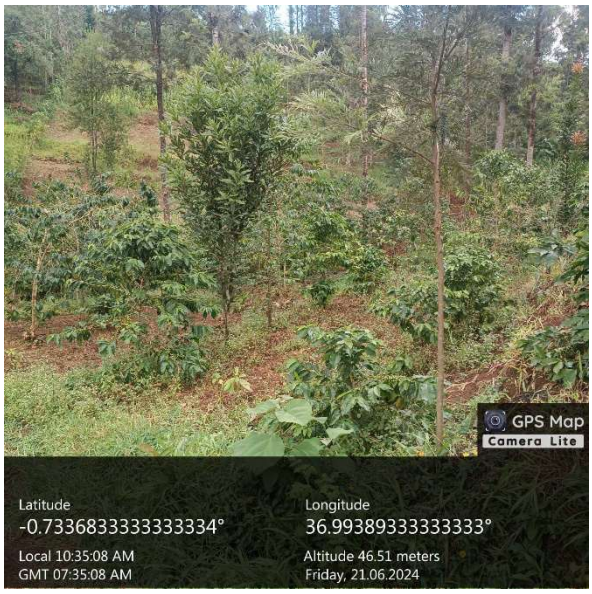


Plate 5: A plantation of trees in Mugoiri Ward

b) Fauna

The study area hosts limited wildlife due to land use changes, with common species including mongooses, rats, squirrels, and various bird species. Vervet monkeys are prevalent in Kahuro Sub-County, causing crop damage during harvest seasons. Historically, elephants caused human-wildlife conflicts by damaging farms. River systems support species such as monitor lizards, geckos, snakes, and fishlike carp and catfish. Livestock rearing is common, with cattle, sheep, goats, poultry, and pigs being raised in the area.

5.6 Socio-Economic Environment

This section outlines the socio-economic environment of the project, focusing on Murang'a County, particularly Kangema and Kahuro Sub-counties. A baseline was established through primary data from FGDs and KIIs with local elders, chiefs, healthcare professionals, teachers, and residents, as well as secondary data from the Murang'a County Integrated Development Plan (CIDP) 2023-2027 and other relevant ESIA reports. This information helps identify and assess potential socio-economic impacts of the project.

5.6.1 Service Function

Kangema and Kahuro urban area offers a number of services to its residents including health, water, electricity, education, housing, security, justice and recreation. This has been enabled by the existence of institutions like MWEWASCO, KPLC, Kangema police station and law courts, Kangema and Muriranja Sub County Hospitals and Michuki Technical Training Institute among others.

5.6.2 Population and Demographics

As of the 2019 Census, Murang'a County had a population of 1,056,640, with a growth rate of 1.2% per year. The population is projected to reach 1,108,594 by 2023, 1,135,520 by 2025, and 1,163,100 by 2027. The most populous sub-counties are Gatanga (187,989) and Murang'a South (184,824). Kangema has the smallest population of 87,989, projected to grow to 88,553 by 2027. The male-female sex ratio is 98 males to 100 females, with a higher female population due to migration, longer life expectancy for women, and higher female birth rates.

Table 17: Demographic Projections as per Project Sub Counties

Sub-County	2019 Census	2020 Estimate	2021 Estimate	2022 Estimate	2023 Estimate	2024 Estimate	2025 Estimate	2026 Estimate	2027 Estimate
Kahuro	88,193	89,258	90,335	91,426	92,529	93,646	94,777	95,921	97,079
Kangema	80,447	81,418	82,401	83,396	84,403	85,421	86,453	87,496	88,553

Source: Murang'a County Statistics Office

5.6.2.1 Specific Site Demographics

The proposed project areas are predominantly inhabited by the Kikuyu ethnic group, with other groups such as Kamba, Meru, Embu, Luo, and Luhya, who have migrated mainly for employment and business reasons. Christianity is the dominant religion, with various denominations present.

In Gatuya, the population has decreased over the last two years due to a lower birth rate. The location has six vulnerable households, including two female-headed, two with elderly, and two with persons living with disabilities (PLWD). Widows are considered the most vulnerable members of the community.

In Muringa-ini, the population has increased in the last two years due to the presence of a tertiary institution and nearby industries. There are 71 vulnerable households, which include 20 female-headed, 5 child-headed, 40 with elderly, 4 with PLWD, and 2 with mental challenges. Female-headed households are viewed as the most vulnerable due to challenges related to employment, property ownership, and decision-making participation.

In Gathamba, the population has increased over the last two years due to higher birth rates and migration from neighboring areas. There are 750 vulnerable households, consisting of 350 female-headed, 270 with elderly, and 150 with PLWD.

In Kiria, the population has grown due to low mortality rates and improved economic stability, which has led to better employment opportunities. The location has 190 vulnerable households, which include 100 female-headed, 10 child-headed, 75 with elderly, and 5 with PLWD. The elderly are considered the most vulnerable due to a lack of income.

Table 18: Demographic characteristics

Location	Approximate Population	Gender (%)		Approximate No. of households	Approximate No. of people per household	Approximate No. of vulnerable households	Most vulnerable members
		Male	Female				
Gatuya	3,000	40	60	600	5	6	Widows
Muringa-ini	960	41	59	240	4	71	Women Headed HH
Gathamba	3,800	45	55	760	5	120	-
Kiria	10,000	45	55	2,500	4	250	Elderly

5.6.2.2 Livestock Population.

This was estimated basing on the number of households in the area where the households were considered to have a certain average number of livestock units. A livestock unit was defined by the following conversion factors;

- 1 Grade cow equivalent to 1 Livestock unit.
- 3 Indigenous cow's equivalents to 1 Livestock unit.
- 15 Sheep or goats equivalent to 1 livestock unit.
- 5 donkey's equivalents to 1 livestock unit.

Through the survey done during the design stage it was found that the households had at least 1 grade cow or an indigenous cow, 12 sheep/goat and 6 pigs while others do not have any livestock. Indigenous cows and donkeys were fewer hence the design took count of the grade cows identified.

More than 90% of the area depends on agriculture and livestock farming. Livestock kept in the area are dairy cattle, sheep, goat pigs and chicken. According to Kenya National Bureau of statistics (2009) Kenya Population and Housing Census the livestock within the supply zone is as follows:

Livestock population was calculated using the following formula;

$$TLU = Av\ LH * H$$

Where:

TLU – Total Livestock Units (no)

$Av\ LH$ - Average Livestock units per household (no)

H – Number of households (no)

Table 19: Livestock population

Name of proposed extension pipeline	Livestock Initial Population (2023)
MUGURU WARD INTERVENTION	
Kihutiini-gitweku	43
Sera	36
Rwathia mihuti	45
Kihuutiini	65
Gikandu	70
Mundika	67
Mundinja	73
Boyo	55
KANYENYAINI WARD INTERVENTION	
Kiruri	43
Karurumo	38
Kanjuku	39
Kiruri Center	49
Mwembe	56
Eden Brook	46
WANGU WARD INTERVENTION	
South africa gathare	33
wanjemgi gatheru	48
Gitui secondary line	34

Name of proposed extension pipeline	Livestock Initial Population (2023)
Gitige Secondary line	44
Gikandu	41
Karindundu	65
Kiangage	62
Rural Wanjengi	56
Wanjengi	56
Gitie	57
Kianduma	53
MUGOIRI WARD INTERVENTION	
Mugumoini	39
Munyutha 2	27
Githioro-Kiria tarmack	43
Gathiru	32
Mwea	43
Sheet 1	88
Gititu	67
Mugwanyoni giaicembe	66
Kahithe	79
Gatuya Kahithe	74
MURARANDIA WARD INTERVENTION	
Gatara	31
Thengeini	45
Mutuango	39
Gatuya	100
Kambara	65
Kariii	89

5.6.3 Institutions Population

5.6.3.1 Schools

The accessibility and quality of education in the proposed project area is generally good with most of the primary schools and secondary schools within a 1.5km radius. Existing barriers to education in the two targeted sub-counties was as a result of lack of school fees, lack of good infrastructure, and unavailability of Technical and Vocational Education and Training institutions. There are several learning institutions in the coverage of MWEWASCO namely;

- ✓ ECDE Centres
- ✓ Primary Schools
- ✓ Secondary Schools
- ✓ Polytechnics
- ✓ KMTC
- ✓ Technical Training institutions

Table 20: Schools and number of students in the project area.

Category	School	Initial	Future	Ultimate
Day	Karurumo Primary School	434	452	470
Day	Karurumo Secondary School	335	349	363
Day	Gathiru Primary School	435	453	471
Day	Kahithe Secondary School	503	523	545
Day	Kahithe Primary School	623	648	675
Day	Kamaguta Secondary School	435	453	471
Day	Kamaguta Primary School	523	544	566
TOTAL		3,288	3,422	3,561

Other schools in the proposed project area included: Gatuya Primary and Gitura Secondary in Gatuya Location; Kiairathe Primary and Secondary in Muringa-ini Location; Karingu Pre-school, Gatheru Primary and Karingu Secondary in Gathamba Location; and Ngari Primary and Kagumo Secondary in Kiria Location.

5.6.3.2 Commercial Establishments

The commercial activity in the project area is dominated by small scale enterprises in trade and services. These enterprises mainly consist of retail shops offering a variety of goods and services for the general needs of the area. It is assumed that the future increase in commercial activity is likely to be associated with the growth of population in the Sub-Counties.

The number of major shopping centres was established and an average number of bars, restaurants, shops, and other common commercial establishments per shopping centre were approximated. The total number of commercial establishments categorised as bars, shops, restaurants and others was calculated separately. The population is as follows:

Table 21: Number of commercial establishments' projections

Categories	Kangema and Kahuro project areas	Supply Zone (2019)	Supply Zone (2023)	Supply Zone (2033)	Supply Zone (2043)
Small Hotels	12	15	18	26	34
Shops	45	49	56	78	85
Bars/Restaurants	13	16	20	24	30

Murang'a County Commercial Data (Murang'a CIDP)

5.6.4 Gender Roles

In all the proposed project locations, men share a similar role of providing for their families as the household heads. They do this from revenue generated from farming activities and running of businesses. During the FGDs, men reported equal opportunities in the community, workplace and education for both men and women. In addition, it was reported that men worked more in high paying opportunities thus more financially empowered than women. The men also reported that women were financially empowered through "*chamas*" (financial groups) where they save and invest.

Women were reported to have the following roles: cooking, fetching water, running household chores, farming, raring of livestock and some operating shops. Women also assisted in farming and raring of

livestock. The women also reported unequal opportunities especially in employment. It was reported that preference for well-paying jobs was given to men.

Men were reported to have control on land, assets and natural resources more than women. The men in the proposed project area owned land, coffee plantations, tea plantations and livestock. Women looked after the farms and a few of them owned assets either by becoming a widow or those who are single. Women reported to have control of livestock especially poultry and rabbit keeping. This was as a result of new training programmes and projects in the area. In Gatuya Location, married women were reported to experience conflicts related to land ownership and inheritance. Some households were headed by a female reported to be mainly due to death of a spouse. This poses challenges to female household heads in terms of ownership of assets of the diseased and lack of proper presentation in the community.

The roles of women and men in the proposed project area are changing. Women nowadays own *bodabodas.* Women are involved in decision making at the household level. At the community level, women tend to support their husbands in decision making.

Traditional cultural groups known as "*Kiama Kiama*" were reported in Gatuya, Muringa-ini and Kiria Locations. This group's function was to teach men religious matters and to maintain culture. In Kiria location, they had a cultural group called "*Muhiriga*" for cultural identity purposes.

Economic activities such as the sale of coffee, tea and milk were reported to be the main income generators for men. The challenges faced by men in the proposed project area included lack of employment, small farms limiting production and health issues.

5.6.5 Land Use and Land Tenure

Land in Murang'a County is classified into public, private, or community land. Land is considered important, and can be owned on a freehold or leasehold basis. In a freehold system, the land holder acquires absolute ownership for life. These rights can be inherited. A leasehold system gives a person land rights for a specific period, subject to frequent payments. The government, local authorities, and individuals can grant leases for public land, trust land, and freeholds respectively. The majority of Murang'a County's population owns land.

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 Kangema and Kahuro Sub-County is designated for farming; nonetheless, along the pipeline route the land is subdivided and utilised for residential house and subsistence farming practices.

From the FGDs it was mentioned that land is owned by men, in particular older men in the proposed 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. As a consequence 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. In Kiria Location, land is usually allocated to men as a cultural belief that men own all the ancestral land. Succession issue was reported to be rampant in this particular location.

During the FGDs, the men 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.

5.6.6 Health

There are several health centres in the area. Gatuya Location has Muriranjas Level 4 Sub- County Hospital and three pharmacies; Muringa-ini Location has one dispensary (Kiairathe Dispensary); Gathamba location has one dispensary (Gatheru Dispensary); and Kiria Location has one dispensary (Kiria dispensary). Karurumo Dispensary. Other health facilities in the proposed area include Gikui Dispensary, Gatangara Dispensary and Matharite Dispensary. These health facilities were reported to lack medical supplies forcing patients to buy prescribed medication from chemists and pharmacies in the area.

Men in the proposed project area reported common cold/flu, diabetes and hypertension as the most common health problems affecting them. Blood pressure, Diabetes and Arthritis were the most common health problems reported by women in the area. Health problems were made adverse by cold seasons and financial distress as reported by women during the FGDs. Dirty water and cold temperature were reported to be the environmental issues that affect health in the community. Community members in the project area prefer seeking medical assistance in hospitals and not traditional medicine.

5.6.7 Infrastructure and Services

5.6.7.1 Water

Sixty percent of the households have access to potable water while 40% of the population depends on water from ponds, dams, streams, rivers, unprotected springs, and unprotected wells (KNBS 2019).

The residents of Gatuya Location get water for domestic use, irrigation and livestock use from Muriuru River and rainwater harvesting. They collect water from the river by gravity flow through pipes and use of jerrycans. This water source was reported to be brownish in colour with increased turbidity during the rainy seasons. Water from this river runs low during the dry seasons. The community practices water rationing from Muriuru River during the dry seasons as a water resource management practice. This location also has a community-based organization known as Gakaki Water that has successfully assisted the locals to carry out irrigation on their farmlands.

In Muringa-ini Location, the residents get water for domestic use from Gathaje and Foyo streams; Kanyiri River and some have access to tap water. Water is collected by use of jerry cans and gravity flow through pipes. The quality from the streams and river was reported to be good. Water for livestock use was reported to be piped from Mathioya River through gravity flow. These sources were reported to be coloured and turbid during the rainy seasons and run low during the dry season. No irrigation activity was reported in Muringa-ini Location. The residents in this location practiced water rationing during the dry seasons.

Gathamba River was the main source of water in Gatheru Location. The residents use the water for domestic and livestock use. Women fetch the water in jerrycans and some use carts. No irrigation activity is carried out in the location as farming is rain fed. Water was reported to run low during the dry seasons.

Residents in Kiria Location get water from streams in the area for domestic use, livestock and irrigation. Water from the streams were reported to be clean and run low during the dry seasons. The village elders monitor the collection points and ensure water rationing during the dry seasons as a community water resource management practice.

5.6.7.2 Sanitation, Hygiene and Waste Management

The proposed project area lacks sewerage and an integrated solid waste management system. This poses health risks as the community water sources are at a high risk of pollution from wastewater and wash down of solid wastes into the streams and rivers. In Gatuya, Muringa-ini and Kiria Locations, most of the homes each have unventilated pit latrines. Residents in Gatheru Location reported to make use of shared pit latrines and in some cases hole in the ground. Household waste was reported to be handled depending on type in the proposed project area. Organic waste was composted to make manure for the farms, other types of waste was burned and/or thrown into the pit latrines.

5.6.7.3 Access to Power/Energy

The main sources of energy in Murang'a County are firewood, paraffin, charcoal, electricity, and gas. Less than 1% of households use electricity for cooking, while 75% of households use firewood for cooking. Nine percent of the households use solar energy for lighting while 60% use electricity for lightning. Firewood was reported to be the main source of energy for cooking in the proposed project area. Moreover, the area is connected to the national electricity grid which the community use for lighting and charging electrical devices. Residents of Gatuya, Gatheru and Kiria Locations reported delay challenges in getting connected to the national electricity grid. No connectivity issues were reported in Muringa-ini Location.

5.6.7.4 Transport

Transport system within the entire project area is good and many centers are linked by all-weather gravel roads as well as a few tarmac roads. Some of the community roads within the residential areas are narrow with very minimal road reserves if any. It is due to this reason that some sections of the proposed interventions will be laid on private land.



Plate 6: A paved road in the project area



Plate 7: Unpaved Road without a road reserve

5.6.7.5 Telecommunication

The posts and telecommunications sector are well developed in Murang'a County with post offices in major trading centres. Murang'a County also has a 98% mobile network coverage. It is also connected to the fibre optic cable network, giving it access to fast internet connectivity. Mobile coverage in the two sub-counties (Kangema and Kahuro) is fairly good; this was confirmed during the field work.

5.6.8 Industrial Function

There exist a number of coffee and milk processing industries in Kangema and Kahuro. These industries are fed by the hinterlands of the urban area where tea, coffee, and dairy farming are dominant. The town as well envisages the processing of other farm produce including milk, bananas, avocados and macadamia nuts due to the increasing volumes produced and profitability of the three produces.

5.6.9 Residential Functions

Kangema and Kahuro sub-counties have a mixture of residential functions ranging from rental housing within Kahuro, Kahatia, Kangema, Kanyenyaini and Karugia towns to farm houses within the agricultural area.

5.6.10 Commercial Function

There also exist a number of commercial establishments in the Centre including banks, petrol and service stations, dairy and coffee processing, banks, hotels and restaurants as well as wholesale and retail stores. The main commercial activities in Kahuro, Kahatia, Kangema, Kanyenyaini and Karugia towns include selling of new and second-hand clothes (mitumba), hardware, health products, recreational and social welfare. Industrial activities include motor garages, metal workshops and Jua Kali.

5.6.11 Agricultural Function

Kangema and Kahuro have agricultural function with coffee and tea as the main cash crops grown in the agricultural zones. There are numerous tea collection centers and coffee factories in the area. The main crops grown are maize, beans and cabbages. Livestock kept in the area are dairy cattle, sheep, goat pigs and rabbits.

5.6.12 Economy and Income situation.

The economy in the project area is primarily driven by agriculture, including food crops such as maize, beans, potatoes, and vegetables, as well as cash crops like coffee, tea, bananas, avocados, and macadamia nuts. Livestock farming involves cows, goats, chickens, sheep, and pigs. Commercial activities are dominated by small-scale enterprises offering trade and services in towns like Kangema, Kahuro, Kahatia, Kanyenyaini, and Karugia. Female FGDs revealed varied contributions to household income, with women in Gatuya reporting lower contributions due to limited asset ownership, while women in Gatheru and Kiria contribute more, citing men's misuse of income on alcohol and women taking on more responsibilities.

5.6.13 Cultural Heritage

There used to be some sacred sites in Gatuya Location i.e., Mukuyu-ini located in Kianjogu and Mutiini Ngondu, but are no longer in use nowadays. In Kiria Location, there is a Mugumo tree at Kagumo Primary. These sites are not near the proposed project sites and thus will not be affected. There are no festivals nor rituals undertaken by men in the proposed project area. There are no burial sites within the proposed project area, the community in the proposed project area bury the dead within their homesteads. Moreover, the ESIA has provided chance find procedures (*Annex 6*) to be adopted by the contractor during the construction phase.

5.6.14 Gender Based Violence

Verbal abuse on women by men was the most common form of Gender Based Violence (GBV) reported in the proposed project area. Minimal physical abuse was reported in Gatuya, Gatheru and Kiria Locations. Physical abuse was majorly as a result of alcohol consumption by men. GBV support centers were noted to be few in the area. The most active centers were police posts and chiefs' offices mainly in Gatuya Location.

6. STAKEHOLDER ENGAGEMENT AND CONSULTATIONS

6.1 Introduction

This chapter outlines the stakeholder engagement approach for the ESIA, emphasizing the importance of informing and consulting local communities and stakeholders for successful project delivery. The program fosters constructive relationships with authorities, organizations, and communities throughout the development phases of the Proposed Project, ensuring stakeholder views and concerns are incorporated to minimize opposition and adverse impacts. Engagement aligns with Kenyan legal requirements (Environmental (Impact Assessment and Audit) Regulations, 2003) and international standards (World Bank OP/BP 4.01), supporting collaborative partnerships, improved designs, and sustainable outcomes.

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:** An open, inclusive and transparent process of culturally appropriate engagement and communication is undertaken to ensure that stakeholders are well informed about the proposed project as it develops. Information is disclosed early, appropriately and as comprehensively as possible;
- **Involving stakeholders in the assessment**: Stakeholders are included in the scoping of issues, the assessment of impacts, and the generation of mitigation measures and the finalization of the ESIA Report. They also provide an important role in providing local knowledge and information for the baseline to inform the impact assessment;
- **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**: It is important to ensure that the project does not create or allow unrealistic expectations to develop amongst stakeholders about Project benefits. The engagement process serves as one of the mechanisms for understanding and then managing stakeholder and community expectations, where the latter is achieved by disseminating accurate information;
- **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 CAP 387 section 58, by achieving sustainable development. Part II Section 7(4) of the Environmental (Impact Assessment and Audit) Regulations of 2003, further requires that all ESIA Project Reports should 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.

6.3.2 World Bank Requirements.

6.3.2.1 OP/BP 4.01: Environmental Assessment

This policy requires the Bank to ensure that environmental assessments include consultations with affected groups and local NGOs about the project's environmental aspects and take their views into account. The goal is to ensure that stakeholders are informed and have a chance to participate in the decision-making process.

Stakeholder Identification and Analysis

The developer will identify the different stakeholders, both project-affected and other interested parties. Individuals or groups affected by or likely to be affected by the project will be identified as "project-affected parties" and other individuals or groups that may have an interest in the project will be identified as "other interested parties".

The developer also identified the project-affected parties (individuals or groups) who, because of their particular circumstances, may be disadvantaged or vulnerable. Based on this identification, the developer further identified individuals or groups with different concerns and priorities about project impacts, mitigation mechanisms, and benefits, and who may require different or separate forms of engagement.

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. The developer also 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 by stakeholders 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 WSP 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 developed 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 WSP will continue to engage with 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 continuously 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

The stakeholder identification and analysis process were a critical step in the project's consultation and engagement strategy. It involved identifying stakeholders, analyzing their potential impact or influence on the project, and planning appropriate consultation approaches and tools. Stakeholders were mapped based on their likelihood of experiencing significant project impacts, their mandate over project activities (e.g., government entities), and their roles as supporters or opponents. The analysis prioritized stakeholders by their interest, expectations, required participation levels, influence on project outcomes, and relationships with other stakeholders, ensuring effective engagement throughout the project lifecycle.

'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 22 below depicts the recommended stakeholder communication strategy based on their level of influence/power and interest concerning the proposed project.

Table 22: 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 34 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 23: 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 1.	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 2.		- 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 3.		- MWEWASCO	- 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 4.	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	- Issue Workplace Registration certificate to the EPC Company	7	4		Preconstruction and construction phase	- **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
		Safety and Health Services (DOSHS)	- Registers the upgrade works site as 'construction site'					
PUS 6.	Ministry of Interior and Coordination of National Government (National Government Administrative Officers)	- Deputy County 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	- Are Representatives of local 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	3	6		Throughout the project's lifetime	- **Official Letters** - **Tele conversations** - **Key Informant Interviews (KIIs)** - **Scheduled Public Barazas/ community meetings**
PUS 7.	County Government of Murang'a	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 8.		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**

I.D.	Stakeholder Group	Stakeholders	Area of interest	Influence/ Power	Level of Interest	Power/Interest Rating	Periods of Active Engagement	Method of communication
PUS 9.		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**
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,	- Anticipated impacts (positive and negative) of the project - Employment opportunities - Increase in water supply	6	8		Throughout the project lifetime	- **Scheduled Public/community meetings (Barazas)** - **Public Posters** - **FGDs/KIIs** - **Public Meetings/Barazas** - **Media announcements**

I.D.	Stakeholder Group	Stakeholders	Area of interest	Influence/ Power	Level of Interest	Power/Interest Rating	Periods of Active Engagement	Method of communication
		- The general public in the areas of influence	- Information sharing on the impact of the project on the community and its environs.					- **Surveys and 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 targeted wards include Murarandia, Muguru, Mugoiri, Wangu and Kanyenyaini*

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 process.

The community public meetings/barazas and FGDs were conducted in both Swahili and Kikuyu 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 Questionnaire**

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 Questionnaires**

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 Questionnaire**

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, 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, 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 MWEWASCO);
- 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 are appended at the end of this report (*Annex 4*).

6.5.2 MWEWASCO Stakeholder Engagement Activities

6.5.2.1 Preliminary consultations

The preliminary consultation aimed to gather initial feedback from key stakeholders, including the Water Sector Trust Fund (WSTF), MWEWASCO, and project area administrative officials (this included the deputy county commissioners, Chiefs, and Assistant chiefs). This consultation was undertaken during the reconnaissance phase with the aim of mapping and understanding stakeholder concerns and expectations.

From the consultations held with the administrative officials for Kagiko B, Gathanji, Kayahwe, Kahithe and buffalo lines, the aim was to agree on steps of mobilisation and the exactly affected community based on the project coverage area. From the meeting with the specific area chiefs, programme was drawn which formed part of the notification letter to the Deputy County Commissioner who then cascaded down the letters to chiefs for planning of public consultation meetings.

Additionally, consultation was held with MWEWASCO technical team and the Managing Director as part of the preliminary discussions. The meeting attended by MWEWASCO technical manager 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 public meetings to further engage the community, inform them about the project details, and gather broader input. These meetings were scheduled by the specific area Chiefs, 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 public baraza meetings were held in Murang'a County i.e., at Gatuya Primary School in Murarandia Ward and at Kahiti Grounds near St. Marks Church on 19th June 2024; at Gatheru Dispensary in Wangu Ward on 20th June 2024; and Kiria Market in Mugoiri Ward on 21st June 2024. The chosen meeting points served as ideal venues for the baraza meetings because they provided a convenient congregation spot for the majority of the targeted stakeholders.

The public baraza held at Gatuya Primary School was attended by sixty-five (65) participants (35 male and 30 female); the one held at Kahiti Grounds was attended by thirty-eight (38) participants (23 male and 15 female); the one at Gatheru Dispensary was attended by twenty-five (25) participants (17 male and 8 female); and the one at Kiria Market was attended by forty-two (42) participants (30 male and 12 female); individuals inclusive of the project team. The four barazas were held with communities from Murarandia Ward (Gatuya location), Muguru Ward (Muringa-ini Location), Mugoiri Ward (Kiria Location), and Wangu Ward (Gathamba Location). These were representatives of the stakeholders that will be affected by the proposed water pipeline project. The meetings were also attended by the National Government Authority Officers in charge of the area i.e. the area Chiefs, assistant chiefs together with the village elders. The area WSP (MWEWASCO) was represented by one officer.

The Consultants (Environmental and Social Experts) together with the MWEWASCO representative 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 Swahili and Kikuyu 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, highlighting the potential positive and negative impacts of the project, and if they are for or against the project.

All substantive issues raised with the consultant's team during the Barazas were noted and responded to. The issues were then recorded in an Issues and Response Report. The table below shows a summary of the views expressed by various stakeholders during the public meetings.

Table 24: summary of the views expressed by various stakeholders during the public meetings

Subject	Question/Concern	Response
Water Use	Can the beneficiaries use the water for both domestic and agricultural use?	Water to be supplied is treated and intended for drinking. It is not fit for farming due to chlorine and other additives used for treating water.
Cost/Charges	What are the connection charges?	Connection charges will be at Ksh. 5,000 for application and meter connection.
Project start date	How long will it take for the project to start? Some projects have failed to start years after the public participation were carried out.	The project is in the initial phases of getting the required approvals after which a contractor will be awarded the tender to install the pipelines.
Employment	Are the project beneficiaries required to prepare the trenches for the water pipes by themselves or will there be hired labourers to do the trenching?	A contractor inclusive of labourers will be hired to prepare the trenches and distribution lines. Priority for employment opportunities will be given to the locals.
Water pressure challenges	Water pressure is low and prevents Ngaru area residents to get treated water yet they have water connection from a nearby river.	There has been a challenge connecting that area but a new line is proposed under this project that will solve the water pressure issues.
Water rationing	There is too much water rationing by MWEWASCO currently.	Rationing is done to serve all areas but water is provided about 3 days per week. The community was urged to have storage tanks.
Standing Charges	The residents also receive standing charges for the water meters even when there is no water consumption.	The charges are for financing periodic maintenance.
Repair delays	There is a delay in attending to repairs	The representative shared the technical team's phone number for reporting water pipe damages.
Payment modalities	What is the procedure for paying the water bills?	Bills will be paid via mobile money to MWEWASCO and not in cash.



Plate 8: Gatuya Primary Public Baraza



Plate 9: Kahiti Ground Public Baraza



Plate 10: Gatheru Dispensary Public Baraza



Plate 11: Kiria Market Public Baraza

Table 25: Summary of Consultative Public Meetings Attendance

Meeting Venue	Date	Participants	Male	Female	Total No.
Gatuya Primary	19th June 2024	- Local administration (Chief, assistant chiefs, elders) - Community members (men, women, youth) -MWEWASCO representative - ESIA Consultants team	35	30	65
Kahiti Grounds	19th June 2024	- Local administration (Chief, assistant chiefs, elders) - Community members (men, women, youth) -MWEWASCO representative - ESIA Consultants team	23	15	38
Gatheru Dispensary	20th June 2024	- Local administration (Chief, assistant chiefs, elders) - Community members (men, women, youth) -MWEWASCO representative - ESIA Consultants team	17	8	25
Kiria Market	21st June 2024	- Local administration (Chief, assistant chiefs, elders) - Community members (men, women, youth) -MWEWASCO representative - ESIA Consultants team	30	12	42
		TOTAL	105	65	170

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 questionnaires, 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

Feedback from the Men:

Feedback from the male participants in the Focus Group Discussion (FGD) highlighted several key points regarding the proposed water pipeline project. They demonstrated a clear understanding of the project's objectives and potential benefits, emphasizing:

- Increased availability of clean drinking water.
- Acknowledgment of reduced health issues associated with dirty water.
- Increased income retention due to reduced health expenses.

- Anticipation of job opportunities for both youth and adults.
- Increase reliability; upgrade of the water pipelines will reduce occurrences of leaks and bursts and therefore improve the reliability of the water supply;

The group also raised concerns

- Potential interruptions in water supply during road improvement and maintenance activities.

They presented the following requests:

- Considering the level of youth unemployment, the WSP to ensure the local community members receive priority in job allocations

Their expectations from the project include;

- Collaborative engagement with the community throughout project implementation
- Timely execution of the project to meet anticipated needs

Feedback from the women

During the focus group discussion, the 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.
- Female participants expressed optimism that the project will significantly reduce water rationing issues, ensuring more consistent access to water for households
- There was a consensus that the project will alleviate the burden of fetching water, particularly benefiting women who traditionally bear this responsibility

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 provider will enhance customer service and respond promptly to water-related issues

Feedback from the Youth

During the focus group discussion, the youth members actively engaged and shared their perspectives on the proposed water pipeline project:

Benefits:

- They acknowledged that the project would enhance water accessibility and improve accountability in water consumption;
- They highlighted that liaison with the community should also continue during construction work and initial operation of the pipeline
- Youth participants highlighted the potential for job creation across various skill levels, anticipating both skilled and unskilled employment opportunities;
- They expressed optimism about the project's promise to ensure a reliable supply of safe drinking water.

Impacts:

- They expressed concerns about potential disruptions to water supply during the construction phase. They noted that such disruptions could compel affected residents to seek alternative water sources which is unprotected sources;
- leakages from the water supply pipeline might overflow to neighbouring farms thus leading to destruction of crops;
- Where water pipeline may affect private property and disrupt business, this calls for fair compensation of the affected;
- Concerns were raised about potential damage to murram roads caused by trenching activities.

Suggestions:

- They emphasized the importance of implementing effective soil erosion control measures throughout the construction process
- 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 water supply disruption to local residents and activities.

Expectations:

- Increased (uninterrupted) water supply is expected
- They anticipate opportunities for skills development and training related to water management, pipeline maintenance, and other relevant technical skills.
- They anticipate that the project will foster community engagement and involvement in its implementation
- There is a hope that the project will enhance educational opportunities or support local youth development initiatives, this is connected to reduced time in search of water.



Plate 12: Female FGD at Gatuya Primary School



Plate 13: Male FGD at Gatuya Primary School



Plate 14: Male FGD at Kahiti Grounds



Plate 15: Female FGD at Kahiti Grounds



Plate 16: Women FGD at Gatheru Dispensary



Plate 17: Youth FGD at Gatheru Dispensary



Plate 18: Women FGD at Kiria Market



Plate 19: Male FGD at Kiria Market

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 (Gatuya Junior School and Kagumo Primary School), Kangema and Kiria Public Health Officers.

Additionally, the Deputy County Commissioner was interviewed to provide information on the security in the area.

Community profile checklists were also filled in with the assistance of Senor Chief Gatuya Location, Assistant Chief Kiairathe Sub-Location, Assistant Chief Gatheru Sub-Location, Senior Assistant Chief Kiria Location 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 26: Summary of Feedback of the KIIs on Project Perception

No	Interviewee	Institution	Project Perception
1.	Deputy County Commissioner (Kangema)	Interior National Administration	Sensitize the community on compensation expectations to minimize conflicts.
2.	Public Health Officer	Kangema Sub-County Hospital	- Increased supply of clean drinking water will reduce water borne disease outbreaks such as cholera, diarrhea, typhoid and dysentery. - Project to ensure health and safety to minimize risks - Regular maintenance of the water pipelines
3.	Head of Institution	Gatuya Junior School	- Access to clean water for better health. - Reduction of health issues because of dirty drinking water will improve the education standards at schools in the area.
4	Head Teacher	Kagumo Primary School	- Will improve the quality of life for the students and teachers in the area.
5.	Public Health Officer	Kiria Health Center	- Provision of clean drinking water in the area will reduce cases of water borne diseases. - Chiefs barazas should be frequent to promote water conservation and safety

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.

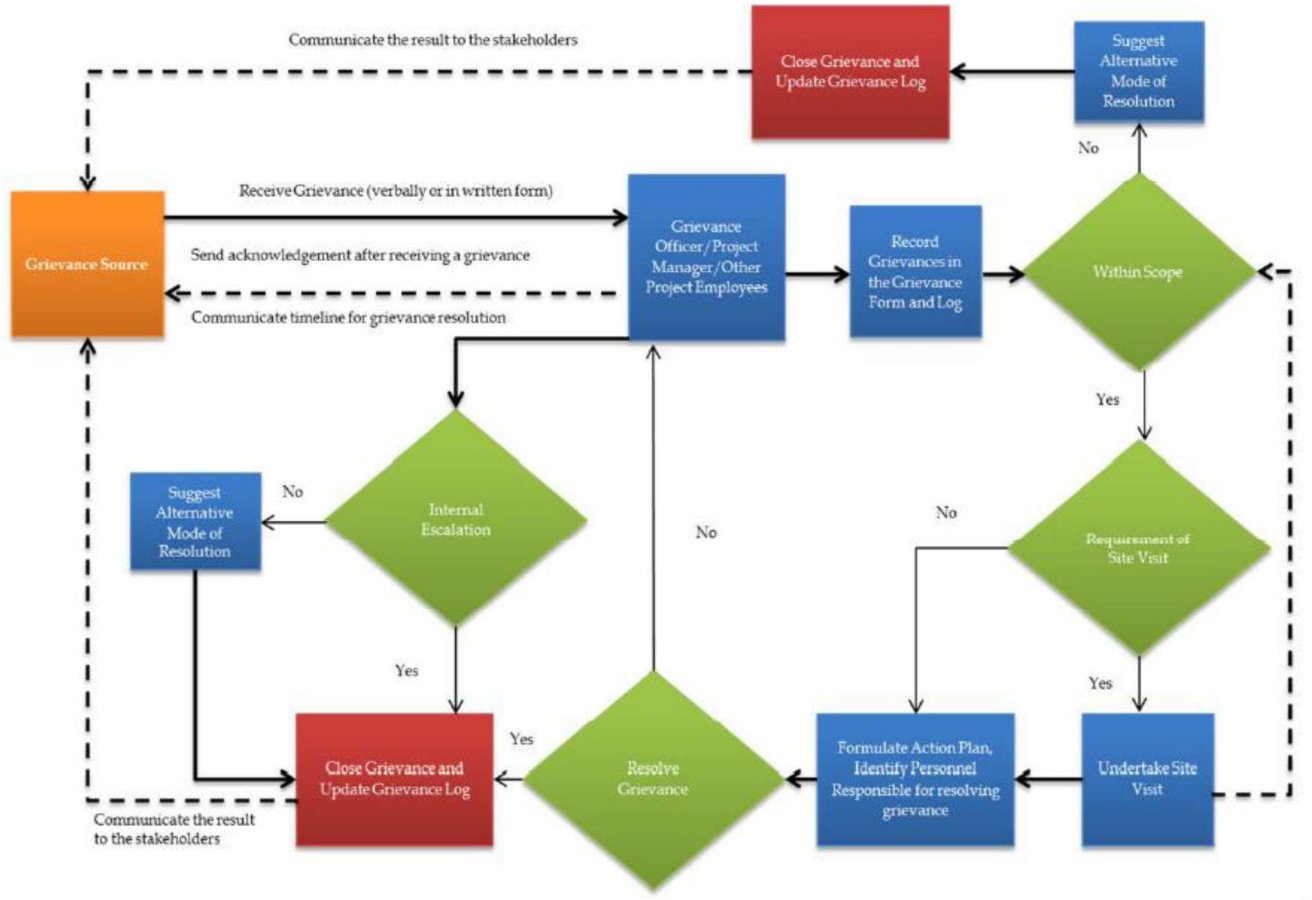
6.6.1 Principles of the GRM

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 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.
   a) .

6.6.2 Grievance Procedures

The process to be followed for the redressal of the stakeholder grievances is summarized overleaf:



6.6.2.1 Publicizing and Disclosure of the 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 as presented in Annex 9

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 presented overleaf.

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/MWEWASCO proposes a resolution;
- ✓ Contractor/MWEWASCO and the complainant jointly decide;
- ✓ Contractor/MWEWASCO 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 MWEWASCO. 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. ALTERNATIVES ANALYSIS

This chapter describes the various alternatives considered for the conceptual design stage of the proposed MWEWASCO 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 MWEWASCO. In addition, the project will increase water supply capacity to provide sufficient water to the population.

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.

Murang'a County and specifically MWEWASCO 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 and exacerbates non-revenue water issues by diverting water from legitimate sources without proper authorization or metering.

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 as a result of water supply increase, reduction of non-revenue water and water meter installation campaign through this project will help MWEWASCO attain financial stability.

Advantages of this alternative

- The proposed site remains undisturbed, preserving its natural state and current land use.
- Prevents ground compaction, maintaining soil structure and minimizing impacts on groundwater.
- By avoiding 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.
- **Financial Impact on MWEWASCO:** The financial condition of the WSP would not benefit from the improved water production and distribution infrastructure, potentially limiting revenue generation and investment in future water service improvements.
- **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 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 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 Murang'a, specifically Kiria Market in Kiria Location, the existing borehole's pump is broken and restoration costs are high. 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.

7.3 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 this project, alternatives such as concrete, cast

iron, and copper were considered but ultimately rejected. Instead, High-density polyethylene (HDPE) pipes will be exclusively utilised. 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 entirely to the opposite side would pose numerous risks. These considerations highlight the economic and operational advantages of maintaining the current sites for the proposed lines along established road networks as proposed in the design.

By opting to utilize the existing road network, the project can capitalize on infrastructure already in place, including access roads and utility connections, thereby minimizing construction complexities and environmental impact. This approach not only streamlines the implementation process but also aligns with project timelines and budgetary constraints, ensuring efficient use of resources and timely completion. Additionally, maintaining the current site supports continuity with existing facilities and operational setups, further enhancing project feasibility and operational effectiveness. Overall, sticking to the current route represents the most practical and cost-effective strategy for achieving project goals while minimizing potential disruptions and maximizing environmental sustainability.

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 the majority 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 machinery 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 (Kagiko B, Gathanji, Kayahwe, Kahithe and buffalo lines) 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 Cap 387 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 were: health; safety; biodiversity; air quality; pollution; restrictions on land use, 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 27.

Table 27: 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.

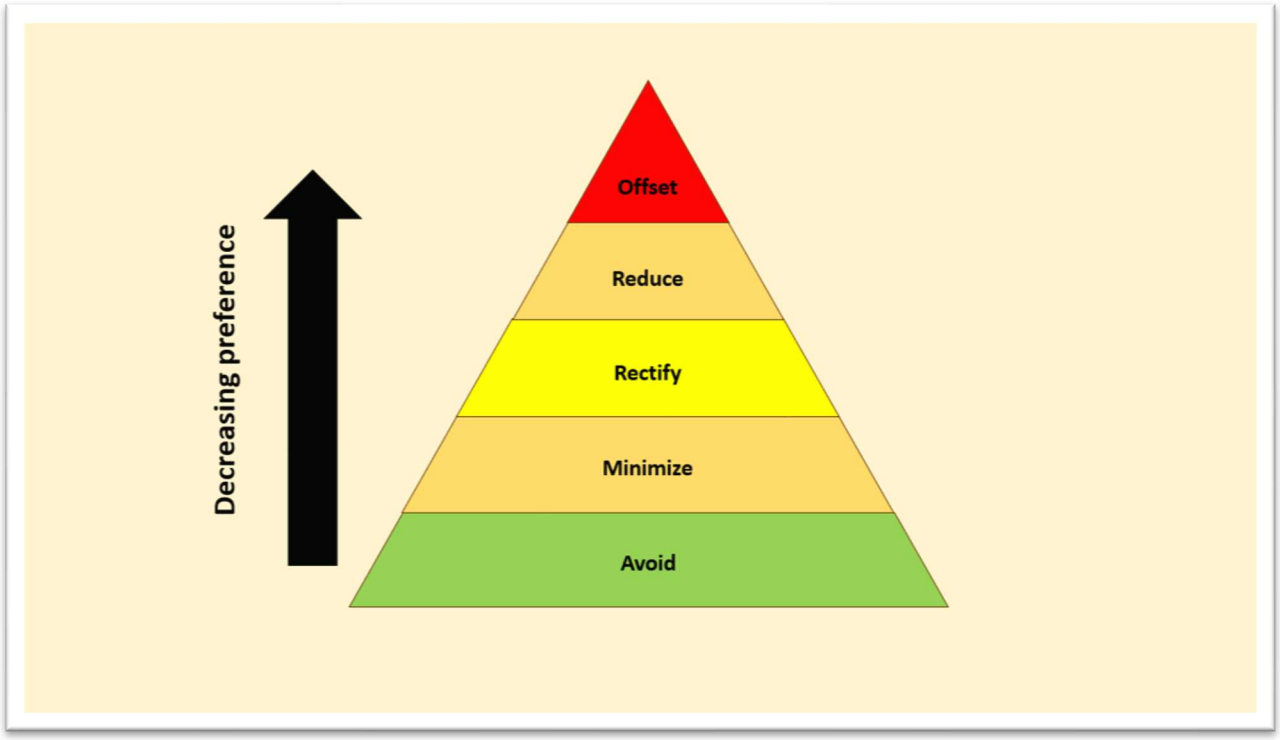


Figure 8: Mitigation hierarchy

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 the contractor for the proposed water project will implement 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 project proponents 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 13 and Table 14.

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. These receptors may experience impacts depending on their proximity to the project activities. Observations from the field indicate that no acquisition of private land, business premises, or structures are expected to face direct disruption or demolition, other impacts remain relevant.

Health and safety risks include potential accidents involving contractor equipment and open excavations, which could pose hazards to residents and the general public. In healthcare facilities, open trenches may restrict ambulance access during emergencies. Dust pollution from construction activities could contribute to respiratory illnesses, while noise and vibrations above acceptable thresholds (60 decibels during the day) could lead to discomfort or minor health concerns. Damage to existing utilities, especially domestic water pipelines, could lead to service disruptions or water contamination, triggering grievances from affected users.

8.4.1 Kagiko B and Gathanji Rehabilitation Pipelines

The 7.7 km pipeline under the Muguru Ward Intervention traverses an area characterized by scattered residences, agricultural farms, churches, and occasional business premises. No social impacts such as land acquisition, business disruptions, or displacement are anticipated along the pipeline route. Table 28 overleaf presents receptors identified along the Kagiko B and Gathanji Rehabilitation Pipeline.

Table 28: Sensitive Receptors along Kagiko B & Gathanji Rehabilitation Pipelines

Type of Receptor	Number	GPS Coordinates	Name of the Receptor
Church	2	0°40'56.00"S, 37°57'16.40"E	St. Joseph Kiangunyi Catholic Parish
		0°40'52.00"S, 37°57'23.40"E	Seventh Day Adventist Church-Kangema
Residential Plots	Approx 69	-	Kagiko B and Gathanji
Tea Plantation	1	0°40'49.57"S, 36°56'3.6"E	Tea Farm



Plate 20: A Catholic and SDA Church



Plate 21: Live fence for residential areas

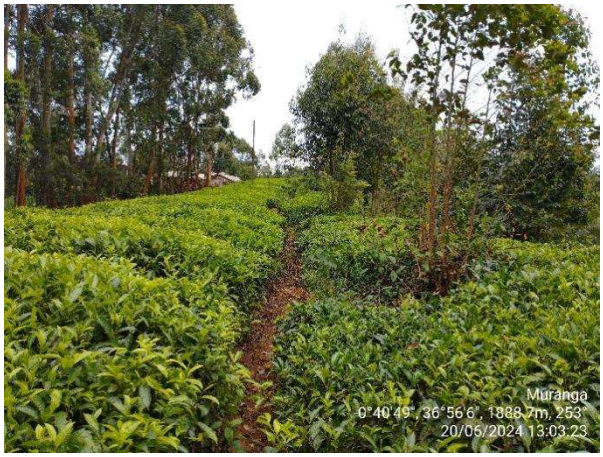


Plate 22: Tea plantation

8.4.2 Kayahwe and Kahithe New Pipelines

The 7.5 km pipeline of Murarandia Ward Intervention passes through areas with residential homes and institutions. Table 29 below presents receptors identified along the Kayahwe and Kahithe New Pipelines.

Table 29: Sensitive Receptors along Kayahwe & Kahithe New Pipelines

Type of Receptor	Number	GPS Coordinates	Name of the Receptor
School	1	0° 44' 6.2874", 36° 59' 8.286"	Kahithe Primary & Junior Secondary
Church	1	0° 44' 1.611", 36° 59' 23.586"	AIPCA Kahithe Church



Plate 23: Tea Kahithe School



Plate 24: AIPCA Kahithe Church

8.4.3 New Buffalo Pipeline in Kiria

The 12 km pipeline of Mugoiri Ward Intervention passes through areas with residential homes, institutions, and farms. Table 30 below presents receptors identified along the new Buffalo Pipeline.

Table 30: Sensitive Receptors along New Buffalo Pipeline

Type of Receptor	Number	GPS Coordinates	Name of the Receptor
Residential	1	0° 43' 59.4762", 36° 59'36.8988"	Homestead
Farm	Approx 7	0° 43' 55.3506", 36° 59' 31.9452"	Maize and vegetable farms
Health Centre	1	0° 45' 32.2986", 36° 4' 17.0574"	Kiria Health Centre



Plate 25: Homestead



Plate 26: Maize farm



Plate 27: Kiria Health Centre

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 will create job opportunities for skilled, semi-skilled, and unskilled labor, including women, with a focus on maximizing local recruitment and preparing the community to benefit from these opportunities. The local population, primarily self-employed in farming and small-scale retail, and a significant number of unemployed youths engaged in informal labor and boda-boda services, stand to gain from employment during the construction phase. Activities such as site clearance, excavations, construction, assembly, site security, and rehabilitation will offer employment across various skill levels.

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: -

- MWEWASCO 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: -

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

8.5.2 Operation Phase Positive Impacts

- *Improved and reliable water supply for the residents under the proposed MWEWASCO jurisdiction*

The operational phase of the water pipeline project will deliver improved and reliable water access to residents of Murarandia, Muguru, Mugoiri, Wangu and Kanyenyaini Wards ensuring consistent supply of clean drinking water for health, economic activities, and community development.

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 increased supply of water.*

Increased water supply during the operational phase will enhance sanitation practices in Murarandia, Muguru, Mugoiri, Wangu and Kanyenyaini Wards, supporting 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 environs.

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.

Analysis of Impact

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

Enhancement Measure: -

- Proper maintenance of the water supply infrastructure.

- *Improved Service Delivery*

The revenues generated from water supply fees by MWEWASCO 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 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 proposed lines of Kagiko B and Gathanji. 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 MWEWASCO.

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 Loss of 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. The proposed pipeline routes along the road reserves are covered with grass vegetation. Consequently, shrubs along the pipeline route are likely to be cleared during construction. However, this development will have minimal impact to the biodiversity because there is no natural or indigenous vegetation along the proposed routes. Further, removal of vegetation and soil cover will be restricted to only those areas necessary for excavation work. In particular, the unnecessary removal of groundcover vegetation from the AoI 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					
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

- 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.

Impact Significance After Mitigation

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

8.6.1.2 Impacts on Water Quality

Mathioya south river and Maragua River are the primary surface water bodies within the project site's footprint, with additional streams and rivers (Muriuru River, Gathaje and Foyo streams; Kanyiri River and Gathamba River) also identified in the proposed area. Consultation with the locals indicated that these rivers and streams are reliable sources of water for domestic use to several households. The construction phase will involve removing topsoil, excavating 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.

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 water pipelines to the seasonal streams is far, 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 mulching, hydro seeding, or other ground cover methods to stabilize exposed soil and prevent erosion;
- Regularly inspect and maintain construction vehicles and equipment to prevent leaks of petroleum products;
- 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.

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.

The pipeline route includes sections with varying slopes and gradients, especially Kagiko B and Gathanji pipeline. 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 impact will only occur during the construction phase. 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

- Protecting excavated areas from storm water runoff;
- Excavated soil should be placed on flat surfaces and away from water ways (at least 100m 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;
- Where compaction occurs, implement soil aeration techniques post-construction to enhance soil structure and fertility.
- Developing emergency procedures to protect soil integrity.

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 vehicles and/or trucks as well as dust generated during construction. The pipeline routes are located in a predominantly settled area where the main air pollution activities include vehicle movements along the road.

During the construction phase, the main sources of air pollution for the proposed pipelines will be soil excavations which raise particular particulate matter (dust) within the Project AoI. More so, 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 vehicles are expected to include CO^2, NO^2, SO^2 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.

Given the locations of the proposed Project Sites and the localized nature of dust emissions, the main receptors of this impact will be the construction workers, other road users and some nearby settlements and institutions, including religious centers, health centers 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 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

8.6.1.5 Noise and Excessive Vibration Generation

Noise levels within the Project footprint vary, being low and insignificant in Gathanji, Kayahwe, Kahithe and Buffalo pipeline areas due to the rural set up of the area and relatively high around Kagiko B pipeline area due to proximity to Kangema town centre and the busy Kangema-Kiriani Road. Construction activities, such as vehicular movements and excavation, will generate noise. The primary sensitive receptors will include construction workers, nearby schools, health centers, religious institutions, 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). 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;
- Schedule noisy activities not to occur during religious and/or examination days.

- Provide advance notice to local communities, schools, religious institutions 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 are serviced as 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		
			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

8.6.1.7 Occupational Health and Safety Impacts Concerns

Health and Safety risks for the workers are often triggered by Project activities during Project construction Phase. Inherent occupational risks include muscular-skeletal injuries, falls into un-marked/ uncovered trenches and accidents from transportation vehicles. During the construction of the proposed project, it is expected that workers are likely to have accidental injuries because of accidental occurrences, neglect of the use of protective gears among others.

Dust and emission: Dust from excavation activities can irritate the eyes causing trachoma and respiratory problems and emissions from vehicles can cause respiratory problems such as asthma, bronchitis, and other lung diseases.

While the handling of tools and 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 an unhygienic manner.

Labour and working conditions: labour and working conditions, including occupational health and safety, will need to be considered to avoid any incidents and/or injuries. Issues that need to be considered include: fair treatment of workers, non-discrimination, equal opportunities, as well as the provision of a safe and healthy working and living conditions. These issues should be considered not only for those employed directly by the Proponent, but also employees of the Contractor and any other sub-contractors during construction. Without careful management, the workforce employed may be exposed to occupational health and safety risks because of insufficient health and safety standards, potentially resulting in 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. Workers 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		
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

- All workers to be trained and inducted on the requirement of the implementation of ESMPs before they 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 occupational health and safety (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 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 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.

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

Construction of the proposed pipelines will be outsourced to an independent contractor who might opt to use vehicles/machineries to transport materials, save on time and ease the task. The term 'vehicles' include: cars, vans, pick-up trucks, Lorries, low-loaders and mobile plant such as excavators, lift trucks and site dumpers etc. Construction site incidents can and should be prevented by the effective management of transport operations throughout the construction process. This assessment provides for key management principles that will guide the Contractor when dealing with traffic on Site during the construction of the Project. To reduce risks of accident on site, the contractor should ensure the below listed measure are assessed in detail.

i. Keeping pedestrians and vehicles apart
ii. Minimizing vehicles movement and People on Site
iii. Turing off Vehicles
iv. Visibility
v. Signs and Instructions

Such small-scaled construction activities are 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	Low	Likely	Medium	Temporary

Impact significance before mitigation

It is likely that there will be vehicles on the road. The severity of impacts associated with movement of vehicles 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, 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 a scenario where the contractor will be using vehicles for transportation of materials, increased traffic near schools and shops raises the risk of accidents involving children and other community members; this is possible for the case of Kayahwe, Kahithe and Buffalo pipelines which are fairly built and with learning institutions near the pipeline routes. The proposed pipelines' routes are generally in residential areas; thus, construction activities may pose risks to livestock, including potential injuries from open trenches or traffic accidents. 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.

With increased construction activities, the community and livestock are exposed to accidents involving traffic and livestock tripping in the trenches.

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					
			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

- Inform the community in advance about construction schedules through meetings, leaflets, and local media;
- Install clear and visible warning signs around the construction site indicating potential hazards, construction zones, and restricted areas;
- For Kayahwe, Kahithe and Buffalo pipelines, 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 and safety campaigns to educate the community about the potential health and safety 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 Spread of HIV/AIDS and STIs

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. The proposed water pipeline project may result to an increase in employment opportunities for skilled and unskilled workers leading to immigration and 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	Likely	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, the social stigma associated with such impacts and the low prevalence of HIV/AIDS in Murang'a County. The significance is Moderate.

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

- 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 implement as part of the Health and Safety Management Plan targeting both workers and the local community;
- Implement signing of a mandatory Code of Conduct to discourage inappropriate workplace relationships, defining acceptable behavior and promoting a respectful environment;
- 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		
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 Gender Based Violence and Sexual Harassment

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. This. The community may also promote sexual exploitation cases by willingly involving themselves with workers.

SH against women might also happen because of mixing of women and men at the construction site. 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 SH in the Project. SEA may be experienced while the women are searching for jobs and those giving the jobs may ask for sexual favour. Further, there is a possibility of sexual exploitation of children, especially young girls.

SEA of community members by project workers and 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 the occurrence of such cases.

Analysis of Impact

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

Impact Significance Before Mitigation

It is probable that this impact may occur on a medium-term scale based on evidence of other construction projects in Murang'a County 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		
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

- 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. All workers will be inducted and sign the code of conduct before deployment to the work station;
- Conduct regular awareness sessions for all project staff and community engagements, 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, women's groups, and local authorities to raise awareness about GBV, SEA, and SH;
- The contractor to prepare a GBV/SEA/SH action plan with an Accountability and Response Framework as part of the C-ESMP
- All GBV, SEA, and SH allegations and cases will be reported promptly to relevant authorities;
- 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;
- Develop and implement a grievance procedure that is easily accessible to local communities.

Impact Significance After Mitigation

Significance after mitigation is expected to reduce from moderate to minor 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

8.6.1.12 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 Murarandia, Muguru, Mugoiru, Wangu and Kanyenyaini 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	Short-term	Low	Unlikely	Minor	Temporary

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

8.6.1.13 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	Temporary

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					
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 Impacts of Archaeological and cultural heritage

The construction phase of the proposed water supply pipelines poses significant risks to archaeological and cultural heritage. Activities such as groundworks, site civil works, and the excavation for installation of pipelines could potentially damage or disturb in-situ cultural remains. These impacts extend to altering the landscape and visual reference points, thereby affecting the overall setting of cultural heritage sites. It's crucial to protect the cultural heritage of the area effectively.

The assessment of cultural and natural heritage for the water supply system considered various sensitive features and resources, this included: above-ground cultural sites such as burial grounds, religious sites, and ritual sites, which hold significant cultural value and sensitivity, presence of archaeological artifacts or resources in the project area. The assessment also considered intangible cultural heritage, encompassing oral traditions, cultural landscapes, customary laws, leadership structures, indigenous values, and languages,

which are integral to the local cultural identity. Furthermore, natural heritage elements like medicinal plants were evaluated for their ecological significance and potential impacts from project activities. This comprehensive assessment helps gauge the sensitivity and importance of these heritage items, guiding efforts to mitigate potential adverse impacts and ensure their preservation throughout the project lifecycle.

The assessment found no significant above-ground cultural sites or features within the direct area of influence (AOI) of the project. The sites do not represent historical events or contribute to local or national historical understanding. Consultation and data collection indicated no cultural or social events occurring in the AOI, and the site lacks aesthetic appeal to local and national stakeholders. As a result, the cultural heritage sensitivity is deemed low, with minor magnitude and significance, leading to a determination that cultural heritage impacts are not considered significant for the project.

Analysis of Impact

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

Impact Significance Before Mitigation

The likelihood of the impact occurring is Un-likely and at a local spatial scale, and severity is low given the proximity of workers to settlement areas, thus leading to negligible 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 Chance Find Procedure (Appendix 6).

Impact Significance After Mitigation

The significance of impact after mitigation is expected to reduce from minor to negligible 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	

8.6.1.15 Interruption of Existing Infrastructure and Services

The pipeline routes for Kagiko B and Gathanji, for instance, traverses existing road reserves and will intersect the Kangema-Gacharage Road and a feeder road in Kiairathe area respectively. While the road infrastructure is not paved at the proposed sites, any crossings will still result in traffic disruptions. Additionally, construction activities may disrupt existing supply and distribution pipeline networks, leading to interruptions in water supply services. These disruptions are critical as they have significant spill-over effects on the social and economic performance of the affected areas. Water supply interruptions can hinder daily activities, impact businesses reliant on water, and affect overall community well-being. Mitigation measures should be planned to minimize these interruptions and ensure timely restoration of services to reduce adverse social impacts. This may include scheduling construction during off-peak hours, providing alternative water supply solutions, and ensuring prompt communication with the affected communities.

Analysis of Impact

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

Impact Significance Before Mitigation

The pipelines 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		
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

- 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.

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 Operation Phase

ENVIRONMENTAL IMPACTS

8.6.2.1 Increased Abstraction from Mathioya South and Maragua Rivers

Mathioya south river and Maragua River are the main water sources for MWEWASCO. The rivers' water also supply Irrigation scheme among other water users in Kangema and Kahuro Sub-Counties and its environs. With the installation of water pipeline in the two sub-counties, there will be an increase in volume of water abstracted from the rivers, this will reduce the available residual flows on the rivers. Further, increased abstraction of water from the rivers 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			
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

- Implement water-efficient technologies and practices 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 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

8.6.2.2 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	Local	Long-term	High	Likely	Major	Temporary

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

- 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 maintenance/excavation 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

During the operational phase of the water pipeline project, the risk of pipeline bursts poses significant challenges, particularly in terms of water wastage and increased NRW percentages. Pipeline bursts can occur due to various factors such as aging infrastructure, material defects, ground movement, or operational errors. When a pipeline bursts, it not only results in immediate water loss but also disrupts water supply to consumers, potentially affecting communities, businesses, and public services reliant on uninterrupted water access. The unrepaired leaks can lead to increased NRW percentages, impacting the financial sustainability of MWEWASCO and reducing overall efficiency in water distribution systems.

Mitigating this risk requires proactive measures such as regular pipeline inspections, using high-quality materials during construction, implementing effective leak detection systems, and establishing rapid response protocols for repairing leaks. By prioritizing maintenance and investing in robust infrastructure management practices, water utilities can minimize the occurrence of pipeline bursts, reduce NRW percentages, and ensure reliable water supply to meet the needs of the community efficiently during the operational lifespan of the pipeline project.

Analysis of Impact

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

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

- Implement a proactive maintenance schedule to inspect pipelines regularly for signs of wear and tear, 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;
- 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

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

During the operational phase of a water pipeline, the risk of illegal connections poses significant challenges to water utilities and the communities they serve. Illegal connections involve unauthorized access to the

pipeline network, often resulting in water theft, revenue loss, and increased NRW. These activities not only undermine the financial sustainability of the utility by reducing revenue streams but also disrupt water distribution systems, potentially causing pressure issues and compromising service reliability for legitimate users. Moreover, illegal connections can lead to infrastructure damage, safety hazards, and regulatory non-compliance, posing legal risks and penalties for the utility. By taking proactive measures to address illegal connections, water utilities can protect their infrastructure, uphold regulatory standards, and maintain trust with stakeholders while ensuring equitable access to water resources.

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

- Implement robust monitoring and surveillance systems to detect unauthorized activities promptly;
- Regularly inspections of the water pipeline to identify illegal connections;
- Regularly engage the 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.

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 to 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	Unlikely	Major	Temporary

Impact Significance Before Mitigation

The impact is unlikely 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 moderate.

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

- 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 moderate to negligible 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

8.6.2.6 Wayleave Encroachment

Wayleave encroachment presents a critical concern for the proposed water pipeline projects in Murang'a. 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. The following proposed 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 to clearly demarcate the boundaries and discourage encroachment;
- Robust monitoring protocols and regular patrol of the pipeline corridor for encroachment;
- Prosecution of encroachers as required by County By-Laws on wayleaves and road reserves maintenance;
- Conduct public sensitization programs on importance of not interfering with way leaves/public reserve land and the consequences of encroachment.
- Strict enforcement of legal agreements, and the development of contingency plans for rapid response to encroachment incidents

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 Soils and geological disturbance s

During the decommissioning phase, vehicles carrying the pipes away and excavations works will inevitably lead to soil disturbance. Therefore, the Contractor must implement mitigation measures aimed at minimizing soil disturbance and erosion.

Vegetation clearance will expose the soil to erosion agents such as surface runoff and wind. The loose soil thus exposed will be highly susceptible to wind erosion, leading to the loss of topsoil crucial for vegetation growth.

The pipeline route includes sections with varying slopes and gradients, especially Kagiko B and Gathanji pipeline. 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 impact will only occur during the decommissioning phase. Likewise exposed soil due to clearance of vegetation is highly susceptible to wind erosion, thus 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

- Protecting excavated areas from storm water runoff;
- Excavated soil should be placed on flat surfaces and away from water ways (at least 100m 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 decommissioning 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;
- Where compaction occurs, implement soil aeration techniques post-construction to enhance soil structure and fertility.
- Developing emergency procedures to protect soil integrity.

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

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

The decommissioning activities often result in increased dust. These pollutants emanate from movement of vehicles and/or trucks as well as dust generated during excavations. The pipeline routes are located in a predominantly settled area where the main air pollution activities include vehicle movements along the road.

During the demolition phase, the main sources of air pollution for the pipelines will be soil excavations which raise particular particulate matter (dust) within the Project AoI. More so, 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 transportation vehicles are expected to include CO^2, NO^2, SO^2 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 decommissioning activities are expected, mainly associated with the pipeline excavation.

Given the locations of the proposed Project Sites and the localized nature of dust emissions, the main receptors of this impact will be the decommissioning workers, other road users and some nearby settlements and institutions, including religious centers, health centers 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's decommissioning, Additionally, workers at the project site will be exposed, and severity is predicted to 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

- 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 transportation vehicles to a speed of 30 km/h or less on the site and on the access roads to the site;
- Ensure transportation vehicles 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

8.6.3.3 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	Temporary

Impact Significance Before Mitigation

With decommissioning of the pipelines, it is highly 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 major to minor as indicated in table 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

8.3.4.4 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, and removal of infrastructure can create a temporary eyesore, disrupting the natural and built environment's aesthetics. In areas like Kahithe and Kiairathe, 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 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 to decommission 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.

8.6.3.5 Occupational Health and Safety Impacts Concerns

Health and Safety risks for the workers are often triggered by Project activities during Project decommissioning Phase. Inherent occupational risks include muscular-skeletal injuries, falls into un-marked/ uncovered trenches and accidents from transportation vehicles. During the decommissioning of the proposed project, it is expected that decommissioning workers are likely to have accidental injuries because of accidental occurrences, neglect of the use of protective gears among others.

Dust and emission: Dust from excavation activities can irritate the eyes causing trachoma and respiratory problems and emissions from vehicles can cause respiratory problems such as asthma, bronchitis, and other lung diseases.

While the handling of tools and 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 an unhygienic manner.

Labour and working conditions: labour and working conditions, including occupational health and safety, will need to be considered to avoid any incidents and/or injuries. Issues that need to be considered include: fair treatment of workers, non-discrimination, equal opportunities, as well as the provision of a safe and healthy working and living conditions. These issues should be considered not only for those employed directly by the Proponent, but also employees of the Contractor and any other sub-contractors during decommissioning. Without careful management, the workforce employed may be exposed to occupational health and safety risks because of insufficient health and safety standards, potentially resulting in injury or death.

Workers Accidents and Hazards: - Decommissioning workers are likely to have injuries and hazards as the decommissioning 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. Workers 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 decommissioning 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		
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

- All workers to be trained and inducted on the requirement of the implementation of ESMPs before they 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 occupational health and safety (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 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 decommissioning workers will be required to wear 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.

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

8.6.3.6 Community Health and Safety Concerns

In a scenario where the contractor will be using transportation vehicles, increased traffic near schools and shops raises the risk of accidents involving children and other community members; this is possible for the

case of Kayahwe, Kahithe and Buffalo pipelines which are fairly built and with learning institutions near the pipeline routes. The proposed pipelines' routes are generally in residential areas, thus decommissioning activities may also pose risks to livestock, including potential injuries from open trenches or decommissioning traffic. Further, lack of proper barriers may allow livestock, school going children and the local populace to wander into decommissioning areas, increasing the risk of accidents.

Falls and trips: Open trenches pose safety risks; community members can accidentally fall into open trenches, leading to injuries such as fractures, sprains, or head injuries. With increased decommissioning activities, the community and livestock are exposed to accidents involving traffic and livestock tripping on the trenches.

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 decommissioning schedules through meetings, leaflets, and local media;
- Install clear and visible warning signs around the decommissioning site indicating potential hazards, construction zones, and restricted areas;
- For Kayahwe, Kahithe and Buffalo pipelines, coordinate with nearby schools to schedule decommissioning activities that avoid peak times for school arrivals and departures;
- Appoint community liaison officers to act as points of contact between the decommissioning team and the community, addressing concerns and providing updates;
- Ensure that access routes for emergency vehicles are always kept clear and accessible;
- Conduct health and safety campaigns to educate the community about the potential health and safety 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			
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

8.6.4 Cumulative Impacts

Cumulative impacts result from effects that act together (including those from concurrent or planned future third-party activities) to affect the same resources and/or receptors as the project under consideration (e.g. the combined effect of other similar projects in the general area). An effect to a resource in itself may not be considered significant, but may become significant when added to the existing and potential effects eventuating from similar or diverse developments in the area.

For evaluation of cumulative impacts, the following list of VECs was established from the global list of environmental components identified for the impact assessment related to water infrastructure:

- 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

The cumulative impact assessment requires that a realistic area and time period be established within which past, present and future projects are identified. The area considered correspond to a 10 km zone around the project. As for the time period, an extent of 10-20 years in the past and future was retained to match the project's construction period. The various past, ongoing and upcoming projects potentially generating impacts that could be cumulative with those of the Project, were identified during the public consultation sessions, discussion with local authorities and consultation of Counties and main governmental agencies. They include:

- Ongoing agricultural activities
- Implementation of Irrigation Schemes
- Expansion of tea farming and other agricultural practices, along with community-driven water projects in Kiairathe
- Development of small-scale commercial activities, improvements in community water supply systems.

All the projects with no official schedule available were included in the cumulative impact assessment due to their location adjacent or very near to the Project's right-of-way. As the water pipeline project progresses, an effort will be made to maintain contact with the various potentially cumulative projects for which only high-level information was available at the time of completing this ESIA. The objective is to update information and the cumulative impact assessment to adjust mitigation measures required in collaboration with the other projects' instigators.

The cumulative impacts that would result from a combination of the proposed sub projects activities under HoAGDP and other actual or proposed future developments is presented in the Table below

Table 31: Evaluation of Cumulative Effects on VECs

Potentially Affected VECs	Environmental/Social Impacts
Water Resources (quantity)	The cumulative demand for water from the MWEWASCO projects, along with the Irrigation Schemes, 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, particularly from tea farming in Kiairathe, can lead to runoff into water bodies. This can result in nutrient accumulation (eutrophication) and contamination of water resources, posing risks to human health and ecosystems.

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 tea farming in Kiairathe.
- 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 local 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 local residents to report issues and provide input on project management.

Conclusion

The cumulative impacts of the proposed water pipeline project, along with the Irrigation Schemes 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

As a part of the ESIA, Climate Change Vulnerability Assessment has been conducted to evaluate potential climate change impacts and propose adaptation measures to enhance project resilience. This assessment is crucial given the county's susceptibility to climate variability and projected climate change impacts. To complete the exposure assessment, climate data for the region 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.

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 Murang'a 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.

Mudslides and Landslides: -Historically, high precipitation in Murang'a County have been linked to mudslides and landslides in the highlands. Mobilization of soil has had a major negative impact on agricultural land, infrastructure such as power transmission lines and water supplies, causing economic and social disruptions. There is a need for landslide monitoring and an early warning system that is currently missing in the county. These systems provide warnings of a slope movement in time to allow construction of physical structures that will reduce the climatic hazard. Specific monitoring techniques include field observation and use of ground motion instruments such as radar and vibrating meters. These instruments can be metered for real time warning. This will help in risk reduction (KMD, 2016).

Murang'a County's annual temperature ranges between 10 and 25°C. Most of the county experiences an annual average temperature of more than 20°C. The county receives between 750 and 1700 mm of precipitation annually. The total annual rainfall tended to diminish between 1985 and 2015 during the long rainy season. This trend is likely to continue up to 2040 however rainfall is projected to increase up to 2060. The total annual rainfall for the short rainy season has increased in the past and is projected to sharply increase up to 2040. The mean annual temperature has increased between 1985 and 2015 and is likely to continue to increase.

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 proposed water project by MWEWASCO.

9.1 Objectives

The purpose of the ESMMP is to ensure that the social and environmental impacts and risks identified during the ESIA process are effectively managed throughout the construction, operation, and decommissioning phases of the Project. The ESMMP outlines the specific mitigation and management measures to which MWEWASCO is committed and details how the Project will mobilize organizational capacity and resources to implement these measures. Additionally, the ESMMP provides a schedule for these measures and ensures that the Project complies with the applicable laws and regulations of Kenya, as well as the World Bank safeguards policies and Environmental Health and Safety Guidelines. The key objectives of the ESMMP are to:

- Outline mitigation measures developed for the MWEWASCO 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.

Best practice principles require that every reasonable effort is made to reduce and preferably to prevent negative impacts while enhancing the benefits. These principles have guided the ESIA process.

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 MWEWASCO 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 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 actually implemented.

9.2.3 MWEWASCO

MWEWASCO will be responsible for the overall implementation of the project. The specific responsibilities include:

- Ensure including all standard and specific mitigation measures from the ESMMP in the 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 MWEWASCO;
- 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.

9.3 The ESMMP

The Environmental and Social Management and Monitoring Plan (ESMMP) for the proposed water project outlines comprehensive details regarding project activities, anticipated impacts, mitigation measures, time schedules, costs, responsibilities, and commitments aimed at minimizing environmental impacts. Table 45 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 (MWEWASCO) 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, MWEWASCO will monitor the facility's operations to ensure compliance with the management measures in the ESMMP and operational procedures. As part of this monitoring, MWEWASCO will undertake the statutory initial environmental audit as required by the EIA/EA Regulations, 2003, and subsequent annual environmental audits.

9.5 Capacity Requirements

To ensure the effective implementation of the ESMMP for the proposed water project, the following is an outline of the capacity requirements:

MWEWASCO

- **Environmental and Social Safeguards Team:** MWEWASCO 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:** MWEWASCO should ensure continuous training for its staff on environmental and social standards, monitoring tools, and compliance with national regulations and international best practices.
- **Stakeholder Engagement:** Ensure capacity to engage effectively with all relevant stakeholders, including regulatory bodies, community members, and local authorities throughout the project lifecycle.
- **Resource Mobilization for Monitoring:** Adequate financial and technical resources to support environmental and social monitoring throughout the project's implementation phase.

The WSP currently lacks a dedicated Environmental and Social (E&S) specialist, which presents a challenge in ensuring compliance with environmental regulations and managing social impacts. To address this, the WSP shall utilize staff from its technical team to oversee the implementation of the ESMMP, with designated personnel doubling up in this role during project implementation. Additionally, provisions for ESMMP implementation costs shall be included in the project's Bill of Quantities (BoQ) to ensure adequate financial support for all E&S activities throughout the project lifecycle.

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.

- **Training and Awareness:** The contractor should provide regular training sessions for all workers on environmental and social standards, health and safety, grievance redress mechanisms, and mitigation measures.
- **Resource Mobilization:** Adequate financial and technical resources to implement the ESMMP during the construction phase.

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 periodic Environmental and Social Compliance Reports, documenting the implementation of the ESMMP. These reports will be reviewed during regular site inspections and progress meetings.
- 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.

Table 32: Environmental and Social Management and Monitoring Plan (ESMMP)

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
Construction Phase					
Loss of 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 of significant or mature vegetation; - Replant native vegetation in disturbed areas immediately after construction to facilitate rapid ecological recovery;	- Area of vegetation cleared	Throughout the construction period	- Contractor - MWEWASCO	25,000
Impacts on Water Quality	- Excavated soil should be placed on flat surfaces and away from water ways (at least 100 away); - Regularly inspect and maintain construction vehicles and equipment to prevent leaks of petroleum products; - 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	27,000
Soils and geological disturbance	- 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; - Use mulching, hydro seeding, or other ground cover methods to stabilize exposed soil and prevent erosion; - Plan construction activities to minimize simultaneous disturbance of large areas, thereby reducing overall soil exposure and erosion risk;	- 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)
	- 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; - 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 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	10,000 Dust masks @ Ksh 100 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;	- Compliance with construction activity time restrictions - Number of advance notices provided to local communities, schools, and health centers	Throughout the construction period	Contractor	42,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- 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 are serviced as per the manufacturer's manual to minimize noise/vibration.	- Percentage of construction workers provided with and using appropriate PPE (e.g., earplugs).			
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 stockpiles 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;	- 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	50,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- 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.				
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 and use of PPE, and describes documentation and reporting of accidents, diseases and incidents; - All construction workers will be required to wear 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.	- Worker's 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 measures, and reporting procedures - Percentage of workers wearing PPE (helmets, gloves, safety boots) during construction -	Throughout the construction period	Contractor	120,000
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;	- 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	Throughout the construction period	Contractor	25,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- Recommend the contractor prioritize manual laborers for excavation and construction tasks, especially in areas where machinery may pose safety risks or environmental concerns;	- 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			
Community Health and Safety Concerns	- Inform the community in advance about construction schedules, road closures, and alternative routes through meetings, leaflets, and local media; - 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 a community liaison officer to act as point 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	- Number of meetings held and leaflets distributed to inform the community about construction schedules, and alternative routes - 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 community interactions frequency - Number of health campaigns conducted and level of community participation	Throughout the construction period	Contractor	65,000
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	- 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	Throughout the construction period	Contractor	50,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	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.	part of the Health and Safety Management Plan			
Increase in cases of Gender Based Violence, SEA & SH	- 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, 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 GBV reported at the community level related to project implementation.	- 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 - No of Workers inducted On the Code of Conduct. - Number of awareness 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 - Number of SEA and SH cases reported	Throughout the construction period	Contractor MWEWASCO	37,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
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 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	- Proportion of workers hired from the local area - Records of non-local workers - Grievances received and resolved related to Labour Influx - No of worker's sensitized on Code of Conduct and Social cultural environment	Continuous	Contactor MWEWASCO	15,000
Impacts of Archaeological and cultural heritage	- Proper and thorough Community stakeholder engagement. - Sensitization of project workers on code of conduct - Implement the approved project GRM and chance find procedures	- No of grievances reported - Records of workers trainings on CoCs - Records of chance finds	Throughout the construction phase	Contractor	No additional cost
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;	- Number of communications (meetings, notices, newsletters) with local authorities, residents, and businesses regarding construction	Continuous	Contactor MWEWASCO	No additional Costs

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- 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.	schedules, disruptions, and alternative routes - Alternative water supply solutions during construction - No. of grievances received on interruption			
TOTAL COST (CONSTRUCTION PHASE)					**536,000**
Operation Phase					
Increased Abstraction on Mathioya south river and Maragua River	- Implement water-efficient technologies and practices 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;	- No. of public awareness campaigns and educational programs conducted on water conservation practices - Monitoring programs tracking water abstraction rates, river flows, and environmental conditions - No. of collaborative meetings and initiatives with the WRA and other stakeholders to develop and implement sustainable water management plans	Quarterly	MWEWASCO	92,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- 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				
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	MWEWASCO	23,000
Risk of Water Pipeline Bursts Leading to Water Wastages	- Implement a proactive maintenance schedule to inspect pipelines regularly for signs of wear and tear, 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;	- 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 and the response time to address them	Continuous	MWEWASCO	170,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- 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				
Risk of illegal connection to the water pipeline	- Implement robust monitoring and surveillance systems to detect unauthorized activities promptly; - Regular 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 the importance of 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	MWEWASCO	Costs are under the responsibility of MWEWASCO
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 individuals to report incidents of SEA and SH without fear of retaliation;	- 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 - No. of SEA risk assessments conducted at the community level - No. of SEA and SH incidents reported, investigated, and resolved	Continuous	MWEWASCO	50,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
Wayleave Encroachment	- 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 Murang'a 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	MWEWASCO	85,000
			TOTAL COST (OPERATION PHASE)		**420,000**
Decommissioning Phase					
Soils and geological disturbance	- 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; - Use mulching, hydro seeding, or other ground cover methods to stabilize exposed soil and prevent erosion; - Plan decommissioning 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.	- 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)
	- Implement phased vegetation clearance to minimize the extent of exposed soil and maintain natural ground cover where possible; - Where compaction occurs, implement soil aeration techniques post-decommissioning 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 transportation vehicles to 30 km/h or less on the site and on the access roads to the site; - Ensure vehicles 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 decommissioning period	Contractor	5,000 Dust masks @ Ksh 100 each
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;	- Worker's induction/tool box records - Number of warning signs and tapes placed around open trenches and active decommissioning sites - Number of visible danger-sign posts installed at the site - Presence of a documented OHS plan addressing potential hazards, preventive measures, and reporting procedures	Throughout the decommissioning period	Contractor	80,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- 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 PPE, and describes documentation and reporting of accidents, diseases and incidents; - All decommissioning workers will be required to wear PPE i.e. helmets, gloves and safety boots during the decommissioning phase; - Provide shaded rest areas and ensure workers have access to ample drinking water.	- Percentage of workers wearing PPE (helmets, gloves, safety boots) during decommissioning -			
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 decommissioning tasks, especially in areas where vehicles may pose safety risks or environmental concerns;	- Number of clear and prominent signs installed indicating speed limits, - Number of safety briefings and training sessions conducted on traffic management procedures - Number of vehicles and personnel present on-site compared to the number of essential operations - Percentage of excavation and decommissioning tasks performed by manual laborers in areas where machinery poses safety risks	Throughout the decommissioning period	Contractor	Costs are under the responsibility of the contractor
Community Health and Safety Concerns	- Inform the community in advance about decommissioning schedules, road closures, and alternative routes through meetings, leaflets, and local media; - Install clear and visible warning signs around the construction site indicating potential hazards, construction zones, and restricted areas;	- Number of meetings held and leaflets distributed to inform the community about decommissioning schedules, road closures, and alternative routes - Number of clear and visible warning signs installed around the decommissioning site	Throughout the decommissioning period	Contractor	30,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	-Coordinate with nearby schools to schedule decommissioning activities that avoid peak times for school arrivals and departures; - Appoint community liaison officers to act as points of contact between the decommissioning team and the community, addressing concerns and providing updates; - Ensure that access routes for emergency vehicles are always kept clear and accessible	- Number of decommissioning activities scheduled outside peak times for school arrivals and departures - CLO appointed and the frequency of their interactions with the community			
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 pipes or fittings, in other construction projects; - Plan excavation activities carefully to minimize the amount of spoil generated during decommissioning; - Cleaning, proper site rehabilitation & adhering to a NEMA approved Decommissioning plan.	- Quantity and percentage of decommissioned materials (e.g., HDPE pipes, fittings) recovered and recycled. - Compliance with the NEMA-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 natural contour of the land; - Ensure that waste materials and debris are promptly removed after decommissioning activities.	- Timely restoration of decommissioned areas after activities are completed - Completion and effectiveness of landscaping plans, including native vegetation replanting and land contour restoration - Efficiency of waste removal processes post-decommissioning	During decommissioning	Contractor	100,000
				TOTAL COST (DECOMMISSIONING PHASE)	**315,000**
GRAND TOTAL					**1,271,000**

9.6 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 financier 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.

9.6.1 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.

9.6.2 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.

9.6.3 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, minimise 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.

9.6.4 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.

9.6.5 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

9.6.6 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.

9.6.7 Communication Procedures and Stakeholder Engagement Plan

The proponent (MWEWASCO) 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.

9.6.8 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. In designing the local recruitment plan contractor shall comply with the provisions of Employment Act, 2007 and wherever possible, give priority to qualified local people when hiring employees.

9.6.9 Stakeholder Engagement Plan

The Stakeholder Engagement Plan (SEP) outlines the strategy for engaging stakeholders throughout the lifecycle of the proposed MWEWASCO 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 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.

10. CONCLUSIONS AND RECOMMENDATIONS

10.1 Introduction

The aim of this Environmental and Social Impact Assessment (ESIA) report is to provide comprehensive information for decision-making that supports sustainable development. Submitted to the National Environment Management Authority (NEMA), this report serves to provide an independent assessment, enabling NEMA to make informed decisions on granting an ESIA license under the Environmental Management and Coordination Act, Cap 387. Should approval be granted, this report will also guide NEMA in defining the necessary conditions for project implementation.

In evaluating water pipeline projects, it is recognized that there may be unavoidable environmental impacts. However, addressing the critical need for improved water infrastructure is essential for sustainable development and meeting local water supply demands. Furthermore, thorough stakeholder engagement has demonstrated strong community support for the project, highlighting its acceptance and alignment with community needs. This conclusion affirms the project's commitment to sustainable development, regulatory compliance, and positive community impact, thereby recommending its approval with necessary safeguards.

Through a comprehensive ESIA process, which incorporated diverse stakeholder inputs, the consultant has meticulously identified and evaluated numerous potential impacts associated with the project development. This chapter presents a consolidated overview of these ESIA findings and offers strategic recommendations for mitigating key impacts concerning the MWEWASCO water project.

The potential impacts associated with the development are summarised below and should be considered both in the context of the project rationale and the discussion of cumulative impacts in the previous chapter.

Construction Phase Impacts: - During the construction phase, several potential impacts are anticipated. These include partial loss of land, vegetation clearance, soil compaction, and erosion, primarily arising from site preparation for pipeline installation. There may also be impacts on water and local air quality due to dust generation and exhaust emissions, as well as noise and excessive vibration from construction activities. Visual impacts will also be noticeable during this phase. Additionally, concerns about social nuisances such as gender-based violence, substance abuse, and the spread of diseases like HIV/AIDS and STIs are highlighted, exacerbated by the influx of workers and temporary land occupation. These activities may also disrupt existing infrastructure and services temporarily.

The positive impact includes creation of direct employment, transfer of skills, indirect employment and procurement for the local economy and increase in disposable income.

Operation Impacts: - The ESIA findings highlight several key considerations for the project. Site maintenance activities may lead to issues such as loss of topsoil, soil compaction, and erosion, increased abstraction from Mathioya South River and Maragua River. Potential impacts on surface and groundwater from increased sediment loading are noted but deemed manageable. Risk of water pipeline bursts leading to wastage, though impacts are expected to be minor. Social risks such as SEA/SH and abuse by workers is considered minor, with CoC signed and workers trained on it. The project is anticipated to create direct and indirect employment during operation, with induced economic benefits from increased disposable income also noted. Social concerns such as wayleave are evaluated as minor.

Decommissioning Phase: - During the decommissioning phase, several significant impacts are foreseen. There is a risk of residents utilizing contaminated water due to reduced access to clean water sources, posing potential health risks. The cessation of project activities could lead to loss of employment, impacting local livelihoods and potentially causing economic strain. This downturn in employment could also result in reduced revenue for MWEWASCO, affecting their operational sustainability. Waste generation is another concern during this phase, necessitating proper management to mitigate environmental impacts. Additionally, the visual intrusion of decommissioned infrastructure may alter the landscape, affecting aesthetic values and potentially local perceptions of the area. These challenges underscore the importance of comprehensive planning and mitigation strategies to address the multifaceted impacts of the decommissioning process 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.

10.2 Recommendations

MWEWASCO commits to diligently incorporate 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 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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ANNEXES:

Annex	Description
Annex 1	Certificate of Incorporation
Annex 2	Pipeline Layout Maps
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Annex 4	Minutes of meetings and List of Participant
Annex 5	Sample Filled Questionnaires
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Annex 7	Environmental and Social screening Form
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Annex 1: Certificate of Incorporation

Annex 2: Pipeline Layout Maps

Annex 3: Bill of Quantities

Annex 4: Minutes of Meetings and List of Participants

Annex 5: Sample Filled Questionnaires

Annex 6: 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 proponent (who is the Muranga West Water and Sanitation Company) 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 7: Environmental and Social screening Forms

Annex 8: Authorization Letter from Road Agencies

Annex 9: Grievance Follow-up Template

Complaint/Grievance Form Sample

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	

Follow-up Action/Review	
Action:	
Action taken by: (Name):	
Results:	
Date action/review completed:	
Signature:	

Annex 10: Water Abstraction Permit

Annex 11: NEMA Lead EIA/EA Practicing License