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 Ngandori-Nginda Water Service Provider (WSP)

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

Comprehensive Project Report (CPR): Ngandori-Nginda Water Supply System

FINAL REPORT

February, 2025

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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)			
Proponent	Ngandori-Nginda		
Project	Construction of DN63 to DN90, (Cumulative) 5.2Km of HDPE pipeline		
Revision Versions	**Item Description**	Comprehensive Project Report for Ngandori-Nginda Water Supply System	
	Document Reference No.	NNWSP-07/2024	
	Revision Version	**Date**	**Description**
	0	13th July, 2024	Initial Draft
	1	23rd August 2024	Revision 1
	2	11th October 2024	Revision 2
	3	29th November 2024	Revision 3
	4	7th February 2025	Revision 4
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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 Ngandori-Nginda 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 in light of the information available to him 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.

CERTIFCATION

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

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

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Disclaimer:

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

ABBREVIATIONS AND ACCRONYMS

AoI	Area of Influence
BoQ	Bills of Quantities
CBC	Competency-Based Curriculum (CBC)
CCKP	Climate Change Knowledge Portal
CIDP	County Integrated Development Plan
CLSG	Conditional Liquidity Support Grant
CPP	Consultation and Public Participation
CPR	Comprehensive Project Report
DPF	Diesel Particulate Filters
EA	Environmental Audit
ECDE	Early Childhood Development Education
EF	Electrofusion
EHS	Environmental, Health and Safety
EHSG	Environmental Health and Safety Guidelines
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
ESIA	Environmental & Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMMP	Environmental and Social Management and Monitoring Plan
ESMS	Environmental and Social Management System
EWASCO	Embu Water and Sanitation Company
FGD	Focused Group Discussion
FPIC	Free, Prior and Informed Consent
GBV	Gender Based Violence
GoK	Government of Kenya
HDPE	High Density Polyethylene
HIV/AIDS	Human immunodeficiency Virus/Acquired Immunodeficiency Syndrome
IDA	International Development Association
IFC	International Finance Corporation
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
NCCRS	National Climate Change Response Strategy
NECC	National Environmental Complaints Committee

NEMA	National Environment Management Authority
NGEC	National Gender and Equality Commission
NRW	Non-Revenue Water
OP	Operational Policies
OSHA	Occupational Safety and Health Act
PAD	Project Appraisal Document
PDA	Project Development Area
SCR	Selective catalytic reduction
SEA	Sexual Exploitation and Abuse
SH	Sexual Harassment
TOR	Terms of Reference
TVET	Technical Vocational and Educational Training
UPVC	Unplasticized polyvinyl chloride
VECs	Valued Environmental Components
WASREB	Water Services Regulatory Board
WB	World Bank
WRA	Water Resources Authority
WSDP	Water and Sanitation Development Project
WSP	Water Service Provider
WSTF	Water Sector Trust Fund

EXECUTIVE SUMMARY

E.1 Introduction

This Environmental and Social Impact Assessment (ESIA) was conducted for the Ngandori-Nginda Water Service Provider (WSP) under the Water and Sanitation Development Programme (WSDP), funded by the World Bank through the Water Sector Trust Fund (WSTF). The project involves constructing 5.2 km of DN63 to DN90 HDPE pipelines to improve water supply reliability, reduce non-revenue water (NRW), and minimize frequent pipe bursts and leakages in Mbukori and Kiambogo, Embu County. This aligns with Kenya's Vision 2030 objectives of enhancing sustainable water management and infrastructure development.

E.2 Project Description

The proposed project entails rehabilitating two pipelines to reduce non-revenue water, leakages, and theft, improving water supply reliability and quality under the Ngandori-Nginda Water Service Provider (WSP). The project includes two lines: Line 1 (Kiambogo-Kamwove) in Nginda Ward, Embu North, 3 km long with a 63mm HDPE pipe, and Line 2 (Rung'ang'a-Mbukori) in Gaturi South Ward, Embu East, 2.2 km long with a 90mm HDPE pipe. Both pipelines will be laid within existing road reserves, avoiding land acquisition or displacement. Approval for road reserve use was granted by the Embu County Department of Roads, with conditions to minimize disruption, maintain accessibility, and restore the road upon completion. The project phases include preconstruction (planning, ESIA, community engagement), construction (site clearing, trenching, pipe laying with local labor), and operation (monitoring and maintaining the durable HDPE pipelines, designed for a 50-year lifespan). Regular monitoring will address leakages and illegal connections, ensuring long-term functionality.

E.3 Legal, Regulatory and Policy Framework

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

E.4 Approach and Methodology

The ESIA was conducted in compliance with the Environmental Management Coordination Act (EMCA) of 1999 and its amendments, as well as World Bank Safeguards Policies and IFC's General EHS Guidelines. The study assessed potential environmental and social impacts within the Project Development Area (PDA) and Local Assessment Area (LAA), focusing on valued environmental components (VECs) important to local communities and regulatory authorities. The methodology included screening to classify the project, scoping to identify key environmental issues, and baseline data collection through desktop reviews, field surveys, and stakeholder engagements. Site reconnaissance and detailed site investigations were conducted in May and June 2024, with primary data gathered through consultations, focus group discussions, and transect walks. The study also included photography to document baseline conditions and potential impacts.

The outcome of the screening process determined that the project falls under the medium-risk classification, necessitating a Comprehensive Project Report. The environmental and social screening form is appended as Annex 11 of this report. Nonetheless, its small-scale nature—approximately 5 km of small-diameter pipelines—might suggest a low-risk classification.

E.5 Baseline Environmental and Social Conditions

The baseline environmental and social conditions were assessed at the national, county, and project site levels through desktop studies and site investigations. Embu County, where the project is located, experiences reliable rainfall, diverse ecosystems, and a population primarily engaged in agriculture, particularly tea farming. Social investigations included interviews with local leaders, key informants, and focus group discussions, focusing on demographics, socio-economic activities, and community structures. While the area is not known for significant archaeological or cultural heritage sites, the population in Kiambogo and Mbukori relies heavily on agriculture, with limited access to healthcare and infrastructural challenges. Key concerns include gender disparities in land ownership, educational access, and rural economic development. The project areas benefit from strong mobile network coverage and an existing road network, though many roads remain unpaved. These factors informed the assessment of potential environmental and social impacts of the water pipeline project.

E.6 Stakeholder Engagement and Consultation

Stakeholder engagement was conducted in compliance with the Environmental Management and Coordination Act (Amendment) 2015 and the World Bank's OP/BP 4.01, emphasizing citizen participation and Free, Prior, and Informed Consent (FPIC). The process involved community meetings, Focus Group Discussions (FGDs), and Key Informant Interviews (KIIs) in both English and Kîembu. Data collection tools included structured questionnaires to document stakeholder views. Extensive consultations were conducted with local communities, key informants, and government stakeholders. Mbukori village meeting had 43 participants (36 male and 7 female) while the Kiambogo village meeting had 85 participants (47 male and 38 female). In total 128 individuals (83 male and 45 female) were consulted within the Study and Project Area, and their comments and concerns were recorded (for minutes & list of participants see Appendix 6). Detailed concerns raised during stakeholder engagement and corresponding responses are provided in section 6.5 (see Table 27 and 29). The consultations highlighted key themes, including local labor prioritization, water service continuity, and worker safety, which have been addressed in the project planning and implementation strategy.

E.7 Analysis of Alternatives

The ESIA evaluated various project alternatives (refer to section 7.1) from the conceptual design phase to construction activities. The alternatives reviewed include the No Project Alternative, alternative water sources, pipeline material options, and alternative project routes.

E.8 Environmental and Social Impact Assessment and Mitigation Measures

The implementation of the water pipeline projects (Mbukori and Kiambogo) is anticipated to result in both positive and/or negative impacts on the project site area. Impacts were assessed based on the methodology outlined in Chapter 4. **Cumulative Impacts: -** Cumulative impacts were assessed as part of the ESIA to evaluate the combined or synergistic effects of the project with other past, present, and future developments (refer to section 8.6.5). While individual impacts may not be significant, they can become substantial when combined with effects from other projects in the area. Several past, ongoing, and upcoming projects have been identified as potentially contributing to cumulative impacts. The biophysical and socio-economic impacts during project implementation include the following:

Positive Impacts: The implementation of the Mbukori and Kiambogo water pipeline projects is expected to yield several positive impacts, including enhanced water supply reliability and quality for local communities,

improved public health due to better access to clean water, and increased economic opportunities related to water distribution and management. Additionally, the projects will help reduce non-revenue water and illegal connections, thereby promoting sustainable water resource management. Overall, these benefits align with the broader objectives of enhancing community well-being, supporting development initiatives.

Negative impacts

The ESIA for the Ngandori-Nginda water pipeline project identifies potential negative impacts across the construction, operation, and decommissioning phases, including vegetation loss, soil and air quality disturbances, waste generation, occupational and community health and safety risks, and social concerns such as labour influx, HIV/AIDS and STIs spread, gender-based violence, and child labor. To mitigate these impacts, the ESIA aligns with international best practices, World Bank operational policies, and local legislative framework. Vegetation loss will be managed through selective clearing, construction zone demarcation, and ecological restoration post-construction, while soil and air quality disturbances will be addressed through proper soil management, dust suppression, and hand equipment management. Waste generation will be minimized through segregation, recycling, and reuse strategies. Robust occupational and community health and safety measures, coupled with targeted awareness campaigns, will help mitigate broader risks. HIV/AIDS and STIs spread will be managed through awareness programs, training, and access to prevention measures in collaboration with local health facilities, while labour influx will be controlled by prioritizing local employment, enforcing worker codes of conduct, and implementing a grievance redress mechanism. During operation, risks such as pipeline bursts will be mitigated through proactive maintenance and advanced monitoring systems. The decommissioning phase will focus on sustainable material reuse, employment support, and financial sustainability for water service providers (WSPs). This approach ensures sustainability, inclusivity, and the minimization of adverse effects throughout the project lifecycle.

E.9 Environmental and Social Management and Monitoring Plan

The ESMP (detailed in Chapter 9, see table 29) outlines actions to manage and monitor potential environmental and social impacts throughout the construction, operation, and decommissioning phases of the project. An overview of the Projects ESMMP responsibilities (see section 9.2) is provided. 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. 340,000, with provisions for pre-operational, construction, operational, and decommissioning activities.

E.10 Conclusion and Recommendation

The ESIA for the Ngandori-Nginda water project identifies potential impacts across the construction, operation, and decommissioning phases, including vegetation clearance, soil compaction, erosion, dust, noise, minor pipeline bursts, and social risks such as gender-based violence and substance abuse. Mitigation measures, such as stakeholder engagement, dust suppression, erosion control, worker training, and adherence to a Code of Conduct, are outlined to address these impacts. Decommissioning impacts, including risks of contaminated water, waste generation, employment loss, and visual impacts, will be managed through effective water and waste management strategies and economic planning. The Ngandori-Nginda Water Consumers Association is committed to implementing these measures, as detailed in the Environmental and Social Management and Monitoring Plan (ESMMP), to ensure the project's sustainability and economic viability. With these safeguards and robust monitoring frameworks, the project is recommended for approval, with no impediments to its successful implementation.

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1. INTRODUCTION

1.1 Project Background

Kenya is a chronically water-scarce country, with an annual freshwater availability of 526 cubic meters per capita and over 80% of its land categorized as arid or semi-arid. Factors such as deforestation and unsustainable agricultural practices have further degraded key water catchment areas. To address this, the Government of Kenya (GoK) outlined water sector reforms under Vision 2030, emphasizing improved access to safe water and sanitation and increasing the area under irrigation. In collaboration with the World Bank, the Water and Sanitation Development Project (WSDP) was conceptualized to enhance water supply and sanitation services in select regions. The Ministry of Water, Sanitation, and Irrigation (MoWS&I), through the Water Sector Trust Fund (WSTF), implements this initiative under the Conditional Liquidity Support Grant (CLSG) program. The second phase, CLSG-II, focuses on financially recovering Water Service Providers (WSPs) to pre-COVID-19 levels or better. The Ngandori-Nginda Water Consumers Association, serving an area of approximately 132 km² in Embu County, has been allocated funding under this program to address water scarcity and operational challenges, such as high non-revenue water and insufficient revenue collection.

The proposed project entails the construction of two pipelines to augment water supply in Mbukori and Kiambogo, where water demand exceeds supply. The intervention includes a 2.2 km DN90 HDPE pipeline from Mbukori to Karingari and a 3 km DN63 HDPE pipeline from Kiambogo to Kamwove. The pipelines will reduce illegal connections and improve water access for underserved areas. Classified as a medium-risk project under Kenya's Environmental (Impact Assessment and Audit) Regulations (Amendment) of 2019, the intervention requires a Comprehensive Project Report (CPR) and adherence to World Bank Operational Policies. This ESIA Project Report, aligned with the Environmental Management and Coordination Act (EMCA) and the World Bank's safeguards policies, incorporates stakeholder consultations, regulatory compliance, and mitigation strategies to ensure environmentally and socially responsible project implementation.

1.2 Project Objectives

The overall objective of the project is to improve water supply and sanitation services in Kiambogo and Mbukori areas and improve the financial performance of Ngandori-Nginda WSP by establishing (cumulative) 5.2km pipeline of between DN63-DN90MM HDPE pipes. 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 Mbukori 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

The project proponent is the **Ngandori-Nginda Water Consumers Association**. Ngandori-Nginda Water Consumers Association is mandated by WSTF to implement the CLSG-II through WSDP. Ngandori-Nginda Water Consumers Association was derived from the defunct Ngandori "A" Water supply, which was constructed, operated and maintained by the GoK. The water scheme was placed under the National Water Conservation and Pipeline Corporation, from 1989 to February 2004. In March 2004, the project was fully handed over to the local community (Ngandori-Nginda Water Consumers Association). Ngandori-Nginda is registered as a Rural Water Service Provider (WSP) under WASREB, Larger category.

The Association operates within Embu North and parts of Embu West and East sub-counties in Embu County, Kenya. Their water supply operations encompass Kirimari, Gaturi South, Ngandori/Ruguru, Nginda, Mbeti North, and Kithimu Wards, covering approximately 132 km^2 with an estimated population of 95,000. Water service coverage currently stands at 68%, with an abstraction potential of 31,000 m^3/day from the Rupingazi River.

1.4 ESIA Objectives

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

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

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

1.5 ESIA Consultants

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

Table 1: Team Composition

S. No.	Experts Names	Qualifications	Position	NEMA Registration
1.	Bubicha Mohamed Jaldesa	- Masters in Biodiversity and Natural Resources Management - B.Sc. Environmental Science	Team Lead	Lead Expert - Reg. No 7683
2.	Gearoid Kieti	B.Sc. Environmental Science	Assistant Environmentalist	Lead Expert - Reg. No 7818
3.	Hottensia Kabuki	Bachelor's Degree Sociology	Sociologist	Associate Expert - 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: outlines the context for the Project and ESIA;

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

Chapter 3 - Policy, Legal, Regulatory and Institutional Framework: describes the legal, institutional and Regulatory frameworks applicable to the Project;

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

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

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

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

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

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

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

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

References

Annexes:

2. PROJECT DESCRIPTION

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

2.1 Project Context and Justification

The Ngandori-Nginda Water Service Provider (WSP) is implementing the Kiambogo and Mbukori pipelines to enhance water supply reliability and quality in response to water scarcity in the region. These projects, covering a cumulative 5.2 km with DN63mm-DN90mm HDPE pipes, aim to improve water distribution, ensure adequate and consistent water access for the growing population, and reduce illegal connections and water theft. Safe and accessible water is vital for public health, hygiene, and livelihoods, as it supports essential activities such as drinking, cooking, and sanitation. Aligned with Kenya's Vision 2030 and the National Water Master Plan, 2030, the projects are part of broader national efforts to improve water infrastructure and resource management, supported by funding from the World Bank under the Conditional Liquidity Support Grant Phase II (CLSG-II) program.

The pipelines will address local water supply deficits, ensuring reliable access for households and institutions while promoting public health by reducing waterborne diseases and improving sanitation. Enhanced water availability will alleviate burdens on women and children, enabling better education and economic opportunities. Designed to incorporate environmental sustainability, the projects will adhere to best practices to preserve ecosystems and ensure the long-term viability of water resources. These interventions are critical for achieving the goals of Vision 2030 and advancing the well-being of vulnerable populations within the Ngandori-Nginda WSP jurisdiction.

2.2 Project Location and Existing Land Use

Line 1-Muthige-Kibugu project is located in Kiambogo Village, Kathangariri Location, Nginda Ward, Embu North Sub County; and **Line 2- Runganga-Mbukori** is located in Mbukori Village, Nembure location, Gaturi South ward, Embu East Sub County in Embu County. Proximal Receptors along the Pipeline Route without direct impact are as presented below.

Coordinates	Receptor within the surrounding	Approximate Length
NGANDORI-NGINDA WSP		
Line 1 - Kiambogo-Kamwove Line (off Muthige-Kibugu main line) 3km		
0°24'02.8"S 37°26'22.5"E	**Start point**	**3km** **63mm diameter HPDE pipe**
0°24'05.5"S 37°26'24.2"E	Poultry farm	
0°24'11.5"S 37°26'30.9"E	residentials	
0°24'11.5"S 37°26'30.9"E	residentials	
0°24'14.1"S 37°26'34.3"E	Kiambogo Tea Buying Centre	
0°24'35.8"S 37°26'43.3"E	Kamuove Tea Buying Centre	
Line 2 - Runganga-Mbukori Line (off Kairiri-Jakairi main line) 2.2km		
0°28'1.17"S, 37°29'11.06"E	**Start point**	**2.2km** **90mm diameter HDPE pipe**
0°28'1.62"S, 37°29'12.42"E	residentials	
0°28'1.36"S, 37°29'28.99"E	residentials	
0°28'7.47"S, 37°29'51.66"E	Manyatta Technical and Vocational College	
0°28'7.96"S, 37°29'53.40"E	Mbukori primary School	
0°28'13.32"S,37°29'59.67"E	St Joseph Mtetu Secondary	
0°28'16.92"S, 37°30'3.34"E	Mbukori ACK Church	
	Total length	5.2kms

The project involves the installation of a 5.2 km water transmission pipeline, running parallel to an existing pipeline. To minimize disruption to private lands, businesses, and properties, the pipeline will be installed exclusively within the designated road reserve. This approach ensures that there will be no involuntary resettlement, loss of assets or Project Affected Persons (PAPs).

Minor detours will be implemented to avoid damage to existing infrastructure, including pavements. Consultations with the relevant road authorities have been conducted, and agreements have been reached to allow the use of the right-of-way (ROW) for road crossings and pipeline installation (see Annex 13 for authorization letter). The proponent has received approval, subject to conditions, to lay the pipeline at a minimum depth of 1 meter, which will ensure minimal disruption to existing infrastructure, preserve road accessibility, and allow for the restoration of the road reserve to its original condition upon project completion. As a result, the proponent has ensured that potential impacts are avoided, and no temporary economic displacement or loss of temporary structures will arise during construction. Ngandori water supply area is as presented in the Figure below.

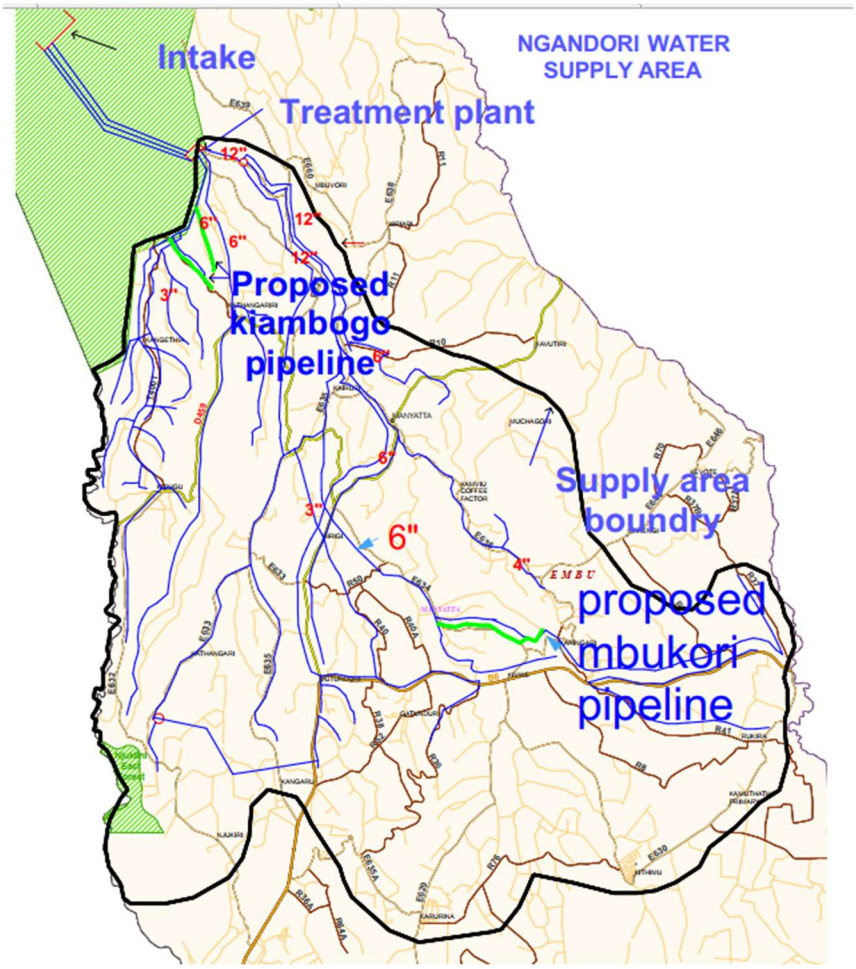


Figure 1: Ngandori Water Supply Area Coverage

Source: Ngandori-Nginda WSP

2.3 Study Area Delineation and Existing Water Supply System

2.3.1 Delineation of Ngandori-Nginda area

The Ngandori-Nginda Water Consumers Association, classified by the Water Services Regulatory Board (WASREB) as a Type 2 Water Service Provider (WSP) serving rural, low-income, and peri-urban areas, operates within a jurisdiction of approximately 132 km², covering peri-urban areas, rural areas, and trading centres with an estimated population of about 95,000. The Peri-urban consists of Mbukori which is within vicinity of Embu East Sub-County with institutions, residences and religious premises. Kiambogo line is in a rural set up with no business/market centres and school situated far away from the settlements. The current water service coverage is 68%, with an abstraction potential of 31,000 m3/day from the Rupingazi River. However, due to limited treatment facilities, current production stands at 8,000 m3/day.

By December 2023, the Ngandori-Nginda Water Consumers Association water supply infrastructure supported a total of 19,230 registered connections, with 15,621 actively receiving water services. Approximately 3,529 connections were classified as dormant or inactive, reflecting periodic usage patterns within the service area. The metering ratio across all connections stands at 100%, ensuring accurate measurement and accountability in water consumption.

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

2.3.2 Existing Water Supply System

The Existing Water Supply System for Ngandori-Nginda consists of the intake at Rupingazi River and local Storage and Distribution Networks as detailed in the following subsections. Besides Ngandori-Nginda which has its intake as the first one at the river located within Mount Kenya Forest, the River provides water to other services providers, among them EWASCO, Tana Water Works, Kibugu-Nguviu Irrigation among many others.

The water from the river is conveyed through Muthigi treatment plant to storage tank field strategically located. The abstracted water is chlorinated and conveyed via a series of pumping and gravity transmission mains to the Ngandori-Nginda consumers. Ngandori Nginda water storage includes:

- Enos 225m^3 tank serving areas of Kangaru, Manyatta and Nembure
- Kiangoci 225m^3 tank serving Nembure area

2.4 Presentation of Project Components and Features

As previously mentioned, the Ngandori-Nginda WSP project involves establishment of 5.2km pipeline of between DN63-DN90mm and the project involves the following primary component:

- Installation of 90mm pipeline between mbukori-Runganga (2.2km length)
- Installation of 63mm pipeline between Muthige-Kiambogo (3km length)

Additionally, the following components are included in the projects:

- Provision of valve chambers (Air Valve and Washout Valve) including points where maintenance and control mechanisms will be installed

- In addition, construction of the project components will be supported by ancillary facilities such as temporary storage area for the contractor

Temporary facilities will be necessary during construction. These temporary facilities will be located on existing Ngandori-Nginda sites/offices which is located in each of the two-pipeline area. The main installations include pipeline works area, concrete work areas (for chambers), and store area for material control. These installations will be mainly located on Ngandori-Nginda office area and road reserves and there will be no land acquisition envisaged except for permission/authorization from relevant road authorities, in this case Embu County Road department (See Annex 13).

2.4.1 Proposed Works

The works to be carried out include replacements of UPVC pipes which are in dilapidated state, with frequent leakages.

Mbukori 2.2km Line - Water main will be constructed to augment water supply and reduce cases of illegal connections and water theft. All consumers' water meters will be installed 1 meter from the tapping point. The pipeline will be laid parallel and next to the existing pipeline and, therefore, share the existing way leave. The existing upvc pipeline, installed in 1978, will be disconnected but left in place to minimize environmental and social disturbance once the new pipeline becomes operational. The pipeline is designed as follows.

Design Flow Required demand – 91 m^3/d or (1.05 l/s)

System Characteristics Pipe Diameter - 0.16 m

Length of pipeline – 3,000 m

Pipe material – HDPE

Level Difference - 39 m (from profiles)

Hydraulic gradient - 1.4%

The nearest commercial pipe diameter is obtained from Colebrook-White equation chart 90 mm. **Provide 90mm HDPE pn 10**

Kiambogo 3km Line - Water main will be constructed to augment water supply and reduce cases of illegal connections and water theft. The pipeline will be laid parallel and next to the existing pipeline and, therefore, Share the existing way leave. The existing upvc pipeline will be disconnected but left in place to minimize environmental and social disturbance once the new pipeline becomes operational. A 50 mm diameter outlet was previously installed and is dilapidated with frequent leaks along the pipeline. The pipeline is designed as follows.

Design Flow Required demand – 44 m^3/d or (0.5 l/s)

System Characteristics Pipe Diameter - 0.16 m

Length of pipeline - 2500 m

Pipe material – HDPE

Level Difference - 67 m (from profiles)

Hydraulic gradient - 1.1%

The nearest commercial pipe diameter is obtained from Colebrook-White equation chart 63 mm. **Provide 63mm HDPE pn 12.5**

The pipeline will be made of High-Density Polyethylene (HDPE) material, which is durable, resistant to corrosion, and suitable for water transmission. The HDPE material was selected based on its durability, resistance to corrosion, and suitability for water transmission. The pipeline will be jointed using electrofusion (EF) joints, which provide a strong and reliable connection between the pipes.

2.4.2 Project Design and Material

Pipeline Layout - The pipeline will be laid in a trench with a depth of approximately 1 meter and a width of approximately 0.6 meters. The pipeline will be covered with a layer of compacted soil. The pipeline for Kiambogo shall run parallel to an existing upvc pipeline – upgraded to DN63mm HDPE pipeline and for Mbukori the pipeline will be of 90mm HDPE. For Mbukori, the pipe will cross-paved runganga-Kivwe Road and follows unpaved mbukori road ending at Mbukori ACK Church. For Kiambogo, the line will follow unpaved public road, along the road reserve. Water deficient social amenities such as schools, hospital/dispensaries and churches along the route will be connected to the Pipeline.

Pipeline Installation - The pipeline will be installed by a qualified technician, with local community members employed for trench excavation and pipe laying. The pipeline will be jointed using electrofusion (EF) joints, and the joints will be tested for leaks. The pipeline will be installed at a depth of 0.9m.

Material – The proposed Ngandori-Nginda water supply project entails construction of approximately 5.2kms (cumulative) of DN63mm (Kiambogo line) and DN90mm (Mbukori line) valve and associated valve chambers (air valve & washout). The project will be constructed using modern materials and procedures to avoid compromising the safety of the neighbouring community and the environment. These materials shall comply with both local and international standards, ensuring they meet the required public health, occupational safety and health, and environmental criteria. The main construction materials and equipment for this project will be:

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

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

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

2.4.2.1 Applicable Design and Operational Standards

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

- **KEBS KS ISO 4427-2:2007:** Standards for polyethylene (PE) pipes and fittings for water supply.
- **ISO 4427:** International standards for PE pipes used for water supply applications.

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

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

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

2.4.3 Topographical Profile

Kiambogo Pipeline: - The proposed line will receive water from Muthigi line (main)**;** the topographical profile indicates a general decline in elevation from 1852.70 meters to 1801.50 meters over the pipeline route. This gradient supports gravity-fed water flow, reducing the need for pumping and enhancing the system's efficiency. This line will have air valves located near the pipeline beginning, midway and near the end to release trapped air from the pipeline, which can cause air locks and reduce water flow efficiency. Washout valves will be strategically placed along the line to facilitate draining the pipeline for maintenance works.

Mbukori Pipeline: - The proposed line will receive water from Kairuri-Jakairi main line; the topography of the line decline in elevation along the pipeline route, this is beneficial for gravity flow systems. The locations for valve chambers including air valves and washouts valves are strategically placed where maintenance and control mechanisms will be installed.

2.5 Project Stages and Activities

2.5.1 Preconstruction Phase

The In the preconstruction phase, the proponent prepared a detailed proposal to justify the project's need and assess its ability to meet the water demand of Kiambogo and Mbukori residents within the Ngandori-Nginda WSP jurisdiction. A critical component of this phase is the Environmental and Social Impact Assessment (ESIA), which identifies potential environmental and social concerns and recommends mitigation measures for the construction, commissioning, operation, and decommissioning phases. Extensive groundwork activities were conducted, including reconnaissance and topographical surveys, hydrological analysis of the water source, and the identification of water demand. The design layout was developed, accompanied by the preparation of Bills of Quantities (BOQ) and tender documents. At this stage, the proponent also engaged with local communities to gather valuable first-hand information regarding physical features and design preferences. Additionally, implementation schedules were prepared. The outputs from the project design were used in the ESIA to evaluate the potential impacts of the project and to propose suitable management strategies to mitigate or eliminate these impacts.

2.5.2 Construction Phase

The construction phase involves several key activities:

Site Clearing and Trenching - Given that the proposed pipeline will pass within the established road reserve, where natural vegetation (grass, shrubs, and bush) was observed during the field assessment, manual excavation and backfilling will be used. Site clearance and trenching will disturb the topsoil, which is rich in organic and humic content. Consequently, vegetation clearing will be limited to the trench width necessary

for pipeline installation, minimizing disturbance to the surrounding environment. The topsoil needs to be stored separately from the overburden to ensure that it can be effectively used for rehabilitation purposes.

Public Amenities - The proposed pipeline crosses public roads at the start each of the pipeline (unpaved road in both lines, except for Mbukori crossing point which cuts across paved Runganga-Kivwe Road), run adjacent to existing water pipeline. Disruptions to these features will be managed in collaboration with the relevant authorities.

Pipe Laying - This stage involves transporting, placing, joining the pipes, and backfilling trenches. Casual workers, preferably from the local community, will be employed on a contractual basis for excavation and related tasks.

Restoration Activities - After construction, road sections and road reserves will be restored. Landscaping will include re-vegetation or leveling to promote natural grass growth, and excavated material will be used for backfilling and land reclamation.

2.5.3 Operation Phase

The operation phase begins after the formal handover and activation of the pipeline following contractor completion. The proponent will ensure all social concerns are resolved, the facility meets design specifications, affected areas are rehabilitated, and the pipeline is fully operational. A physical evaluation with the contractor will be conducted, and a final report shared with WSTF and relevant County Executive Members. Ongoing monitoring of water supply will ensure designed flows and adherence to abstraction limits, addressing any leakages or illegal connections. The pipeline, primarily made of HDPE, is expected to last at least 50 years, with HDPE pipes having a lifespan exceeding 100 years. Water demand projections for the two proposed pipelines are summarized in the table below. On average billing for Mbukori on monthly is 1,975m^3/month; per day it will be 65m^3/day by year 2043 water demand will be as tabulated below

Table 2: Water Demand Projections from 2022-2043

Year	Water Demand (m3/day)	
	Mbukori	Kiambogo
2022	64	29
2023	65	31
2033	76.9	37
2043	91	44

On average billing for Kiambogo on monthly is 907m3/month per day it will be 31m3/day by year 2043 water demand will be as tabulated below

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 - The Routine Maintenance Programme will detail the inspections frequency and maintenance activities for all maintenance to be carried out regarding the pipelines and the associated facilities

2. Emergency Works and Response - Maintenance staff will be trained to respond to potential and immediate failure events to mitigate any adverse impacts on Users, frequent patrol will be undertaken by Ngandori-Nginda to ensure an appropriate response.

2.5.4 Decommissioning Phase

The decommissioning phase involves safely removing equipment, restoring affected areas, and implementing monitoring measures to ensure minimal environmental and social impact. Although decommissioning is not anticipated soon, proactive planning ensures compliance with regulatory requirements and sustainable management practices, preparing for potential future needs. This approach aligns with best practices in project stewardship throughout its lifecycle.

2.6 Input and Materials

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

Table 3: Materials Required for the Pipeline Installation

Material/Input	Quantity	Source
HDPE Pipes	5200 meters	Local suppliers or manufacturers of HDPE pipes
Fittings	Based on pipe joints	
Valves	Several types as needed	
Jointing Materials	Depending on joint type	
PPE		Local suppliers of PPEs
Electrofusion Jointing Machine	1 unit	Local suppliers
Testing Equipment (Pressure testing; Leak detection; Flow meters)	One set per testing type (on need basis)	Import
Bedding materials	500m^3	Crushed stone & graded materials suppliers
Backfill material	300m3	Excavated soil from the trenches

2.6.1 Power Supply:

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

2.7 Output and Wastes

Wastes will be generated by the project activities. Consequently, all project generated wastes will need to be managed and disposed of in a manner to prevent potential impacts on the environment and risks to human health. Potential wastes to be generated includes excavated soil (overburden), pipe cuttings, unused pipe segments, packaging wastes, debris (including cleared shrubs, tea leaves etc.), concrete/cement wastes generated from repairs or adjustments to private properties or infrastructure affected by construction. These outputs and wastes should be managed according to environmental regulations and project-specific requirements to minimize environmental impact and ensure efficient project execution. At this stage, the quantity of waste generated has been estimated but it must be noted that the supplied values may change as details on the development of the Project are finalized. Table 4 below provides an estimate of the potential waste streams, source and management.

Table 4: Potential Wastes Estimates and Management Measures

Waste (s)	Est Qty	Source	Potential Management
Excavated Soil (Overburden)	52,000m^3	Excavated soil	Reuse as backfill or disposal in designated areas
Unused Pipe Segments/cuttings	TBD	Cut sections or leftover pieces of HDPE pipes	Recycled or disposed properly

Broken or Damaged Materials (fittings/valves/pipes)	TBD	Broken pipes, fittings/valves, PPEs	Recycled or disposed properly
Concrete or Cement Waste:	TBD	Generated from repair activities	Reuse/recycle

Anticipated operational waste is minimal, primarily limited to routine maintenance activities.

2.8 Excavation and Installation Methodology

Pipeline construction for the Kiambogo and Mbukori water projects, involving the installation of DN63 to DN90 mm pipelines, will be carried out exclusively using manual excavation methods. This approach ensures precision, minimizes environmental disturbance, and aligns with the project's environmental and design requirements. Local expertise in water infrastructure construction has been successfully utilized in recent projects within Embu County, where contractors have demonstrated proficiency in manual pipeline installation. The Government of Kenya encourages labor-intensive methods for such tasks, and local labor availability is sufficient to support the project. An independent contractor will be engaged to oversee the works, ensuring adherence to project specifications while utilizing only manual labor for excavation and pipeline installation.

2.9 Workforce

The workforce required for the construction phase of the Kiambogo and Mbukori pipeline projects will consist of skilled, semi-skilled, and unskilled laborers:

- Approximately 17-20 manual laborers will be needed for excavation across the 3km Kiambogo section, and around 23-30 laborers will be required for the 2.2km Mbukori section, totaling approximately 40 laborers for excavation, estimated to last about one month.
- A team of 12-16 workers will be assigned to the Kiambogo line, and 18-20 workers will be needed for the Mbukori line for pipe handling, laying, and backfilling.
- Supervision and engineering oversight will be provided by 2-4 personnel throughout the project.

While the exact workforce numbers may vary, it is expected that around 95% of the construction workers will be locals, with a focus on hiring youths from the surrounding community. The project is expected to be completed within one month.

2.10 Access and Land Acquisition

The pipelines for both the Mbukori (2.2 km) and Kiambogo (3 km) sections will be installed within existing road reserves along Kiambogo-Kibugu Road and Runganga-Mbukori Road, respectively, utilizing established access routes. This approach avoids land acquisition, as the pipelines will run parallel to existing lines within the road reserves. The roads will facilitate the transportation of materials and personnel to the construction sites. A site walk with the WSP team and community consultations confirmed the pipeline remains within the road reserve, with no encroachments or private land crossings.

Temporary Land use: - Material Storage: Designated areas near the pipeline route for storing pipes, fittings, and construction materials may be required. Consequently, for these areas, the contractor will manage using the Ngandori-Nginda offices, eliminating the need for rental arrangements with landowners.

2.11 Road Crossings

The Mbukori pipeline route begins by crossing the Runganga-Kivwe paved road, the only tarmac section along its alignment, after which it runs along the road reserve for the majority of its length. At this road

crossing, the existing sleeve will be utilized to facilitate the pipeline installation, eliminating the need for trenchless methods or road reinstatement. In contrast, for the Kiambogo pipeline, which follows unpaved minor roads, excavation will be confined to the road reserve without any road crossings. The proponent has obtained authorization from the relevant road agencies (see Annex 13), with conditions in place to minimize disruption to existing infrastructure, maintain road accessibility, and ensure the road reserve is restored to its original condition upon project completion. Consultations were conducted with county road officers to obtain approval for pipeline installation within the designated road reserve (see Section 6.5.2.4 - Table 22). Additionally, the Managing Director of Ngandori engaged the County Executive Committee (CEC) for Roads, Transport, and Public Works in Embu County specifically regarding the pipeline installation.

2.12 Project Timelines

The probable timelines for the project are as presented in Table 5 below.

Table 5: Approximate Project Timelines

Activity		Probable Timelines
Permitting and Approvals		1 month
Procurement of Materials		1 month
Construction Phase	Site preparation	2 weeks
	Trenching and excavation	3 weeks
	Pipe laying and jointing	3 weeks
	Backfilling and compaction	2 weeks
	Site restoration	1 month
Commissioning and Testing		2 weeks
Total Duration		6 months

2.13 Cost Estimates

The estimated total cost of the project is 5,036,575.45 (Ksh Five Million Thirty-Six Thousand Five Hundred and Seventy-Five only) and a summary breakdown of the costs is presented in Table 6 below:

Table 6: Project Budget Estimates

	BILL NO 1-EXCAVATION AND PIPEWORKS				
S/NO.	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSH)**	**AMOUNT (KSH)**
	SITE CLEARANCE				
1.1	Site clearance (1.2m width)	m^2	5400	30	162,000.00
	EXCAVATION AND EARTHWORKS				
1.2	Excavation (1.0m depth, 0.6m width)	m^3	2,700	205	553,500.00
1.3	Excavation (1.0m to 2.0m depth)	m^3	80	200	16,000.00
1.4	Excavation in soft rock	m^3	30	210	6,300.00
	PIPE WORK				
1.5	Supply and install 63mm HDPE pipes PN 12.5	m	3000	430	1,290,000.00
1.6	Supply and install 90mm HDPE pipes PN 12.5	m	2200	850	1,870,000.00
	sub-total 1				**3,897,800.00**

	BILL NO. 2 CHAMBERS AND BENDS				
S/ NO	DESCRIPTION	UNIT	QTY	RATE (KSH)	AMOUNT (KSH)
	Gate Valve and Air Valve Chambers				
1.7	Air valve & washout chambers	No	2	30,000.00	60,000.00
1.8	Supply and install 90mm gate valve	No	1	25,000.00	25,000.00
	AIR VALVES AND ITS FITTINGS				
1.9	Single oriface air valve (1")	No	1	25,000.00	25,000.00
2.0	peglar gate valve (1")	No	1	3,613.00	3,613.00
2.1	saddle clamp (3"x1")	No	1	4,000.00	4,000.00
	sub-total 2				**117,613.00**
	ULTASONIC FLOW METERS				
2.2	Supply and install 63mm ultrasonic flow meter	No	1	90,000.00	90,000.00
2.3	Supply and install 90mm ultrasonic flow meter	No	1	110,000.00	110,000.00
	sub-total 3				**200,000.00**
	TOTAL 1				**4,215,413.00**
	Add 3% administration cost+ contingencies				**126,462.39**
	TOTAL 2				**4,341,875.39**
	Add 16% VAT				694,700.06
	GRAND TOTAL				**5,036,488.00**

2.13.1 The ESMMP Costs

The total estimated cost for implementing this plan is Ksh. 50,000 for the pre-operational, Ksh. 160,000 for construction phase and Ksh. 80,000 for operational phase, with an additional Ksh. 50,000 allocated for the decommissioning phase amounting to a total ESMMP cost of Ksh 340,000.

3. POLICY, LEGAL, REGULATORY AND INSTITUTIONAL FRAMEWORK

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

3.1 The Constitution of Kenya

The constitution of Kenya, 2010 spells out the fundamental rights of every Kenyan citizen. Article 42 of the bill or rights of the Constitution provides that 'every Kenyan has the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative and other measures.' Article 43 defines the right of each person to clean and safe water in adequate quantities. Article 58 requires the State to put in place affirmative action programmes designed to ensure that minorities and 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. Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits.
ii. Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya.
iii. Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities.
iv. Encourage public participation in the management, protection and conservation of the environment; Protect genetic resources and biological diversity.
v. Establish systems of environmental impact assessment, environmental audit and monitoring of the environment.
vi. Eliminate processes and activities that are likely to endanger the environment; and
vii. Utilize the environment and natural resources for the benefit of the people of Kenya.

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

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

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

Relevance

The Constitution of Kenya stipulates for sustainable and sound management of the environment in relation to development projects. In article 69, the project proponent is mandated to cooperate with State organs and other persons to protect and conserve the environment. Ngandori-Nginda WSP should therefore ensure compliance with the constitution in so far as ensuring sustainable development. Moreover, the proposed project should aim at ensuring sustainability of the livelihoods and biological resources within the project area while taking cognizance to the powers given under the constitution to communities and individuals to enforce their rights through legal redress.

3.2 Kenya Vision 2030

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

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

Relevance

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 sets out important provisions relating to the management of ecosystems and the sustainable use of natural resources. The policy further acknowledges that natural resources are under immense pressure from human activities particularly for critical ecosystems including

forest, grasslands and arid and semi-arid lands. The policy seeks to develop an integrated approach to environmental management, strengthening the legal and institutional framework for effective coordination, promoting environmental management tools.

The objectives of the Policy are inter alia to:

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

Relevance

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

3.3.2 National Water Policy, 2021

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

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

This Policy focuses on the following objectives:

- Strengthening sustainable water resource management.
- Improving delivery of water supply services through progressive realization of universal access to water and the human right to water.
- Promoting the development of water harvesting and storage infrastructure.
- Realizing the delivery of sewerage and non-sewerage sanitation services.
- Implementing a harmonized 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 throughout the water sector.
- Mainstreaming gender considerations and youth interests in water sector, towards progressive attainment of gender equality.
- Enhancing the use of alternative dispute resolution, including the Water Tribunal, to manage conflicts in the water sector.

- Providing for the application of the following principles in the governance and management of water sector: precautionary principle; polluter pays principle; consumer protection; public participation.

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

Relevance

While this policy enhances a systematic development of water facilities in all sectors of socio-economic progress, it recognizes the by-products of this process as residual chemicals and water disinfection products. 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 1100 residents of Mbukori and Kiambogo area. As an ongoing process, it is important for the proponent to put in place strategies and plans for a wastewater management system having in mind that the project area lacks a sewerage system coverage.

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

3.3.6 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, especially during hiring of staff to be involved in the project, procuring of suppliers and sub consultants and sub-contractors to the project and involvement of both men and women, as well as youths.

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 National Sustainable Waste Management Policy, 2021

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

awareness, and the adoption of innovative technologies to enhance waste management practices across the country.

Relevance

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

3.3.9 Kenya Youth Development policy 2019

The Kenya Youth Development Policy, 2019 aims to empower young people by creating opportunities for them to actively participate in the country's development process. It focuses on fostering youth engagement in employment, entrepreneurship, and skills development. The policy seeks to address the challenges faced by the youth, including unemployment, by integrating them into the labor market and encouraging their participation in national development projects.

Relevance

The water pipeline project is aligned with the goals of the Kenya Youth Development Policy by ensuring that local youth are considered for employment throughout the project's various phases. Engaging young people in manual labor, such as trench digging and pipe laying, not only provides them with valuable skills and income but also promotes local economic growth.

3.4 Legal Framework

Ngandori-Nginda WSP is obligated under national statutes and regulations to ensure that the proposed water supply project is implemented in a way that preserves natural resources, respects the socio-cultural environment, and supports the economic potential of the local communities in the 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 Co-ordination Act, 1999 and Environmental Management and Co-ordination (Amendment) Act, 2015

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

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

zone or riverbank as protected area and impose such restrictions, as he considers necessary to protect the lakeshore, wetland, coastal zone and riverbank from environmental degradation.

Relevance

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

The Act has further provided for the development of several subsidiary legislations and guidelines which govern environmental management and are relevant to the proposed water project implementation. These are tabulated in table 7 below:

Table 7: Regulations under EMCA relevant to the proposed water project

S.N.	Subsidiary Legislation	Description	Relevance
1.	Environmental (Impact Assessment and Audit) Regulations, 2003 (and the amendments, 2019)	These Regulations contain rules relative to the content and procedures of an EIA, to environmental audit and to Monitoring. Provides for the procedure for carrying out Environmental Impact Assessment (EIA) and Environmental Audit (EA). Provides for the carrying out of an environmental audit study following commencement of project operations. Provides for the contents of an EIA and an EA Report.	The EIA to be carried out on the potential interventions should be carried out in accordance to these regulations. An initial environmental audit should also be carried out in the first year of operation of the project.
2.	The Environmental Management and Coordination (Conservation and Management of Wetlands) Amendment Regulations, 2017	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 River Rupingazi resources in the project area and hence the regulation is relevant. The proponent has taken measures to ensure that the ecology of the Rupingazi River will be protected by adopting adequate mitigation measures.
3.	The Environmental Management and Coordination, (Water Quality) Regulations 2006	The regulation provides for the protection of ground and surface water resources. It also Provides the water quality standards for sources of domestic water which shall be complied with.	The Proponent is expected to adhere to the water quality standards during the project construction and operation phase
4.	The Environmental Management and Coordination (Waste Management) Regulations (2006)	-Provides standards for handling, transportation and disposal of various types of wastes including hazardous wastes. -Requirements to ensure waste minimization or cleaner production, waste segregation, recycling or composting. -Provides for licensing of vehicle transporting waste. -Provides for the licensing of waste disposal facilities.	The 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 exceeds 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.	The contractor will comply with these regulations by regulating. -Exhaust emissions from construction machinery. -Dust from Site clearance and excavation of foundations. -Dust and exhaust emissions from transportation and disposal of spoil.

		-Provides for prevention of dispersion of visible particulate matter or dust from any material being transported. -Provides for acquisition of an emission license.	
6.	The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009	-Prohibits the generation of unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. -Provides for the maximum noise levels permissible in various environmental set ups such as residential areas, places of worship, commercial areas and mixed residential	The Contractor will be required to ensure compliance with the above regulations in order to promote a healthy and safe working environment throughout the Construction Phase.
7.	Extended Producer Responsibility Regulations, 2020	The Extended Producer Responsibility (EPR) Regulations, 2020, mandate that producers are accountable for the entire lifecycle of their products, particularly the post-consumer phase. These regulations aim to reduce environmental impact by requiring producers to establish take-back schemes, recycling programs, and waste management plans, and to design products that are easier to recycle, use fewer resources, and generate less waste. The EPR framework shifts waste management responsibility from the public to the private sector, promoting a circular economy and reducing the environmental burden of waste.	These regulations are relevant in ensuring that materials used during construction and maintenance comply with EPR principles. The project should work with suppliers who adhere to these regulations and incorporate EPR principles into its procurement strategy, thereby reducing its environmental footprint and aligning with national sustainability goals.

3.4.2 Water Act, 2016

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

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

Relevance

The proponent operates because of the act. Ngandori-Nginda intends to increase the water supply in areas of Mbukori and Kiambogo through tapping of the water from an existing main line (Muthigi-Kibugu Line for Kiambogo and Kairuri-Jakairi line) for which the Company has WRA permit for abstraction. Relevant permits must thus be always acquired/renewed 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 public. It also provides that compensation shall be paid promptly in full to all persons whose interests in the land have been determined. The Land Act mandates the Land Commission and other public officers to use the following guiding principles and values:

- Equitable access to land.
- Security of land rights.
- Sustainable and productive management of land resources.
- Conservation and protection of ecologically sensitive areas

Relevance

The proposed project shall be constructed along the road reserve within the project area. Easement/ acquisition of the land shall require coordination with the relevant government agencies in its usage. Nonetheless, considering that the project will be a long road reserve and parallel to existing line to be rehabilitated, easement will not be required. Consultation with road agencies has been done and an authorization letter given

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. In addition, the Act emphasizes the need for public participation and stakeholder engagement in decision-making processes. Therefore, stakeholder consultations and community involvement will be integral to ensuring transparency and fostering local support throughout the project lifecycle, from planning to implementation and ongoing operations.

Relevance

Once commissioned, the Project shall be handed over to Ngandori-Nginda WSP for operation and maintenance in accordance with the Act. As stipulated in the Act, public participation and stakeholder engagement will remain key throughout the project's lifecycle. The WSP will be responsible for ensuring ongoing community involvement, particularly in decision-making processes related to service delivery, tariff, and infrastructure maintenance.

3.4.5 Kenya Roads Act Of 2007

The Act stipulates the legal and institutional aspects of the road sub-sector policy. The Act provides for the establishment of three independent Road Authorities, namely: (i) Kenya National Highways Authority (KeNHA), responsible for the administration, control, development and maintenance of all class A, B and C roads in Kenya, (ii) Kenya Rural Roads Authority (KeRRA), responsible for rural and small-town roads including class D, E roads and Special Purpose Roads and (iii) Kenya Urban Roads Authority (KURA) responsible for all City and Municipal Roads. The Authorities fall under the Ministry of Transport and Infrastructure, which will retain the role of policy formulation, and general oversight of public roads

including regulatory aspects such as technical standards. Section 22 of the Act details the procedure for acquisition of any land required by an authority for the purposes of its functions under this Act.

Relevance

The water supply pipeline will traverse along and, in some sections, cross the project area roads (Mbukori). The proponent has engaged with the relevant Embu County Road authority and obtained necessary authorization letter for use of the road reserve. A courtesy call was made to the relevant offices as part of the initial engagement process, and further consultations were carried out during the ESIA study. The agreements reached have been documented in this ESIA (Annex 13) to ensure compliance with the Kenya Roads Act and to prevent delays during project implementation.

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 Embu 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, as 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 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 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 by establishing clear policies, monitoring mechanisms, and enforcing legal requirements.

3.4.13 National Gender and Equality Commission Act, Cap 7K

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

Relevance

This Act will be applied during the hiring of workforce in both the construction and operation phases.

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 against minor (children).

Relevance

The contractor is obligated to put in place mechanisms which are necessary or 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 and HIV testing and counselling.

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 Kiambogo and Mbukori residents and the neighbouring areas. The proponent is tasked to always provide clean water free from any contamination during the operation phase

3.4.17 Climate Change (Amendment) Act, 2023

The Climate Change (Amendment) Act, 2023 is pivotal for water infrastructure projects in Kenya, emphasizing comprehensive environmental impact assessments (EIAs) to evaluate climate change impacts such as altered precipitation patterns and water availability. Further, the Act, strengthens Kenya's commitment to addressing climate change by enhancing the role of county governments, mandating the development of comprehensive Climate Action Plans, and increasing public participation. The amendments require counties to establish Climate Change Units and appoint officers to coordinate local climate actions, ensuring integration into planning and budgeting. The Act introduces rigorous monitoring and reporting requirements for both public and private entities, promotes climate financing through the establishment of a Climate Change Fund, and incentivizes private sector investments. These measures aim to foster localized,

transparent, and well-resourced climate mitigation and adaptation efforts, ensuring that climate considerations are central to development projects, including the proposed water pipeline installation.

Relevance

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

3.4.18 Embu County Water Act, 2015

The Embu County Water Act, 2015, is designed to regulate water services within Embu County to ensure the sustainable management and conservation of water resources. It establishes mechanisms for managing and regulating water services, including the creation and responsibilities of water service providers (Section 5). The Act promotes the sustainable use and conservation of water resources (Section 7), outlining procedures for licensing water service providers and ensuring compliance with standards (Sections 8-10). It encourages local participation in water resource management decisions (Section 12), providing guidelines for setting and regulating water tariffs to ensure affordability and transparency (Section 15). Additionally, the Act offers mechanisms for resolving conflicts related to water services (Section 18) and details penalties for non-compliance to maintain the integrity of water services (Section 21).

Relevance

The Embu County Water Act, 2015, is highly relevant to the ESIA for the water pipeline project. The Ngandori-Nginda WSP adheres to licensing and regulatory requirements and has obtained necessary permits and following water service standards as stipulated under Sections 8-10. The WSP must align with sustainable water resource management principles, ensuring no negative impact on water availability and quality (Section 7). The project should engage local communities in planning and implementation, addressing concerns and promoting support (Section 12). If the project involves water distribution, it must follow guidelines for fair and transparent pricing (Section 15). Additionally, the project should utilize dispute resolution mechanisms for any conflicts related to water services (Section 18). Compliance with all provisions of the Act is necessary to avoid penalties and ensure smooth project execution (Section 21).

3.4.19 National museums and heritage act 2006

The National Museums and Heritage Act, 2006 provides for the conservation, protection, and preservation of Kenya's cultural and historical heritage. The act mandates that any discoveries of historical or cultural significance, such as artifacts or ancient sites, be reported to the National Museums of Kenya for appropriate action. It ensures that construction activities are conducted without damaging the nation's heritage.

Relevance

The water pipeline project will involve excavation and construction activities that may potentially unearth artifacts or culturally significant materials. Therefore, it is crucial to implement a "chance find procedure" that outlines the steps to take should any unexpected discoveries occur during excavation. This will include halting work immediately and notifying the relevant authorities.

3.5 National Water Quality Standards

In In providing water to consumers, Ngandori-Nginda will adhere to both national regulatory drinking water quality standards and the World Bank Group (WBG) water quality guidelines, ensuring that the more

stringent standard is applied. Regular monitoring will be conducted by the Water Service Provider (WSP) to assess compliance with these standards. Where necessary, corrective actions and mitigation measures will be implemented.

The National Drinking Water Quality Standards, as outlined in the Environmental Management and Coordination (EMC) Water Quality Regulations, 2014, along with the microbiological limits specified in KS 05-459: Part 1:1996, and the World Health Organization's (WHO) Drinking Water Specifications and Guidelines (WHO, 2017). These standards establish acceptable limits for various microbiological parameters, thereby safeguarding the quality and safety of drinking water supplied to consumers.

3.6 Institutional Framework for Environmental and the Water Sector

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

3.6.1 Ministry of Environment, Climate Change and Forestry

The Ministry is charged with the responsibility to conserve, protect, and sustainably manage the environment and natural resources to support Biodiversity and Socio-Economic transformation. The ministry's main objectives are to:

i. Enhance environmental, climate change and forestry governance.
ii. Sustainably manage and resilient environment and forest ecosystems.
iii. Mitigate climate change impacts.
iv. Expand agroforestry and commercial forestry.
v. Ensure adequate and sustainable resources.

Relevance: Provides policy guidance to ensure that the project aligns with national environmental and climate change goals, fostering sustainable development.

3.6.2 National Environment Management Authority

National Environment Management Authority (NEMA) is the administrative body that is responsible for the coordination of the various environmental management activities in Kenya. NEMA is also the principal government authority for implementing all environmental policies. NEMA is also responsible for granting ESIA approvals and for monitoring and assessing activities to ensure that the environment is not degraded by such project activities.

The authority's core functions are:

- Advise the Government on legislative and other measures for the management of the environment or the implementation of relevant international conventions, treaties and agreements.
- Undertake and coordinate research, investigation and surveys, collect, collate and disseminate information on the findings of such research, investigations or surveys.
- Promote the integration of environmental considerations into development policies, plans, programmes and projects, with a view to ensuring the proper management and rational utilization of environmental resources, on sustainable yield basis, for the improvement of the quality of human life in Kenya.
- Coordinating the various environmental management activities being undertaken by the lead agencies.

- To take stock of the natural resources in Kenya and their utilization and conservation.
- Initiate and evolve procedures and safeguards for the prevention of accidents, which may cause environmental degradation and evolve remedial measures where accidents occur e.g. floods, landslides and oil spills. Carry out surveys, which will assist in the proper management and conservation of the environment.
- Mobilize and monitor the use of financial and human resources for environmental management.
- Identify projects and programmes for which environmental audit or environmental monitoring must be conducted for.
- Monitor and assess activities, including activities being carried out by relevant lead agencies, to ensure that the environment is not degraded by such activities. Management objectives must be adhered to and adequate early warning on impending environmental emergencies is given.

Relevance: Grants ESIA approval and oversees environmental compliance, ensuring that the project adheres to environmental standards and mitigates potential impacts.

3.6.3 County Environment Committees

The County Environment Committees are responsible for the proper management of the environment within the county for which it is appointed. The Committee also develops county strategic environmental action plan for five years that informs the county environmental priority areas of focus.

Relevance: Facilitates alignment with county-level environmental priorities, engages the local community, and ensures that the project addresses county-specific environmental concerns.

3.6.4 National Environment Complaints Committee

The National Environmental Complaints Committee (NECC) is the body charged with the task of investigating complaints or allegations regarding the condition of the environment in Kenya and suspected cases of environmental degradation. The NECC also undertakes public interest litigation on behalf of the citizens in environmental matters.

Relevance: Acts as a grievance mechanism to address any environmental complaints from stakeholders, safeguarding community interests.

3.6.5 National Environment Tribunal

The tribunal is provided for under Section 125 of the Act. Its core purpose is to preside over appeals from administrative decisions by organs responsible for enforcement of environmental standards. An appeal may be lodged by a project proponent upon denial of an EIA license or by a local community upon the grant of an EIA license to a project proponent. NEMA may also refer any matter that involves a point of law or is of unusual importance or complexity to NET for direction.

Relevance: Provides a legal avenue for resolving disputes related to the ESIA process, ensuring fair treatment for both the project proponent and affected communities.

3.6.6 Institutional Framework for the proposed Project

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

3.6.6.1 Ministry of Water, Sanitation and Irrigation

This is the overall Ministry in charge of water in Kenya. It is responsible for policy development, sector co-ordination, monitoring and supervision to ensure effective Water and Sewerage Services in the Country, sustainability of Water Resources and development of Water resources for irrigation, commercial, industrial, power generation and other uses. Its mission statement is to contribute to national development by promoting and supporting integrated water resource management to enhance water availability and accessibility.

3.6.6.2 Water Resources Authority

Water Resources Authority (WRA) is a state corporation established under Section 11 of the Water Act, 2016. It is mandated through delegated Authority on behalf of the National government to safeguard the right to clean water by ensuring that there is proper regulation of the management and use of water resources, to ensure sufficient water for everyone- now and in the future.

3.6.6.3 Basin Water Resources Committee

A basin water resources committee is responsible for the management of the water resources within a respective basin area. The powers and functions of the basin water resources committee are to advise the Authority and county governments, at the respective regional office, concerning:

a) Conservation, use and apportionment of water resources.
b) The grant, adjustment, cancellation or variation of any permit.
c) Protection of water resources and increasing the availability of water.
d) Annual reporting to the users of its services and the public on water issues and their performance within the basin area.
e) Collection of data, analysing and managing the information system on water resources;
f) Review of the basin area water resources management strategy.
g) Facilitation of the establishment and operations of water resource user associations.
h) Flood mitigation activities;
i) Information sharing between the basin area and the Authority;
j) The equitable water sharing within the basin area through water allocation plans; and
k) Any other matter related to the proper management of water resources.

3.6.6.4 Water Resource Users Associations

This is a community-based association for collaborative management of water resources and resolution of conflicts concerning the use of water resources. The basin water resources committees may contract water resource users' associations as agents to perform certain duties in water resource management.

3.6.6.5 Water Works Development Agencies

The relevant Water Works Development Agency (WWDA) is the Tana Water Works Development Agency (TWWDA). The powers and functions of the water works development agency shall be to:

a) undertake the development, maintenance and management of the national public water works within its area of jurisdiction;
b) operate the waterworks and provide water services as a water service provider, until such a time as responsibility for the operation and management of the waterworks are handed over to a county government, joint committee, authority of county governments or water services provider within whose area of jurisdiction or supply the waterworks is located;

c) provide reserve capacity for purposes of providing water services where pursuant to section 103, the Regulatory Board orders the transfer of water services functions from a defaulting water services provider to another licensee;
d) provide technical services and capacity building to such county governments and water services providers within its area as may be requested; and
e) Provide to the Cabinet Secretary technical support in the discharge of his or her functions under the Constitution and this Act.

3.6.6.6 The Water Services Regulatory Board

The principal objective of the Water Services Regulatory Board is to protect the interests and rights of consumers in the provision of water services. The powers and functions of the Regulatory Board shall be to:

a) Determine and prescribe national standards for the provision of water services and asset development for water services providers;
b) Evaluate and recommend water and sewerage tariffs to the county water services providers and approve the imposition of such tariffs in line with consumer protection standards;
c) Set licence conditions and accredit water services providers;
d) Monitor and regulate licensees and enforce licence conditions;
e) Develop a model memorandum and articles of association to be used by all water companies applying to be licensed by the Regulatory Board to operate as water services providers;
f) Monitor compliance with standards including the design, construction, operation and maintenance of facilities for the provision of water services by the water works development bodies and the water services providers;
g) Advise the Cabinet Secretary on the nature, extent and conditions of financial support to be accorded to water services providers for providing water services;
h) Monitor progress in the implementation of the Water Strategy and make appropriate recommendations;
i) Maintain a national database and information system on water services;
j) Establish a mechanism for handling complaints from consumers regarding the quality or nature of water services;
k) Develop guidelines on the establishment of consumer groups and facilitate their establishment;
l) Inspect water works and water services to ensure that such works and services meet the prescribed standards;
m) Report annually to the public on issues of water supply and sewerage services and the performance of relevant sectors and publish the reports in the Gazette;
n) Make Regulations on water services and asset development which shall include business, investment and financing plans in order to ensure efficient and effective water services and progressive realization of the right to water services;
o) Advise the Cabinet Secretary on any matter in connection with water services; and
p) Make recommendations on how to provide basic water services to marginalised areas.

3.6.6.7 Water Service Providers

Water Service Providers are established by the respective County Government and licensed by the Regulatory Board, which makes regulations on the standard of water to be supplied. A water services provider shall be responsible for the provision of water services within the area specified in the licence, and

the development of county assets for water service provision. For Mbukori and Kiambogo, Ngandori-Nginda Water Service Provider, operating as a rural WSP with a defined service area independent of EWASCO, is responsible for the provision and management of water services. Further, EWASO also operates in the area as the primary WSP for Embu County and is responsible for water supply and sanitation services in various parts of the county.

These WSPs are established by the County Government and are licensed by the Regulatory Board. They are responsible for ensuring that water services meet the required standards and for the development of county assets related to water service provision.

3.6.6.8 Water Sector Trust Fund

The objective of the Fund is to provide conditional and unconditional grants to counties, in addition to the Equalisation Fund and to assist in financing the development and management of water services in marginalized areas or any area, which is considered by the Board of Trustees to be underserved including:

a) community level initiatives for the sustainable management of water resources;
b) development of water services in rural areas considered not to be commercially viable for provision of water services by licensees;
c) development of water services in the under-served poor urban areas; and
d) Research activities in water resources management and water services, sewerage and sanitation.

3.6.6.9 Water Tribunal

The Water Tribunal hears and determines appeals at the instance of any person or institution directly affected by the decision or order of the Cabinet Secretary, the Authority and Regulatory Board or of any person acting under the authority of the Cabinet Secretary, the Authority and Regulatory Board.

In addition, the Tribunal has the power to hear and determine any dispute concerning water resources or water services where there is a business contract, unless the parties have otherwise agreed to an alternative dispute resolution mechanism.

3.7 World Bank Operational Policies

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 8 below.

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

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

The World Bank Group EHS Guidelines on Water and Sanitation provide performance levels and measures for managing environmental and health risks in water supply and sanitation projects. These guidelines focus on water resource management, conservation, sanitation systems, and water quality control. They emphasize protecting public health by ensuring safe water supply and effective sanitation while minimizing environmental impacts. Compliance with these guidelines helps align projects with international standards for sustainable and responsible development. For existing facilities, site-specific targets and timetables may be needed to meet these standards.

Relevance

The EHS Guidelines for Water and Sanitation cover the operation and maintenance of:

i. Potable water treatment and distribution systems
ii. Sewage collection in centralized or decentralized systems, and sewage treatment at centralized facilities.

These guidelines address environmental health issues related to water distribution and the capacity required to meet water demand. The most significant environmental concerns include water system leaks, loss of pressure, and water discharges. The project design has incorporated measures to mitigate these environmental risks.

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

These technical reference documents provide examples of Good International Industry Practice (GIIP), both general and industry-specific. When World Bank Group members are involved in a project, these EHS Guidelines are applied as required by their policies and standards. The General EHS Guidelines complement local guidelines and offer mitigation measures for environmental and social impacts identified in the report. In cases where Kenyan regulations differ from the WBG EHS Guidelines, the stricter one will be applied. The main EHS guidelines include:

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

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

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

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

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

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

Table 9: 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 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 to determine if further environmental and social assessments (ESIAs) are needed An ESIA of a project will be prepared in accordance to EMCA guidelines and the report submitted to NEMA for licensing. EMCA is also equipped with regulations on air, noise, water, waste management, emissions and wetlands management.	Both the Kenyan and World Bank safeguards require screening to establish the level of ESIA prepared. The ESIA will be prepared with mitigation measures for any negative environmental and social impacts. The various limits set out in the regulations are close to World Bank and IFC policies with minimal differences in the actual figures.	Preparation of the ESIA comply with both NEMA and World Bank Standards. Use of Kenyan regulations in accordance to EMCA.
World Bank OP 4.11	**EMCA (amendments), 2015**	**Comparison**	**Recommendation**
This policy guides in preserving physical cultural resources and helps reduce chances of their destruction or damage	The National Museums and Heritage Act identifies the need for the protection, conservation and transmission of the cultural and natural heritage of 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

3.8 International Conventions

There exist several international conventions on environment that have social and/or environmental aspects tied to them. Kenya is a signatory to some of these conventions and applies them in environmental management. Some of the conventions that the State is signatory to or has acceded is as presented in Table 10 below:

Table 10: Relevant International Conventions Kenya is party to

Relevant International Convention	Relevance
Vienna Convention for the Protection of the Ozone Layer (1985)	This treaty mandates the reduction of ozone-depleting substances. The project must ensure that construction and operational processes do not involve or release such substances, thus contributing to global efforts to protect the ozone layer.
Convention on Wetlands of International Importance (Ramsar Convention 1971)	Where the pipeline route intersects or is near wetland areas, the project must implement measures to avoid disrupting these ecosystems. Compliance with this convention ensures the preservation of wetland biodiversity and ecological functions.
Convention on the Elimination of All Forms of Discrimination against Women	This treaty require that the project promotes gender equality and safeguards women's rights. This involves ensuring equal employment opportunities and addressing specific needs of women in community engagement and project implementation.
The Protocol to the African Charter on the Rights of Women in Africa (Maputo Protocol)	The Maputo Protocol underscores the importance of gender equality, emphasizing equitable access to resources and the involvement of women in decision-making. In the context of the water pipeline project, this means ensuring that women and girls have equal access to the new water resources and are actively included in planning and decision-making processes to address their specific needs. By aligning with these principles, the project supports gender equality and enhances its overall effectiveness.
Convention on the Rights of the Child	The project must consider and protect the rights and welfare of children, ensuring that construction activities do not adversely affect their health, education, or overall well-being.
The African Charter on the Rights and Welfare of the Child	The African Charter on the Rights and Welfare of the Child emphasizes the right to access clean water and protection from harm. For the water pipeline project, this means ensuring the pipeline delivers safe water to children and implementing measures to safeguard them from construction-related hazards.
Convention on the Rights of Persons with Disabilities	This requires the project to ensure accessibility for persons with disabilities, both in terms of physical access to project areas and in employment opportunities.
The African Charter on Human and Peoples" Rights (African Charter)	The project must respect and uphold the human rights of local communities, including their right to a healthy environment and participation in decision-making processes
Convention on Biological Diversity (2006)	This requires that the project minimizes its impact on local biodiversity. Measures should be taken to protect plant and animal species and their habitats during construction and operation.
Paris Agreement, 2015	The treaty for aligning with global climate action goals, particularly in terms of minimizing greenhouse gas emissions and considering climate adaptation.

3.9 Permits/Licenses

The Project must comply with the requirements of national legislation that requires certain permits that the contractor will need to put in place. Some permits may be obtained during the operation stage of the water pipeline project since they will be determined as need arises. Table 17 below lists permits/Licenses required for this project

Table 11: Relevant Permit/Licenses Required

S/No	Requirement	Issuing Authority	Remarks
1.	ESIA License for the project	NEMA	This ESIA forms parts of the process
2.	Water Abstraction Permit	WRA	Permit obtained- (in place)
3.	Requisite permissions from Road Authorities	County Government of Embu- Department of Roads, Transport and Public Works (to lay the pipes within the road reserves).	Authorization 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 is 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, 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 because of the project is likely to affect the local level biodiversity. The selected VECs typically includes riparian vegetation, aquatic life, riverine ecosystem and avifauna.

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

4.2 ESIA Methodology

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

4.2.1 Screening

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

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

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

- Amendment of Second Schedule of EMCA, 1999 vide Legal Notice No. 31 lists water resources infrastructures as project that must undergo ESIA. Further, as specified under Amendment of Second Schedule, Ngandori-Nginda Project is classified as a **Medium Risk project** (3 (c) water supply and distribution infrastructures). The completed screening form has been attached in Appendix 11.
- The nature and extent of the potential impacts of the Project. Considering its nature and extent it is recommended that Comprehensive Project Report (CPR) is submitted to the National Environment Management Authority. It is on this basis that this CPR was prepared.

4.2.2 Scoping

The scoping exercise was conducted to identify the key environmental issues to be addressed in the study and to determine the anticipated impacts throughout the project lifecycle. During the scoping phase, primary environmental and social issues were identified to guide the ESIA process during the detailed study.

As a first step of the ESIA process a scoping study was undertaken. The objectives of the Scoping Study were to identify the potentially significant environmental and social issues relating to the Project that will need to be addressed as part of the ESIA. As part of the scoping study the following activities were undertaken:

- Establishing the nature of the landscape, settlements and habitats served by the project.
- Identifying critical habitats that might be directly and indirectly affected by the project.
- Identification of sources of data on baseline conditions.
- Determination of the likely area of influence to be considered in the ESIA.
- Consideration of alternatives related to the Project.
- Identification and consultation with stakeholders who would be interested and/or affected by the Project.
- Identification of cross-sectoral issues and impacts, 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.
- Tana Water Services Board. (2010). Basic design study report on the project for improvement of water supply system in Embu and surrounding area in the Republic of Kenya.

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

4.2.3.2 Site Visits

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

A Detailed site investigations visit was undertaken starting the 6th to 10th of June, 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 project affected persons, government officers and the public in the vicinity of the proposed project be identified and their opinion considered during project planning, design, construction, operation and decommissioning phases. Consequently, public consultations were carried out in the project area in a bid to inform the public and other interested parties on the proposed project and obtain their views on the same. The consultations also presented an opportunity for the community to raise issues and concerns pertaining to the project.

Public consultations were conducted thorough public barazas organized at appropriate locations near each of the proposed Ngandori-Nginda pipeline. Key stakeholder's views on the project were solicited through interviews and discussions with County officials, technical teams at Embu County Department of Water and EWASCO and The Ngandori-Nginda WSP technical team. A courtesy call was made to the relevant offices as part of the initial engagement process. It is essential to emphasize that consultation is an ongoing process. The Ngandori-Nginda WSP has continued to engage with road authorities throughout the authorization process to ensure compliance with the Kenya Roads Act and address any concerns raised by stakeholders.

a) Stakeholder Identification and Mapping

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

- **Interested persons or parties:** 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 a letter (letter Ref No. WSTF/CLSG 11/ VOL. 1/219/(1) dated 21st May, 2024 presented under annex 10) sent out to the Deputy County Commissioner for Embu East Sub County and Embu North Sub County, who cascaded down to the ACC and Chiefs 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 Ngandori-Nginda water project. The message was announced by word of mouth at public social gatherings and churches.

- **Meeting with Embu County Key Stakeholders**

A meeting was held with the Embu County Government Director water on 7th June, 2024. The main agenda was to explain the project to them and solicit their views on the project. Further, the county officer was also briefed that on the need for carrying out consultations with the target communities. NEMA office was visited to understand the project and requirements in terms of reporting and prerequisite documents to allow for approval of the report once submitted.

- **Public Forum/Meeting**

The consultant's team conducted community engagement forums in the areas where the project will be implemented. The main objective was to explain the project details, including alignment identification and solicit broad community support and acceptability of the project. Separate meetings for Mbukori and Kiambogo were held with the community members. During these meetings, the team provided detailed information about the project, as documented in the minutes appended in Annex 6. The forums were then opened for plenary discussions to address any questions or concerns from the community.

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

- **Focus Group Discussions**

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 Embu, Embu County Water Supply Improvement Report, Kenya National Bureau of Statistics Reports, Feasibility study report among others. Primary data was collected from key informants and consultations which included public barazas, community profile forms and FGDs.

4.2.3.5 Assessment of Project Impact

The method used to identify and assess the Project impact relies 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:

- Identification: What will happen to the environment if the project is implemented or not implemented?
- **Prediction:** What will happen to the environment because 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 Ngandori-Nginda project:

a) Sources of Impacts

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

b) Mitigation of Impacts

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

c) Impact Characterization/Assessing Significance

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

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

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

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

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

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

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

Likelihood: - the likelihood that an impact will occur

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

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

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

- **Permanent:** the impact is considered to cause permanent change or irreversible.

Magnitude: - The magnitude of the impact reflects the intensity of the impact, its extent, and its duration. Impact magnitude is ranked as minor, moderate, or major. Once an assessment is made of the magnitude and likelihood, the impact significance is rated through a matrix process as shown in Table 16 and Table 17 overleaf.

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

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

Table 12: Significance Rating Matrix

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

Table 13: Significance Colour Scale

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

Approach to Impacts Mitigation and Management

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

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

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

4.2.3.5 Social Acceptability Assessment

The social acceptability of the Ngandori-Nginda water pipeline project is dynamic and influenced by communication and the expectations of local populations. Insights into social acceptability were gathered through interactions with stakeholders and public consultations in Kiambogo and Mbukori. While initial expectations are generally positive, concerns about safety, access to water, and potential impacts during construction may affect perceptions if not addressed. Social acceptability will be continuously monitored, with better evaluations possible once mitigation measures and community benefits are finalized. Building trust within the community is key to sustaining social acceptability, which may vary across locations and demographics.

4.2.3.6 Cumulative Impacts Assessment

Cumulative impact refers to the combined environmental effects of a project when considered alongside past, present, and future human activities. This assessment evaluates how the project's impacts interact with those of other projects, particularly in the context of water resources and ecosystem health. By reviewing baseline data, identifying relevant past and current projects, consulting stakeholders, and applying quantitative methods, the assessment provides a comprehensive understanding of how the project's effects might cumulatively influence environmental and social components, ensuring a holistic approach to managing impacts.

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 machineries material will be required for the construction of Project.

- Lack of Recently Available Secondary Data

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

5. BASELINE OF ENVIRONMENTAL AND SOCIAL CONDITIONS

5.1 General Overview and Approach

This chapter of the report provides a description of the existing physical, biological and social conditions of the Project site and surrounding areas, which may directly or indirectly be affected by the proposed water pipeline projects. It is essential that the baseline conditions of an environment are characterized to accurately predict the potential effects the Project may have on the environment. 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 Embu County.
- ***Project Site:*** Secondary and primary information was collected along the Project Sites, specifically within Mbukori and Kiambogo Village 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 Embu 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 28th May 2024, as well as between 6th and 9th June 2024. During the site visits, information pertaining to the natural environment, particularly related to existing flora, fauna, soils, and hydrology within the Area of Influence, Project Footprint, and Project Site, was photographed and GPS data was collected. Further, during the site visits, social investigations were also conducted. This involved engaging with local communities through interviews and focus group discussions to gather information on demographics, socio-economic conditions, cultural practices, and community structures. Data on the social environment was documented through photographs, notes, and audio recordings where appropriate, and GPS data was collected for relevant social features.

5.2 Geographic Context

The project entails 2 water pipelines situated in Kiambogo and Mbukori. Kiambogo pipeline is located in Kathangariri Location, Embu North Sub County, within Embu County. Mbukori pipeline is in Nembure Location, Embu East Sub County, within Embu County. Embu County is one of the 47 Counties in Kenya. It has a total area coverage of 2,818 km^2 and extends from longitude 37°3' to 37°9' east and latitude 0°8' and 0°50' north. Embu County shares common borders with Kirinyaga County to the West, Kitui County to the East, Machakos County to the South, Murang'a County to the Southwest, Tharaka Nithi County to the North and Meru to the North West as shown in Figure 1 overleaf.

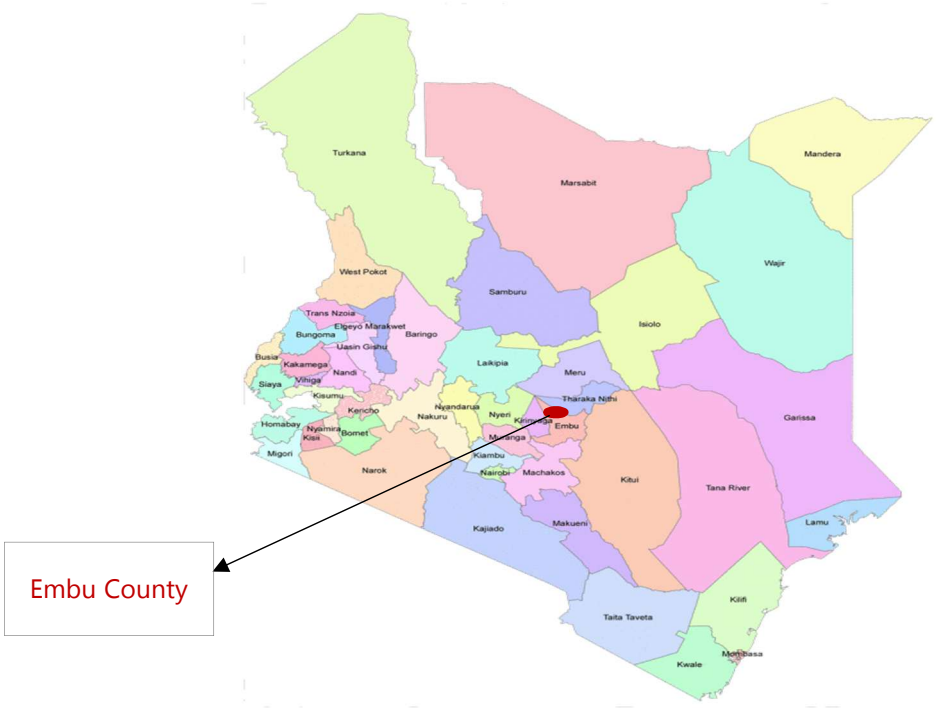


Figure 2: Map Showing the Counties of Kenya

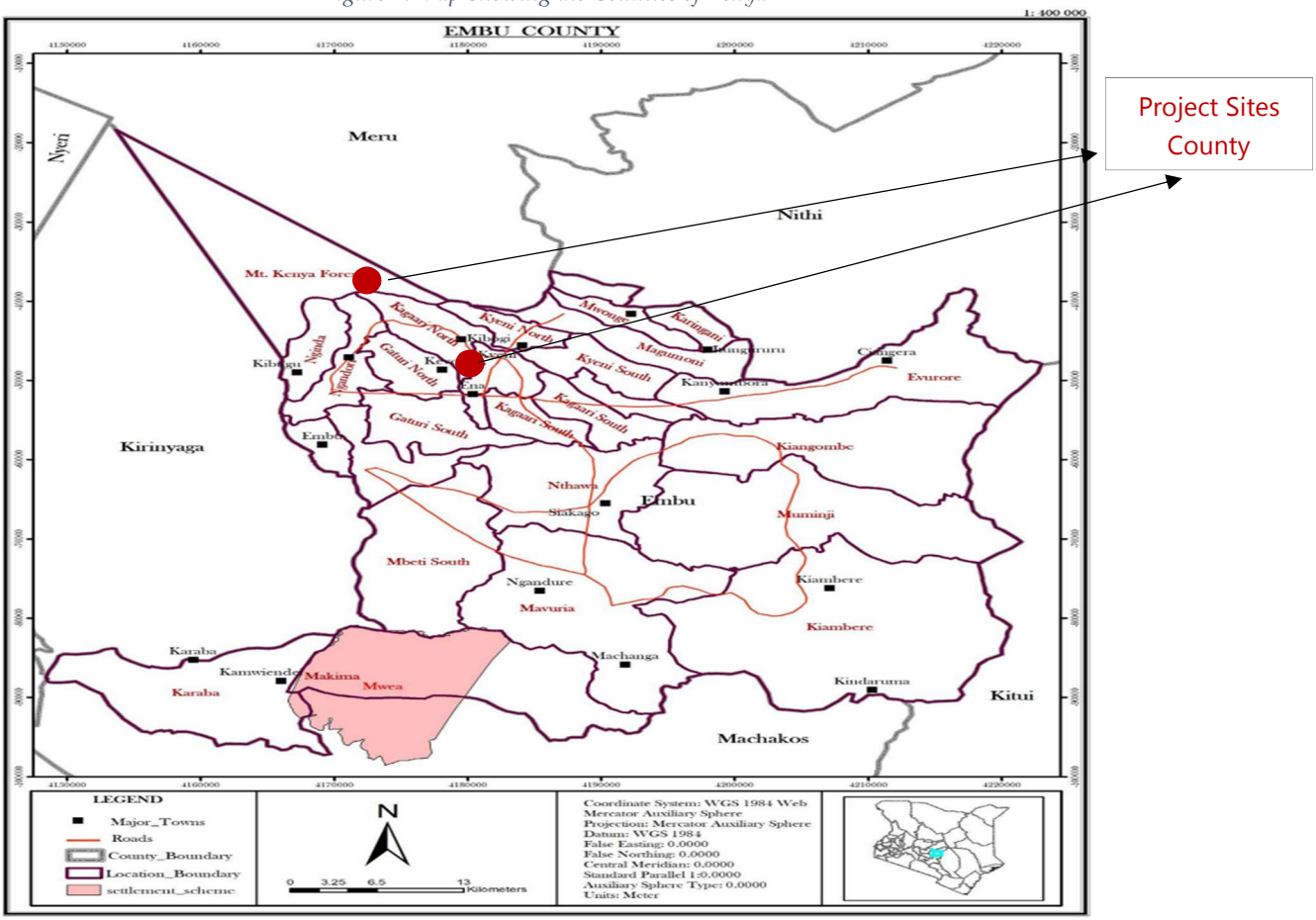


Figure 3: General view of Embu County

Source: Lukalo, F., C. Boone, S. Joireman. (2019).

The county is sub-divided into six administrative sub-counties: Embu East, Embu West, Embu North, Mbeere North, Mbeere South, and Mwea. These sub-counties are further, divided into 16 divisions, 47 locations, and 120 sub-locations. Embu County has 4 constituencies, namely Runyenjes, Manyatta, Mbeere North and Mbeere South and 20 wards as highlighted in the table 14 below.

Table 14: Embu County Administrative Wards

Sub-County	No. of Wards	Wards by Name
Embu East	6	1. Gaturi North 2. Kagaari South 3. Runyenjes Central 4. Kagaari North 5. Kyeni North 6. Kyeni South
Embu North	3	1. Ruguru-Ngandori 2. Nginda 3. Gaturi North – Partly
Embu West	4	1. Mbeti North 2. Kithimu 3. Kirimari 4. Gaturi South
Mbeere South	3	1. Mbeti South 2. Mavuria 3. Kiambere
Mbeere North	3	1. Nthawa 2. Muminji 3. Evurore
Mwea	2	1. Makima 2. Mwea

Source: Embu, CIDP 2023-2027

5.3 Physical Environment

5.3.1 Climatic Conditions

5.3.1.1 Rainfall

The project area experiences high, reliable, and evenly distributed rainfall. The rainfall pattern is bimodal, with two distinct rainy seasons: the long rains occurring between March and June, and the short rains falling between October and December. The quantity of rainfall received varies with altitude, averaging about 1,067.5 mm annually. It ranges from 640 mm in the central and southern areas to as high as 1,495 mm per annum towards Mount Kenya. The county often has periods of excessive precipitation as well as dry spells, according to historical weather records. During the second wet season, dry spells last longer, lasting an average of 65 days straight under moisture stress, with a range of 60 to 80 days annually. During the first rainy season, there are roughly 45 consecutive days, ranging from 25 to 70 days annually. Figure 3 overleaf shows annual mean precipitation received in Embu County.

The high-altitude areas of Kiambogo pipeline receives high rainfall compared to the Mbukori pipeline which is located in the southern area with lower precipitation compared to Kiambogo.

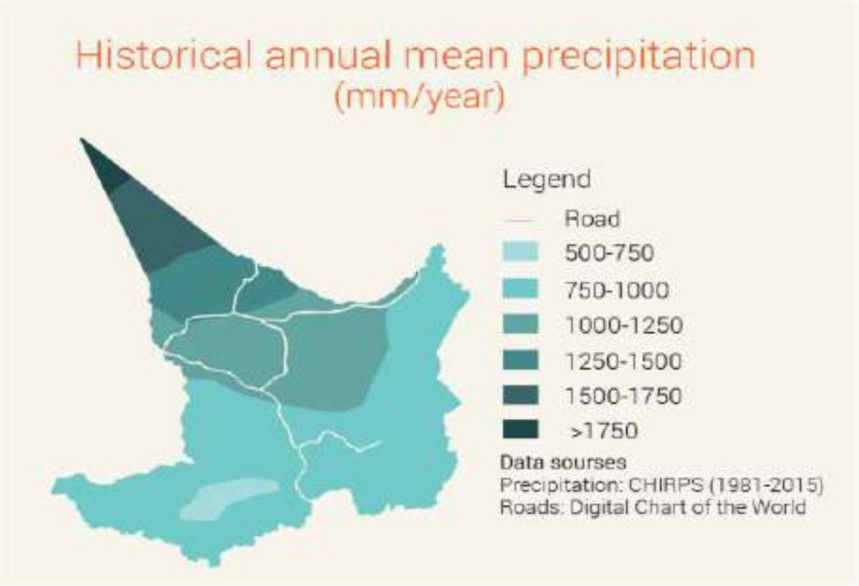


Figure 4: Historical Mean Annual Precipitation for Embu County[1]

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

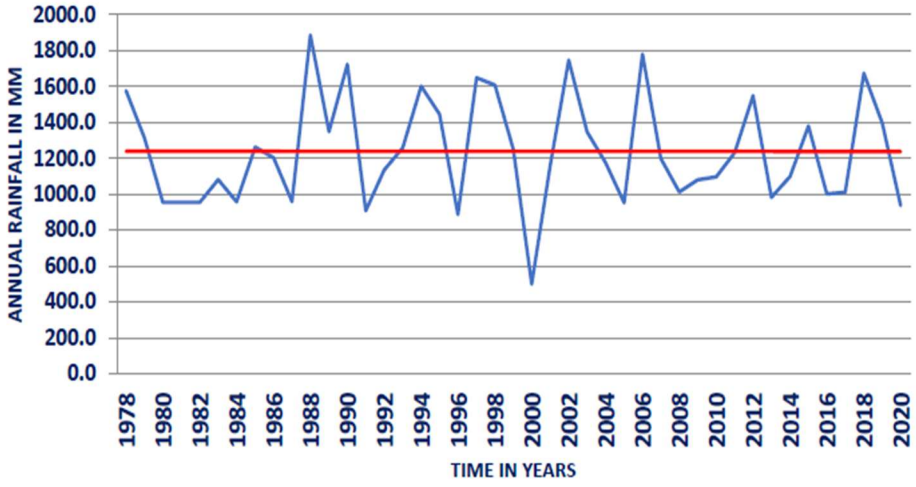


Figure 5: Long-term trend of rainfall (1978-2020)

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

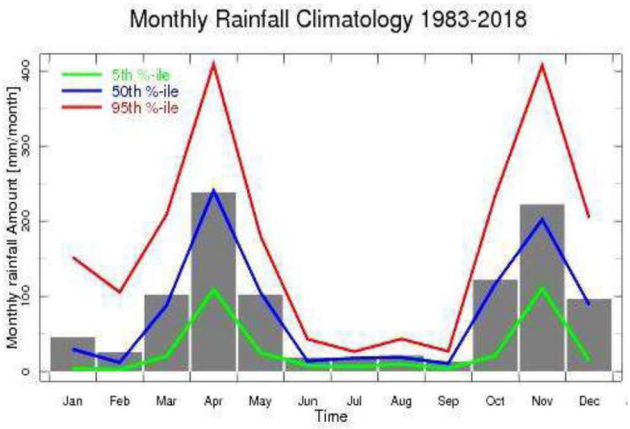


Figure 6: Monthly rainfall trend in Embu County

5.3.1.2 Temperature

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

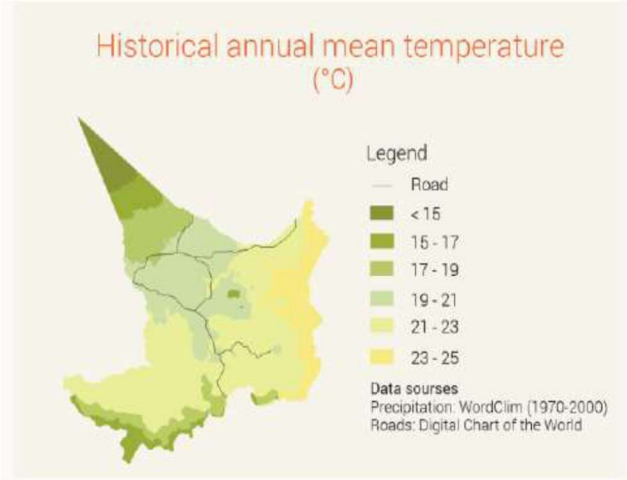


Figure 7: Historical Mean Annual Temperature for Embu County[4]

5.3.2 Topography and Landscape

Embu County features diverse geographical landscapes. To the north, it includes the lower slopes of Mount Kenya, the highest mountain in Kenya and the second highest in Africa, with elevations ranging from 1,200 meters to over 2,500 meters. This region is marked by rugged terrain, steep slopes, and dense forests. Surrounding these slopes are highland areas, sitting between 1,200 meters and 1,800 meters, known for their fertile soils and agricultural productivity, including tea, coffee, and horticultural crops. These highlands have rolling hills and valleys. The southern part of the county, particularly in Mbeere North and Mbeere South sub-counties, has lower elevations between 500 meters and 1,200 meters. This area is more arid, with

savannah and semi-arid landscapes, gentle slopes, flat plains, and scattered hills. The county is also traversed by several rivers, notably the Tana River, which originates from Mount Kenya and flows towards the Indian Ocean. These river valleys, characterized by deep gorges and alluvial plains, are vital for irrigation and agriculture in the drier southern regions. Additionally, significant portions of Embu County are covered by forests, especially in the higher elevations around Mount Kenya, forming part of the Mount Kenya Forest Reserve, which is an essential water catchment area. These forests support diverse flora and fauna and play a crucial role in the local ecosystem.

Kiambogo village is characterized by is characterized by high elevations with relatively flat or gently sloping terrain, lacking significant undulations or variations in elevation while Mbukori village is characterized by gently undulating topography and there are no predominant mountains or hills nearby that may result in shading of the along the pipeline route and the area itself is flat with gentle slopes.

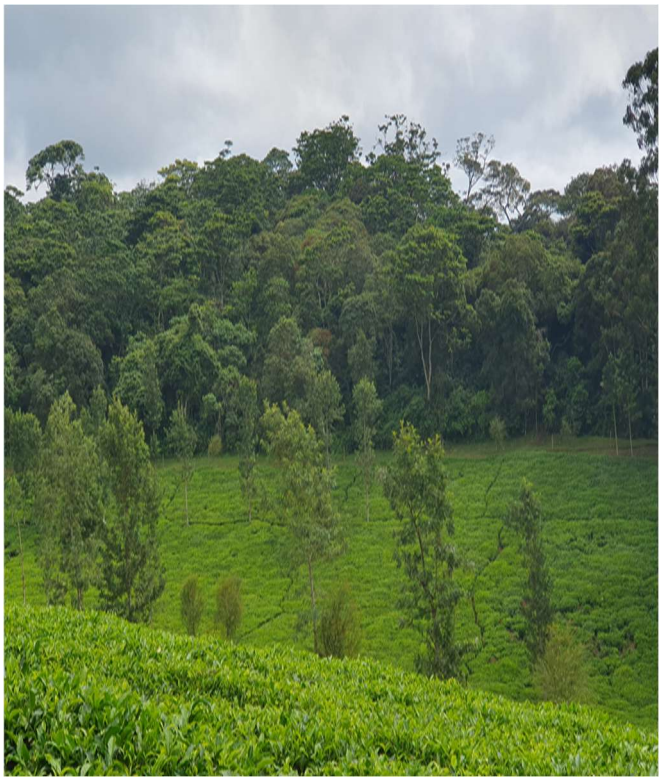


Plate 1: Photo of Kiambogo area at Ground Level Showing Typical Landscape

Source: Consultant's site visit 6th June 2024



Plate 2: Mbukori Photo at Ground Level Showing Typical Landscape

5.3.3 Geology and Soils

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

5.3.4 Flooding Risk

The average risk of flooding and excessive precipitation is considerable during both seasons. Extreme events and distribution abnormalities tend to become more extreme (**Fig., ---).** Rainfall events in Embu County that fall short of or surpass the average are happening increasingly frequently. Rainfall events in Embu County that are below average during the March, April, and May seasons or the October, November, and December seasons are becoming more common. This has to do with the long-term trend that indicates a rise in the frequency of extreme events but no discernible decline in the overall amount of rainfall received. When there is more rain than usual, it comes in the form of extremely strong storms.

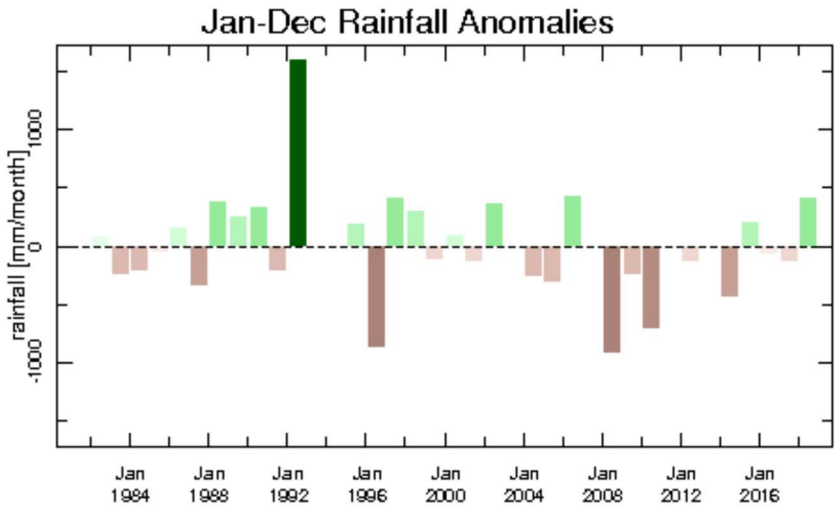


Figure 8: The Trend of Extreme Rainfall Events

5.3.5 Ecological Conditions

The County exhibits distinct ecological conditions within its boundaries, which create two major agro-climatic regions that are characterized by a range of agro-ecological zones from the cool and wet highlands of Mt Kenya to the hot and dry lowland zones. These agro-ecological zones from the highlands to the lowlands are eight (GoK, 2013) including: The Lower Highland (LH1) zone, including Runyenjes and Manyatta, is cold and wet with high rainfall, supporting tea and dairy farming, as well as horticulture and dairy goat farming in the upper areas. The Upper Midlands (UM1) zone, such as Kyeni North, Kagaari, and Gaturi North, is warm and humid, favoring crops like maize, beans, coffee, and bananas. Similarly, the Upper Midlands (UM2) zone, represented by Runyenjes Central, also supports maize, beans, and bananas. The Upper Midlands (UM3) zone, including Kagaari South, Githumu, Nthawa, and Kanyuombora, is warm and humid, predominantly growing maize, beans, and bananas. The Upper Midlands (UM4) zone, such as Mbeti South, is warm and semi-humid, with maize being the main crop. The Lower Midlands (LM3) zone, covering Mavuria, Mwea, Evurore, and Makima, is hot and dry, focusing on livestock and sorghum cultivation. The Lower Midlands (LM4) zone, including Kiambere, Evurore, Makima, and Muminji, is also hot and dry, with livestock and drought-resistant crops. Finally, the Lower Midlands (LM5) zone, which includes Kiambere, Muminji, Makima, and Evurore, supports drought-resistant crops like millet, sorghum, green grams, and indigenous livestock. The average annual rainfall for the county ranges from 600 mm in the lowland zones to 2200 mm in the highlands. The annual average minimum and maximum temperatures range between 18-19 °C and 27-28 °C in the lowlands, and between 14 -15 °C and 25-26 °C in the highlands respectively.

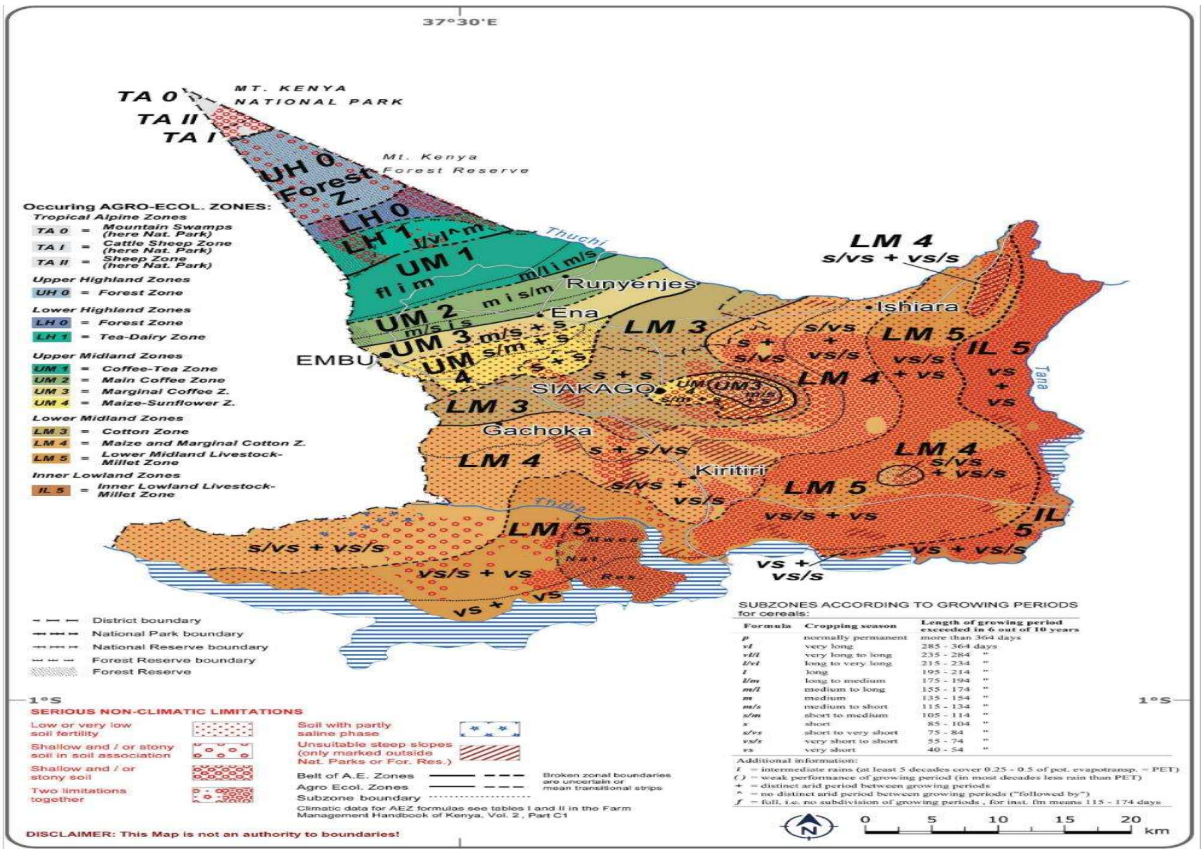


Figure 9: Embu agro-ecological zones
Source: CIDP2023-2027)

5.3.6 Hydrology

Embu County is located within Tana River Basin Catchment, which is the longest river Kenya in the region. The Tana River originates from the Aberdare Mountains and Mount Kenya and flows southeastwards through Embu County towards the Indian Ocean. There are several water sources, including rivers, streams, and springs. The county's water sources are primarily fed by rainfall, with some sources also receiving water from nearby rivers. The main water sources in Embu County is Rivers, with the main rivers within the county being Tana River, Thuci River, Rupingazi River and Thiba River. The County has several streams and springs that flow into the rivers, including the Muthanthara Stream and Mwiria Spring feeding into Rupingazi.

The dominant hydrological feature in the Kiambogo project area include Gicangariri River, Weru and Gacuka river located within the Kiambogo project area. It was reported that Gacuka River, located approximately 500m away from the end of Kiambogo line tops the culvert provided during the rainy season. There are no rivers or streams located within the Mbukori area. Water used on the surrounding farms is obtained from Kibugu-Nguviu irrigation scheme lines that draws water from River Rupingazi, this is all year round

5.3.7 Water Resources and Water Quality

The County is served by six major rivers which are Thuchi, Tana, Kii, Rupingazi, Thiba and Ena. Several man-made dams that serve the country's electricity needs are located in Embu County. They include Masinga dam, Kamburu dam, Kindaruma dam, Kiambere dam, Thuchi dam and Gitaru dam. The rivers in the region are an important source for domestic water and supports riparian agriculture as evidenced by farmlands on the riparian zone. Ground water resources include the numerous springs which dot the landscape and

shallow wells found within the homesteads. The proposed project's main water source is Rupingazi River. The springs are mostly found on the ridges and steep slopes. It was reported that springs support farming of wetland crops like arrow roots among other crops. Shallow wells are mainly used by people who can't access the river[2]. The area also has various community-based water projects which supply piped water to the community members. Some of the intakes of these projects are found in the section of the river that is in the forest.

From the discussion with locals, it was reported that the quality of the water resources in the area is generally good, especially upstream, they have clear water, which is a pointer to low pollution. For this reason, the local households upstream usually consume its waters without any form of treatment. However, owing to the intense agricultural activities in the sub-catchment areas, the water quality of the river is increasingly being compromised. The area is steep; therefore, when it rains runoff may wash off the residual fertilizers and other agrochemical farm inputs into the river. Pollution of the ground water may occur in the area either through fertilizers leaching to the lower horizons and mixing with the groundwater or through contamination through seepage from the pit latrines which are common among households. This may be aggravated by the high-water table (as evidenced by the springs).

In Kiambogo village, domestic water demand stands at 3791m^3/day while Mbukori village water demand stands at 91m^3/day. With the two areas practicing farming of Tea leaves and Khat, illegal connection is high, where the farmers divert water into their farms for irrigation.

The Ngandori-Nginda water project undertakes rigorous water quality monitoring monthly to ensure that the water meets and exceeds the standards required for safe consumption. This consistent monitoring helps to identify and address potential contaminants promptly, ensuring the provision of clean, safe drinking water to the community. The proactive approach not only safeguards public health but also fosters community trust in the water supply system.

5.3.8 Air Quality

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

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

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

Efforts by the county to manage and improve air quality include afforestation and reforestation projects primarily led by the Kenya Forest Service (KFS), promoting the use of clean energy to reduce reliance on wood and charcoal, which are major sources of indoor air pollution, and conducting awareness campaigns to educate the public on the impacts of air pollution and encourage practices that contribute to cleaner air.

For Kiambogo and Mbukori projects there were limited sources of air pollution, this is due to the relatively rural location of the area. Based on the observations from the site visit, the main sources of air pollution were dust generated by tractors and cars moving along the unpaved Road. In Kiambogo, source of air pollution is Kathangariri Tea Factory, the factory may contribute to air quality issues through emissions from tea processing activities, including particulate matter, smoke, and other pollutants

5.4 Biological Conditions

5.4.1 Flora and Fauna

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

a) Flora

The highland regions of Embu County, particularly around Mount Kenya, are home to montane forests with indigenous trees like Ocotea usambarensis (Camphor), Olea europaea (African Olive), Podocarpus latifolius (Podo), and Hagenia abyssinica (Hagenia). The midland and lowland areas feature savannah grasslands and mixed forests, with species like Acacia spp. (Acacia), Adansonia digitata (Baobab), and various shrubs and grasses. Riparian vegetation along rivers includes Ficus sycomorus (Sycamore fig), Syzygium cordatum (Waterberry), and Cyperus papyrus (Papyrus). The Kiambogo pipeline borders the Nyayo tea zone, containing Pennisetum purpureum (Napier grass), Eucalyptus spp. (Eucalyptus), Persea americana (Avocado), and Camellia sinensis (Tea). The Mbukori pipeline features Persea americana (Avocado), Macadamia integrifolia (Macadamia), Pennisetum purpureum (Napier grass), and landscaped flower beds.



Plate 3: Vegetation observed along Mbukori pipeline route



Plate 4: Napier grass, eucalyptus and avocado fruit tree observed along the Kiambogo pipeline route

Source: Consultant's site visit 6th June 2024

b) Fauna

Embu County hosts a diverse range of mammals, particularly in its forested and protected areas, including elephants (Loxodonta africana), buffaloes (Syncerus caffer), bushbucks (Tragelaphus scriptus), and monkeys such as the Black and White Colobus (Colobus guereza) and Vervet monkeys (Chlorocebus pygerythrus). The county is also a haven for bird watchers, with notable species like Hartlaub's Turaco (Tauraco hartlaubi), African Fish Eagle (Haliaeetus vocifer), various sunbirds (Nectariniidae family), and different species of weavers and hornbills. Additionally, Embu's varied habitats support several species of reptiles and amphibians, including chameleons, agama lizards, and a variety of frogs and toads. The insect population is equally diverse, featuring numerous species of butterflies, beetles, and bees, which play a crucial role in pollination.

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

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

5.4.2 Ecosystems and Habitats

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

a. **Forest Ecosystem**
    i. **Montane Forests:** Predominantly found in the highland areas around Mount Kenya, these forests are characterized by dense stands of indigenous trees such as camphor (Ocotea usambarensis), African olive (Olea europaea), podo (Podocarpus latifolius), and Hagenia (Hagenia abyssinica). These forests are crucial for water catchment, soil conservation, and providing habitats for a variety of wildlife.
    ii. **Riparian Forests:** Located along rivers and streams, these ecosystems include species such as sycamore fig (Ficus sycomorus), waterberry (Syzygium cordatum), and papyrus (Cyperus papyrus) in swampy areas. They play a vital role in maintaining water quality and supporting aquatic life.
b. **Grassland and Savannah Ecosystems**
    i. **Savannah Grasslands:** Predominantly found in the midland and lowland areas of Mbeere North and South wards, these ecosystems are characterized by grasses and scattered acacia (Acacia spp.) and baobab trees (Adansonia digitata). They support herbivores such as antelopes and various bird species.
    ii. **Agricultural Landscapes:** These areas, especially in the Midlands, are modified ecosystems where crops like coffee, tea, and maize are cultivated. While primarily agricultural, these areas also support certain wildlife species adapted to farm environments.
c. **Wetland Ecosystems**

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

d. **Urban and Peri-urban Ecosystems**

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

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

Specific Wards and their Ecosystems

- ***Nginda Wards:*** Located in the highlands, these wards are rich in montane forests and agricultural landscapes. They are crucial for biodiversity conservation and water catchment. Kiambogo pipeline project area boarders Mount Kenya forest ecosystem and the Nyayo tea zone buffer.
- ***Gaturi South:*** Known for their riverine vegetation and agricultural activities, these wards play a key role in water management and sustaining local biodiversity.

5.5 Socio-Economic Environment

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

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

5.5.1 Administrative Structure

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

5.5.2 Population and Demographics

Demographic characteristics are important in development planning as they provide a basis for sharing limited resources. They also determine the size of the labour force as well as the expected utilization of social amenities. The total population of Embu County according to the 2019 Kenya Population Housing Census was recorded to be 608,599 people, with about 182,743 total households and a population density of 216 no. per sq. km.

Embu East sub-county has the highest total population of 129,562, comprising 64,571 males and 64,991 females. This population is projected to increase to 143,469 by 2027. Mwea Sub County has the lowest population of 62,497 comprising 31,553 males and 30,944 females. The Sub-County was created in 2022, making it the youngest with a projected population of 69,192 by 2027. The County population is projected to rise by 11% from 608,575 to 673,843 during the plan period[3].

The county's demographic structure is diverse, primarily composed of the Embu, Mbeere, and Kamba ethnic groups. Most of the population is young, with significant portions in the 0-14 and 15-64 age groups, which account for most of the population. The county's rural areas house the bulk of the population, with around 532,675 people living in rural settings compared to 75,924 in urban areas.

Table 15: Demographic Projections as per Sub Counties

Sub-County		2019 (Census)		**2025 (Projection)**		**2027 (Projection)**	
	Area (Km^2)	Population	Density	Population	Density	Population	Density
Embu East	253	129562	512	140,866	557	143,459	567
Embu North	111	79,553	717	86,496	779	88,088	794
Embu West	158	127,091	804	138,187	875	140,730	891
Mbeere South	784	108,877	139	118,379	151	120,558	154
Mbeere North	795	100,973	127	109,747	138	111,764	141
Mwea	517	62,497	121	67,942	131	69,192	134

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

Mbukori pipeline project is administratively located in Mbukori Village, Nembure Location, Gaturi South Ward within Embu West Sub County; Kiambogo pipeline project is located in Kathangariri Location, Nginda Ward within Embu North Sub County, Embu County.

5.5.2.1 Specific Site Demographics

During the field visit, the current number of population and household size was estimated for each village to be: (Mbukori 2500 people and 650 household and Kiambogo 1800 people and 450 households). Nonetheless, the figure as provided contradicted the design projections of Ngandori-Nginda WSP. The projections by the WSP as acquired from the WSP design is as presented in below table.

Table 16: Design Population projections for the two villages

Village	**2019**	**2023**	**2033**	**2043**
Mbukori	960	1026	1214	1436
Kiambogo	328	346	409	484

Source: Ngandori-Nginda Mbukori and Kiambogo lines design report

From the public consultations, the average household was estimated to be around 4 to 5 people for both Mbukori and Kiambogo. It should be noted that many households consist of multiple generations living on one plot of land. The population projection in Kiambogo is 45% male and 55% female, and for Kiambogo 60% female and 40% male. This difference was attributed to women living longer and higher female birth rates. Communities also indicated that men of working age migrated out of the area in search of employment opportunities in larger towns like Nairobi and Mombasa, as their wives usually remain in the area and are generally considered within the population numbers provided.

[3] Embu County CIDP, 2023-2027

5.5.3 Gender Roles

In both Mbukori and Kiambogo villages, gender roles are strongly defined, with women generally serving as housewives and caretakers of children. In Kiambogo Women are also responsible for collecting water and firewood for cooking, as well as growing vegetables such as tomatoes, spinach, and onions. Men typically work and acquire the income derived from farming of tea leaves and khat "Muguka". However, both men and women engage in casual jobs for survival and to cover schooling costs, such as working on larger farms for weeding, harvesting, and sowing.

In Kiambogo, a notable number of households are female-headed due to men traveling to other areas in search of work. Most women reported having no ownership or control over productive assets such as land. All the women interviewed indicated that they did not possess title deeds for land, which forms a significant barrier to gender equality and economic development.

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

5.5.4 Land Use and Land Tenure

Land holds a significant position in the social and economic well-being of the population. Further, land is key in meeting the basic subsistence needs of the households in the area and it's perceived to be 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 the majority of land within Kiambogo is designated for tea farming; nonetheless, along the pipeline route the land is subdivided and utilised for residential house and subsistence farming practices. In Mbukori land is mainly subdivided and developed as individual plots and the opposite side of the proposed line is mainly used for Khat 'Muguka" farming by the residents.

From the FGD it was mentioned that all land is owned by men, in particular older men in the area. This is because traditionally sons inherit land from their fathers, the land is subdivided between the sons once the elderly die or divides for the children. Because of this inheritance system land plots are getting smaller and smaller. Most people in the area have land title for their land plots or a member of their family will hold the title (both men and women reported to have equal opportunity on this.

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

5.5.3 Crop Production

Agriculture is the mainstay of the Kenyan economy and currently represents 24% of the Gross Domestic Product (GDP) – vision 2030. More than one-third of Kenya's agricultural produce is exported, and this

accounts for 65% of Kenya's total exports. The agricultural sector accounts for 18% of total formal employment in the country.

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

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

In larger Embu County, the major crops can be categorized as food crops, industrial crops and horticultural crops. Maize and beans, which are often intercropped comprise the most important food crops. Others are sweet potatoes, Irish potatoes, sorghum and pulses in that order. Industrial crops comprise of tea and coffee as the major crops. Macadamia is also an important industrial crop. There are also traces of cotton in the lower, drier area of the district. Bananas top the list of horticultural crops followed by mangoes and avocadoes. Other horticultural crops are paw paws, tomatoes, kales and French beans. Most of these are, however, in very small scale due to lack of sufficient irrigation water and high dependency on rain fed agriculture.

From the field visit, major crops observed in the areas of Kiambogo was tea, coffee. Subsistence crops observed in the area include maize, sweet potatoes and arrow roots.



Plate 5: Tea plantation illustrating agricultural practices in the Kiambogo area



Plate 6: Maize, Banana plantation (for subsistence)

Source: Consultant's site visit 7th June 2024

5.5.4 Infrastructure and Services

5.5.4.1 Transport

According to Kenya Rural Roads Authority the county has an extensive road network of 2,213.1 km of which 167.1 km is covered in bitumen and 2046 km is just earth. There are two airstrips in the county, one meant

for security purposes is located at Don Bosco in Embu town and the other airstrip in Kiambere is used by KENGEN.

Mbukori site where the proposed pipeline infrastructure is to be constructed is along Runganga-Mbukori line, which is unpaved, the pipeline crosses paved Runganga-Kivwe Road. Kiambogo Pipeline is along an unpaved road; both under the maintenance of the County Government of Embu.



Plate 7: Kibugu-Kiambogo Road- pipeline to run on the reserve



Plate 8: Runganga-Mbukori Road (pipeline to run on the reserve)

Source: Consultant's site visit 7th June 2024

5.5.4.2 Telecommunication

The post and telecommunication sectors are well developed in Embu County. It has two post offices at Embu and Runyenjes and 13 sub-post offices in major trading centres. Embu County also has 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 villages (Kiambogo and Mbukori) is good; this was confirmed by the local community. There are no postal services within Kiambogo village and villagers are forced to travel to Embu town to receive such services; Mbukori is close to Embu town and can access these services conveniently.

5.5.5 Economic Activities

The following are the economic activities practiced in the county

1. **Agriculture:** Agriculture is the backbone of Embu County's economy, employing 70.1% of the population. Key products include tea, coffee, macadamia, maize, beans, and horticultural crops. The county is renowned for high-quality tea production, contributing significantly to Kenya's tea export reputation. Livestock farming, including cattle, sheep, goats, and poultry, is also important, particularly in the semi-arid Mbeere North and South regions. In Mbukori and Kiambogo villages, tea, coffee, maize, and beans are cultivated, with tea farming playing a key role in the local economy.

2. **Trade and Commerce:** Embu County has a thriving trade and commerce sector, driven by its strategic location along key transport routes. Local markets and shopping centers are hubs for small-scale trading, while industries such as manufacturing and processing plants support local employment. In Mbukori and Kiambogo, small-scale retail and informal markets are common, with Kiambogo hosting Kathangariri Tea Factory, while Mbukori lacks large-scale industries.

Tourism: The county features notable tourist attractions like Mount Kenya National Park and Mwea National Reserve, known for their scenic beauty and biodiversity. However, Mbukori and Kiambogo villages lack significant tourist destinations.

The county faces economic vulnerability due to declining farm sizes, land productivity, and reliance on rain-fed agriculture, exacerbated by climate change and rainfall variability. Vulnerability increases from the upper tea zone to the lower lands, where drought and famine have become more frequent, affecting households' ability to provide adequate food, education, and healthcare.

5.5.6 Archeological and Cultural Heritage

Cultural heritage refers to tangible forms of cultural heritage, such as tangible property and sites having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values, as well as unique natural environmental features that embody cultural values, such as sacred groves. Intangible forms of culture, such as cultural knowledge, innovations and practices of communities embodying traditional lifestyles, are also included.

Generally, Embu County boasts several cultural and historical sites. The Mugae Cultural Centre and Gikanda Cultural Centre highlight Embu and Gikuyu traditions respectively. Nthawa Kioro features ancient stone ruins, Kirubia Fort stands as a colonial-era outpost, and the Kerugoya-Kutus Road holds cultural significance. Kanyonga Kithumo Rock is spiritually important, and Mwea National Reserve enriches the county's cultural diversity. Mbukori and Kiambogo site has no significant sites of archaeological and cultural heritage.

5.5.7 Health Access

Access to healthcare in Embu County varies by sub-county, influenced by geography, infrastructure, and facility availability. The Embu County Referral Hospital serves as the main center for specialized care, while sub-county hospitals offer general medical, outpatient, and maternity services. Numerous health centers and dispensaries provide basic healthcare, including maternal and child health, immunizations, and treatment for common illnesses. Rural areas, especially Mbeere North and South, face challenges due to long distances and poor road infrastructure, with ongoing efforts to improve access through better roads and mobile health services. A shortage of healthcare professionals, such as doctors, nurses, and midwives, remains a concern, particularly in remote areas.

In Mbukori, there is Nembure health centre as the main health service provider. The community reported that Nembure Health Centre has a doctor, nurse and clinical worker as well as inpatient facilities but stated that it lacks capacity and does not offer specialized services. Those who hold National Hospital Insurance Fund (NHIF) cards are assisted. As such, they prefer to travel to the Health Centre. In Kiambogo, Kathangariri dispensary is the main heath service provider; it was reported that this dispensary provides only first aid services and the villagers are referred to Embu general for specialized treatment.

5.6 Social Structure and Dynamics

5.6.1 Community Structure

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

1. **Ethnicity and Languages:** Embu County's population includes a variety of ethnic groupings, including Embu, Mbeere, Kikuyu, Meru, and Kamba. The Embu are the dominant ethnic group, making up a sizable share of the population. Each ethnic group adds to the county's cultural richness and tradition, enhancing the social fabric of the community. The main languages spoken include Embu and Kikuyu. Embu, a Bantu language within the Eastern Bantu subgroup, is widely used by the Embu and Mbeere communities. Kikuyu, another Bantu language, is spoken by the Kikuyu community who have settled in Embu County over time. Additionally, English and Swahili are widely spoken and are the official languages of Kenya.

2. **Governance and community development:** The County is divided into administrative units known as sub-counties (e.g., Manyatta, Runyenjes, Mbeere North, and Mbeere South). Each sub-county has its administrative structure overseeing local governance and development. Social welfare, economic empowerment, and community development programs are actively promoted by community-based organizations (CBOs), self-help groups, and cooperatives.

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

5.6.2 Education and skills

Embu County follows the 8-4-4 and CBC education systems, with a network of primary and secondary schools across urban and rural areas. While primary school access has improved, some rural areas still face challenges with infrastructure and resources. According to the CIDP (2023), the county has 619 Early Childhood Development (ECD) centers, 482 primary schools with a 96.2% enrolment rate, and 137 secondary schools with a 73% enrolment rate. The high primary enrolment is attributed to the Free Primary Education initiative, with girls having a higher enrolment rate (91%) than boys (88%). The primary-to-secondary transition rate is 59.9%. Efforts to enhance education include scholarships, bursaries for marginalized students, and government initiatives in infrastructure, teacher training, and school feeding programs.

The women from both Mbukori and Kiambogo village reported that families cannot afford to send their children to Secondary School and that the majority reach Primary School (Standard 8). The parents are typically able to send one child to Secondary School, but not all their children. The cost of secondary education and the distance to suitable secondary schools were identified as barriers to continuing education. Most people of working age in the two villages have only completed secondary education at most, although there are a small number of people who have achieved higher levels of education. As such, the skills base in the villages is relatively low.

Access to education in the region contributes to preparing youth for employment opportunities in various sectors, promoting socio-economic development and poverty reduction. Including the Vocational training

programs that are critical in equipping students with practical skills aligned with market demands. Gender equity efforts have led to improvements in girls' enrollment and retention rates, although challenges in some rural areas persist. The tables below (as extracted from KNBS, 2019) show both the school attendance status and highest level of education as per census 2019.

Table 17: Distribution of Population Age 5 Years and above by Activity Status, Sex, County and Sub-County

Sub-County/Sex[1]	Total	Working	Seeking Work/ No Work Available	Persons outside the Labour Force[2]	Not Stated
EMBU	**543,425**	**317,105**	**19,986**	**206,286**	**48**
Male	270,430	157,937	13,015	99,456	22
Female	272,976	159,153	6,971	106,826	26
EMBU EAST	**117,073**	**70,906**	**4,533**	**41,631**	**3**
Male	58,277	34,978	3,054	20,244	1
Female	58,795	35,927	1,479	21,387	2
EMBU NORTH	**72,125**	**43,659**	**2,680**	**25,782**	**4**
Male	35,878	21,419	1,727	12,731	1
Female	36,244	22,237	953	13,051	3
EMBU WEST	**112,061**	**65,902**	**5,528**	**40,622**	**9**
Male	54,883	33,330	3,111	18,437	5
Female	57,169	32,564	2,417	22,184	4
MBEERE SOUTH	**145,688**	**84,431**	**4,164**	**57,066**	**27**
Male	74,120	43,225	2,922	27,959	14
Female	71,563	41,203	1,242	29,105	13
MBEERE NORTH	**96,457**	**52,188**	**3,081**	**41,183**	**5**
Male	47,254	24,967	2,201	20,085	1
Female	49,202	27,221	880	21,097	4
MT. KENYA FOREST	**21**	**19**	**-**	**2**	**-**
Male	18	18	-	-	-
Female	3	1	-	2	-

Source: KNBS Population and Housing Census, 2019

6. STAKEHOLDER ENGAGEMENT AND CONSULTATIONS

6.1 Introduction

This chapter outlines the approach to stakeholder participation and communication for the Environmental and Social Impact Assessment (ESIA) of the Ngandori-Nginda WSP water distribution system upgrade (Kiambogo and Mbukori pipelines) under the CLSG II program. The stakeholder engagement program aims to build and maintain positive relationships with local authorities, organizations, and communities throughout the project's phases. Continuous engagement ensures stakeholders' concerns are addressed from the planning phase through to operation, minimizing opposition and potential environmental and social impacts. The process complies with both Kenyan legal requirements and international standards for public participation and environmental assessments.

6.2 Objectives of Stakeholder Engagement

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

- **Communication with stakeholders:** Identify the best methods to provide balanced and objective information and obtain stakeholder feedback in an understandable language.
- **Ensuring understanding:** Undertake open, inclusive, and culturally appropriate engagement to ensure stakeholders are well informed early and comprehensively about the project.
- **Involving stakeholders in the assessment**: Engage stakeholders in scoping, impact assessment, mitigation measures, and finalizing the ESIA Report, contributing local knowledge to the baseline.
- **Building relationships**: Develop a model for ongoing community participation and collaboration through the project lifecycle, including environmental management.
- **Managing Expectations**: Ensure the project does not create unrealistic expectations among stakeholders by disseminating accurate information.
- **Ensuring Compliance**: Ensure adherence to local regulations and international best practices for stakeholder engagement.
- **Grievance Redress**: Provide tools for effective resolution of community issues during project implementation.

Key outcomes of engagement should be:

- **Free:** engagement free of external manipulation or coercion and intimidation.
- **Prior**: Timely engagement, with early information disclosure
- **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 mandatory for proposed projects under the Constitution of Kenya, 2010, and the EMCA 1999 (amended 2015), Section 58, to achieve sustainable development. The Environmental (Impact Assessment and Audit) Regulations of 2003 (Part III, Section 17) mandate that all ESIA studies incorporate public consultation to inform stakeholders of the project's impacts and benefits, and integrate their concerns into project planning, design, construction, and operation.

Public participation and consultation requirements state that the Proponent will:

1. Consult affected persons with NEMA's involvement.
2. Publicize the project and its effects by placing posters in public areas.
3. Hold public meetings to explain the project and gather comments.
4. Ensure notices are sent at least one week before meetings, with convenient venues and times.
5. Publish a notice in a nationwide newspaper and announce on nationwide radio in official and local languages.

Upon submission of the ESIA report to NEMA, the Authority will invite public comments within fourteen days. If necessary, NEMA may hold a public hearing based on these comments.

6.3.2 World Bank Requirements.

6.3.2.1 OP/BP 4.01: Environmental Assessment

This 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.

The World Bank OP 4.01: Environmental Assessment outlines the importance of public consultation and Information Disclosure during the environmental assessment process. The stakeholders should be provided with timely, relevant, understandable, and accessible information, and consult with them in a culturally appropriate manner, which is free of manipulation, interference, coercion, discrimination, and intimidation.

According to the standard, the process of stakeholder engagement will involve the following:

i. Stakeholder identification and analysis
ii. Planning how the engagement with stakeholders will take place
iii. Disclosure of information
iv. Consultations with stakeholders
v. Addressing and responding to grievances; and
vi. reporting to stakeholders

Stakeholder Identification and Analysis

The developer, in this case the WSP, identified the various stakeholders, including directly engaged parties and other interested groups. 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 WSP and the consultant undertook an assessment to identify any individuals or groups who, due to their circumstances, may be disadvantaged or vulnerable. Based on the project's alignment along the road reserve and the results of the assessment, no Project-Affected Persons (PAPs) have been identified.

Stakeholder Engagement Plan

According to the World Bank standards, the developer should develop a Stakeholder Engagement Plan (SEP) proportionate to the nature and scale of the project and its potential risks and impacts. The elements

of the SEP may be included as part of the Environmental and Social Commitment Plan and preparation of a stand-alone SEP may not be necessary. The SEP will describe the timing and methods of engagement among stakeholders throughout the lifecycle of the project.

Information Disclosure

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

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

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

Reporting to Stakeholders

The developer 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 continue to conduct stakeholder engagement in accordance with the SEP and will build upon the channels of communication and engagement already established with stakeholders. In particular, the developer will seek feedback from stakeholders on the environmental and social performance of the project, and the implementation of the mitigation measures.

6.4 Engagement Approach: Affected Parties and Other Stakeholders

6.4.1 Stakeholder Identification and Analysis

Stakeholder identification and analysis was the first step in the engagement process. This section outlines the following:

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

Stakeholder mapping identified individuals, communities, groups, and institutions who:

- Are likely to experience significant impacts (positive or negative).
- Have authority over the project's activities (e.g., government ministries).
- Are considered the project's main supporters and opponents.

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

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

'Power/Influence' refers to leverage a stakeholder may have in relation to decisions either taken by or affecting the project and the degree to which they can affect project success/failure. Table 23 overleaf depicts the recommended stakeholder communication strategy based on their level of influence/power and interest concerning the proposed project.

Table 18: Communication strategy based on the stakeholder power/interest matrix

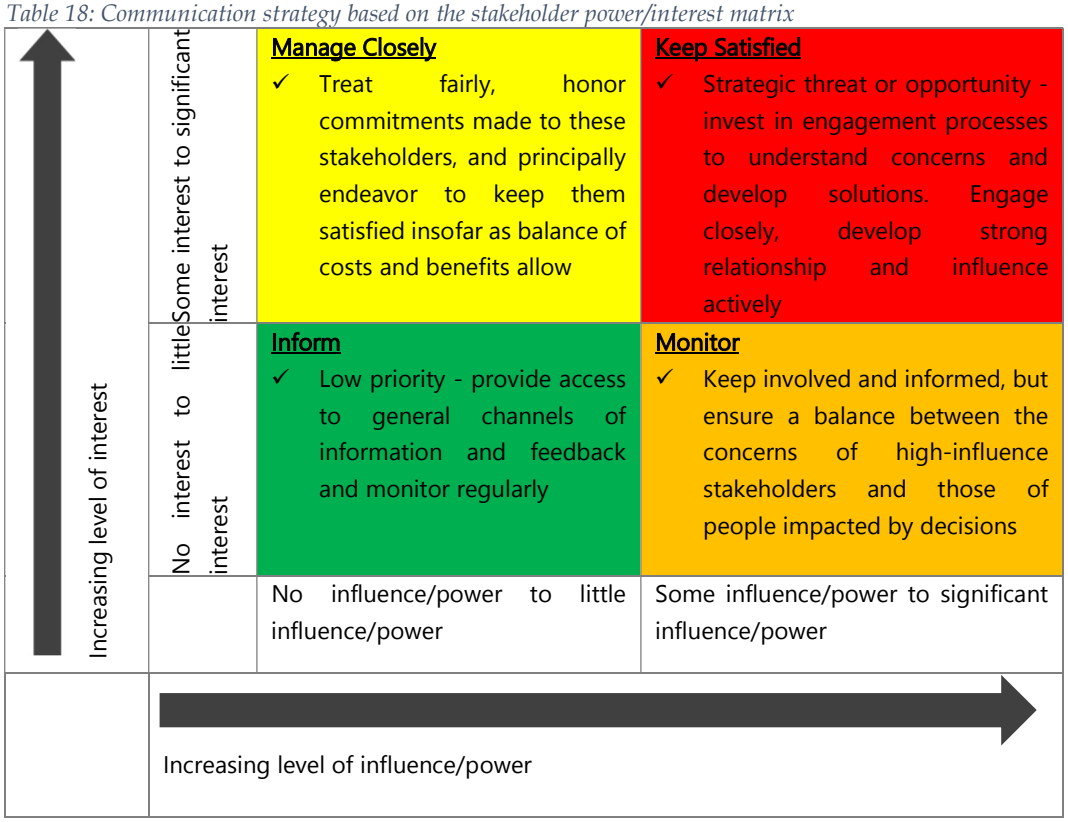


Table 19 overleaf presents the findings of the stakeholder analysis for the proposed upgrade works. This is a live matrix that will be updated before the commencement of and during every phase of the proposed project improvements while Table 19 overleaf displays the stakeholder Power/Interest matrix.

Table 19: 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
	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**
		- 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**
		- Ngandori-Nginda - (WSP)	- 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**
	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**
		- Directorate of Occupational Safety and Health Services (DOSHS)	- Issue Workplace Registration certificate to the fixed-price Contractor - Registers the upgrade works site as 'construction site'	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
	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	- These 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**
	County Government of Embu	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** -
		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**
		Sub-County Department of Water, Environment and Climate Change	- Development and maintenance of water infrastructure - Environmental conservation	5	5		Pre-construction and construction phases	- **Official letters** - **One-on-one meetings** - **Key Informant Interviews**

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

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

NB: * The sub counties affected include Embu East Sub-County and Embu North Sub County
The Line 1-Kiambogo-Kamwove project is in Kiambogo Village, Kathangariri Location in Nginda Ward within Embu North Sub County.
Line 2- Runganga-Mbukori line is in Mbukori Village, Nembure location, Gaturi South ward, Embu East Sub County in Embu County.

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

Project information was disseminated through verbal discussions and invitation letters containing a project synopsis and the ESIA study. Community meetings/barazas were conducted in both Kîembu and English, while Key Informant Interviews (KIIs) were in English. Questions and comments were recorded.

6.4.3 Data Collection Tools

Data collection tools were developed before stakeholder consultation, using surveys and questionnaires to gather feedback on potential environmental and social impacts. The data collected was both qualitative and quantitative. Tools used included:

1. Focus Group Discussion Guide

Structured questionnaires guided FGDs to capture stakeholders' perceptions, expectations, and concerns on the project, including topics like health, livelihoods, and water challenges.

2. Key Informant Interviews Guide

Structured questionnaires tailored to specific sectors (e.g., health, education, security) were used to enrich the socio-economic baseline of the project area. A list of interviewees is in section 6.5.2.4.

3. Minutes

Stakeholder views and discussions were captured through minutes, detailing how the project team responded to raised issues.

4. General ESIA Questionnaire

Structured questionnaires gathered comprehensive information on environmental and social impacts, infrastructure, services, and mitigation measures. Feedback is presented in section 6.5.2.5.

6.5 Stakeholder Consultations

Stakeholder consultation and public engagement is fundamental to an effective environmental and social impact assessment process and for the successful implementation of the proposed project. It serves to promote confidence and trust between the Proponent and Project Stakeholders. Stakeholder engagement is an ongoing process; for the proposed project, stakeholder consultation was initiated during the scoping phase and will continue throughout the construction, operational, and decommissioning phases of the project. The approach to public engagement has been designed to promote meaningful, two-way communication between the proponent and the stakeholders.

As depicted in the**Error! Reference source not found.** Stakeholder_Identification_and_Analysis the stakeholder consultation was focused on engaging: affected communities, implementing agencies, regulatory authorities, National and County authorities/departments, community leaders, the general public as well as other individuals or groups that express interest in the project. The Proponent is committed to effective and open consultation to ensure that potentially affected members of the public are fully aware of the project and can 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 Ngandori-Nginda WSP);
- How stakeholders will be notified of upcoming meetings and the invitation process.
- The choice of appropriate venue.
- The preparation of tools to be used during consultation.
- The resources required to facilitate the consultation.
- How minutes will be written, recorded, and disclosed; and
- How grievances will be addressed.

The engagement program included:

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

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

6.5.2 Ngandori-Nginda WSP 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), Ngandori-Nginda WSP, and project area administrative officials (this included the deputy county commissioners, Assistant County commissioners, Chiefs, Assistant chiefs, NEMA, and Water Resource Authority). This consultation was undertaken during the reconnaissance phase with the aim of mapping and understanding stakeholder concerns and expectations.

From the consultations held with the administrative officials for Mbukori and Kiambogo line, 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, a programme was drawn which formed part of the notification letter to the DCCs who then cascaded down the letters to chiefs for planning of public consultation meetings.

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

Additionally, plans were made for a public meeting to further engage the community, inform them about the project details, and gather broader input. This meeting was scheduled by the specific area Chief's, where

stakeholders had opportunity to raise concerns, ask questions, and provide valuable feedback, ensuring transparent communication and community involvement from the onset.

6.5.2.2 Public Baraza Meetings

Two public baraza meetings were held. In Kiambogo a meeting was held at Kiambogo tea buying centre on 6th June 2024 and Mbukori meeting held at Mbukori Center 6th June 2024. The chosen meeting points served as ideal venues for the baraza meetings because they provided a convenient congregation spot for most of the targeted stakeholders.

The Kiambogo public baraza meeting at Kiambogo tea buying centre was attended by 85 (47 male and 38 female) participants while the Mbukori baraza was attended by 43 (36 male and 7 female) individuals inclusive of the project team. The two barazas were held with communities from the Kathangariri sub-location (Nginda Ward) and Nembure location (Kirimari Ward). These areas were representative of the stakeholders that will be affected by the proposed water pipeline rehabilitation project. The meetings were also attended by the National Government Authority Officers in charge of the area i.e. the area Chiefs together with the village elders. The area WSP (Ngandori-Nginda) was represented by three Officers.

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

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

After giving a presentation on the proposed project, the stakeholders were provided with an opportunity to comment and give views on their perceptions of the proposed project. The verbal discussions were done in both Embu "Kîembu" and Swahili languages as it had been established through the Chiefs that the audience would be most comfortable with the two languages. The respondents were able to comment on the project, highlight the potential positive and negative impacts of the project, and if they are for or against the project.

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

Table 20: summary of the views expressed by various stakeholders during the public meetings

Subject	Question/Concern	Response
Landowners' Benefits	Inquiries on whether there will be any benefit to the landowners in scenario where the water line will pass through their land?	There are no specific benefits targeting affected landowners, aside from those achieved through rehabilitation of the line.
Existing infrastructure Damage	Will permanent structures be damaged	The laws governing the water pipeline remain unchanged; there should be no impact on permanent structures beyond what is necessary for rehabilitation.

	because of the rehabilitation works?	
Community Relationship	There has been a good relationship between the community and the water service provider; they support the project for improved water services.	The project aims to improve water services to the community, reflecting the support received from the community and the water service provider.
Water Cost	The current cost per unit for water is high.	There will be no changes anticipated; the WSP competitively selected fair rate hence cost per unit for water remains the same.
Community Employment	Will the community be given priority in employment opportunities?	The contractor will prioritize locally available labor unless local capacity is insufficient.
Trench Depth and Wages	What is the trench depth and expected wage rate?	Trench depth will be 3 feet unless design recommends otherwise. The minimum wage will be determined based on Kenya's labour laws.
Consumer Connection Fees	Will changing the water line affect current consumers in terms of connection fees?	Current consumers will not be affected by the change to the new water line, with no extra connection fees incurred. Consumers may need to purchase some fittings for seamless transition to the new line once installed.
Cost Implications	Will there be any cost implications for current consumers?	Consumers will incur costs for purchasing fittings to ensure seamless transfer of their connections to the new water line.
Water Use	Is the new water supply line for irrigation or household use?	The new water line is intended for household use, not irrigation.
Pipeline Location	Will the pipeline be relocated across the road from its current position?	The new water line will remain on the current side of the road, integrating with the current line's alignment to avoid new interferences. Crossings is only at the start of each of the proposed pipelines (Mbukori and Kiambogo).
Proximity to Farms/Land	How close will the new line be to farms or land?	The new line will maintain proximity to the current line, minimizing impacts on adjacent farms or land.
Payment System Enhancement	How can the company enhance seamless payment of water bills, especially for those who find USSD systems challenging?	The company introduced USSD payment via M-Pesa to facilitate easier bill payments without requiring customers to visit offices. Assistance is available at the water office for those needing support with payments.
Impact on Existing Connections	Will the depth of the new water line affect existing connections?	The depth of the new water line will not significantly affect existing connections.

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



Plate 9: Kiambogo Public Participation Baraza
Source: Consultant's site visit 7th June 2024



Plate 10: Mbukori Public Participation Baraza

Table 21: Summary of Consultative Public Meetings Attendance

Pipeline	Meeting Venue	Date	Participants	Male	Female	Total No.
Mbukori	Mbukori Centre	6th June 2024	- Local administration (Chief, assistant chiefs, elders) - Community members (men, women, youth) - Ngandori representative - EHS Consultants team	44	10	54
Kiambogo	Kiambogo Tea Buying Centre	6th June 2024	- Local administration (Chief, assistant chiefs, elders) - Community members (men, women, youth) - Ngandori representative - EHS Consultants team	47	38	85
			TOTAL	83	45	139

6.5.2.3 Focus Group Discussions

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

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

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

I. Feedback from the FGDs undertaken with the Mbukori Community

Feedback from the Men:

Feedback from 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:

- Recognition of increased water availability.
- Acknowledgment of potential property value enhancements.
- Anticipation of job opportunities for both youth and adults.

The group also raised concerns

- Potential interruptions in water supply during project implementation

Apprehensions about increased population leading to competition for water resources.

They presented the following requests:

- Installation of durable water pipeline infrastructure to avert cases of bursts and leakages are
- Considering the population growth from in-migration, new marriages and births, it is crucial to design the project to meet future water demands amid population growth
- 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, five female participants actively contributed with valuable insights:

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

Feedback from the Youth

During the focus group discussion, five 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 the potential for creating employment opportunities, particularly for community members skilled in plumbing.
- They highlighted that liaison with the community should also continue during construction work and initial operation of the pipeline

Impacts:

- They expressed concerns about potential disruptions to the 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.
- The water pipeline might affect private property and disrupt business, this calls for fair compensation of the affected.

Suggestions:

- They urged minimizing disruptions to water supply by completing replacement works as swiftly as possible.
- They recommended increase in water supply and for the locals to be allowed to use the water in irrigating their crops as part of job creation/income generation through farming.

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.



Plate 11: Male FGD with Mbukori Participants



Plate 12: Youth FGD with Mbukori Participants



Plate 13: Female FGD with Mbukori Participants

Source: Consultant's site visit 7th June 2024

Feedback from FGDs undertaken with Kiambogo Community

Feedback from the Men:

During the FGD engagement with Men, twelve participated and shared the following insights on the proposed project. They expressed a clear understanding of the proposed project. They were particularly raised the following benefits anticipated:

- They believe the pipeline will improve access to clean water, which is crucial for their household and families;
- Participants expressed interest in potential employment opportunities during the construction phase;
- Increase reliability; upgrade of the water pipelines will reduce occurrences of leaks and bursts and therefore improve the reliability of the water supply;
- There was a consensus on the importance of environmental safeguards during construction to protect local ecosystems.

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

- Concerns about disruptions during construction were discussed, especially regarding access to roads and services; and
- Participants highlighted concerns about potential environmental impacts, particularly on nearby tea farms and water sources.

Feedback from the Women:

Female participants 12 in No. contributed significantly to the FGD. The women expressed the following opinions:

- Female participants expressed optimism that the project will significantly reduce water rationing issues, ensuring more consistent access to water for households
- Participants highlighted expectations that improved water infrastructure will lead to better sanitation conditions in their communities
- 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 providers in Ngandori-Nginda will enhance customer service and respond promptly to water-related issues

Feedback from the Youth

Six youth members actively participated in the FGD and expressed their awareness of the project. They gave the following feedback regarding the proposed project:

Benefits:

- 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:

- Concerns were raised about potential damage to murram roads caused by trenching activities.

- Participants voiced worries about temporary interruptions in the water supply during the construction phase.

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 disruption to residents and activities.

Expectations:

- They anticipate that the project will foster community 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 14: Male FGD-Kiambogo Participants



Plate 15: Female FGD-Kiambogo Participants



Plate 16: Youth FGD Kiambogo Participants

Source: Consultant's site visit 7th June 2024

6.5.2.4 Key Informant Interviews (KIIs)

A key Informant Interview (KII) is a structured interview with an individual who can provide specialized information that might not be known by the general community. I.e. a Health practitioner, community

leader, an educator etc. the outcomes of the KIIs contribute to the understanding of the severity of a certain situation in a community by sector. The target groups for the KIIs for this study were schools, health institutions, security management personnel, and community leadership.

Key informant Interviews were undertaken with staff members of local institutions that offer basic services and will equally be affected by the project i.e. Educators for St Joseph Secondary School and Mbukori Primary School, Manyatta Technical and Vocational Education and Training (TVET) and a medical practitioner from Nembure Health Centres.

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

Community profile checklists were also filled in with the assistance of the Mbukori Chief and Kathangariri Area Chief 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 22: Summary of Feedback of the KIIs on Project Perception

No	Interviewee	Institution	Project Perception
1.	Director - Mr. Albert Gatuta	Embu County Water and Sanitation Department	- Sees the project as crucial for improving water supply reliability in the area, potentially enhancing public health outcomes through better access to clean water. Suggests ensuring minimal disruption to existing water services during construction and emphasizing water conservation practices post-project. Emphasizes the project's role in meeting Sustainable Development Goals (SDGs) related to water and sanitation.
2.	Nurse - Ms. Jannet Mbijiwe	Nembure Health Centre	- Believes increased water availability will positively impact health outcomes, reducing waterborne diseases and improving sanitation. Emphasizes the need for community health education during and after construction to maximize health benefits. Considers potential challenges related to health risks during construction and suggests mitigation measures.
3.	Nutrition Officer - Ms. Mercy Kariuki	Nembure Health Centre	- Expects improved water access to benefit nutrition programs, particularly in schools and healthcare facilities. Recommends monitoring nutritional outcomes pre- and post-project to assess improvements and address any emerging issues. Highlights the potential for improved food security and dietary diversity.
4	Environment Officer - Mr. Clement Kokaten	NEMA	- Emphasizes adherence to environmental regulations and standards throughout the project lifecycle. Recommends comprehensive mitigation measures for potential impacts on local flora, fauna, and ecosystems, ensuring compliance with IFC and national guidelines for environmental management. Highlights opportunities for biodiversity conservation and habitat restoration.
5.	Assistant County Commissioner (ACC)-	National Government (OPP)	- Views the project as a catalyst for community development, potentially enhancing local economic activities through improved

	Nembure and Kathangariri - Mr. Mohamed Noor (Mbukori) - Ms. Jane (ACC Kiambogo)		infrastructure. Advocates for transparent communication with affected communities and timely resolution of any grievances during project implementation. Considers social cohesion benefits and potential for community empowerment. Provide skills during project implementation (knowledgeable in water-related projects)
6.	Deputy Principal Mr. Egla Muriithi	Mbukori Primary School	- Sees the project positively impacting education by ensuring reliable water supply for students and staff. Suggests integrating educational programs on water conservation and environmental stewardship into the school curriculum. Emphasizes the project's role in enhancing school infrastructure and facilities.
7.	Deputy Principal Mr. Boniface Njue	St. Joseph Mtetu High School	- Expects the project to enhance school hygiene and sanitation standards, reducing absenteeism due to water-related illnesses. Requests proactive measures to minimize disruption to academic activities during construction and ensure student safety. Highlights opportunities for practical learning and student engagement in environmental stewardship.
8.	Deputy Principal Mr. Symon Njoka	Manyatta Technical Vocational Centre	Foresees the project benefiting vocational training by ensuring adequate water supply for practical training and student projects. Recommends incorporating practical aspects of pipeline construction into vocational training programs. Emphasizes the project's potential to enhance technical skills and workforce readiness.
9.	Managing Director Mr. Geoffrey Munyi	Ngandori-Nginda	Sees the project as an opportunity to upgrade water infrastructure and enhance service delivery to customers. Advocates for close collaboration between the WSP, contractors, and community representatives to ensure project success and long-term sustainability of water services. Highlights economic benefits and improved operational efficiency.
10.	Embu County Department of Roads, Transport and Public Works Mr. Paul N. Thiga	Embu County Department of Roads Chief Officer Roads	The consultation focused on ensuring the compliance of the proposed water pipeline project with the Kenya Roads Act and addressing any concerns raised by relevant stakeholders. As a result of the discussions, the county roads officers granted the necessary authorization for the use of the road reserve for the pipeline installation. The agreement ensures that all necessary procedures will be followed, and any infrastructure within the road reserve will be minimally impacted. Additionally, the county roads officers provided guidance on the proper handling of road crossings and the restoration of the road reserve to its original condition post-project

6.5.2.5 Analysis from General ESIA Questionnaires

The General ESIA Questionnaires were designed to capture comprehensive feedback from various stakeholders regarding the proposed water pipeline project. The questionnaires included questions aimed at understanding the environmental and social impacts, as well as the stakeholders' perspectives on the project's implementation. The responses collected through these questionnaires have been analyzed to provide detailed insights into the concerns and suggestions of the community. The key areas addressed by the questionnaires included:

- **Distance from the proposed intervention: -** The responses indicated a range of distances from the proposed pipeline route, with most stakeholders residing along the project and a few within range of 1km.

- **Perceived negative impacts:** - A majority of respondents expressed concerns about potential negative environmental and social impacts. Specific concerns included the disturbance of local flora and fauna,

disruption of daily activities, and potential impacts on water quality. However, some stakeholders were optimistic about the project's benefits, such as improved water supply and infrastructure. There were no concerns on the projects adverse effect on local flora and fauna as no sensitive ecosystems is traversed by the pipeline.

- Preventive Measures: - Respondents suggested various measures to mitigate negative impacts, including undertaking project in phases to avoid disconnection abruptly, notice period issuance, barricading the trenches and engaging with community to address any concers that may arise.

Support for the project: - Support for the project varied among respondents. While majority expressed support due to the anticipated benefits of improved water supply and infrastructure, a few were cautious emphasizing on need for enforcement of stringent measures to address any negative impacts.

It is essential to emphasize that consultation is an ongoing process. The Ngandori-Nginda WSP has continued with its engagement with key relevant authorities throughout the authorization process to ensure compliance and address any concerns raised by stakeholders

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 dedicated GM for workers. The Grievance Mechanism will be a dynamic document that shall be revised and updated periodically based on experience and feedback from stakeholders.

6.6.1 Principles of the GRM

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

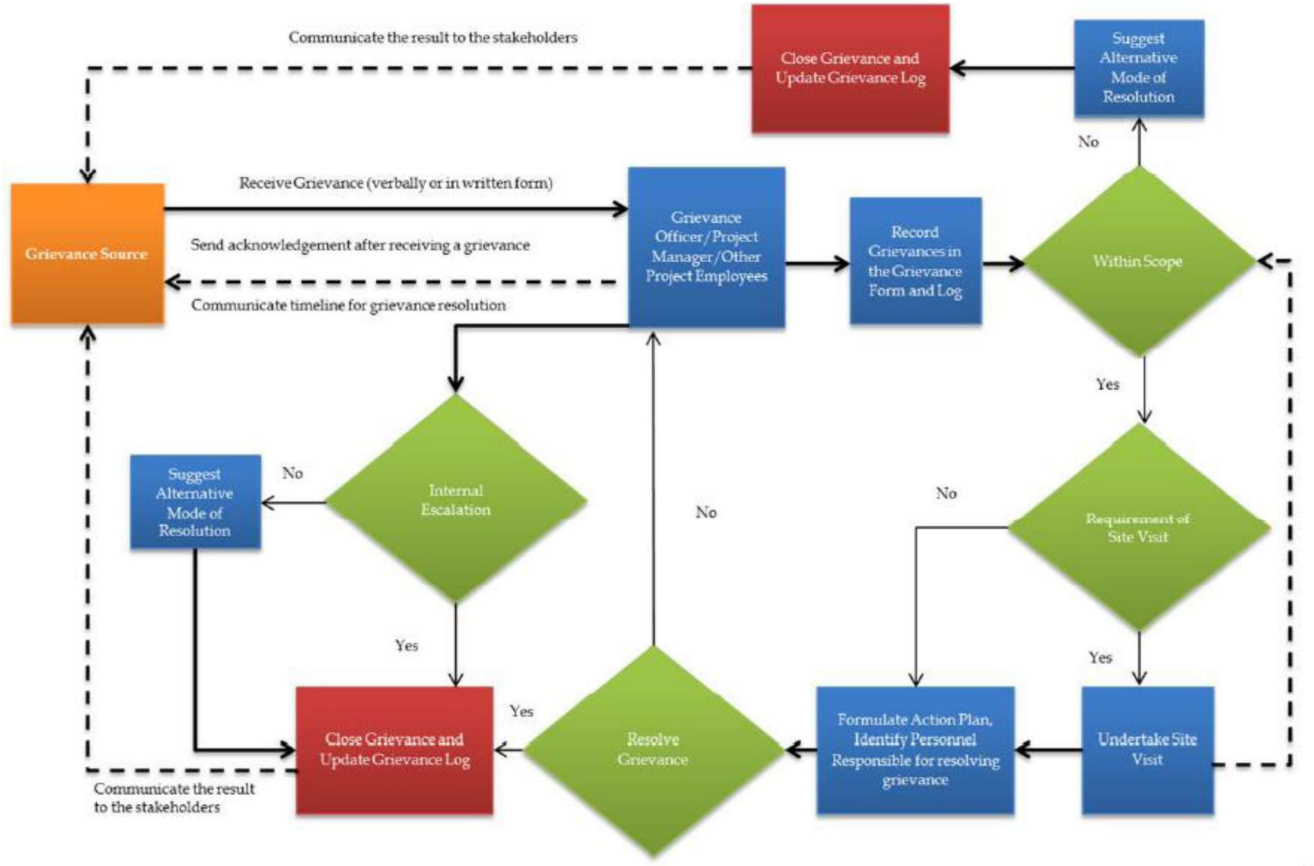
1. **Equity** – Aggrieved parties will have a chance to be heard even in situations that require them to write their complaints when some cannot write. The project will put in place mechanisms to allow proxies draft complaints for community members who cannot write.
2. **Transparency** – grievances or complaints will be dealt with openly before local leaders or other formal institutions with facts being disclosed as and when required without favour.
3. **Language** – the language of discussion in the process of handling grievances shall be that that is used by the community members namely, Kikuyu. When community members cannot read or write in this language, they will be assisted by the project to grasp what is written that affects them;
4. **Options** – parties to any dispute or any person with a grievance will be given options openly to follow customary procedures or formal procedures. If they begin with customary procedures and

are not happy with the outcomes, they will be allowed to proceed to formal processes. These options and courses of action will be made known to them beforehand; and

5. **Monitoring** – grievances and complaints will be monitored to have them settled within the shortest possible time. The project will facilitate the speedy resolution of grievances to the extent possible.

6.6.2 Grievance Procedures

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



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 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 follows:

This receipt is an acknowledgment of grievance registration by _____, a resident of village _____ on date_____. His/her Case number is _____ The date for the response is _____ **Full name& signature of recording person**_____

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

6.6.2.4 Site Inspection and Resolution

For the purpose of verifying and resolving the grievances received, site inspection may not be required in all cases. Depending upon the sensitivity of the issue, the requirement for a site inspection will be identified.

A site inspection will be undertaken by the project member assigned by the contractor's Environmental and Social officer. The purpose of the site inspection will be to check the validity and severity of the grievance.

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

6.6.2.5 Resolution, Escalation, and Closure

Based on the understanding thus developed, the Grievance Officer in consultation with the concerned departments, shall identify a suitable resolution to the issue. This could involve the provision of information to clarify the situation, undertaking measures to remedy actual problems or compensate for any damage that has been caused either by financial compensation or compensation in-kind, and introduction of mitigation measures to prevent the recurrence of the problem in the future. This resolution shall be accordingly communicated to the grievant within 10 working days of completing the site investigation.

Different resolution approaches include:

- ✓ Contractor/Ngandori-Nginda proposes a resolution;
- ✓ Contractor/ Ngandori-Nginda and the complainant jointly decide;
- ✓ Contractor/ Ngandori-Nginda 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 similar grievances.

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 Ngandori-Nginda. Monitoring will include:

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

6.6.4 Reporting of the GRM

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

7. ANALYSIS OF ALTERNATIVES

This chapter describes the various alternatives considered for the conceptual design stage of the proposed Ngandori-Nginda 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 Ngandori-Nginda. In addition, the project will increase water supply capacity to provide sufficient water to the population from the current 68% coverage. The proposed Ngandori-Nginda Project involves:

- Laying of DN63mm water pipeline for Kiambogo (rehabilitating by replacing existing line which experiences frequent leakages)
- Laying of DN90mm water pipeline for Mbukori (rehabilitating by replacing existing line which experiences frequent leakages and with cases of water theft).

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.

Embu County and specifically Ngandori-Nginda WSP has for a long time been struggling with cases of non-revenue water and theft through illegal connections; non-revenue water, which arises primarily from physical losses like leaks in aging infrastructure and systematic issues such as billing inaccuracies. Addressing these challenges is crucial for improving water utility efficiency and ensuring sustainable water supply to consumers. Further, illegal connections contribute significantly to water losses through the community irrigating Khat "miraa" farm using domestic water. The cultivation of "Khat" (miraa) consumes water, and illegal connections are sometimes used to irrigate these crops. This practice 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 Ngandori-Nginda 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 Ngandori-Nginda:** 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 construction of reservoirs and expansion of distribution pipes to support areas with inadequate water service will not proceed, hampering infrastructure development and modernization efforts in the region.

The 'No Action' alternative is therefore ruled out.

7.2 Alternative Water Source

7.2.1 Drilling Borehole

Drilling boreholes involves tapping into underground water sources. Once drilled and equipped, water is pumped to elevated storage tanks, from where it flows to user points via gravity. The distribution network and number of user points depend largely on borehole yields and other factors. In the context of Embu, specifically Kiambogo and Mbukori pipeline, boreholes yield insufficient water, unable to meet community needs. Considering boreholes as a viable water source was dismissed due to their high-cost relative to low yields, which would not adequately meet population demands. Moreover, boreholes require equipping, transmission pipelines, elevated storage tanks on suitable land, distribution pipelines, and user points (such as water kiosks or standpipes), making them a more expensive option compared to the preferred alternative.

Moreover, boreholes require ongoing maintenance and operational costs for pumps, water quality monitoring, and potential treatment of saline water, adding to their overall expense. Environmental impacts,

such as potential groundwater depletion or contamination, also necessitate rigorous assessment and management. Community consultation and regulatory compliance further complicate their implementation. Given these factors, alternative options like river-based pipelines are favored for their reliability, lower operational costs over time, and ability to meet larger water demands effectively.

7.2.2 Other Existing Rivers

The current water source is Rupingazi River supplying between 13,000m^3/day to 19,661m^3/day. At present, the Gandori-Ginda Water Union draws 9,000m3/day from the Rupingazi River, and EWASCO is also entitled to draw water up to 20,000m3/day. This River augments supply to nguviu irrigation project among many others. Among other rivers in the vicinity includes River Gicangari, River Gacuka and River Weru, all these three rivers are the tributaries of River Rupingazi and their discharge is low.

Considering alternative rivers (Gicangari, Gacuka, and Weru) which are tributaries of the Rupingazi River, their low discharge rates present significant challenges for water abstraction. The limited flow from these rivers, despite their proximity and connection to the main river system, renders them unsuitable for meeting the water demands of the project. The environmental impact assessment reveals that the lower discharge rates could potentially exacerbate environmental stress, affecting local ecosystems and biodiversity dependent on these water sources. Stakeholder consultations highlighted concerns from communities and environmental groups regarding the ecological implications of increased water abstraction from these already fragile river systems. Consequently, these factors collectively informed the decision to reject these alternative rivers as viable water sources in favor of maintaining the current abstraction from the Rupingazi River and exploring other sustainable options to meet water supply requirements 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 our project, alternatives such as concrete, cast iron, and copper were considered but ultimately rejected. Instead, we will exclusively utilize High-density polyethylene (HDPE) pipes. HDPE is chosen for its exceptional durability, corrosion resistance, and environmental benefits compared to traditional materials. Unlike galvanized steel, HDPE does not require a protective zinc coating, reducing maintenance costs and environmental impact while ensuring long-term reliability in diverse soil conditions. This decision aligns with current best practices in the industry, emphasizing sustainability and efficiency in water pipeline construction.

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

7.4 Alternative Project Route

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

By 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

This analysis compares the use of heavy machinery and manual labor for water pipeline installation, considering environmental, social, and economic factors.

a) **Use of Heavy machineries: -** This alternative involves using excavators, trenchers, and cranes for excavation, pipe laying, and backfilling, which results in rapid project completion. However, it generates high levels of air and noise pollution, soil compaction, and vegetation disturbance. It offers limited local employment opportunities and raises safety concerns near populated areas. Though highly efficient for large-scale projects, it requires skilled operators and regular maintenance.

b) **Use of manual labour: -** This alternative relies on local laborers using hand tools for construction, which extends the project timeline but significantly reduces air and noise pollution, minimizing the environmental footprint. It provides substantial local employment, enhancing community involvement and support. However, it requires safety training and is less efficient compared to machinery, making it suitable for smaller-scale projects or areas with limited machinery access.

For small-sized pipelines, manual labor is recommended due to its lower environmental impact, cost-efficiency, and community involvement. For larger-scale projects where time efficiency is crucial, a hybrid approach combining heavy machinery for major tasks with manual labor for finishing work is recommended.

8. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND MITIGATION MEASURES

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

8.1 Overview

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

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

8.2 Impact Types and Definitions

An impact is any change to a resource or receptor brought about by the presence of a Project component or by the execution of a Project related activity. The evaluation of baseline data provides crucial information for the process of evaluating and describing how the Project could affect the biophysical and socio-economic environment. Impacts are described according to their nature or type, as summarised in Table 23

Table 23: 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 as a consequence of the Project (e.g. in-migration for employment placing a demand on resources).
Cumulative impact	Impacts that act together with other impacts (including those from concurrent or planned future third-party activities) to affect the same resources and/or receptors as the Project.

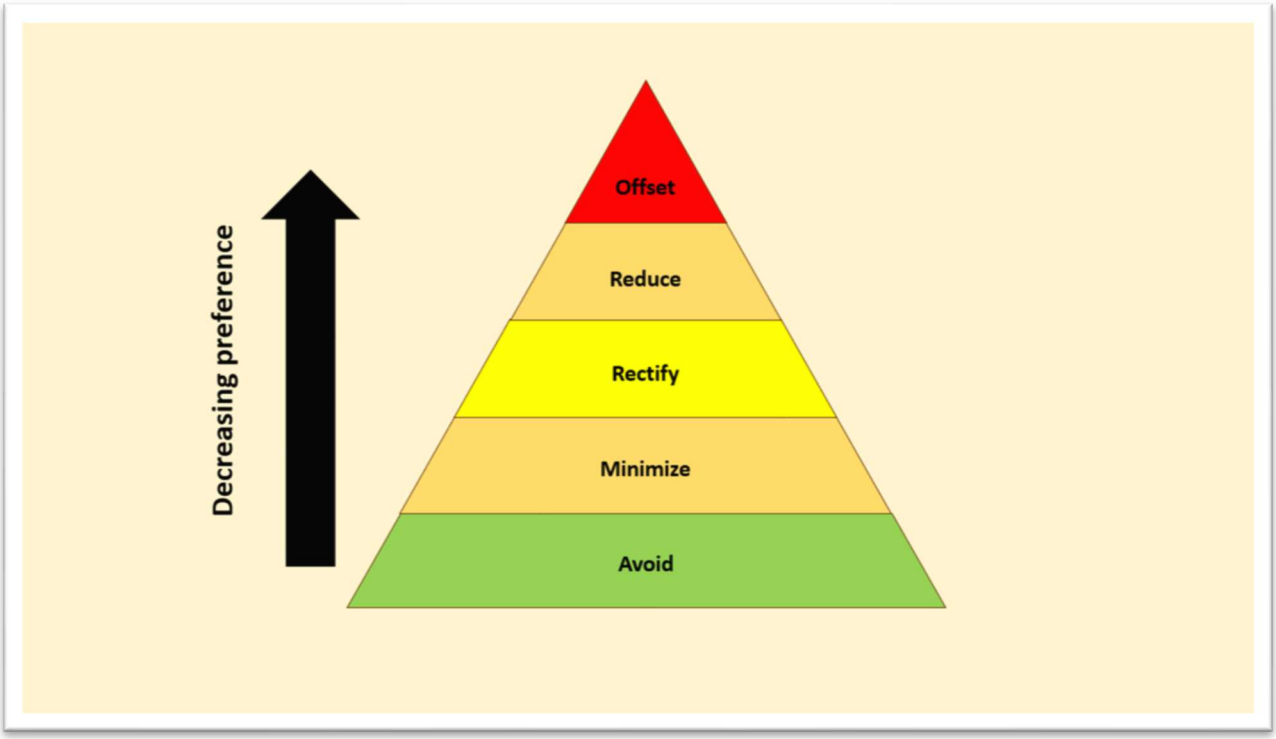
8.3 Mitigation Hierarchy

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

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

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

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



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

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

Rectify: - Rectification of an impact involves damage control, acknowledging that an impact has already occurred. Essentially, rectification allows the 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. Contractors 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 7 and Table 8

8.4 Sensitive Receptors Likely to be Impacted

The assessment has identified that while several sensitive receptors, such as schools, markets and communal water bodies are located within 200m to 500m of the proposed pipeline routes, the project alignment has been designed to avoid direct impacts on these receptors. Consequently, no businesses or structures will be affected, and no disruption to community activities is anticipated. However, potential indirect impacts, such as noise, dust, or temporary access challenges during construction, have been noted. Mitigation measures have been proposed to address these potential impacts to ensure the safety and well-being of all stakeholders.

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

8.4.1 Mbukori Pipeline Sensitive Receptors

The 2.2km pipeline of DN90mm HDPE pipe passes through a fairly built-up area with residences, schools, business premises, churches and farms. Table 24 overleaf presents receptors identified along the Mbukori-Karingari line. For a detailed analysis of the anticipated impacts to these receptors, please refer to the Impacts sections (Section 8.6 onwards).

Table 24: Sensitive Receptors along Mbukori Line

Type of Receptor	Number	GPS Coordinates	Name of the Receptor
Schools	2	0°28'7.96"S, 37°29'53.40"E	Mbukori primary School
		0°28'13.32"S, 37°29'59.67"E	St Joseph Mtetu Secondary
Vocational Centre	1	0°28'7.47"S, 37°29'51.66"E	Manyatta Technical and Vocational College
Church	1	0°28'16.92"S, 37°30'3.34"E	Mbukori ACK Church
Residential plots	Approx 86		

Note: The specific impacts to these receptors, including noise, dust, and health and safety concerns, are discussed in detail in this Impacts Chapter (Section 8.6 onwards).



Manyatta Technical



St. Joseph Secondary



Mbukori Primary School



Mbukori Centre

8.4.2 Kiambogo Pipeline

The 3km pipeline of DN63mm HDPE pipe passes through a fairly built-up residential area, adjacent tea buying centres and farms. Table 25 below presents receptors identified along the Kiambogo-Kamwove line.

Table 25: Sensitive Receptors along Kiambogo Line

Type of Receptor	Number	GPS Coordinates	Name of the Receptor
Tea Buying Centre	2	0°24'14.1"S 37°26'34.3"E	Kiambogo Tea Buying Centre to be affected
		0°24'35.8"S 37°26'43.3"E	Kamuove Tea Buying Centre
Residential plots	Approx 95		



Kiambogo Tea Buying Centre showing economic activities in the area



Tea leaves farm showing agricultural practices in the area



Kamuove Tea Buying Centre-illustrating economic activities in the area



Mount Kenya Forest/Nyayo Tea Zone bordering the start point

8.5 Positive Impacts

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

8.5.1 Construction Phase Positive Impacts

- Creation of Employment Opportunities

The commencement of project activities is anticipated to create job opportunities both for the skilled, semi-skilled and casual laborers. This will include employment opportunities for women. It will be necessary to put in place measure to maximise local recruitment potential and to prepare the local people to take advantage of these opportunities. Most of the interviewed persons are semi-skilled, while a smaller proportion is unskilled. The population of Kiambogo and Mbukori were observed to be primarily self-employed; mostly working in their team farms, Khat "miraa", boda-boda and small-scale retail shops. For the youth in the area, the majority are unemployed; some are engaged in informal temporary labour as and when opportunities arise. Construction phase activities will include site clearance, excavations, general construction, assembly, site security and site rehabilitation. The construction phase of the Project will create direct employment opportunities across different skills levels, from unskilled to highly skilled labour.

Analysis of Impact

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

Enhancement Measures: -

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

- *Injection of Money into Local Economy*

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

Analysis of Impact

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

Enhancement Measures: -

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

- *Skills Transfer*

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

Analysis of Impact

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

Enhancement Measures: -

- Implement structured on-the-job training programs for local artisans.
- Facilitate mentorship and knowledge-sharing sessions between experienced staff and local hires.
- Provide access to industry-standard tools and resources.

- *Increased Revenue Generation for National/County*

The project will contribute to the national kitty. The contractor will pay Value Added Tax (V.A.T) on purchasing materials for the project. The proponent will pay fees to NEMA, road agencies affected (Embu County Department of Roads, Transport and Public Works) 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: -

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

8.5.2 Operation Phase Positive Impacts

- *Improved and reliable water supply for the residents of Mbukori and Kiambogo*

The operational phase of the water pipeline project will deliver improved and reliable water access to residents of Mbukori and Kiambogo, ensuring consistent supply 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 increase supply of water.*

Increased water supply during the operational phase will enhance sanitation practices in Mbukori and Kiambogo, 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.

- *Improved Service Delivery*

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

Analysis of Impact

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

Enhancement Measures: -

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

- *Reduced Non-Revenue Water*

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

Analysis of Impact

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

Enhancement Measures: -

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

8.6 Negative Impacts

8.6.1 Construction Phase

ENVIRONMENTAL IMPACTS

8.6.1.1 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. However, this development will have minimal impact to the biodiversity because the vegetation cover along the Kiambogo line is minimal and the Mbukori line area is built up area with minimal coverage. Further, removal of vegetation and soil cover will be restricted to only those areas necessary for excavation work. In particular, 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					
			Unlikely		Likely		Definite	
			1		2		3	
MAGNITUDE	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Clearly demarcate construction zones to restrict vegetation clearance to only those areas essential for the pipeline installation.
- Implement selective clearing to avoid the unnecessary removal of significant or mature vegetation.
- Replant native vegetation in disturbed areas immediately after construction to facilitate rapid ecological recovery.
- Give chance to affected community to harvest the targeted vegetation that are within the raw water mains if they so wish

Impact Significance After Mitigation

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

8.6.1.2 Impacts on Water Quality

Rupingazi River is the primary surface water body within the project site's footprint, with additional streams and seasonal rivers (Gicangari, Gacuka and Weru River) also identified along the proposed water transmission route. 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 pipeline to the seasonal streams is far, hence moderate impact significance.

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

Mitigation Measures

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

Impact Significance After Mitigation

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

8.6.1.3 Soils and geological disturbance

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

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

The pipeline route includes sections with varying slopes and gradients, especially for Kiambogo 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 in the short term, and severity will be medium considering that the site doesn't experience rainfall to suppress soil/dust emission. Likewise exposed soil due to clearance of vegetation is highly susceptible to wind erosion, thus leading to moderate impact significance.

SIGNIFICANCE						
			LIKELIHOOD			
			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

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

Impact Significance after Mitigation

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

SIGNIFICANCE								
			LIKELIHOOD					
			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

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

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

During the construction phase, the main sources of air pollution for the two 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 construction equipment and machinery are expected to include CO2, NO2, SO2 and volatile organic compounds, since most of them will be powered by diesel/ petrol engines. However, these will be in very small quantities since light construction activities are expected, mainly associated with the pipeline excavation.

Given the location of the proposed Project Site (Mbukori and Kiambogo) 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 health centres and schools.

Analysis of Impact

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

Impact significance before mitigation

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

SIGNIFICANCE								
			LIKELIHOOD					
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 construction vehicles to a speed of 30 km/h or less on the site and on the access roads to the site;
- Ensure construction equipment and machinery are well-maintained to minimize emissions;
- Install and properly maintain exhaust emission control devices, such as diesel particulate filters (DPF) and selective catalytic reduction (SCR) systems, on diesel-powered machinery to minimize emissions of particulate matter and nitrogen oxides.

Impact Significance after Mitigation

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

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

8.6.1.5 Noise and Excessive Vibration Generation

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

Analysis of Impact

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

Impact significance before mitigation

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

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

Mitigation Measures

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

Impact Significance After Mitigation

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

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

8.6.1.6 Waste Generation

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

Analysis of Impact

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

Impact significance before mitigation

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

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

Mitigation Measures

- Provide litter collection facilities such as bins and create awareness campaigns to segregate as early as possible, using the appropriate bins
- Temporary storage in stock piles for further use on site or removal;
- Evaluate the suitability of spoil for non-critical backfilling or landscaping within the project area where permissible;
- Ensure pipe cuts are returned to the store for future use;
- Develop a spoil management plan to identify opportunities for reuse, recycling, or proper disposal of excavated materials based on site-specific conditions;

- Store spoil in designated areas with secure covers or enclosures to prevent dispersion and minimize visual and environmental impacts;
- All personnel shall be instructed to dispose of all waste in a proper manner;
- Ensure spoil from excavations is arranged according to the various soil layers. This soil can then be returned during landscaping and then rehabilitation, in the correct order which they were removed that is topsoil last.

Impact significance after mitigation

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

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

8.6.1.7 Occupational Health and Safety Impacts Concerns

Health and Safety risks for the community and workers are often triggered by Project activities during Project implementation Phase. These risks often affect both workers on site as well as general community near the work site. Inherent occupational risks include muscular-skeletal injuries, falls into un-marked/ uncovered trenches and accidents from construction vehicles. During the construction of the proposed project, it is expected that construction workers are likely to have accidental injuries because of accidental occurrences, neglect of the use of protective gears among others. Accidents may also occur to members of public, and livestock from trenches left open.

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

While the operation of construction equipment and handling of materials can result in injuries to the workers especially in the absence of appropriate protective devices. The health of the site workers may be further compromised by the food that is often supplied by mobile individuals with no licenses to handle food and some of the foodstuffs may be prepared in unhygienic manner.

Labour and working conditions: labour and working conditions, including occupational health and safety, 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 and operation. 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 and construction equipment. Workers or bystanders may accidentally fall into open trenches, leading to injuries.

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

Analysis of Impact

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

Impact Significance Before Mitigation

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

SIGNIFICANCE					
			LIKELIHOOD		
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 start working;
- Strict use of warning signage and tapes where the trenches are open and at other active construction sites;
- Maintain adequate spacing of at least 2mbetween workers during excavation to prevent accidental injuries
- Ensure there are sufficient, visible danger-sign posts put up at the site to warn passers-by or workers of potential accidents or incidents;
- Establish a safe working environment with an occupational health and safety (OHS) plan that addresses potential hazards, identifies preventive and protective measures, including training and use of personal protective equipment (PPE), and describes documentation and reporting of accidents, diseases and incidents;
- All construction workers will be required to PPE i.e. helmets, gloves and safety boots during the construction phase;
- Provide shaded rest areas and ensure workers have access to ample drinking water. Schedule work to avoid peak heat periods;
- Ensure all hand tools are inspected daily to confirm they are in good working condition and free from defects.

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 Mbukori and Kiambogo pipeline will be outsourced to an independent contractor who might opt to use vehicles/machineries to save on time and ease the task. The term 'vehicles' include cars, vans, 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. Turning off Vehicles
iv. Visibility
v. Signs and Instructions

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	Low	Likely	Medium	Temporary

Impact significance before mitigation

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

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

Mitigation Measures

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

Impact significance after mitigation

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

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

8.6.1.9 Community Health and Safety Concerns

In scenario where the contractor will be using machineries, increased traffic and machinery use near schools and shops raise the risk of accidents involving children and other community members; this is possible for the case of Mbukori pipeline which is fairly built and with learning institutions along the pipeline route. For Kiambogo pipeline which has rural set up, construction activities may pose risks to livestock, including potential injuries from open trenches or machinery. Further, lack of proper barriers may allow livestock, school going children and the local populace to wander into construction areas, increasing the risk of accidents

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

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

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

Analysis of Impact

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

Impact Significance Before Mitigation

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

Mitigation Measures

- Inform the community in advance about construction schedules, road closures, and alternative routes through meetings, leaflets, and local media;
- Excavation, pipe-laying, and backfilling will be conducted on the same day where feasible to minimize exposure from open trenches;
- Install clear and visible warning signs around the construction site indicating potential hazards, construction zones, and restricted areas;
- For Mbukori pipeline, coordinate with nearby schools to schedule construction activities that avoid peak times for school arrivals and departures;
- Temporary access ramps will be provided across open trenches at key access points to maintain mobility and safety;
- All chambers will be promptly covered to prevent accidents and unauthorized access;
- Ensure that access routes for emergency vehicles are always kept clear and accessible;
- Immediate backfilling will be prioritized at access points to residential areas and other sensitive receptors to reduce disruption.

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

SOCIAL IMPACTS

8.6.1.10 Spread of HIV/AIDS and STIs

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

Analysis of Impact

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

Impact Significance Before Mitigation

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

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

Mitigation Measures

- The contractor will undertake sensitization of the HIV /AIDs AND STD awareness e.g. by use of posters etc.
- Encourage workers to go for HIV voluntary counselling, testing and referral services.
- Contractor to institute HIV/AIDS awareness program and implemented as part of the Health and Safety Management Plan targeting both workers and the local community.
- The Contractor shall institute HIV/AIDS awareness and prevention campaign amongst his workers for the duration of the contract.

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 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

8.6.1.11 Increase in cases of Gender Based Violence

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

Analysis of Impact

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

Impact Significance Before Mitigation

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

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

Mitigation Measures

- Proponent to develop and enforce a comprehensive policy against GBV, SEA, and SH that includes zero-tolerance principles.
- Contractor will implement the approved code of conduct that has provisions in addressing GBV/SEA/SH.
- Conduct regular awareness sessions for all project staff, emphasizing respectful behavior, and the consequences of GBV, SEA, and SH.
- Implement transparent and fair recruitment practices to prevent instances where job seekers may be coerced into providing sexual favors.
- Ensure that recruitment processes are gender-sensitive, promoting equal opportunities for all.

- Engage with community leaders, women's groups, and local authorities to raise awareness about GBV, SEA, and SH.
- The contractor to prepare a GBV/SEA/SH action plan that will guide implementation of GBV mitigations.
- All workers will be inducted and sign the code of conduct before deployment to the work station.
- All GBV, SEA, and SH allegations and cases will be reported promptly to relevant authorities.
- The contractor will establish and maintain adequate referral mechanisms to address cases of Gender-Based Violence (GBV) reported at the community level related to project implementation.

Impact Significance After Mitigation

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

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

8.6.1.12 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 Mbukori and Kiambogo attend school regularly and child labor is not prevalent, making the risk of child labor associated with the project to be low. However, it's essential to remain vigilant and have measures in place to prevent any potential risks.

Analysis of Impact

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

Impact Significance Before Mitigation

Children in the project area are fully engaged in schooling and child labor is not prevalent. There is a 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 supporting 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 addressed. Additionally, the project's positive economic contributions, including job creation and local economic development, are expected to bolster community resilience and stability. Nonetheless, given the project's small-scale nature and limited workforce requirements, the likelihood of significant disruption to the community's social dynamics is minimized.

Analysis of Impact

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

Impact Significance Before Mitigation

Children in the project area are fully engaged in schooling and child labor is not prevalent. There is a 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 Sexual Exploitation and Abuse (SEA) and Sexual Harassment

Sexual harassment against women might also happen because of mixing of women and men at the construction site. Further, there is the possibility of sexual exploitation of children, especially young girls. This impact may be committed by Project staff against communities and represents a risk at all stages of the Project, especially when employees and community members are not clear about prohibitions against SEA in the Project.

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

Analysis of Impact

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

Impact Significance Before Mitigation

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

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

Mitigation Measures

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

Impact Significance After Mitigation

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

8.6.1.15 Impacts of Archaeological and cultural heritage

The construction of the Mbukori and Kiambogo water supply pipelines presents potential risks to archaeological and cultural heritage, especially during groundworks and excavation. These activities could

damage cultural remains and alter the landscape, affecting the setting of heritage sites. A thorough impact assessment is essential to predict these effects and implement mitigation strategies.

The assessment considered both tangible and intangible cultural heritage, including burial grounds, religious and ritual sites, archaeological artifacts, oral traditions, cultural landscapes, and medicinal plants. These elements are vital to the local cultural identity.

The assessment revealed no significant cultural sites or features within the project's area of influence (AOI), and no historical events or cultural activities are associated with the area. Based on consultations, the cultural heritage sensitivity was found to be low, with minor impacts, meaning 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	Likely	Moderate	Temporary

Impact Significance Before Mitigation

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

SIGNIFICANCE					
		LIKELIHOOD			
		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

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

Impact Significance After Mitigation

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

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

8.6.1.16 Interruption of Existing Infrastructure and Services

The pipeline route for Mbukori traverses an existing road reserve and will intersect both the tarmacked Runganga-Kivwe Road and the unpaved Mbukori-Runganga feeder road. For the Kiambogo line, while the road infrastructure is not paved, any crossings will still result in traffic disruptions. Additionally, construction activities will 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 pipeline construction will cause local, short-term traffic disruptions and interruptions in water supply services, with high intensity and major significance. These impacts are likely but temporary, affecting daily activities and businesses. Mitigation measures are essential to minimize these disruptions and ensure prompt service restoration.

SIGNIFICANCE					
		LIKELIHOOD			
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 Risk of Soil Erosion

During the operational phase, the project activity that will cause a reduction in water quality is periodic repairs which might result in soil spoil. Earth material excavated during repair and maintenance of the pipeline may be carried away by wind and surface water run-off. Excavated soils could be swept into surface water bodies by storm water floods during rains, potentially leading to sedimentation in nearby water bodies such as rivers and streams. This sedimentation can degrade water quality, disrupt aquatic ecosystems, and increase the operational burden on downstream water treatment facilities. Additionally, erosion along the pipeline route, exacerbated by vegetation removal and soil disturbance during maintenance, can compromise the stability of the pipeline infrastructure. To mitigate these risks, it is crucial to implement robust erosion control measures

Analysis of Impact

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

Impact Significance Before Mitigation

The impact is likely to occur and would have **high** intensity if it occurs. Therefore, the overall significance of the impact, before any mitigation measures are implemented, is considered **major**.

SIGNIFICANCE						
			LIKELIHOOD			
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 construction activities to restore ground cover and reduce erosion risks.
- Conduct maintenance activities during dry periods when soil is less susceptible to erosion and avoid operations during heavy rainfall or storm events.

- Implement a schedule for regular inspections of erosion control measures and pipeline integrity to promptly address any issues and ensure effectiveness.

Impact Significance After Mitigation

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

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

8.6.2.2 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 Non-Revenue Water (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 water utilities 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	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 a proactive maintenance schedule to inspect pipelines regularly for signs of wear, corrosion, or potential weaknesses that could lead to bursts.
- Install and maintain advanced leak detection systems along the pipeline network.
- Optimize pressure levels within the pipeline system to reduce stress on pipes and fittings, thereby lowering the likelihood of bursts.
- 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 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	

SOCIAL IMPACTS

8.6.2.3 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 Non-Revenue Water (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 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

8.6.2.4 Risk of Sexual Exploitation and Abuse by project workers

During the operation phase of a pipeline project, the risk of sexual exploitation and abuse by project workers against the community members is a serious concern that requires careful consideration and proactive measures. This risk arises due to several factors inherent in water projects and the interactions between project personnel and local communities: Project workers, often in positions of authority or influence, may exploit power differentials between themselves and community members, particularly vulnerable groups such as women, children, and marginalized populations.

Analysis of Impact

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

Impact Significance Before Mitigation

The impact is likely to occur and would have high intensity if it occurs. Therefore, the overall significance of the impact, before any mitigation measures are implemented, is considered major.

SIGNIFICANCE					
			LIKELIHOOD		
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 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

8.6.2.5 Wayleave Encroachment

Wayleave encroachment presents a critical concern for the proposed water pipeline projects in Mbukori and Kiambogo. Defined as the unauthorized use or occupation of designated infrastructure corridors, such activities pose significant risks to project integrity and community welfare. Encroachment not only violates legal and regulatory standards but also threatens the operational functionality of the water supply systems. Potential consequences include infrastructure damage, service disruptions, and environmental impacts such as soil erosion and water contamination. To mitigate these risks, the ESIA recommends robust monitoring protocols, community engagement initiatives to raise awareness, strict enforcement of legal agreements, and the development of contingency plans for rapid response to encroachment incidents. These measures aim to safeguard infrastructure integrity, ensure regulatory compliance, and maintain positive stakeholder relations throughout the project lifecycle.

Analysis of Impact

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

Impact Significance Before Mitigation

The impact is likely to occur and would have High intensity if it occurs. Therefore, the overall significance of the impact, before any mitigation measures are implemented, is considered major.

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

Mitigation Measures

- Mapping and installation of beacons to which illustrate the width of the pipeline reserve.
- Regular patrol of the pipeline corridor for encroachment.
- Conduct outreach programs to educate local communities about the importance of preserving the designated corridor and the consequences of encroachment.
- Prosecution of encroachers as required by County By-Laws on wayleaves and road reserves maintenance.
- Provide marker posts along the pipeline corridor to clearly demarcate the boundaries and discourage encroachment.
- Conduct joint public sensitization programs with other utility service providers and road authorities to educate the community on the importance of not interfering with wayleaves and public reserve land.

Impact Significance After Mitigation

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

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

8.6.3 Decommissioning Phase

The decommissioning of water supply infrastructure requires a strategic and practical approach to ensure the continued provision of essential services to the community. It is crucial to recognize that the complete removal of a pipeline without a replacement or upgrade would not be feasible or sustainable. Instead, the decommissioning process will focus on rehabilitation through upgrading or replacing the existing pipeline infrastructure.

8.6.3.1 Utilization of Contaminated Sources

In the absence of a reliable potable water supply from the pipeline, communities may resort to using contaminated or untreated water sources. This poses significant health risks, particularly in areas where

waterborne diseases are prevalent. Access to safe drinking water is essential for public health, and the use of contaminated sources can lead to outbreaks of diseases such as cholera, typhoid, and dysentery, placing additional burdens on local healthcare systems.

Analysis of Impact

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

Impact Significance Before Mitigation

It is high likely that the local community will utilise contaminated water directly from the river. The intensity is graded high making the impact significance major.

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

Mitigation Measures

- Establish temporary water supply points with safe water tanks or truck deliveries.
- Implement regular monitoring and testing of alternative water sources.
- Conduct public awareness campaigns on the risks of contaminated water.
- Upgrade existing water supply systems and repair communal water points.
- Distribute affordable household water treatment options (e.g., chlorine tablets, ceramic filters).

Impact Significance After Mitigation

The significant impact after mitigation is expected to reduce from major to moderate as indicated below

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

8.6.3.2 Impact on Livelihoods and Well-being

Access to reliable clean water is fundamental to sustaining livelihoods and ensuring the well-being of communities. Agriculture, a critical sector in both Mbukori and Kiambogo, relies heavily on adequate water supplies for irrigation and livestock. Reduced availability can jeopardize crop yields, livestock health, and overall food security. Additionally, inadequate water access affects sanitation facilities, compromising hygiene standards and increasing the risk of water-related illnesses.

Analysis of Impact

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

Impact Significance Before Mitigation

It is high likely that the local community will be greatly impacted due to effect on sanitation and overall health. The intensity is graded high making the impact significance major.

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

Mitigation Measures

- Implement water storage solutions like reservoirs or tanks to ensure continuous supply for irrigation.
- Provide community education on efficient water use practices for livestock watering.
- Mobilize government and NGO resources to provide financial support for water infrastructure projects.
- Collaborate with local stakeholders to implement long-term water management strategies and policies.

Impact Significance After Mitigation

The significant impact after mitigation is expected to reduce from major to moderate as indicated below

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

8.6.3.3 Increased Competition for Water Resources

When a water pipeline is decommissioned, communities that previously relied on it faces a sudden shortage of accessible, clean water. This scarcity can trigger heightened competition among residents, agricultural interests, and industrial users for alternative water sources. In densely populated areas like Mbukori, where the pipeline serves multiple sectors including schools, shops, and households, the cessation of supply can lead to immediate pressures on nearby water resources.

Further, the cessation of water supply from the pipeline often precipitates conflicts over water access and rights. Disputes may arise between different community groups, businesses, and even neighboring villages as they vie for limited water resources. In the rural setting of Kiambogo, where water is crucial for agricultural activities and household use, disputes could potentially disrupt community cohesion and strain local governance structures.

Analysis of Impact

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

Impact Significance Before Mitigation

With Rupingazi river as the main source and small feeder stream (Gacuka, Weru & Gicangari) It is high likely that the local community will compete on use. 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

- Develop and implement comprehensive water management plans that prioritize equitable distribution of water among different users, including households, agriculture, and industry.
- Identify and develop alternative water sources such as groundwater wells, desalination plants (if feasible), and treated wastewater reuse systems.
- Implement emergency water supply measures, such as mobile water tanks or truck deliveries, to mitigate immediate shortages during the transition phase.
- Conduct outreach programs to educate communities about water conservation, sustainable use practices, and the importance of equitable water sharing.
- Facilitate inclusive dialogue and consultation among all affected stakeholders, including community groups, businesses, and local authorities.
- Establish transparent and fair water allocation systems that prioritize essential needs such as drinking water, agriculture, and sanitation.
- Promote community-based water management initiatives that empower local communities to participate in water resource planning and governance.
- Develop formal and informal mechanisms for resolving water-related disputes, including mediation, arbitration, and community-led conflict resolution processes.

Impact Significance After Mitigation

The significant impact after mitigation is expected to reduce from major to moderate as indicated in the Table below.

SIGNIFICANCE					
			LIKELIHOOD		
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

8.6.3.4 Loss of Revenue for the WSP

For a WSP like Ngandori-Nginda, which relies on water supply services as a primary revenue stream, the decommissioning of a pipeline can lead to a sudden loss of income. Revenue typically generated from water

tariffs and service fees may decrease or cease entirely, impacting the financial sustainability of the WSP. This loss can disrupt operational budgets, hinder investment in infrastructure upgrades, and potentially affect the WSP's ability to maintain service quality and expand coverage to underserved areas.

Analysis of Impact

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

Impact Significance Before Mitigation

With decommissioning of the two pipelines (Mbukori and Kiambogo) It is high likely that the Ngandori-Nginda will lose revenue generated from water service provision. 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

- Review and adjust water tariffs or service fees to reflect the actual cost of service provision and ensure financial sustainability.
- Allocate funds for essential infrastructure upgrades, repairs, and maintenance to enhance service reliability and operational efficiency.
- Prioritize essential expenditures and explore cost-saving measures to optimize operational efficiency'.

Impact Significance After Mitigation

The significant impact after mitigation is expected to reduce from major to moderate as indicated in the Table below.

SIGNIFICANCE					
			LIKELIHOOD		
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

8.6.3.5 Loss of Employment Opportunities

Water pipeline projects often support local employment opportunities through various roles such as maintenance technicians, meter readers, customer service representatives, and administrative staff. The decommissioning phase may result in job losses or reduced employment opportunities within the WSP and associated service industries. This can have broader socio-economic consequences, particularly in communities where the WSP is a major employer or where job opportunities are limited.

Analysis of Impact

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

Impact Significance Before Mitigation

With decommissioning of the two pipelines (Mbukori and Kiambogo) It is high likely that people working with the Ngandori-Nginda will lose their jobs. The intensity is graded high making the impact significance major.

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

Mitigation Measures

- Offer retraining programs and skill development initiatives to enhance the employability of affected workers in new sectors or emerging industries.
- Facilitate job placement services, career counseling, and networking opportunities to assist displaced workers in finding new employment opportunities.

Impact significance after mitigation

The significant impact after mitigation is expected to reduce from major to moderate as indicated below

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

8.6.3.6 Waste Generation

The decommissioning process typically involves the removal of pipelines, fittings, and associated infrastructure that are no longer in use. These materials, predominantly composed of non-corrosive materials such as HDPE (High-Density Polyethylene), contribute to the overall waste generated. Depending on the project scale, this can range from a few tons to substantial amounts of material. Additionally, excavation activities during decommissioning generate spoil—earth, rocks, and other materials—that must be managed responsibly. Proper handling and disposal are crucial to prevent soil erosion, contamination of water sources, or impacts on local ecosystems.

To minimize environmental and social disturbances, the decommissioned UPVC pipelines will be left in place. This approach reduces waste generation, prevents unnecessary excavation impacts, and avoids disruptions to local communities. Their locations will be documented for future reference.

Analysis of Impact

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

Impact Significance Before Mitigation

With decommissioning of the two pipelines (Mbukori and Kiambogo) It is high likely that waste will be generated from retrieved pipes, fittings, spoil materials etc. The intensity is graded high making the impact significance major.

SIGNIFICANCE					
		LIKELIHOOD			
		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

- Careful dismantling to ensure materials remain as re-usable as possible.
- Prioritize the recovery and recycling of decommissioned materials such as HDPE pipes and fittings.
- Assess the feasibility of reusing decommissioned infrastructure components, such as pipelines or fittings, in other construction projects or applications.
- Plan excavation activities carefully to minimize the amount of spoil generated during decommissioning.
- Cleaning and proper site rehabilitation by adhering to a NEMA approved Decommissioning plan.

Impact significance after mitigation

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

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

8.6.3.7 Visual Intrusion

The decommissioning phase of a water pipeline project can significantly impact the visual landscape of the affected area. Activities such as the excavation of old pipelines, removal of infrastructure, and presence of heavy machinery can create a temporary eyesore, disrupting the natural and built environment's aesthetics. In areas like Mbukori and Kiambogo, where the community takes pride in their surroundings, such visual disturbances can be particularly concerning. The presence of debris, spoil heaps, and construction barriers can detract from the local scenery, potentially affecting tourism, local businesses, and overall community satisfaction. Moreover, the visual disruption can lead to negative perceptions of the project, causing unrest among residents and stakeholders. Addressing these concerns through effective mitigation measures is essential to maintain community relations and ensure minimal long-term visual impact.

Mitigation Measures

- Plan 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.

8.6.4 Cumulative Impacts

Cumulative impacts arise when the effects of a project combine with those of other ongoing, past, or planned activities in the same area, potentially leading to significant effects on shared resources or receptors. While individual project impacts may be minor, their combined effect could be significant. To assess cumulative impacts, the following key environmental components (VECs) were considered:

- 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 considered a 10 km zone around the project area and a time frame of 10-20 years. Potential cumulative impacts from past, ongoing, and future projects were identified through public consultations, discussions with local authorities, and consultations with government agencies. These include:

- Ongoing agricultural activities
- Implementation of the Kibugu Nguviu Irrigation Scheme
- Expansion of tea farming and other agricultural practices, along with community-driven water projects in Kiambogo
- Development of small-scale commercial activities, improvements in community water supply systems, and expansion of Khat (miraa) farming
- Construction of ECDE Centres in Kiambogo
- Construction of Kiambogo-Kianjura Road
- Tarmac of Kivwe – Karurina

Projects with no official schedule but located near the project's right-of-way were also considered. Ongoing communication with these projects will be maintained to update the cumulative impact assessment and adjust mitigation measures as necessary.

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

Table 26: Evaluation of Cumulative Effects on VECs

Potentially Affected VECs	Environmental/Social Impacts
Water Resources (quantity)	The cumulative demand for water from the Mbukori and Kiambogo projects, along with the Kibugu Nguviu Irrigation Scheme, 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 (including from Khat farming in Mbukori) 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 Khat (miraa) farming in Mbukori and tea farming in Kiambogo, can lead to runoff into water bodies. This can result in nutrient pollution (eutrophication) and contamination of water resources, posing risks to human health and ecosystems.
	On the positive side, improved water infrastructure and irrigation could boost agricultural productivity and create new business opportunities.

Cumulative Impacts Synergies:

Synergies:

- Enhanced Agricultural Productivity: Improved water infrastructure can lead to better irrigation, enhancing agricultural productivity and supporting local businesses, including Khat farming in Mbukori.
- Collaborative Resource Management: Projects can collaborate to manage water resources more effectively, sharing benefits and reducing competition.

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.

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 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 Mbukori and Kiambogo water pipeline projects, along with the Kibugu Nguviu Irrigation Scheme 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

The Ngandori-Nginda Water Service Provider (WSP) project aims to enhance water supply and infrastructure in Kiambogo and Mbukori, Embu County. A Climate Risk Vulnerability Assessment (CRVA) was conducted as part of the Environmental and Social Impact Assessment (ESIA) to identify and assess climate change risks, focusing on their potential impact on project activities and the region's vulnerability.

assessment utilized climate data from the World Bank's Climate Change Knowledge Portal (CCKP), which provides scientific climate information to help evaluate vulnerabilities and risks for specific projects. This data is processed by reputable organizations including the National Center for Atmospheric Research and the European Space Agency.

8.7.1 Climate Change Context

Climate Risks Identified

- **Droughts: -** Drought conditions are usually triggered by a lack of precipitation and high temperatures facilitating evapotranspiration. Extreme weather events especially those associated with drought and erratic rainfall have disrupted livelihood patterns triggering major socio-economic and environmental upheavals. In Embu County these disruptions have been the key source of vulnerability for different categories of community members, their lives and livelihoods.
- **Extreme Precipitation and Pluvial Flooding:** - Under the influence of climate change, precipitation regimes are likely to change overall, but a great variability remains among the different climate models. Increased frequency and intensity of extreme weather events (e.g., floods, storms) could impact pipeline infrastructure consequently, designing infrastructure to withstand extreme weather events and changing hydrological conditions.

The amount of daily sunlight received in Embu varies seasonally, ranging from 6.6 kWh to 7.5 kWh due to factors such as day length, sun elevation, and cloud cover. According to the climate change assessment for Embu County, temperatures are expected to rise by 0.4ºC by the early 2040s. Significant changes are also projected for rainfall patterns: a decrease of 0.7% is anticipated during the first wet season, while the second wet season could see a notable increase of 19%. This information is illustrated in Figure 10 below, depicting the geographic distribution of rainfall across the county[4].

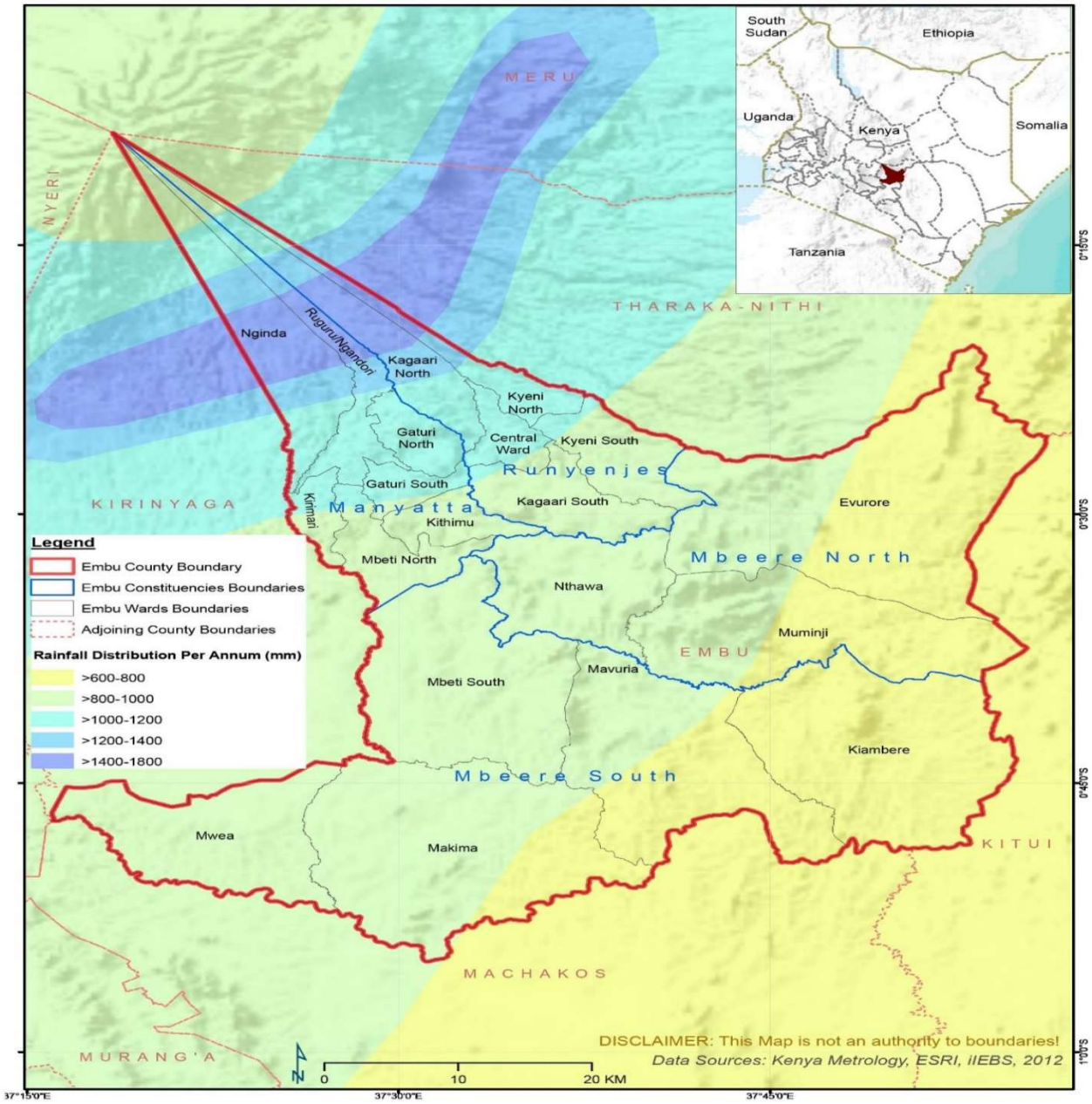


Figure 10: Embu County Rainfall Distribution

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

8.7.1.1 Historical Climate Data

- **Temperature:** Embu County has experienced a 1.5°C increase in temperature over the last 50 years. The hottest months (February and March) have average maximum temperatures of 30°C, while the coolest months (July and August) drop to 15°C.
- **Precipitation:** The average annual rainfall in Embu County has decreased by about 10% over the last 50 years. Rainfall has become more variable, with reduced rainfall in both the long rains (March-May) and the short rains (October-December).
- **Extreme Events:** There has been an increase in the frequency of extreme weather events such as droughts (severe in 2021-2022) and heavy rainfall leading to flash floods. These events have caused significant damage to infrastructure, including roads and water systems.
    - There has been an increase in the occurrence of heavy rainfall events, leading to flash floods. These events are typically concentrated in the short rainy season and have caused significant damage to infrastructure, including roads and water systems

8.7.1.2 Future Climate Projections

- **Temperature:** By 2050, temperatures in Embu County are projected to rise by 2-3°C, with more warming expected during the dry seasons, exacerbating heat stress and evaporation.
- **Precipitation:** Annual rainfall will likely become more variable. The long rains may see a reduction in total rainfall, while the short rains could become more intense, affecting agricultural planning and water management.
- **Extreme Events:** There is a projected increase in the frequency and intensity of extreme weather events, including droughts and heavy rainfall.

8.7.2 Vulnerability Assessment

8.7.2.1 Key Project Components Affected by Climate Change

- **Water Sources:** Dependent on precipitation and temperature, surface and groundwater sources are sensitive to changes. Reduced flow rates and increased turbidity from heavy rainfall events have impacted water supply reliability.
- **Infrastructure:** Pipelines, storage tanks, and treatment facilities are vulnerable to extreme weather and temperature fluctuations.

8.7.2.2 Sensitivity and Exposure

- **Water Sources:** Highly sensitive to reduced rainfall and increased evaporation.
- **Infrastructure:** Moderate sensitivity, with high exposure in flood-prone areas.
    - ✓ **Flood-Prone Areas:** Infrastructure in flood-prone zones is highly exposed to risks of flooding, causing potential damage to pipelines and treatment plants.
    - ✓ **Landslides and Erosion:** Heavy rainfall could cause landslides and erosion, undermining infrastructure stability.
    - ✓ **Heat Waves:** Prolonged heat can increase thermal stress on materials used in construction.

8.7.3 Risk Identification and Analysis

8.7.3.1 Potential Risks

- **Water Shortages:** Decreased rainfall and higher evaporation rates pose risks of water shortages, especially in dry periods.

- ✓ The water sources in Embu County, including rivers, streams, and groundwater, are highly sensitive to changes in rainfall patterns. Reduced rainfall directly affects the recharge rates of these sources, leading to lower water availability during dry periods.
- ✓ Higher temperatures increase the rate of evaporation from surface water bodies, further reducing the available water. This is particularly critical during dry spells when water demand is high but supply is limited

- **Infrastructure Damage:** Heavy rainfall and floods could damage pipelines and treatment facilities.
  - ✓ Infrastructure such as water pipelines, storage tanks, and treatment plants are moderately sensitive to extreme weather events. Heavy rainfall and floods can cause physical damage, while prolonged dry spells can lead to increased demand and strain on infrastructure.
  - ✓ Climate change can exacerbate maintenance challenges by increasing the frequency of extreme weather events that damage infrastructure, requiring more frequent repairs and upgrades

8.7.3.2 Risk Analysis

Likelihood and Severity:

- Water shortages: Likely (4/5), Severe (4/5)
  - ✓ The region of Embu County has already experienced a significant decrease in average annual rainfall and an increase in the frequency of droughts. With future climate projections indicating more variable rainfall and higher temperatures leading to increased evaporation, the likelihood of water shortages is **high**. The dependency on rainfall for water sources such as rivers, streams, and groundwater make the region particularly vulnerable to fluctuations in precipitation. Consequently, water shortages have severe implications for the Ngandori-Nginda WSP project and the communities it serves. Reduced water availability can lead to insufficient water for household use, impacting hygiene and health and potential conflicts over water resources.
- Infrastructure damage: Possible (3/5), Moderate (3/5)
  - ✓ The infrastructure associated with the Ngandori-Nginda WSP project, including pipelines, storage tanks, and treatment facilities, is exposed to various climate risks. The likelihood of damage is **moderate**, given the current frequency and intensity of extreme weather events. Future projections indicate an increase in the severity and frequency of such events, which raises the risk of infrastructure damage. Consequently, the severity of potential infrastructure damage is considered moderate, but it can still have significant impacts

8.7.4 Impact Assessment

8.7.4.1 Effects on Baseline

- **Water Availability:** Decreased availability during dry periods, impacting households and agriculture.
  - ✓ Reduced rainfall and higher evaporation cause lower water levels in rivers, streams, and groundwater, affecting households reliant on surface water and shallow wells. This leads to water rationing, hygiene, and sanitation issues.
- **Public Health:** Potential increase in waterborne diseases due to compromised water quality during extreme events.
  - ✓ Heavy rainfall and flooding can overwhelm sanitation systems, leading to contamination of water sources with pathogens and pollutants. This increases the risk of waterborne diseases such as cholera, dysentery, and typhoid fever.

- ✓ During droughts, water scarcity can force communities to use unsafe water sources. Limited access to clean water exacerbates the spread of diseases, as hygiene practices may be compromised.

- **Economic Impacts:** decreased water availability can greatly increase expenditure on alternative sources
  - ✓ Water shortages and compromised water quality can lead to increased household expenditure on alternative water sources, medical treatments, and coping mechanisms, reducing disposable income

8.7.4.2 Impacts on Project Activities

- **Operational Disruptions:** Inconsistent water supply and infrastructure damage can hinder project operations.
  - ✓ Fluctuating water availability may disrupt reliable service, requiring complex operational adjustments, including water rationing during dry spells.
- **Increased Costs**: Higher maintenance and repair costs due to climate-induced damages.
  - ✓ Floods can damage pipelines, causing leaks that disrupt distribution. Heavy rains and soil erosion may undermine infrastructure foundations, clog pipes, and reduce treatment efficiency, leading to delays and increased maintenance.

8.7.5 Adaptation and Resilience Measures

8.7.5.1 Adaptation Strategies

- **Water Management:** Promote water-saving technologies and efficient irrigation.
  - ✓ Raise community awareness on installing low-flow fixtures to reduce water use;
  - ✓ Implement leak detection systems in the pipeline to minimize water loss;
  - ✓ Encourage rainwater harvesting in households and community buildings;
  - ✓ Use smart meters to monitor and control water usage effectively.
- **Infrastructure Resilience:** Design infrastructure to endure extreme weather, with flood protection and temperature-resistant materials.
  - ✓ Construct water treatment plants, pump stations, and critical infrastructure on elevated platforms to safeguard against floodwaters.

8.7.5.2 Resilience Measures

- **Community Engagement:** Educate and involve local communities in water management and conservation efforts.
- **Monitoring and Early Warning Systems:** Establish systems to monitor climate risks and provide early warnings for extreme events.
- **Policy and Planning:** Working with the Embu County, integrate climate risk management into local development plans and policies.

In conclusion, the Ngandori-Nginda WSP project faces significant climate risks that could impact water availability and infrastructure integrity. By implementing adaptive strategies and resilience measures, the project can mitigate these risks and ensure sustainable water supply and community resilience in the face of climate change.

9. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

This section of the ESIA presents the Environmental and Social Management and Monitoring Plan (ESMMP) proposed for the construction and operation activities of the Ngandori-Nginda WSP Project.

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 Ngandori-Nginda 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 Safety Guidelines (EHSG). The key objectives of the ESMMP are to:

- Outline mitigation measures developed for the Ngandori-Nginda 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 the WSP about Environmental issues.
- Ensure continual improvement in environmental management on site through measuring and evaluating environmental performance.
- Monitoring that the health and hygiene of the community near the construction sites is not adversely affected by the Contractor's operation.
- Induct workers on safety and health risks and management.
- To keep communities informed about upcoming construction activities and progress with construction.

9.2.2 NEMA

The responsibility of the National Environmental Management Authority (NEMA) is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal

instrument of Government in the implementation of all policies relating to the environment and to ensure that all mitigation measures proposed are implemented.

9.2.3 Ngandori-Nginda

Ngandori-Nginda will be responsible for overall implementation of the project. The specific responsibilities include:

- Ensure including all standard and specific mitigation measures from the ESMMP in contract and ensure the contractor adheres to them throughout the project.
- Regularly supervising and overseeing the contractor's activities to ensure compliance with the ESMMP and environmental and social regulations.
- Facilitating communication between the contractor and local communities, stakeholders, and affected parties to address any concerns and keep them informed about the project's progress and impacts.
- Conducting environmental monitoring to ensure that the contractor's activities do not negatively impact the environment and that mitigation measures are effectively implemented.
- Ensuring that the contractor implements health and safety measures to protect workers and the public, including the use of personal protective equipment (PPE) and adherence to safety protocols.
- Requiring the contractor to maintain detailed records of all ESMMP activities, including monitoring data, incidents, and corrective actions, and submitting regular reports to Ngandori-Nginda WSP.
- Overseeing the contractor's site restoration activities post-construction to ensure that affected areas are restored to their natural state or as agreed with stakeholders.

9.2.4 Water Sector Trust Fund

The Water Sector Trust Fund (WaterFund) plays a crucial role in financing and supporting water, sanitation, and water resource management projects in underserved and marginalized areas of Kenya. In the context of ESMMP implementation, WaterFund's responsibilities can be outlined as follows:

- Overseeing the compliance of projects with environmental and social standards as outlined in the ESMMP and ensuring adherence to national and international regulations.
- Providing technical and financial support for capacity-building initiatives to enhance the ability of project implementers to effectively manage environmental and social impacts.
- Acquiring detailed documentation and regular reporting on ESMMP activities, compliance records, and any incidents related to environmental and social management.

9.3 The ESMMP

The Environmental and Social Management and Monitoring Plan (ESMMP) for the proposed Ngandori-Nginda outlines comprehensive details regarding project activities, anticipated impacts, mitigation measures, time schedules, costs, responsibilities, and commitments aimed at minimizing environmental impacts. Table 15 on overleaf 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, Ngandori-Nginda WSP will monitor the contractor's activities to verify that the management measures, procedures, and specifications are implemented as contained in the ESMMP and design. Compliance will indicate that the contractor is fulfilling their contractual obligations. During the operation phase, Ngandori-Nginda WSP will monitor the facility's operations to ensure compliance with the management measures in the ESMMP and operational procedures. As part of this monitoring, Ngandori-Nginda WSP will undertake the statutory initial environmental audit as required by the ESIA/EA Regulations, 2003, and subsequent annual environmental audits.

To support these monitoring efforts, Ngandori-Nginda WSP will designate an existing staff member to oversee Environmental and Social (E&S) monitoring, compensating for the absence of a dedicated E&S Officer. The supervision of works, including ESMP implementation, will be managed by the WSP's technical department under the leadership of the Technical Manager. Additionally, the contractor will be required to submit monthly reports on ESMP compliance, reinforcing commitment to environmental and social safeguards throughout the project lifecycle.

Table 27: 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; - Give chance to affected community to harvest the targeted vegetation that are within the raw water mains if they so wish	- Area of vegetation cleared - No. of trees cleared/replanted	Throughout the construction period	- Contractor - Proponent (Ngandori-Nginda)	20,000
Impacts on Water Quality	- Use mulching, hydro seeding, or other ground cover methods to stabilize exposed soil and prevent erosion; - Regularly inspect and maintain construction machinery and equipment to prevent leaks of petroleum products; - Limit the movement of heavy machinery to designated paths to reduce the overall area of soil compaction; - Where possible construction activities close to these rivers should be scheduled for the dry seasons; - The removal of vegetation and soil cover will be restricted to only those areas necessary for excavation work. Particularly, the unnecessary removal of groundcover vegetation from the AoI will be avoided.	- Spills and leakages on the ground - Signs of soil erosion (soil washed down to water bodies) - Spoil material storage	Throughout the construction period	- Contractor	30,000
Soils and geological disturbance	- Excavated soil should be placed on flat surfaces and away from water ways (at least 100 away); - Ensure timely removal (reuse) of excavated materials from the project site to minimize soil exposure and erosion risk;	- Placement area of excavated soil/spoil - Area of soil disturbed	Monthly	Contractor	No additional cost

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- Avoid excavation in floodplains, near stream banks, or other sensitive areas prone to erosion; - Plan construction activities to minimize simultaneous disturbance of large areas, thereby reducing overall soil exposure and erosion risk; - Earthworks shall be meticulously controlled to ensure the surrounding areas remain undisturbed and preserved in their natural state. - Implement phased vegetation clearance to minimize the extent of exposed soil and maintain natural ground cover where possible; - Utilize tracked or low-ground-pressure equipment to minimize soil compaction during construction activities; - Where compaction occurs, implement soil aeration techniques post-construction to enhance soil structure and fertility.				
Impact on Local Air Quality (Dust Generation)	- Practice prevention measures such as dampening dust by use of water (sprinkling water on surfaces that produce dust or covering them); - Provide PPEs such as nose masks to the workers on the construction site; - Spraying water on soil before excavation and periodic access road wetting to reduce nuisance dust levels; - Speed restriction of construction vehicles to a speed of 30 km/h or less on the site and on the access roads to the site; - Ensure construction equipment and machinery are well-maintained to minimize emissions; - Install and properly maintain exhaust emission control devices, such as diesel particulate filters (DPF) and selective catalytic reduction (SCR) systems, on diesel-powered machinery to minimize emissions of particulate matter and nitrogen oxides.	- Frequency of dust suppression activities - PPE Provided to workers - Maintenance checks of construction equipment	Throughout the construction period	Contractor	30,000 Dust masks @ Ksh 250 each

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
Noise and Excessive Vibration Generation	- Use modern, well-maintained equipment designed to operate with minimal noise and vibrations; - Prioritize manual excavation methods in areas close to sensitive receptors to minimize noise and vibration impact; - Limit construction activities to daytime hours (e.g., 8 AM to 5 PM) to reduce the impact on nearby residents and sensitive institutions; - Restrict the use of high-impact equipment, such as drill hammers, to specific times and durations to minimize disruption; - Provide advance notice to local communities, schools, and health centers about the timing and duration of noisy activities; - Provide construction workers with appropriate PPE, such as earplugs to protect against prolonged exposure to high noise levels; - Ensure vehicles and construction machinery are serviced per the manufacturer's manual to minimize noise/vibration.	- Compliance with construction activity time restrictions - Number of advance notices provided to local communities, schools, and health centers - Percentage of construction workers provided with and using appropriate PPE (e.g., earplugs)	Throughout the construction period	Contractor	20,000
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;	- 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	10,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- 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.				
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; - Maintain adequate spacing of at least 2m between workers during excavation to prevent accidental injuries - Ensure there are sufficient, visible danger-sign posts put up at the site to warn passers-by or workers of potential accidents or incidents; - Establish a safe working environment with an occupational health and safety (OHS) plan that addresses potential hazards, identifies preventive and protective measures, including training and use of personal protective equipment (PPE), and describes documentation and reporting of accidents, diseases and incidents; - All construction workers will be required to PPE i.e. helmets, gloves and safety boots during the construction phase; - Provide shaded rest areas and ensure workers have access to ample drinking water. Schedule work to avoid peak heat periods;	- Workers' induction/tool box records - Number of warning signs and tapes placed around open trenches and active construction sites - Number of visible danger-sign posts installed at the site - Presence of a documented OHS plan addressing potential hazards, preventive measures, and reporting procedures - Percentage of workers wearing PPE (helmets, gloves, safety boots) during construction	Throughout the construction period	Contractor	15,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- Ensure all hand tools are inspected daily to confirm they are in good working condition and free from defects.				
Risks Associated with Traffic on Site	- Install clear and prominent signage indicating speed limits, right of way, and site rules; - Provide regular safety briefings and training sessions for all personnel on traffic management procedures and protocols; - Limit the number of vehicles and personnel on-site to essential operations only; - Recommend the contractor prioritize manual laborers for excavation and construction tasks where feasible, especially in areas where machinery may pose safety risks or environmental concerns;	- Number of clear and prominent signs installed indicating speed limits, right of way, and site rules - Number of safety briefings and training sessions conducted on traffic management procedures and protocols - Number of vehicles and personnel present on-site compared to the number of essential operations - Percentage of excavation and construction tasks performed by manual laborers in areas where machinery poses safety risks	Throughout the construction period	Contractor	Costs are under the responsibility of the contractor
Community Health and Safety Concerns	- Inform the community in advance about construction schedules, road closures, and alternative routes through meetings, leaflets, and local media; - Excavation, pipe-laying, and backfilling will be conducted on the same day where feasible to minimize exposure from open trenches; - Install clear and visible warning signs around the construction site indicating potential hazards, construction zones, and restricted areas; - For Mbukori pipeline, coordinate with nearby schools to schedule construction activities that avoid peak times for school arrivals and departures; - Temporary access ramps will be provided across open trenches at key access points to maintain mobility and safety; - All chambers will be promptly covered to prevent accidents and unauthorized access; - Ensure that access routes for emergency vehicles are always kept clear and accessible;	- Number of meetings held and leaflets distributed to inform the community about construction schedules, road closures, 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 the frequency of their interactions with the community	Throughout the construction period	Contractor	10,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- Immediate backfilling will be prioritized at access points to residential areas and other sensitive receptors to reduce disruption.	- Number of health campaigns conducted and the level of community participation			
Spread of HIV/AIDS and STIs	- The contractor will undertake sensitization of the HIV /AIDs AND STD awareness e.g. by use of posters etc.; - Encourage workers to go for HIV voluntary counselling, testing and referral services; - Contractor to institute HIV/AIDS awareness program and implemented as part of the Health and Safety Management Plan targeting both workers and the local community. - The Contractor shall institute HIV/AIDS awareness and prevention campaign amongst his workers for the duration of the contract.	- Number of HIV/AIDS and STI awareness sessions conducted (e.g., through posters, workshops) - Number of workers participating in HIV voluntary counselling and testing services - Completion and implementation of an HIV/AIDS awareness program as part of the Health and Safety Management Plan	Throughout the construction period	Contractor	10,000
Increase in cases of Gender Based Violence	- Contractor 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	- Presence and enforcement of a comprehensive policy against GBV, SEA, and SH, including zero-tolerance principles. - Number of project staff who have signed and adhere to the code of conduct addressing GBV/SEA/SH - Number of awareness 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	Throughout the construction period	Contractor	Cost under responsibility of the contractor

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	mitigations; - All workers will be inducted and sign the code of conduct before deployment to the work station; - All GBV, SEA, and SH allegations and cases will be reported promptly to relevant authorities; - The contractor will establish and maintain adequate referral mechanisms to address cases of Gender-Based Violence (GBV) reported at the community level related to project implementation.				
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	5,000
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 Nonlocal workers - Grievances received and resolved related to Labour Influx - No of worker's sensitized on Code of Conduct and Social cultural environment	Continuous	Contactor Proponent (Ngandori-Nginda)	No additional cost

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
Sexual Exploitation and Abuse (SEA) and Sexual Harassment	- Community engagement to create awareness on SEA/SH risk/ issues - Creating awareness to workers on the need to refrain from SEA/SH incidences - Mandatory awareness creation for workers on required lawful conduct in the community and legal consequences for failure to comply with laws - Develop and implement a SEA action plan with an Accountability and Response Framework as part of the C-ESMP; - Integrate provisions related to sexual harassment in the employee COC; - Mandatory signing and implementation of code of conduct for the workers - Contractor to provide established referral pathway including police station with a gender desk for handling SEA/SH cases and also free toll numbers/hot lines for reporting GBV; - Ensure prompt reporting of all SEA/SH incidences in the project; - Develop and implement a grievance procedure that is easily accessible to local communities; - Ensure all complaints on SEA/SH or harassment are reported directly through the WSP.	- Number of SEA and SH cases reported - Code of Conduct that govern sexual Behavior - No of Workers inducted On the Code of Conduct	Continuous	Contactor Proponent (Ngandori-Nginda)	10,000
Impacts of Archaeological and cultural heritage	- Proper and thorough stakeholder engagement with the local community to identify and understand archaeological and cultural heritage sites. - Sensitization of project workers on code of conduct on the importance of protecting heritage sites and proper procedures if discoveries occur. - Implement the approved project GRM to help address concerns related to heritage impacts if discoveries occur	- No of grievances reported - Records of workers trainings on COCs - Records of chance finds	Throughout the construction phase	Contractor	No additional cost

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
Interruption of Existing Infrastructure and Services	- Plan construction activities to minimize peak traffic hours. Only conduct major activities during off peak times to reduce traffic congestion and disruptions; - Maintain clear communication with local authorities, and residents about construction schedules, anticipated disruptions, and alternative routes; - Provide alternative water supply solutions, such as temporary water tanks or connecting affected households to alternative sources, to mitigate interruptions in water supply; - Engage with local communities to understand their concerns and incorporate feedback into mitigation strategies.	- Number of communications (meetings, notices, newsletters) with local authorities, and residents regarding construction schedules, disruptions, and alternative routes - Alternative water supply solutions during construction - No. of grievances received on interruption	Continuous	Contactor Proponent (Ngandori-Nginda)	No additional Costs
TOTAL COST (CONSTRCUCTION PHASE)					**160,000**
Operation Phase					
Risk of Soil Erosion	⁻ Establish vegetative buffers along the pipeline route to stabilize soil, reduce erosion, and filter runoff before it reaches water bodies; ⁻ Implement reseeding and replanting programs with native vegetation after construction activities to restore ground cover and reduce erosion risks; ⁻ Conduct maintenance activities during dry periods when soil is less susceptible to erosion, and avoid operations during heavy rainfall or storm events; ⁻ Implement a schedule for regular inspections of erosion control measures and pipeline integrity to promptly address any issues and ensure effectiveness.	- Area reseeded or replanted with native vegetation after construction - Frequency and outcomes of inspections for erosion control measures and pipeline integrity	Monthly	Proponent (Ngandori-Nginda)	Costs are under the responsibility of Ngandori-Nginda
Risk of Water Pipeline Bursts Leading to Water Wastages	- Implement a proactive maintenance schedule to inspect pipelines regularly for signs of wear, corrosion, or potential weaknesses that could lead to bursts; - Install and maintain advanced leak detection systems along the pipeline network;	- 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	Proponent (Ngandori-Nginda)	50,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- 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				
Risk of illegal connection to the water pipeline	- Implement robust monitoring and surveillance systems to detect unauthorized activities promptly. - Regularly inspections of the water pipeline to identify illegal connections. - Regularly engage community to educate users about the consequences of illegal connections and to foster compliance with water usage regulations. - Conduct public sensitization programs on importance not interfering with the water pipeline and the need to seek official water connection.	- Frequency and thoroughness of pipeline inspections specifically targeting illegal connections - No. of community engagement sessions conducted and the level of community participation - No. of unauthorized activities detected and addressed - No. of community reports or tips about suspected illegal connections.	Continuous	Proponent (Ngandori-Nginda)	Costs are under the responsibility of Ngandori-Nginda
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	Proponent (Ngandori-Nginda)	Cost under responsibility of the contractor

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 County By-Laws on wayleaves and road reserves maintenance; - Provide marker posts along the pipeline corridor to clearly demarcate the boundaries and discourage encroachment; - Conduct public sensitization programs on importance of not interfering with way leaves and public reserve land.	- No. of public sensitization programs conducted and their reach (e.g., number of people informed, materials distributed) - No. of marker posts installed along the pipeline corridor - No. of encroachment cases prosecuted and resolved.	Continuous	Proponent (Ngandori-Nginda)	30,000
		TOTAL COST (OPERATION PHASE)			**80,000**
Decommissioning Phase					
Utilization of Contaminated Sources	- Establish temporary water supply points with safe water tanks or truck deliveries; - Implement regular monitoring and testing of alternative water sources; - Conduct public awareness campaigns on the risks of contaminated water; - Upgrade existing water supply systems and repair communal water points; - Distribute affordable household water treatment options (e.g., chlorine tablets, ceramic filters).	- No. of temporary water supply points established with safe water tanks or truck deliveries. - Frequency and results of water quality tests conducted on alternative water sources No. of public awareness campaigns conducted on the risks of contaminated water and the level of community participation No. of existing water supply systems upgraded and communal water points repaired	Continuous	Contractor	Costs are under the responsibility of Ngandori-Nginda
Impact on Livelihoods and Well-being	- Implement water storage solutions like reservoirs or tanks to ensure continuous supply for irrigation;	- No. and capacity of water storage solutions (e.g., reservoirs, tanks) implemented	Continuous	Contractor	Costs are under the responsibility of Ngandori-Nginda

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	⁻ Provide community education on efficient water use practices for livestock watering; ⁻ Mobilize government and NGO resources to provide financial support for water infrastructure projects; ⁻ Collaborate with local stakeholders to implement long-term water management strategies and policies	- No. of community education sessions conducted on efficient water use practices for livestock watering			
Increased Competition for Water Resources	⁻ Develop and implement comprehensive water management plans that prioritize equitable distribution of water among different users, including households, agriculture, and industry; ⁻ Identify and develop alternative water sources such as groundwater wells, desalination plants (if feasible), and treated wastewater reuse systems; ⁻ Implement emergency water supply measures, such as mobile water tanks or truck deliveries, to mitigate immediate shortages during the transition phase; ⁻ Conduct outreach programs to educate communities about water conservation, sustainable use practices, and the importance of equitable water sharing. ⁻ Facilitate inclusive dialogue and consultation among all affected stakeholders, including community groups, businesses, and local authorities; ⁻ Establish transparent and fair water allocation systems that prioritize essential needs such as drinking water, agriculture, and sanitation; ⁻ Promote community-based water management initiatives that empower local communities to participate in water resource planning and governance; ⁻ Develop formal and informal mechanisms for resolving water-related disputes, including mediation, arbitration, and community-led resolution processes.	- No. of emergency water supply measures implemented (e.g., mobile water tanks, truck deliveries). - No. and impact of community-based water management initiatives implemented.	Continuous	Contractor	No additional cost

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
Loss of Revenue for the WSP	⁻ Review and adjust water tariffs or service fees to reflect the actual cost of service provision and ensure financial sustainability; ⁻ Allocate funds for essential infrastructure upgrades, repairs, and maintenance to enhance service reliability and operational efficiency; ⁻ Prioritize essential expenditures and explore cost-saving measures to optimize operational efficiency'.	- Completion and implementation of a tariff review process - Implementation and impact of identified cost-saving measures	Continuous	Contractor	No additional cost
Loss of Employment Opportunities	⁻ Offer retraining programs and skill development initiatives to enhance the employability of affected workers in new sectors or emerging industries; ⁻ Facilitate job placement services, career counseling, and networking opportunities to assist displaced workers in finding new employment opportunities.	- No. of retraining programs and skill development initiatives implemented - No. of career counseling sessions conducted.	During decommissioning	Contractor	No additional costs
Waste Generation	- Careful dismantling to ensure materials remain as re-usable as possible; - Prioritize the recovery and recycling of decommissioned materials such as 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; - Proper site rehabilitation by 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	20,000
Visual Intrusion	- Plan decommissioning in stages to limit the area affected at any one time; - Restore each section promptly after decommissioning; - Implement landscaping plans with native vegetation and natural contour restoration; - 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	During decommissioning	Contractor	30,000
TOTAL COST (DECOMMISSIONING PHASE)					**50,000**
GRAND TOTAL					**290,000**

9.4 Topic Specific Management Plans

The contractor will develop targeted management plans to address specific environmental and social aspects, guided by the ESMMP and any emerging issues on the ground. These plans must be prepared and approved by both the proponent and the Bank before the contractor mobilizes to the site. The following Sections present the specific management plans foreseen for construction and operation, based on the outcomes of the impact assessment.

9.4.1 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.

9.4.2 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.

9.4.3 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 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.

9.4.4 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.

9.4.5 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

9.4.6 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.

9.4.7 Communication Procedures and Stakeholder Engagement Plan

The proponent (Ngandori-Nginda) 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.

9.4.8 Local Recruitment Plan

Defines the actions that will be implemented to favor local recruitment. The contractor will prepare a local recruitment plan to guide on recruitment of locals. The plan shall pay attention or adhere to Employment Act. In designing the local recruitment plan contractor shall comply with the provisions of Employment Act, 2007 and wherever possible, give priority to qualified local people when hiring employees.

9.4.9 Stakeholder Engagement Plan

The Stakeholder Engagement Plan (SEP) outlines the strategy for engaging stakeholders throughout the lifecycle of the Ngandori-Nginda water project. Effective engagement ensures that stakeholders are informed, consulted, and involved in the decision-making processes, thereby promoting transparency,

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

9.5 Capacity Requirements

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

a) Ngandori-Nginda

• Environmental and Social Safeguards Team: Ngandori WSP should establish or strengthen a team responsible for overseeing the implementation of the ESMMP, including dedicated E&S specialists, an OHS officer, and a Community Engagement Officer.
• Project Monitoring and Evaluation Unit: A unit to conduct regular monitoring and evaluation of environmental and social impacts, ensuring that mitigation measures are properly implemented and adjusted where necessary.
• Grievance Redress Mechanism (GRM) Specialist: A staff member or external consultant responsible for managing grievances raised by affected communities and ensuring timely resolution in line with the GRM established for the project.
• Capacity Building: Ngandori WSP 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 and sufficient financial resources to effectively implement the ESMMP. This gap presents a significant challenge in ensuring compliance with environmental regulations and managing social impacts. To address this, the WSP will engage an external E&S consultant with relevant expertise to oversee the implementation of the ESMMP. Additionally, provisions for ESMMP implementation costs should be included in the proposed project's Bill of Quantities (BoQ), ensuring that the necessary financial resources are allocated to cover 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.

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, 1999 (amendments, 2015). 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 Ngandori-Nginda 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 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. 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 water service providers (WSPs), 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

Ngandori-Nginda Water Consumers Association 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 Environmental and Social Management and Monitoring Plan (ESMMP) in Chapter 9, will serve as the foundation for managing both positive and negative impacts associated with the project's establishment.

In conclusion, following this assessment, the consultant finds no impediment to authorizing the proposed water pipeline project, contingent upon the rigorous application of the outlined mitigations and the establishment of robust monitoring frameworks to address potential environmental and socio-economic impacts.

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ANNEXES:

Annex	Description
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Annex 1: Ngandori-Nginda Certificate of Incorporation

Annex 2: Photographic presentation



Plate 17: Consultation and Public Participation Baraza at Kiambogo Village



Plate 18: Nyayo Tea Zone (Mt. Kenya Forest Buffer) Approximately 300m from Kiambogo pipeline start point



Plate 19: Kiambogo pipeline route Transect Walk with Elder



Plate 20: View of Kibugu-Kiambogo Pipeline Route

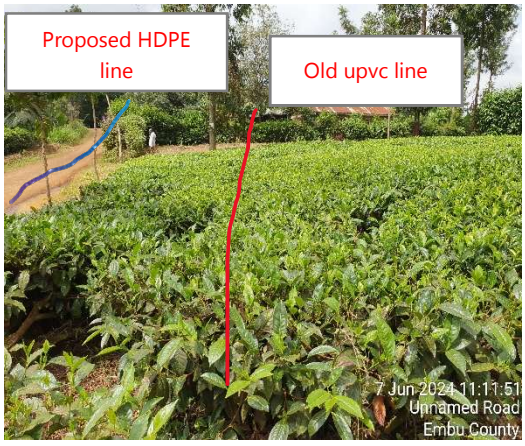


Plate 21: Kiambogo Tea plantation section where pipeline will pass



Plate 22: Perimtred Entry Gate to a private Property along the pipeline route

Source: Consultant's Field Assessment between 6-8th June 2024



Plate 23: Consultation and Public Participation Baraza at Mbukori Village



Plate 24: Consultation and Public Participation Baraza at Mbukori Village



Plate 25: Mbukori pipeline route Transect Walk with Elder



Plate 26: View of Runganga-Mbukori Pipeline Route



Plate 27: Banana plantations among other crops along the pipeline route at Mbukori



Plate 28: Perimtred fence of private Property along the pipeline route

Source: Consultant's Field Assessment between 6-8th June 2024

Annex 3: Pipeline Layout Maps

Annex 4: Proposed Lines Topographical Profile

Annex 5: Bill of Quantities

Annex 6: Minutes of meetings and List of participants

Annex 7: Sample Filled Questionnaires

Annex 8: Chance Find Procedures

Regulatory and Other Requirements

The primary legislation on cultural heritage issues is the National Museums Heritage Act, 2006 (which updated and replaced the National Museums Act, 1983), the Antiquities Monuments Act 1983 and is enshrined in the requirements of the provisions of the Environmental Management and Co-ordination Act, 1999; (amendment) Act, 2015 which defines the Environmental and Social Impact Assessment (ESIA) process.

The National Museums Heritage Act sets out the overarching administrative processes for protecting and preserving cultural heritage and management by the National Museums of Kenya (NMK). As there are no designated monuments or sites within the immediate Project's area of influence, the heritage legislation only has a limited bearing on the Project's activities. However, the water pipeline project will take precautionary measures for handling any potentially significant chance finds through its implementation of the chance find procedure and requirement presented in subsequent sections of this procedure.

Physical and Cultural Resources OP/BP 4.11 For purposes of this policy, "physical cultural resources" are defined as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be 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 Ngandori-Nginda Water Consumers Association) 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. If chance finds are encountered the following procedure shall apply:

Procedures to Address Chance Finds

With the aim to avoid damaging cultural resources during project activities the following will be followed;

- Project personnel must take total care to any unfamiliar materials encountered during project activities. Upon establishing a discovery, the personnel must immediately report the case to their immediate supervisor;
- The contractor or supervising engineer would report the finds to the local administration such as the local chief or the Assistant County Commissioner (ACC);
- The local administration would then report the find to NMK;
- The contractor must stop work immediately after discovering evidence of possible scientific, historical, prehistoric, or archaeological data and notify the Supervision team/Engineer giving the location and nature of the finds;
- The proponent will then notify the NMK which will have to send qualified personnel to assess the material for further steps

- NMK would temporarily stop the works to conduct an assessment and prepare a report. The period of stoppage is from 10 days to 21 days depending on the complexity of the project; Retrieve movable artifacts and preserve immovable ones;
- NMK would also map out the area to be preserved during the investigation period and arbitrate between the community and developers in the event of dispute;
- NMK to circulate the cultural impact assessment report to the Contractor, NEMA, relevant lead agencies and the community.

Measures for Care of Chance Finds

Upon retrieval of movable artifacts and conservation of immovable ones, NMK would proceed with segregation and dating of the artifacts and determination of their significance; Segregated artifacts would be stored in the NMK archeological stores according to their size and dates, and labeled with the geographical area where found; The artifacts may be displayed in an exhibition when required or published to enrich the cultural heritage.

Chance Find Report

Chance Find Report				
Date (DD/MM/YYYY)	**Time (xx: xx)**	**Site Name**	**GPS Coordinates (Northing)**	**GPS Coordinates (Easting**
Description of Find				
Proximity to Contractor Activity				
Sensitivity				
Vulnerability				
Recommended Action Description				
Site Checklist		**Yes / No**	**Comment**	
Responsible persons notified				
Coordinates verified				
Site Marked				
Site Secured				
Photograph(s)				
Impacts Assessed				
Actions Agreed				
Authorized Instruction				
National Museums Kenya Representative		**Position**	**Signed (Name**	
Contractor Representative		**Position**	**Signed (Name)**	

Annex 9: Complaints/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	

Details	
Name of Complainant:	
Complainant's contact address:	
Phone Number:	
E-mail:	
Complaint received by:	
Date received:	
Details of Complaint/Grievance: (What happened? Where did it happen? Who did it happen to? What is the result of the problem?)	(attach extra sheets if necessary)
Date of Incident/Grievance:	

Grievance Follow Up Template

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

Annex 10: Environmental and Social screening Forms

Annex 11: Notice Letter Sent Out Prior to Meeting

Annex 12: Water Abstraction Permit

Annex 13: Authorization Letter from Road Agencies

Annex 14: NEMA Lead EIA/EA Practicing License