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 Othaya-Mukurwe-ini Water Service Provider (WSP)

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

Comprehensive Project Report (CPR): Othaya-Mukurweini 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)			
WSP	Othaya-Mukurwe-ini Construction of DN20 to DN90 68 km of HDPE pipeline (Othaya Town-35km and Mukurwe-ini Town- 33Km) and 600 DN 15 water meters		
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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 Othaya-Mukurwe-ini 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 the consultant's best judgment in light of the information available to it at the time of preparation. Consequently, the findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of WSTF or the WSPs.

CERTIFICATION

ESIA /EA Lead Expert Mr. Bubicha Mohamed (Reg. No. 7683) has prepared this Comprehensive Project Report (CPR) for the proposed Othaya-Mukurwe-ini Interventions in Nyeri County**.** The report adheres to the World Bank Operational Procedures (OPs), the EMCA, 1999 (Cap 387) (Amended, 2015) and the Environmental (Impact Assessment and Audit) Regulations, 2003 (amended, 2019) to bring out the true nature of the intended development**.** The report was prepared based on the information provided by various stakeholders in Othaya and Mukurwe-ini in Nyeri 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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PROPONENT

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Moses Munyi
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For Othaya-Mukurwe-ini Water Services Company

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 (amended, 2019)

ABBREVIATIONS AND ACRONYMS

AoI	Area of Influence
BoQ	Bill of Quantities
CCKP	Climate Change Knowledge Portal
CIDP	County Integrated Development Plan
CLSG	Conditional Liquidity Support Grant
CPP	Consultation and Public Participation
CPR	Comprehensive Project Report
DPF	Diesel Particulate Filters
EA	Environmental Audit
EF	Electrofusion
EHS	Environmental, Health and Safety
EHSG	Environmental Health and Safety Guidelines
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
ESIA	Environmental & Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMMP	Environmental and Social Management and Monitoring Plan
ESMS	Environmental and Social Management System
FGD	Focused Group Discussion
GBV	Gender Based Violence
GI	Galvanized Iron
GoK	Government of Kenya
HDPE	High Density Polyethylene
HIV/AIDS	Human immunodeficiency virus/acquired immunodeficiency syndrome
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
NGAO	National Government Administration Officers
NGEC	National Gender and Equality Commission
NRW	Non-Revenue Water

OMWASCO	Othaya-Mukurwe-ini Water Services Company
OP	Operational Policies
OSHA	Occupational Safety and Health Act
PAD	Project Appraisal Document
PAP	Project Affected Persons
PDA	Project Development Area
SCR	Selective Catalytic Reduction
SEA	Sexual Exploitation and Abuse
SH	Sexual Harassment
TOR	Terms of Reference
TTI	Technical Training Institute
TVET	Technical Vocational and Educational Training
TWWDA	Tana Water Works Development Agency
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 Programme
WSP	Water Service Provider
WSTF	Water Sector Trust Fund

EXECUTIVE SUMMARY

Project Description

The OMWASCO Water Service Provider (WSP) seeks to improve water supply reliability and quality in its jurisdiction through the Othaya and Mukurwe-ini pipeline projects, addressing water scarcity and enhancing the distribution network to meet growing demand while reducing illegal connections. Funded by the World Bank via the Water Sector Trust Fund under the Ministry of Water, Sanitation, and Irrigation, the project includes:

- Line 1 (Mukurwe-ini Town): Located in Muhito Location, Mukurwe-ini Central Ward, Mukurwe-ini Sub County; 33 km length, 90mm diameter HDPE pipe.
- Line 2 (Othaya Town): Located in Othaya Township location, Iria-ni ward, Nyeri South/Othaya Sub County; 35 km length, 90mm diameter HDPE pipe.
- Installation of 600 DN15 water meters

The pipeline will run along road reserves and affect some infrastructure i.e. pavement mainly in Othaya Town; this will be mitigated by reinstating to their original condition or better by the contractor. Businesses in Mukurweini and Othaya town will be affected; shrubs and bushes will require clearing, etc. Specific affected locations in Othaya Town include concrete pavements, cabro blocks, and infrastructure nearby:

- concrete pavement 1 (-0.55'4485°, 36.939560°), concrete pavement 2 (-0.551591°, 36.940511°), concrete pavement 3 (-0.552405°, 36.945425°).
- Pavements near Silver Brook Apartments (-0.552405°, 36.945425°), Family Bank (-0.553293°, 36.945222°), and a petrol station under construction (-0.558749°, 36.943226°).

This initiative will improve the region's water distribution while minimizing environmental and social impacts.

Legal, Regulatory, and Policy Framework

The "Legal, Regulatory, and Policy Framework chapter (see chapter 3 for details)" outlines the relevant national and international laws, policies, and regulations guiding the proposed water pipeline project. It highlights compliance with the Constitution of Kenya, 2010, which mandates environmental protection, and key legislations like the Environmental Management and Coordination Act, 2015, which requires the project to undergo an ESIA as a medium-risk undertaking. Other frameworks include the Water Act, 2016, emphasizing permits and water quality; the Occupational Safety and Health Act, 2007, mandating worker and public safety; and the Climate Change Act, 2016, stressing climate resilience. Local laws, such as the Nyeri County Water and Sewerage Services Act, 2017, support sustainable water resource management. Internationally, the project aligns with World Bank Operational Policies and IFC Environmental, Health, and Safety Guidelines to mitigate environmental and social impacts while ensuring sustainable development.

Stakeholder Engagement and Consultation

Some of the concerns raised by Participants in stakeholder engagement forums i.e. community meetings and FGDs include:

Table 1: Views Expressed by stakeholders in the public meetings and responses provided

Subject	Issue	Response
Interruption of water supply	Inquiries on how long water supply would be interrupted during project implementation	There is no anticipated interruption of water supply, however, if it is expected that there will be interruptions, the affected people will be notified well in advance to preserve some water
	Concerns that if the supply is interrupted for an extended	

Subject	Issue	Response
	period, they may be forced to start fetching water from the river which might be a strenuous task for elderly people	
Project Area	Inquiries on which particular areas in Mukurwe-ini will be affected	The project shall be implemented within the urban areas starting from Ngoru to OMWASCO's Gichecheni and Kanunga water tanks.
Project Costs	What are the cost implications for the water users	The affected water users will not incur any costs. All the rehabilitation costs will be catered for using the grants from the World Bank
Land acquisition and compensation	Compensation process for landowners whose land will be acquired for the proposed project	The project will utilize the existing wayleave and therefore no land will be acquired for this project.
Water supply disconnections	Complaints for lack of notification on water interruptions and scheduled water pipeline works	Assures that notifications will be issued well in advance to allow the affected persons to prepare accordingly
Grant repayment	Inquiries of increased billing costs for the customers to enable repayment of the loan from World Bank	The agreement with the World Bank for the grant is that with the rehabilitation project, OMWASCO should be able to recover the project implementation costs within a year. However, if they are not able to then the grant becomes a loan which they will repay with the revenue collected. The costs will not be transferred to the customers.
Smart water Metering	Suggestions for the rehabilitation project to include the installation of smart water meters	The smart water meters are costly i.e. 1 meter currently costs Ksh. 15,000 and therefore it might not be feasible at the moment
Water for Irrigation	Requests for OMWASCO to provide water for irrigation	OMWASCO is only mandated to provide water for domestic use. The county is in charge of water for irrigation. The community can come together and make a proposal to the County Government for the provision of water for irrigation.
Project Area	Inquiry on whether the project will be implemented in the whole of Mukurwe-ini sub-county	The project will be implemented in phases and will eventually cover the whole sub-county. However, in this first phase, the rehabilitation will cover the urban areas i.e. Mukurwe-ini and Othaya town areas
Water overflows	Concerns with the current overflow pipeline leading to huge water losses	The new water pipeline will be fitted with ball valves to control the flow of water
Compensation for damaged infrastructure	Inquiries whose responsibility it will be to reinstate the pavements situated outside their business that will be destroyed during construction.	The contractor in charge of the project will do the repairs and reinstate the damaged infrastructure to its previous condition. The cost of reinstating the pavements has been catered for in the project budget.
Quality of works	Inquiries on who will ensure that the quality of work by the Contractor is up to standard	Quality control will be done by OMWASCO since they are the ones who are offering the jobs to the contractors

Environmental and Social Impact Assessment Implementation Arrangements

The implementation of the water pipeline projects (Mukurwe-ini and Othaya) is anticipated to result in both positive and/or negative impacts on the physical, social, economic, and biophysical environment of the project site area.

Project impacts have been assessed based on the methodology presented in Chapter 4. Pre-mitigation and residual (post-mitigation) impacts on VECs were analysed, according to the following parameters:

- Intensity of the impact indicates the degree to which the VEC will be disturbed (combination of apprehended impact and sensitivity/vulnerability);
- Geographic extent of the impact refers to the spatial area of influence affected;
- Duration of the impact refers to the period during which the impacts will be felt;
- Magnitude of the impact reflects the overall degree of disturbance considering the intensity, the geographical extent, and the duration.

Affected Asset Inventory/Register

A summary of assets inventory/register was prepared to address temporary business disruptions affecting 13 businesses in Othaya and 16 in Mukurweini during pipeline construction. No physical displacement or land acquisition required, and all affected businesses will be reinstated in accordance with the project's mitigation measures. The summary PAPs register outlines compensation for three days of business disruption, a 15% disturbance allowance, and support for vulnerable PAPs. Compensation totals are Kshs. 135,658.5 with 64,060 for Othaya and Kshs. 71,598.50 for Mukurweini, determined through open market valuation. Affected businesses include retail shops, hotels, and agrovets, with the majority owned by females in Othaya and males in Mukurweini. A grievance redress mechanism (GRM) is included to address disputes, ensure fair resolution, and maintain positive community relations.

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1. INTRODUCTION

1.1 Project Background

Kenya is classified as a chronically water-scarce country, with freshwater availability of 526 cubic meters per capita and over 80% of its land categorized as arid or semi-arid[1]. The Government of Kenya (GoK), through Vision 2030, prioritizes improved access to safe water and sanitation, emphasizing water supply expansion and rehabilitation as flagship initiatives. In collaboration with the World Bank, the GoK conceptualized the Water and Sanitation Development Project (WSDP) to enhance water supply and sanitation in select regions and support financial recovery of Water Service Providers (WSPs) impacted by the COVID-19 pandemic. The Ministry of Water, Sanitation, and Irrigation (MoWS&I), through the Water Sector Trust Fund (WSTF), implements the program. Othaya Mukurwe-ini Water Services Company (OMWASCO), a WSP under Tana Water Works Development Agency (TWWDA), is mandated to provide water services in Nyeri South and Mukurwe-ini Districts, leveraging assets from previous national water projects.

The current water system, developed in the 1970s, has degraded due to aging materials and corrosion, resulting in water losses and quality concerns. To address these issues, OMWASCO proposes rehabilitating the 35 km and 33 km pipelines in Othaya and Mukurwe-ini towns, respectively, using 90mm HDPE pipes. The project aligns with the Environmental (Impact Assessment and Audit) Regulations, 2019, and is classified as a medium-risk intervention, requiring a Comprehensive Project Report (CPR). It adheres to both the Environmental Management and Coordination Act (EMCA) and World Bank safeguards policies, guided by an Environmental and Social Management Framework (ESMF). This ESIA report ensures compliance with national and international regulations, identifying and mitigating environmental and social impacts to deliver sustainable water infrastructure.

1.2 Project Objectives

The overall objective of the project is to improve water supply and sanitation services in and improve the financial performance of the OMWASCO WSP by establishing (cumulative) 68km pipeline of between DN20-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 Othaya and Mukurwe-ini town
- 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] FAO. (2015). Country Profile: Kenya. AQUASTAT, Food and Agriculture Organization of the United Nations

1.3 Project Proponent

The project proponent, OMWASCO, is a limited company incorporated in 2006 under Section 51 of the Companies Act as a public company limited by guarantee. Mandated by the WSTF to implement the CLSG-II program through the WSDP, OMWASCO operates under a Service Provision Agreement (SPA) with TWWDA. It manages and maintains assets previously held by the National Water Conservation and Pipeline Corporation (NWCPC) and the Ministry of Water and Irrigation. Serving Nyeri South and Mukurwe-ini districts in Nyeri County, the company provides water services across Chinga, Iria-ni, Karima, Mahiga, Mukurwe-ini Central, Mukurwe-ini West, Rugi, and Gikondi wards, covering approximately 365 km² with a population of 137,967. Currently, water service coverage in the area is at 84%.

OMWASCO is categorized as a Type 2 WSP by the Water Services Regulatory Board (WASREB), serving rural, low-income, and peri-urban areas. Type 2 WSPs are expected to cover their operations and maintenance costs but may require support for capital expenditures. Figure 1 below shows water supply coverage area by the OMWASCO WSP.

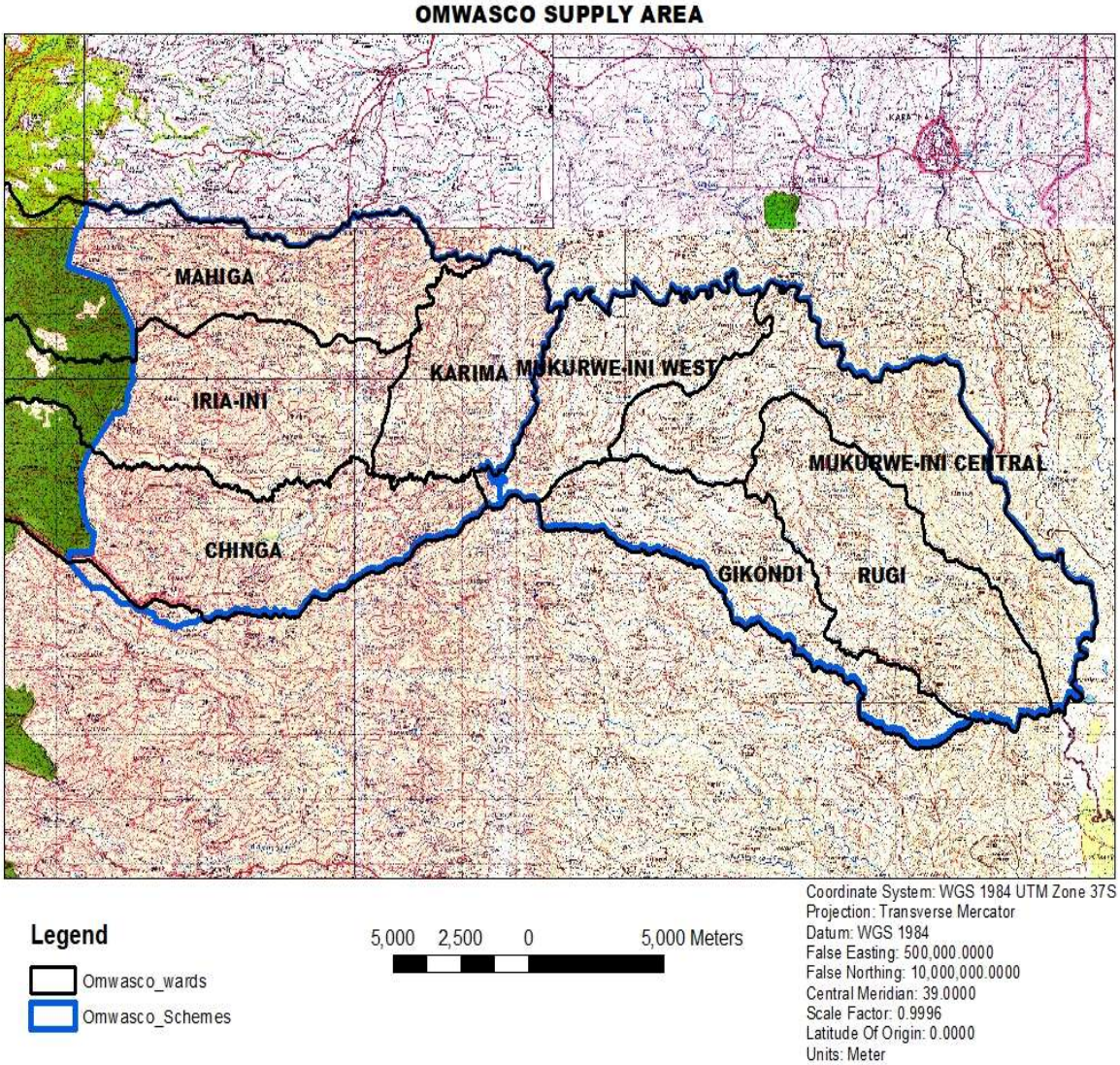


Figure 1: OMWASCO Water Supply Area Coverage

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 OMWASCO WSP. This section outlines the team composition and qualification; tailored for the expedited ESIA for the Othaya-Mukurwe-ini Water Supply Project, demonstrating expertise and commitment to delivering a comprehensive assessment within accelerated timelines. The ESIA team is presented in Table 1 overleaf.

Table 2: Team Composition

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

Non-Technical Executive summary

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

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

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

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

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

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

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

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

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

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

Chapter 10 - Conclusions and recommendations: Summarises 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 describes 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 Othaya and Mukurwe-ini pipeline projects, part of the OMWASCO WSP initiative, aim to improve water supply reliability and quality by addressing water losses and enhancing the distribution network. Spanning 68 km with DN20mm-DN90mm HDPE pipes, these projects will ensure consistent water availability, reduce pipe degradation, and support public health. Aligned with Kenya's Vision 2030 and the National Water Master Plan, 2030, the projects face challenges like informal settlements, rural-urban migration, and limited maintenance resources but are crucial for economic development and improved living conditions. The Kenyan Government, through MoWS&I and WSTF, with financial support from the World Bank, has selected OMWASCO to benefit from funding aimed at improving the water service provider's financial recovery[2].

The implementation of these pipelines will address local water supply deficits, reduce waterborne diseases, and support better hygiene and sanitation practices, benefiting vulnerable populations. Furthermore, the improved water supply will ease the burdens on women and children, promoting their involvement in income-generating activities and education. Designed with environmental sustainability in mind, the pipelines will follow best practices to protect the ecosystem and ensure the long-term viability of water resources in the area. The Government of Kenya (GoK) continues to engage in the development of water infrastructure as a key pillar to stimulate the economy, and the National Water Master Plan, 2030, developed with technical assistance from the Japan International Cooperation Agency (JICA), is pivotal in achieving these goals[3].

2.2 Objectives of the Project

The OMWASCO WSP water pipeline rehabilitation project aims to address existing water challenges by assessing the current water situation, calculating the water demand for target communities, and developing a sustainable, technically and economically viable system. The key objectives of the project are to: 1) Reduce non-revenue water by addressing physical losses from pipe leakages, 2) Minimize commercial losses from non-revenue water, 3) Decrease customer complaints related to insufficient and irregular water supply, 4) Eliminate spaghetti water networks to facilitate easier monitoring of water consumption and future expansions, and 5) Replace old, dilapidated networks to improve water quality for customers.

2.3 Project Location and Existing Land Use

The **Mukurwe-ini urban water pipeline rehabilitation project** is located in Mukurwe-ini sub-county Mukurwe-ini Central and Mukurwe-ini West wards-Muhito Location in Gaturia, Thiha and Murundu-ini sub-locations and Gakindu location, -Mbiu-ini sub location.

[2] World Health Organization. (2022). Guidelines for drinking-water quality: fourth edition incorporating the first and second addenda. Geneva: World Health Organization

[3] USAID. (2020). Kenya: Water, Sanitation and Hygiene

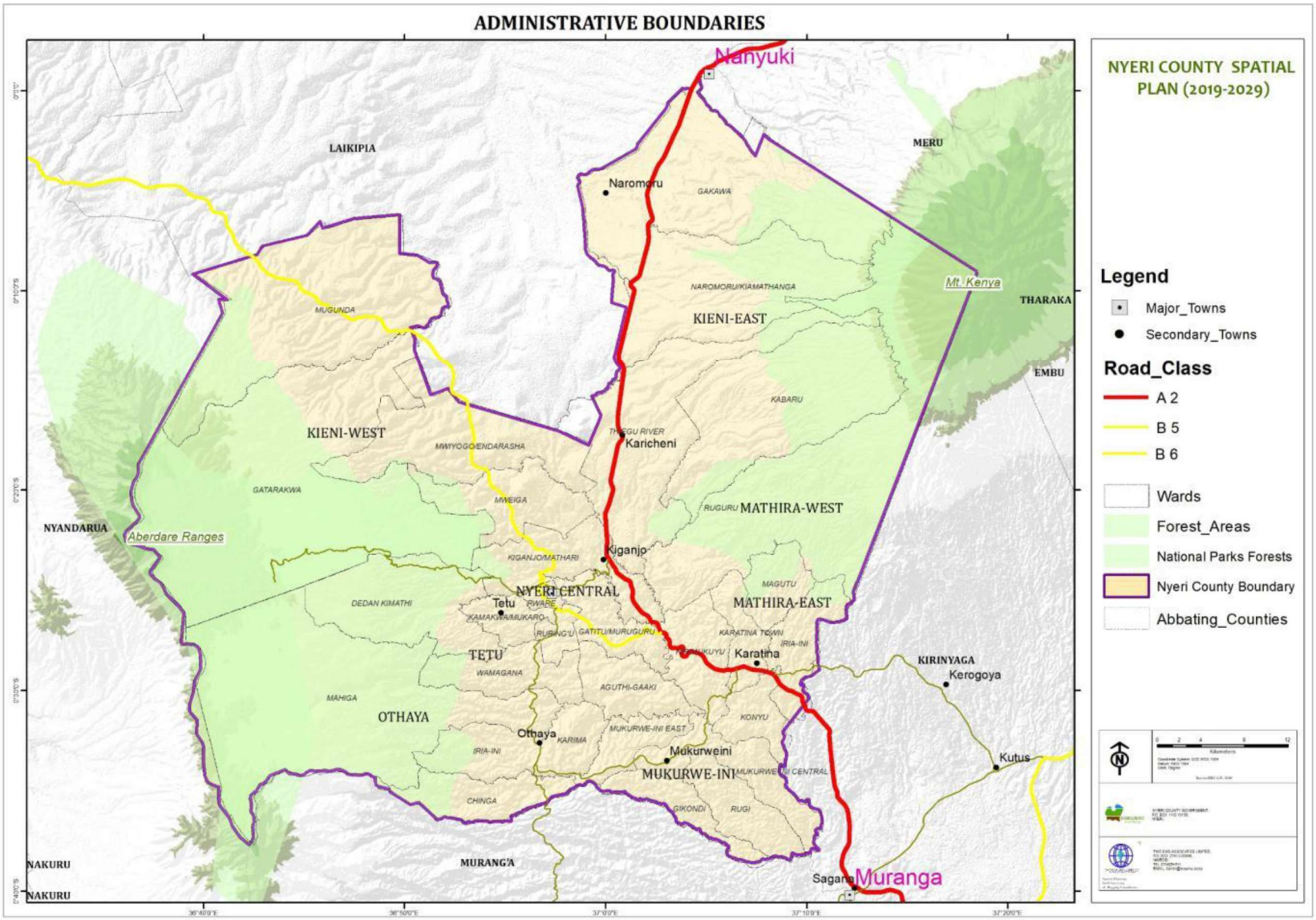


Figure 2: Nyeri County Spatial Plan- (Othaya-Mukurweini Boundaries Displayed

The **Othaya Urban Water Pipeline Rehabilitation Project** is in Nyeri South/Othaya sub-county, Iria-ini ward-Othaya Township Location, Kiahagu and Kihugiro sub-locations. Examples of some of the major establishments that will be affected by the project.

Table 3: Examples of establishments in proximity to the Proposed Othaya_Mukurweini Pipeline Route

Coordinates	Description	Approximate Length
OMWASCO WSP		
Line 1 – Othaya Urban-35km		
0° 33' 35. 47" S 36° 56' 34'.86" E	Munaini Primary school	35km 90 mm diameter HDPE Pipe
0° 33' 04. 28" S 36° 56' 36'.17" E	St. Martin Othaya Catholic School	
0° 33' 08. 52" S 36° 56' 41'.16" E	Bewomi Children's Home	
0° 32' 54. 40" S 36° 56' 40'.12" E	Othaya Farmer's Co-operative,	
0° 33' 06. 30" S 36° 56' 40'.93" E	Muringa Tea Buying Center	
0° 32' 52. 79" S 36° 56' 37'.50" E	Othaya Town Market	
0° 33' 04. 14" S 36° 56' 32'.97" E	OMWASCO	
0° 33' 21. 76" S 36° 56' 37'.44" E	Green Hut Guest House	
0° 33' 09. 01" S 36° 56' 43'.73" E	Silver Brook Hotel	
Line 2 – Mukurwe-ini Urban-33km		
0° 34' 40. 40" S 37° 01' 38'.29" E	MTTI	33km 90mm diameter HDPE pipe
0° 33' 38. 86" S 37° 01' 38'.29" E	Wakulima Dairy	
0° 32' 59. 42" S 37° 03' 40'.80" E	Ngoru Orthodox Secondary School	
0° 33' 17. 44" S 37° 03' 23'.89" E	Muhito Primary School	

The project will be 68km (cumulatively). The proposed water transmission pipe route will basically run in parallel to the existing pipeline. The pipe is to be installed along the public road reserve, there is no inhabitant, and no involuntary resettlement of residents will be caused. OMWASCO water supply area is presented in the Figure 2 and 3.

2.4 Study Area Delineation and Existing Water Supply System

2.4.1 Delineation of Othaya-Mukurwe-ini area

The area under the jurisdiction of OMWASCO comprises of Urban Areas, Rural Areas and Trading Centres with an estimated population of about 137,967 people. The urban consists of Othaya Township and Mukurwe-ini central which is within the vicinity of Othaya Sub-County and Mukurwe-ini with institutions, residences and religious premises. Mukurwe-ini West is in a rural setup with no business/market centers, schools, and health facilities that will be affected by the rehabilitation project. By June 2024, the OMWASCO water supply infrastructure supported a total of 36007 registered connections, with 22,259 actively receiving water services. Approximately 13,748 connections were classified as dormant or inactive, reflecting periodic usage patterns within the service area.

2.4.2 Existing Water Supply System

The existing water supply for the **Othaya** project area is a gravity scheme in which water is sourced from 5 intakes (Gikira, Thuti, Changachicha, Chinga and Mumwe) within the Aberdare Forest. The intakes that will be used for this project are only two i.e. Gikira and Thuti. The scheme serves the following zones

1. Under Kaharo Treatment
    - Mumwe zone (zone 4)
    - Mahiga zone (zone 5)
2. Under Kihuri Treatment
    - Othaya Urban zone- (zone 1)
    - Karima zone- (zone 2)
    - Chinga zone- (zone 6 &7)
    - Iriaini zone- (Zone 3)

Within Othaya, the project area falls under Zone 1 (Othaya Urban Zone) in sub-zone 3 and sub-zone 6. The intakes used in this project are only 2. These intakes are Gikira and Thuti. Raw water from Gikira River intake is conveyed to Kihuri water treatment works via a 315mm diameter steel pipe. Kihuri Treatment Works produces 10,000m3 of water a day and will supply the project area within sub-zone 3 and 6 (the project area) within the Othaya urban zone as well as sub-zones 4, 5 and 7. OMWASCO's water storage in the affected areas includes:

- Githagara 500m^3 Tank and Gichecheni 500m^3 tanks
- Kihuri 90m^3 storage tank

The existing Water Supply System for the **Mukurwe-ini** Water Supply Scheme (under OMWASCO) is the Chinga Dam. The Scheme was designed in the late 1970s and covers the following zones.

1. Gakindu (zone 9)
2. Kanunga (zone 10)
3. Gikondi (zone 13)
4. Karundu (zone 12)
5. Thiha (zone 11)
6. Mukurwe-ini Urban (zone 8)

The amount of water is adequate, and the quality is reliable and suitable for treatment for domestic uses. For context, the proposed project falls under the Mukurweini Urban Zone and a small section in Kanunga (zone 10) as delineated by OMWASCO. The proposed system will acquire existing intakes of Chinga Dam and Gikira River. The capacity of the existing supply system is 17,370m3/day. The existing supply system also has an existing raw water gravity main from the intakes which transmit water to the treatment works. One line is approximately 9.7km from Gikira River and the other is 300m from Chinga dam transmitted using ferrous pipes.

2.4.2.1 Treatment Works

The proposed supply network in **Othaya** will be served from one treatment work. Kihuri Treatment Works produces 10,000m3 a day and is set to supply subzones 3, & 6 (and in future, subzones 4, 5, 7& 8) within the new Othaya urban zone. The combined ultimate demand for subzones 3 and 6 is 772m3/day. The existing water supply system for **Mukurwe-ini** has two treatment works of capacity 5,000m3/day and 12,370m3/day.

2.4.2.2 Mainlines and Distribution Lines

Othaya Project Area-Kihuri system: post-treatment, water from Kihuri treatment plant is conveyed to the 90m3 Kihuri storage tank through two Upvc lines of 315mm and 200mm diameters respectively. It is then transmitted to Ruruguti 225m3 tank via two upvc lines of 225mm and 125mm diameter respectively. Ruruguti tank has been proposed to be the header tank for water distribution to zones 3, 4, 5, 6, 7 and 8 as has been indicated on the layout map. This has been done through a main transmission line of OD 225mm from the tank, which reduces as main distribution lines for the zones it traverses offtake from it. The total length of this line is 6154m, and it terminates as an OD 63mm pipeline with an endcap after it supplies Othaya town. Distribution lines vary from 110mm for the principal zone feeders to 25mm for the laterals. The total length of the pipeline served by the Kihuri system is 36km.

Mukurwe-ini System: After the water is treated, it is transmitted to the Githagara tank of capacity 500m3/day for 7.72km using 3 main lines of the following material. From the Githagara tank water is transmitted to the Gichecheni tank for approximately 4.29 km using 3 main lines of the following material: 1 Ferrous Pipe and

2 UPVC Pipe. From the Gichecheni tank water shall be transmitted to Mukuruweini town using 2 main lines each transmitting water to a distinct metering area. One of the lines is an existing uPVC, while the other is a proposed HDPE pipeline. Both lines are 160mm dia. in dimension.

2.5 Presentation of Project Components and Features

As previously mentioned, the OMWASCO WSP project involves the establishment of 68km pipeline of between DN63-DN90mm and the project involves the following primary component:

- Installation of 90mm pipeline in Mukurwe-ini urban area (33km cumulative length)
- Installation of 90mm pipeline in Othaya urban area (35km cumulative length)
- Installation of 600 number DN15 water meters

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 a temporary storage area for the contractor

Temporary facilities will be necessary during construction. These temporary facilities will be located on existing OMWASCO offices located in each of the two pipeline areas. The main installations include pipeline works area, concrete work areas (for chambers and where repair for affected community property will be needed), and store area for material control. These installations will be mainly located on OMWASCO's office area and road reserves and there will be no land acquisition envisaged except for easement permit from relevant road authorities (in this case KeRRA and KURA).

2.5.1 Design Criteria

The design has been undertaken to address the existing water challenges by assessing the current water situation, computing the water demand for the target community, and eventually developing a sustainable system that is technically and economically viable. Design considerations to cater to future demands include:

a) Population Project
   - Human Population
   - Livestock Population

b) Institutions Projection
   - Schools
   - Health
   - Administrative Offices
   - Commercial establishments (Hotels, bars and restaurants, shops, industrial plants)

The following references were used in the design criteria for the two water pipelines;

- Ministry of Water and Irrigation Design Manual for Water Supply in Kenya, October 2015.
- Al-Layla M.A, Ahmad S. and Middlebrooks E.J (1978), Water Supply Engineering Design, Michigan, Ann Arbor Science Publishers.
- Ministry of Water and Irrigation-Tanzania (2007), Design Manual for Water Supply and Waste Water Disposal.
- Kenya National Bureau of Statistics (2019) Kenya Population and Housing Census

A design period of 20 years was considered from the initial year (2023). The ultimate year was therefore taken as 2043 for which the ultimate water demand was computed.

2.5.2 Proposed Works

The works to be carried out include replacements of UPVC and Galvanized Iron/ pipes that are dilapidated, with frequent leakages.

Mukurwe-ini 33km Line - The water distribution pipelines will be replaced to augment water supply, reduce water losses from pipe leakages and bursts and cases of illegal connections. 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 pipeline will be disconnected once the newly installed line is operational, the old upvc line will be left in place to minimize environmental and social disturbance once the new pipeline becomes operational. The pipeline is designed as follows.

System Characteristics Pipe Diameter - 0.16 m

Length of pipeline – 33000 m

Pipe material – HDPE

Othaya 35km Line - The water main will be constructed to augment the 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 pipeline will be disconnected once the new one is operational. The pipeline is designed as follows.

Length of pipeline - 35000 m

Pipe material – HDPE

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, corrosion resistance, and suitability for water transmission. The pipeline will be jointed using electrofusion (EF) joints, which provide a strong and reliable connection between the pipes.

2.5.2 Project Design and Material

Pipeline Design: The pipeline design ensures maximum water flow by selecting materials based on hydraulic and structural needs, corrosion resistance, strength, watertight joints, availability, and cost-effectiveness. HDPE pipes were chosen for buried sections due to their durability, corrosion resistance, local availability, and cost efficiency. Pipe classes were determined by static pressure, ranging from PN10 to PN20. A design flow velocity of 0.6 to 1.5 m/s was maintained to prevent siltation and pipe scouring. Hydraulic analysis determined optimal pipe size, flow rates, and pressure variations

Pipeline Layout: The pipeline will be buried in 1m deep trenches with a 0.6m width, covered with compacted soil, and will run parallel to existing UPVC and GI pipelines. It crosses key roads and serves social amenities like schools and public institutions. Installation will be managed by qualified technicians, with trench excavation and pipe laying done by the local community. Electrofusion jointing will be used, followed by leak testing.

Pipeline Installation - The pipeline will be installed using 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.

Material – Approximately 68km of DN90mm HDPE pipelines with valves (air, washout) and associated chambers will be constructed using materials compliant with local and international standards. Key materials

include HDPE pipes, valves, jointing machines, and excavation tools, with labor comprising both skilled and unskilled workers.

Appurtenances

Air valves: Installed at high points and flat sections, approximately every 1,000m, designed as double orifice valves with isolation features for maintenance.

Washout valves: Installed at low points for sediment removal, with appropriate drainage and gate valves.

Section Valves: Placed at branch points, major structures, and every 2-3 km for operational efficiency.

Valve Chambers: Valve chambers, designed for durability and accessibility, include lockable covers and reinforced fittings. Anchor and thrust blocks, made of reinforced concrete, are placed at points of directional change to manage water pressure and surges.

Marker Posts: Marker posts are positioned every 500m, especially at bends and crossings, for easy identification. Road crossings use protective steel or concrete casings for tarmac and gravel roads, with excavated and reinstated trenches for murram roads.

2.6 Project Stages and Activities

2.6.1 Preconstruction Phase

During the preconstruction phase, the proponent prepared a comprehensive proposal to justify the project's necessity and evaluate its ability to meet the water demands of Othaya and Mukurwe-ini residents under OMWASCO WSP. This included conducting an ESIA to identify environmental and social concerns and proposing mitigation measures for all project phases. Extensive groundwork was undertaken, including reconnaissance and topographical surveys, hydrological analysis of the water source, water demand assessment, design layout development, and preparation of Bills of Quantities (BOQ) and tender documents. Local community interactions were conducted to gather insights on physical features and design preferences, while implementation schedules were also established. The ESIA utilized these design outputs to quantify impacts and recommend a robust management plan to mitigate or eliminate potential environmental and social risks.

2.6.2 Construction Phase

Site Clearing and Trenching - The proposed pipeline will follow the road reserve, where vegetation such as grass and shrubs will be cleared in Othaya Zone 3 and Mukurweini to facilitate trenching and pipeline installation. In Othaya Urban, some cabro pavements may be affected but will be reinstated by the contractor as per the BoQ. Manual excavation will be the primary method, except in concrete-paved and rocky sections (Mukurweini), where mechanical tools such as jackhammers and concrete cutters may be used to ensure efficiency and minimize disruptions. The table below gives the locations of the affected pavements/ tarmac.

Table 4: Location of concrete pavements and cabro blocks to be demolished

Co-ordinates	Description
Othaya Town	
-0.554485°, 36.939560°	concrete pavements 1
-0.551591°, 36.940511°	concrete pavements 2
-0.552405°, 36.945425°	concrete pavements 3
-0.552405°, 36.945425°	Silver Brook Apartment Pavement 1
-0.553293°, 36.945222°	Family Bank Pavement 2
-0.558749°, 36.943226°	Petrol station (under construction) Cabro Paving

The demolished concrete pavements and cabro blocks shall be reinstated post-construction. The cost of reinstatement has been included in the project's Bill of Quantities (BoQs). Site clearance and trenching for both pipelines will disturb the topsoil, which is rich in organic and humic content. The topsoil needs to be stored separately from the overburden to ensure that it can be effectively used for rehabilitation purposes

Public Amenities - The proposed pipeline crosses public roads and run adjacent to power lines and an existing water pipeline. These features are likely to be disrupted during construction and therefore need to be appropriately managed in collaboration with the relevant service providers and authorities.

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

Restoration Activities - Upon completion of construction, the contractor will be responsible for restoring all damaged road sections, road reserve areas, and any affected private property to their original condition or better, as per the project's BoQ and contractual requirements. Landscaping of the backfilled areas through re-vegetation and/or leveling to encourage the growth of natural grass will be conducted as a means of environmental conservation and to enhance aesthetics, with the excavated material being properly used for backfilling and land reclamation.

2.6.3 Operation Phase

Upon completion, the supply pipeline will be formally handed over and operationalized by the proponent, ensuring all social concerns are addressed, affected sites rehabilitated, and components meet design specifications. The hand-over process will include verifying completion through a joint physical evaluation with the contractor, with a finalization report submitted to WSTF and relevant County Executive Members. Continuous monitoring will ensure the pipeline conveys the designed flows and adheres to abstraction limits, with regular checks for leakages or illegal connections. The pipeline, constructed using HDPE, is expected to have a lifespan of at least 50 years, with potential durability exceeding 100 years, per the Plastics Pipe Institute. This longevity outperforms traditional materials, ensuring sustainable water supply for the projected demands of the two proposed pipelines.

Table 5: Othaya Water Demand Projections for the Ultimate Year-2043 (m3/day)

Zone	DOMESTIC/COMMERCIAL DEMAND	EDUCATIONAL DEMAND	HEALTH DEMAND	LIVESTOCK DEMAND	TOTAL DEMAND
3	400	4			404
6	372	3		8	383
					787

Table 6: Mukurwe-ini Water Demand Projections from 2023-2043

Category	2023	2033	2043
Domestic Demand	1138	1414	1758
Health Centres Demand	53	66	82
Educational Demand	80	99	123
Administrative Demand	10	12	15
Commercial Demand	170	212	263
Livestock Demand	131	213	348
Total	**1581**	**2016**	**2588**

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 OMWASCO to ensure an appropriate response.

2.6.4 Decommissioning Phase

The decommissioning phase of the water pipeline project entails a systematic cessation of operations or facility upgrades to ensure minimal environmental and social impact. If decommissioning occurs, it will involve the safe removal of equipment and infrastructure, restoration of affected areas to their original state, and implementation of monitoring measures to ensure restoration effectiveness. All activities will adhere to approved decommissioning plans and regulatory requirements to mitigate potential long-term impacts on the environment and local communities. Although decommissioning is not anticipated in the near future, proactive planning ensures that environmental and social impacts are effectively managed if necessary. This approach aligns with regulatory standards, best practices in sustainable project management, and demonstrates responsible resource and infrastructure stewardship throughout the project lifecycle.

2.7 Input and Materials

Various materials and inputs will be required for a water pipeline project. Table 4 below provides an estimate as well as projected sources of each.

Table 7: Materials Required for the Pipeline Installation

Material/Input	Quantity	Source
HDPE Pipes	68000 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 1. Pressure testing 2. Leak detection 3. Flow meters	One set per testing type (on need basis)	Import
Cement/concrete	depend on the extent of damage and the area needing repair	Local suppliers of cement or concrete products
Bedding materials	500m^3	Suppliers of crushed stone or graded materials
Backfill material	300m3	Excavated soil from the trenches

2.7.1 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.

2.8 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, 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 not yet been determined. The old upvc pipe will not be exhumed to reduce environmental disturbance and waste.

2.9 Equipment and Machinery

The construction of the Othaya and Mukurwe-ini pipelines (DN20–DN90 mm) will primarily utilize manual excavation, ensuring precision and minimal environmental impact, consistent with previously implemented projects by OMWASCO and Tana Water Works. This approach aligns with Kenya's labor-intensive policy, favoring manual methods over heavy machinery for straightforward tasks. With readily available local labor, workforce supply is assured. However, in select sections with hard surfaces, such as concrete-paved areas in Othaya and rocky sections in Mukurwe-ini, the contractor may use handheld hydraulic or pneumatic jackhammers to facilitate excavation while maintaining project efficiency.

2.10 Workforce

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

- Approximately between 270-350 manual laborers will be assigned to handle excavation duties across the 35 km in the Othaya section and approximately 250-300 laborers for the 33 km Mukurwe-ini section. Cumulatively, total manual laborer for excavation will be approximately 520. If the excavation is to go for estimate 6 months.
- Approximately at team of 210-235 workers responsible for pipe handling, laying, and backfilling for Othaya line and between 180-240 workers for Mukurwe-ini line.
- Supervision and engineering oversight will be provided by 5-10 personnel throughout project duration.

However, the exact number of personnel to be involved in the project may not be clear at this stage. The contractor will be required to give priority to youths from local community when hiring construction workers. The workforce will be employed for the duration of all construction works. In order to promote the employment of local labour, it is estimated that about 95% of the construction workers will be composed of locals. It is expected that the execution of the project will not go beyond 12 months.

2.11 Access and Land Acquisition

Both the Othaya pipeline (35 km) and Mukurwe-ini pipeline (33 km) will be installed within existing road reserves, utilizing established access routes for material and personnel transport. The Othaya pipeline involves rehabilitation in Zone 3, while Othaya zone 6 and Mukurwe-ini is a new extension. This approach ensures no displacement or land acquisition, as it relies on reserved areas and aligns with existing routes. However, temporary disruptions to businesses, including restricted access to shops, markets, and services, may occur. These impacts have been identified, with mitigation measures in place to minimize disruptions and support affected communities during construction.

2.12 Road Crossings

The Othaya pipeline route traverses a fairly built-up environment for much of its length, necessitating a few road crossings. The Othaya pipe works will entail three road crossings i.e. 2 crossings at Kanyange- Munaini Road and 1 crossing at the Othaya town-Kihuri road. It is proposed to adopt micro-tunneling (a trenchless method of laying pipes) rather than open cutting and road reinstatement. The use of trenchless technologies for crossing major roads is mandated by the road authorities to minimize disruption and maintain road integrity. There will be no road crossings for the Mukurwe-ini pipeline. Additionally, road crossings have been designed as follows;

1. Where a pipe crosses tarmac road, a gravel road or a busy earth road, a steel pipe casing or a concrete pipe/culvert will be installed to protect the pipe and allow easy maintenance
2. Where the pipe cuts across a murram road, the pipe trench will be excavated across the road and backfilled after laying, making sure to reinstate the road back to its original state

2.13 Cost Estimate

The estimated total cost of the project is 28,018,335 (Ksh Twenty-Eight Million, Eighteen Thousand Three Hundred and Thirty-Five Shillings only) and a summary breakdown of the costs is presented in Tables below:

Table 8: Project Budget Estimates for Othaya Urban Pipeline

	REHABILITATION OF PIPELINES IN OTHAYA URBAN PIPELINE	
ITEM	**DESCRIPTION**	**AMOUNT (KSH)**
BILL NO. 1	PRELIMINARIES AND GENERAL ITEMS	1,755,000
BILL NO.3.0	MI1SZ3	2,834,712
BILL NO.3.1	DL 1 SZ3	159,650
BILL NO.3.2	DL 2 SZ3	136,070
BILL NO.3.4	LINE 4 SZ3	198,730
BILL NO.3.9	LINE 9 SZ3	89,890
BILL NO.3.10	LINE10 SZ3	96,290
BILL NO.3.11	LINE 11 SZ3	124,720
BILL NO.3.12	LINE 12 SZ3	127,090
BILL NO.3.13	LINE 13 SZ3	109,890
BILL NO.3.14	LINE 14 SZ3	74,290
BILL NO.3.15	LINE 15 SZ3	64,190
BILL NO.6.1	DL SZ 6	3,712,767
BILL NO.6.4	LINE 4 SZ 6	95,190
BILL NO.6.5	LINE 5 SZ 6	95.190
BILL NO.6.6	LINE 6 SZ 6	203,990
BILL NO.6.8	LINE 8 SZ 6	156,590
BILL NO.6.9	LINE 9 SZ 6	136,790
BILL NO.6.10	LINE 10 SZ 6	84,510
BILL NO.6.11	LINE 11 SZ 6	124,720
BILL NO.6.12	LINE12 SZ 6	106,390
BILL NO.6.13	LINE 13 SZ 6	114,390
BILL NO.6.16	LINE 16 SZ 6	74,290
BILL NO.6.17	LINE 17 SZ 6	96,990
	SUB TOTAL A	**10,772,329**

	ADD 5% FOR CONTINGENCIES	538,616
	SUBTOTAL B	**11,310,945**
	ADD 16% VAT	1,809,751
	GRAND TOTAL	**13,120, 697**

Table 9: Project Budget Estimates for Othaya Urban Pipeline

	MUKURWE-INI TOWN WATER SUPPLY NETWORK	
ITEM	**DESCRIPTION**	**AMOUNT (KSH)**
BILL NO. 1	PRELIMINARIES AND GENERAL ITEMS	2,350, 000.00
BILL NO.6.1	Muote PF 1SZ 6	239,020.00
BILL NO.6.1.1	Muote B LT1 SZ 6	105,665.60
BILL NO.6.2	Muote County PF2 SZ6	437,560.00
BILL NO.6.2.1	Muote County LT 1 SZ6	103,870.00
BILL NO.6.2.2	Muote County B LT2 SZ6	109,986.00
BILL NO.6.3	Gospel Outreach PF3 SZ6	1,130,512
BILL NO.6.4	Gospel Outreach B PF 4 SZ6	940,960
BILL NO.6.4.1	Milimani Court LT1 SZ6	109,986
BILL NO.6.4.2	Noah House LT2 SZ6	112,490.00
BILL NO.6.4.3	Musamalia LT3 SZ6	146,870.00
BILL NO.6.4.4	Upper Hill LT4 SZ6	137,582.00
BILL NO.6.5.1	Gachiririo Law Court LT1 SZ^	328,260.00
BILL NO.6.5.1B	Gachiririo Opposite Wakulima LT	116,102.00
BILL NO.6.5.2	Muthaiga LT2 SZ6	143,624.00
BILL NO.6.5.3	Resco LT3 SZ6	143,624.00
BILL NO.6.5.4	Karimururi LT 4SZ6	695, 284.00
BILL NO.6.5.5	Kabuku LT 5 SZ6	189,278.40
BILL NO.5.1	Pewa Service PF 1 SZ5	628,160.00
BILL NO.5.1.1	Opposite Davis LT1 SZ5	124,986.00
BILL NO.5.1.2	Jubilee LT2 SZ5	124,986.00
BILL NO.5.1.3	Resco Town LT3 SZ5	111,525.00
BILL NO.5.1.4	Kuwait LT4 SZ5	111, 525.00
BILL NO.5.1.5	Super café LT SZ5	131, 402.00
BILL NO.5.1.6	Kiongo Miti LT6SZ5	105,409.00
BILL NO.5.1.7	Kiongo Miti B LT 7 SZ 5	109,809.00
BILL NO.5.1.8	Kiongo Miti LT 8 SZ5	122, 228.00
BILL NO.5.2	Muhito PF 2 SZ5	515, 360.00
BILL NO.5.2.1	Kiamungu A LT 1 PF 2 SZ 5	115, 812.00
BILL NO.5.2.2	Kiamungu B LT 2 PF 2 SZ 5	123,012. 00
BILL NO.5.2.3	Kiamungu C LT 3 PF 2 SZ 5	115,812.00
BILL NO.5.3	Muhito PF 2 SZ5	1,401,260.00
BILL NO.5.4	Ngoru MMTI PF4 SZ5	258,210.00
BILL NO.5.5	Ngoru Sec PF5 SZ5	591,060.00
SUB TOTAL A		**12,231,230.00**
ADD 5% FOR CONTINGENCIES		611,561. 50
SUBTOTAL B		**12,842,791.50**
ADD 16% VAT		2,054,846
GRAND TOTAL		**14,897,638,14**

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 Safeguard Policies. For the majority of disciplines, where there is a difference between the national Kenyan standards and World Bank Safeguard Policies, whichever is more stringent will apply.

3.1 The Constitution of Kenya

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

i. Ensure sustainable 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. OMWASCO 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 wastewater. The policy requires that those who pollute water bodies must pay the full cost of remediation of the contaminated water; in tandem with the "Polluter Pays Principle." The proposed water project aims at providing sufficient and good quality water supply to water users of the Othaya and Mukurwe-ini areas. 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 have to be complied with to ensure the proposed water project is environmentally sustainable and aligns with the national climate goals.

3.3.4 Kenya Environmental Sanitation and Hygiene Policy 2016-2030.

The Kenya Environmental Sanitation and Hygiene Policy 2016-2030 (KESHP) proposes a range of complementary activities including the provision of sanitation services and maintenance of sanitary facilities for proper collection, treatment and environmentally sound disposal of liquid and solid wastes, water treatment and safety, promotion of hygiene practices, public education, sanitation marketing, regulation and legislation supported by clearly mandated institutions, sustainable financing and research and development. It covers urban and rural areas including households and local institutions. The areas of concern include, among others, rural sanitation, treatment of household water, disposal of (industrial) wastes, protection of wetlands and water courses from indiscriminate disposal of wastes, and food safety and hygiene, safe water supply. County governments will enforce standards regarding sanitation and hygiene at household levels in rural areas. The policy measures shall embrace the specified principles that impact on the access to improved environmental sanitation and hygiene services and a clean and healthy environment such as the recognition of a clean and healthy environment and sanitation as human rights, community-led total sanitation, gender responsiveness and social inclusion, and the polluter pays.

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

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

Relevance

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

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

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

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

Relevance

The proposed water project 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.

3.3.7 National Sustainable Waste Management Policy, 2021

The National Sustainable Waste Management Policy aims to create an enabling environment for Kenya to effectively tackle waste challenge by implementing sustainable, waste management that prioritizes waste minimization and contributes to a circular economy. The policy proposes the adoption of a waste hierarchy that includes reducing or preventing waste generation at the source and re-use of materials.; effective and affordable waste collection in all neighborhoods, where waste is to be separated at source ensuring that recyclable materials are not contaminated by or mixed with waste.

Relevance

The Proponent and the Contractor will be required to reduce waste generation; segregate waste (recyclable and non-recyclable) and dispose of the non-recyclable in an environmentally acceptable manner.

3.3.8 Gender Policy, 2011

The National Gender Policy (2011) aims to mainstream concerns in the national development process in order to improve the social, legal/civic, economic and cultural conditions of women, men, girls and boys in Kenya. The policy aims at ensuring gender equality and women's empowerment and mainstreaming of needs and concerns of women, men, girls and boys in all sectors of development in the country so that they can participate and benefit equally from development initiatives.

Relevance

This policy would especially apply to the recruitment of construction labour for the water pipeline rehabilitation project, where women should have equal opportunity as men for available jobs. This policy also requires provision of a work environment that is safe and conducive to women and men, considering gender-disaggregated differences and vulnerabilities.

3.3.9 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 the implementation of the proposed water project. The tender document and contract have incorporate the implementation of HIV awareness initiatives during the construction phase of the proposed water project as well as measures on IEC for workers and community members, voluntary as / Health testing and counselling during construction.

3.3.10 Kenya Youth Development Policy, 2019

The Youth Policy seeks to appreciate the stipulation of the Constitution of Kenya 2010 and especially the National Values and Principle of Governance under Article 10. The Policy addresses key strategies needed to engage the youth in ensuring their active participation and holistic engagement in actualizing national values and principles of governance.

The policy's goal is to promote holistic empowerment and participation of the youth in socio-economic and political development for themselves, the country, and the future.

Relevance

The project will contribute to youth empowerment through employment opportunities, especially during the construction.

3.4 Legal Framework

There exists national statutes and regulations that the OMWASCO WSP will have a legal duty and social responsibility in ensuring the proposed water supply project is implemented in a manner that does not compromise the current status of natural resources, socio-cultural setting as well as the economic potential of the communities in the proposed project area. The proposed works will be implemented within the provisions of the following applicable Acts of Parliament and their respective regulations:

3.4.1 The Environmental Management and Coordination (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. The permission can be granted subject to the findings of an Environmental Impact Assessment. The Act also empowers the Minister of Environment to declare a lakeshore, wetland, coastal zone or riverbank as protected area and impose such restrictions, as he considers necessary to protect the lakeshore, wetland, coastal zone and riverbank from environmental degradation.

Relevance

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

The Act has further provided for the development of several subsidiary legislations and guidelines which govern environmental management and are relevant to the proposed water project implementation. These are tabulated in table 10 below:

Table 10: Regulations under EMCA relevant to the proposed water project

S.N.	Subsidiary Legislation	Description	Relevance
1.	The Environmental Management and Coordination (Strategic Assessment, Integrated Impact Assessment and Environmental Audit) Regulations, 2018	These Regulations contain rules relative to the content and procedures of an EIA, to environmental audit and to Monitoring and strategic environmental assessment. These rules regulate other matters such as the appeal for, and registration of, information regarding EIA. The rules also provide the applicable environmental licensing fees for the different project categories.	The EIA to be carried out on the potential interventions should be carried out in accordance to these regulations. An initial environmental audit should also be carried out in the first year of operation of the project.
2.	The Environmental Management and Coordination (Conservation and Management of 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 Gikira and Thuti river resources in the project area and hence the regulation is relevant.
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 of the fact that during construction, waste will be generated from the construction materials as well as by the construction workers.
5.	The Environmental Management and	-Provides for ambient air quality tolerance limits.	The contractor will comply with these regulations by regulating.

	Coordination (Air Quality) Regulations, 2014	-Prohibits air pollution in a manner that exceed specified levels. -Provides for installation of air pollution control systems where pollutants emitted exceed specified limits. -Provides for the control of fugitive emissions within property boundary. -Provides for the control of vehicular emissions. -Provides for prevention of dispersion of visible particulate matter or dust from any material being transported. -Provides for acquisition of an emission license.	-Exhaust emissions from construction machinery. -Dust from Site clearance and excavation of foundations. -Dust and exhaust emissions from transportation and disposal of spoil.
6.	The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009	-Prohibits the generation of unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. -Provides for the maximum noise levels permissible in various environmental set ups such as residential areas, places of worship, commercial areas and mixed residential	The Contractor will be required to ensure compliance with the above regulations in order to promote a healthy and safe working environment throughout the Construction Phase.
7.	Extended Producer Responsibility Regulations, 2022	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.
8.	Water Resources Regulations, 2021	The Water Resources Regulations, 2021 govern the management, use, and conservation of water resources in Kenya. These regulations establish guidelines for obtaining permits, managing water quality, protecting water catchment areas, and ensuring sustainable water use. They emphasize the need for Environmental Impact Assessments (EIAs) for activities that may affect water resources and set standards for the protection of aquatic ecosystems. Compliance with these regulations is crucial for the sustainable development and management of water infrastructure projects.	

3.4.2 Water Act, 2016

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

- Subject to the Land Act, 2012, land required for national public water works may be acquired in any manner provided by law for the acquisition of land for public purposes;
- Compensation on just terms shall be payable by the Government to the owner of the land on which any such works are constructed;

- Every person in Kenya has the right to clean and safe water in adequate quantities and to reasonable standards of sanitation;
- Provides that a permit is required for use of water from a water resource;
- A person shall not, without authority conferred under this Act throw, convey, cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive matter or thing into or near to any water resource in such manner as to cause, or be likely to cause, pollution of the water resource;
- Provides for payment for water use as part of the permit conditions.

Relevance

The proponent operates as a result of the act. OMWASCO intends to increase the water supply in areas of Othaya town and Mukurwe-ini town through tapping of the water from an existing main line for which the Company has WRA permit for abstraction. Relevant permits must thus be acquired/renewed at all times in compliance with the law and consequent notification of the relevant authorities under the Act.

3.4.3 Land Act 2012

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

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

Relevance

The proposed project shall be constructed along the road reserve within the project area. Easement/ acquisition of the land shall require coordination with the relevant government agencies in its usage.

3.4.4 County Government Act No. 17, 2012

This act provides for the roles and duties of County governments. Part II of the Act empowers the county government to be in charge of functions described in Article 186 of the constitution, (county roads, water and Sanitation, and 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.

The Act also states that public participation in the county planning processes shall be mandatory and provision of the public with unambiguous information including clear strategic environmental assessments and environmental impact assessment reports, expected development outcomes, and, development options and their cost implications.

Relevance

The Project once commissioned shall be handed over to OMWASCO WSP, for operation and maintenance in accordance with the Act. This ESIA study is in fulfillment of the requirement of public participation by providing clear information on the proposed OMWASCO project.

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 (Mukurweini and Othaya). The proponent has engaged with the relevant 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 6) 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 Nyeri County Physical and Land Use Plan.

3.4.7 Occupational Safety and Health Act (OSHA), 2007

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

Under this Act, the duties of the Occupier are:

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

    a) The provision and maintenance of plant and systems of work that are, so far as is reasonably practicable, safe and without risks to health;

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

Relevance

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

3.4.8 The Public Health Act (Cap 242)

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

Relevance

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

3.4.9 Sustainable Waste Management Act, 2022

The Sustainable Waste Management Act, 2022 establishes the legal and institutional framework for the sustainable management of waste. The Act ensures the realisation of the constitutional provision on the right to a clean and healthy environment and for connected purposes. Section 12 of the Act stipulates that all private and public sector entities shall segregate non-hazardous waste into organic and non-organic fractions, The segregated waste shall be placed in properly labelled and colour coded receptacles, bins, containers and bags. Section 13 of the Act states that every producer shall bare extended producer

responsibility obligations to reduce pollution and environmental impacts of the products they introduce into the Kenyan market and waste arising therefrom. Each county government is required to prepare an integrated county waste management plan once every five years and submit to the county assembly for approval under section 18 of the Act. In section 19, a private sector entity is required to prepare a three-year Waste management plan and submit an annual monitoring report to the authority.

Relevance

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

3.4.10 Employment Act 2007

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

Relevance

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

3.4.11 Work Injury Benefits Act, 2007

The Act provides for compensation to employees for work related injuries and diseases contracted in the course of employment. Section 7 directs all employers to obtain and maintain an insurance policy in respect of any liability that the employer may incur under this Act to any of his employees. Section 10 gives direction on compensation for work related injuries. Part (1) of the Section states that an employee who is involved in an accident resulting in the employee's disablement or death is entitled to compensation.

Relevance

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

3.4.12 Children Act, Cap 141

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

Relevance

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

3.4.13 National Gender and Equality Commission Act, 2011

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 on minor (children).

Relevance

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

3.4.15 HIV and AIDS Prevention and Control Act, 2006

The object and purpose of this Act is to

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

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

Relevance

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

3.4.16 Penal code, Cap 63

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

Relevance

The project intends to supply water to Othaya and Mukurwe-ini residents and the neighbouring areas. The proponent is tasked to provide clean water free from any contamination at all times during the operation phase

3.4.17 Climate Change Act, 2016

The Climate Change Act, 2016 is pivotal for water infrastructure projects in Kenya, emphasizing comprehensive environmental impact assessments (EIAs) to evaluate climate change impacts such as

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

Relevance

Water infrastructure projects are crucial under the Climate Change Act, 2016 as they align with goals of climate resilience and sustainable development. They necessitate rigorous assessment of climate impacts via EIAs, integrate adaptive measures to enhance resilience against extreme weather events, and promote sustainable water management practices to mitigate environmental impacts and support long-term climate goals in Kenya.

3.4.18 Nyeri County Water and Sewerage Services Act, 2017

The Nyeri County Water and Sewerage Services Act, 2017, is designed to provide for the development, regulation, and management of Water, sewerage, flood, and storm water management systems, water conservation, and connected purposes. The Act establishes the Directorate of Water and Sewerage Services headed by the Directorate for Water and Sewerage Services. Water services providers shall be established under the provisions of this Act. It stipulates that Water Service Providers shall manage water and sewerage Services under delegated Authority and shall be licensed by the County Government under the provisions of this Act. The Directorate of Water and Sewerage Services shall be responsible for formulation, promotion and monitoring the implementation of policies. It shall also, among other things, issue authorization and/or licenses to water service providers as defined under this Act, monitor, regulate and enforce license conditions, establish a mechanism for handling complaints from consumers regarding the quality or nature of water services, and develop and promote policies, strategies and mechanisms for climate change mitigation and adaptation in the water sector.

The Act also establishes mechanisms for managing and regulating water services, including the creation and responsibilities of water service providers. The Act promotes the sustainable use and conservation of water resources (Section 16), outlining procedures for registration and licensing water service providers and ensuring compliance with standards (Sections 8-12). It encourages local participation in water resource management decisions (Section 41), providing guidelines for setting and regulating water tariffs to ensure affordability and transparency (Section 13). Additionally, the Act offers mechanisms for resolving conflicts related to water services (Section 62) and details penalties for non-compliance to maintain the integrity of water services (Section 69).

Every water service provider licensed under this Act shall enter into a written Service Provision Agreement (SPA) with the County Government for purposes of exercise and performance of all its powers and functions under the license. The Act defines the power of a Water Service Provider to prohibit or restrict use of water. It may also require the compulsory acquisition of land for any of its purposes. The Act furthermore provides with respect to, among other things, protection of storm water systems, control of water pollution and effluent discharge.

Relevance

The Nyeri County Water and Sewerage Services Act, 2017, is highly relevant to the ESIA for the water pipeline project. The OMWASCO WSP adheres to licensing and regulatory requirements and has obtained necessary permits and following water service standards as stipulated under Sections 8-12. The WSP must align with sustainable water resource management principles, ensuring no negative impact on water availability and quality. The project should engage local communities in planning and implementation, addressing concerns, and promoting support (Section 41). If the project involves water distribution, it must follow guidelines for fair and transparent pricing (Section 13). Additionally, the project should utilize dispute resolution mechanisms for any conflicts related to water services (Section 62). Compliance with all provisions of the Act is necessary to avoid penalties and ensure smooth project execution (Section 21).

3.4.19 The National Museums and Heritage Act,2006

The National Museums and Heritage Act CAP 2016 protects all archaeological and historical cultural heritage objects of historical interest and other protected objects. These objects of historical interest include:

- Antiquities - any moveable object other than a book or document made in or imported into Kenya before the year 1895, or any human, faunal or floral remains of similar minimum age;
- Object of archaeological or paleontological interest in existence before the year 1800;
- Object of historical, cultural or scientific interest which came into existence in or after the year 1800;
- Architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of universal value from the point of view of history, art or science;
- Works of humanity or the combined works of nature and humanity, and areas including archaeological sites, which are of outstanding value from the historical, aesthetic, ethnological or anthropological point of view;
- Areas which are and have been of religious significance, use or veneration and which include but are not limited to Kayas;
- A door or door frame carved in an African of Oriental style before the year 1946; and
- Any object or type of object, whether or not part of an immovable structure, which being of historical or cultural interest has been and remains declared by the Minister under section 25 (1) (d) to be a protected object.

Relevance

The project will adhere to the requirements of this Act in ensuring the protection of any cultural heritage structures and objects found within the project area. Additionally, a chance-find procedure has been annexed to this report to guide the Proponent on how to handle chance-finds.

3.5 National Water Quality Standards

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

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

3.6 Institutional Framework for Environment and Water Sector Management

Key administrative agencies regulating water development and its environmental implications include:

3.6.1 Ministry of Environment, Climate Change and Forestry

Responsible for conserving and sustainably managing natural resources, enhancing governance, mitigating climate change, and promoting agroforestry and ecosystem resilience.

3.6.2 National Environment Management Authority

The primary agency for environmental management, responsible for granting ESIA approvals, monitoring projects to prevent environmental degradation, and integrating environmental considerations into development policies.

3.6.3 County Environment Committees

Oversee environmental management within counties and develop five-year strategic environmental action plans.

3.6.4 National Environment Tribunal

Handles appeals related to environmental standards enforcement, including disputes over EIA licenses and legal referrals from NEMA.

3.6.5 Ministry of Water, Sanitation and Irrigation

Develops policies, monitors water resources, and ensures sustainable water and sewerage services.

3.6.6 Water Resources Authority

Water Resources Authority (WRA) Safeguards water resources, ensuring sustainable and equitable access for all.

3.6.7 Water Works Development Agencies

Develops, maintains, and manages public waterworks, supports county governments, and provides technical services

3.6.8 The Water Services Regulatory Board

Protects consumer rights, regulates water services, sets standards, and monitors compliance with water services laws and policies.

3.6.9 Water Service Providers

Water Service Providers Licensed by WASREB, WSPs deliver water services and manage county water assets.

3.6.10 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.

3.6.11 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.

3.7 World Bank Operational Policies

The World Bank has well set Safeguard Policies aimed at ensuring the organization's funded projects adhere to environmental and social protection. Applicable World Operational Policies (OPs) are listed in Table 11 below.

Table 11: Applicable World Bank Operational Policies

OPs	Provision	Relevance
World Bank OP 4.01 on Environmental Assessment	Provides for environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making.	The proposed water project is classified under category C, as it is likely to have minimal or no adverse environmental impacts.
World Bank OP 4.12 on Involuntary Resettlement	▪ The objective of this policy is to avoid where feasible, or minimize, exploring all viable alternative Project designs, to avoid resettlement. This policy is triggered in situations involving involuntary taking of land and involuntary restrictions of access to land. ▪ This policy is triggered when a Project activity causes the involuntary taking of land and other assets resulting in: Relocation or loss of shelter, loss of assets or access to assets, loss of income sources or means of livelihood, whether or not the affected persons must move to another location.	The project will not result in any physical resettlement. Policy is triggered due to temporary income disruptions, though no physical resettlement or land acquisition will occur. Mitigation measures in the ESMP address restricted access to businesses during construction.
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 (annex 6) to be adopted by the contractor during civil works.

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

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry- specific examples of Good International Industry Practice. When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors.

The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site -specific targets, with an appropriate timetable for achieving them.

Relevance

The EHS Guidelines for Water and Sanitation include information relevant to the operation and maintenance of:

i. Potable water treatment and distribution systems
ii. Collection of sewage in centralized systems or decentralized systems and treatment of collected sewage at centralized facilities.

The above discussed Guidelines/ Instruments, present Environmental Health issues concerned with Water Distribution and the necessary requirement to assure adequate capacity to supply the water demand. The most significant environmental issues associated with operation of water distribution systems include: Water system leaks, loss of pressure and Water discharges**.** The Project design has ensured mitigation of these environmental risks.

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

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

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

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

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

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

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

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

Table 12: Summary of Gaps between Kenyan legislation and World Bank Safeguards giving recommendations on how to bridge the Gaps

World Bank OP 4.01	EMCA (amendments), 2015	Comparison	Recommendation
O.P 4.01 requires screening of sub project investments in order to determine if further environmental and social assessments (ESIAs) are needed Following screening and determination of the category of ESIA required, an ESIA will be prepared before project design and implementation (which also includes an assessment of social impacts). Also gives guidelines on air, noise, water, waste management, emissions and wetlands management.	EMCA requires screening of project investments in order to determine if further environmental and social assessments (ESIAs) are needed An ESIA of a project will be prepared in accordance to EMCA guidelines and the report submitted to NEMA for licensing. EMCA is also equipped with regulations on air, noise, water, waste management, emissions and wetlands management.	Both the Kenyan and World Bank safeguards require screening to establish the level of ESIA prepared. The ESIA will be prepared with mitigation measures for any negative environmental and social impacts. The various limits set out in the regulations are close to World Bank and IFC policies with minimal differences in the actual figures.	Preparation of the ESIA to meet both NEMA and World Bank Standards. Use of Kenyan regulations in accordance to EMCA.
World Bank OP 4.11	**EMCA (amendments), 2015**	**Comparison**	**Recommendation**
This policy guides in preserving physical cultural resources and helps reduce chances of their destruction or damage	The National Museums and Heritage Act identifies the need for the protection, conservation and transmission of the cultural and natural heritage of Kenya	The World Bank policy offers more detail on the physical and cultural resources other than archaeological finds identified in the Kenyan Policy	Use of the World Bank policy in handling any physical and cultural site, while making use of the Kenyan institutional framework
World Bank OP 4.12	**EMCA (amendments), 2015**	**Comparison**	**Recommendation**
Involuntary resettlement should be avoided wherever possible, or minimized, exploring all alternatives.	Involuntary resettlement may occur as a result of projects implemented in public interest.	Land Act, 2012 aligns with international practices by advocating for minimizing involuntary resettlement wherever possible. While resettlement may be permitted for projects in the public interest, the Act emphasizes exploring alternatives to avoid or reduce displacement. The statement should be revised to reflect this policy position.	Resettlement issues considered at the design stage of the project in order to avoid/ minimize resettlement.

3.8 International Conventions

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

- Convention on the Elimination of All Forms of Discrimination Against Women.
- The Protocol to the African Charter on the Rights of Women in Africa (Maputo Protocol)
- Convention on the Rights of the Child
- The African Charter on the Rights and Welfare of the Child
- Convention on the Rights of Persons with Disabilities
- Convention on Biological Diversity (2006)
- Convention on Climatic Change and the Paris Agreement (2016)

3.9 Sustainable Development Goals

Kenya, like many other countries, is actively working towards achieving the United Nations Sustainable Development Goals (SDGs). These 17 goals aim to address global challenges, including poverty, inequality, climate change, environmental degradation, peace, and justice, by 2030.

The following are the SDGs that are relevant to this project;

1. SDG No. 1- No Poverty; Ending poverty in all its forms everywhere
2. SDG No. 2- Good Health and Well-Being: Ensuring healthy lives and promoting well-being for all at all ages
3. SDG No. 6-Clean water and Sanitation: Ensuring availability and sustainable management of water for all
4. SDG No.12-Responsible consumption and production: ensuring sustainable consumption and production patterns
5. SDG No. 13- Climate Action: Taking urgent actions to combat climate change and its impacts

3.10 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 project since they will be determined as need arises. Table 13 below lists permits/Licenses required for this project

Table 13: Relevant Permit/Licenses Required

S/No	Requirement	Issuing Authority
1.	ESIA License for the project	NEMA
2.	Requisite permissions from Road Authorities	KURA (for the Othaya Section) and KERRA (for the Mukurwe-ini section) to lay the pipes within the road reserves

4. APPROACH AND METHODOLOGY

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

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

4.1 Spatial Boundaries

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

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

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

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

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

4.2 ESIA Methodology

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

4.2.1 Screening

EMCA requires screening of project investments in order to determine if further environmental assessments (ESIAs) are needed. The proposed Othaya-Mukurwe-ini 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, the Othaya-Mukurwe-ini Project is classified as a **Medium Risk project** (3 (c) water supply and distribution infrastructures). Completed screening form has been attached in Appendix 11.
- The nature and extent of the potential impacts of the Project. Considering 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 identified key environmental and social issues to address in the ESIA and anticipated impacts throughout the project lifecycle. It served as the first step in the ESIA process, with objectives to pinpoint significant environmental and social concerns. The following activities were undertaken:

- Evaluating the landscape, settlements, and habitats served by the project.
- Identifying critical habitats potentially affected by the project.
- Collecting baseline data sources.
- Determining the project's area of influence.
- Assessing project alternatives.
- Consulting stakeholders interested in or affected by the project.
- Identifying and prioritizing cross-sectoral issues and impacts.
- Defining the environmental and legislative context of the project.

4.2.3 Baseline Data Collection

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

4.2.3.1 Document Review

A literature review was conducted to understand the baseline conditions and establish the legal, institutional, biophysical, and socioeconomic context of the proposed project. The review guided the development of fieldwork tools, schedules, and the Stakeholder Engagement Plan. Key documents reviewed included:

- **Project-Specific Documents:** CSLG-II Environmental and Social Screening Report & Road Map, WSDP Environmental and Social Management Framework.;
- **International Guidelines:** World Bank Operational Policies, WHO standards;

- **Local and Regional References:** KNBS 2019 Census, Mukurwe-ini Urban Area Plan (2020-2030), Nyeri County Water and Sewerage Services Act (2017), Participatory Climate Risk Assessment (2023), Spatial Plan (2019-2029), and Integrated Development Plan (CIDP III) 2023-2027.

4.2.3.2 Site Visits

The Consultant conducted an initial site reconnaissance on 30th and 31st May 2024 to assess existing conditions, identify potential environmental and social impacts, and collect preliminary data for the ESIA. During the visit, the Consultant met with the MD of OMWASCO and was later accompanied by the GIS Officer to discuss any environmental, social, or technical constraints observed in the field.

A detailed site investigation was carried out on 19th–20th June, 25th June, and 12th July 2024. This included site walkovers, examination of the proposed wayleave, and stakeholder meetings at both County and community levels to announce the project, identify data sources, and begin assessing potential impacts. Primary environmental and social data were collected through public meetings, Focus Group Discussions (FGDs), Key Informant Interviews, and additional site walkovers.

Photography and GPS were used during site visits to record notable features and baseline conditions. Photos documented existing site features, soils, and flora species, while transect walks and imagery helped identify potential project impacts. Relevant images were stored and are included in this report.

Flora and fauna assessment the methodology for assessing flora and fauna involved site walks, interviews, and secondary data collection. Walks along the project route enabled direct ecological observations. Supplementary information was obtained through local stakeholder interviews and secondary sources. GPS coordinates, digital photographs, and data sheets documented findings comprehensively. This approach allowed for identifying and mapping sensitive receptors, ensuring all 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 general 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 Othaya and Mukurwe-ini pipelines. Key stakeholder's views on the project were solicited through interviews and discussions with County officials, technical teams at Nyeri County Department of Water and also the OMWASCO WSP technical team.

a) Stakeholder Identification and Mapping

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

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

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

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

- Mobilization for the Community Meeting

Prior to the community engagement meetings, a two weeks' notice was issued through a letter (letter Ref No. WSTF/CLSG 11/ VOL. 1/219/ (1) dated 4th June, 2024) sent out to the Deputy County Commissioner for Mukurweini Sub County and Othaya Sub County, who cascaded down to the ACC and Chiefs to inform the community members of the meeting. The mobilization was done by the area Assistant chiefs through village administrators of the area after firming up where the meeting was to take place and the locals informed of the meeting and venue with regards to Othaya-Mukurwe-ini water project. The message was announced by word of mouth at public social gatherings and churches.

- Meeting with Nyeri County Key Stakeholders

A separate meeting was held with the DCC Othaya and Ag. DCC Mukurweini on 31st May, 2024. The main agenda was to explain the project to them and solicit their views on the project. Further, the officers were also briefed that on the need for carrying out consultations with the target communities. The NEMA office was visited to understand the project requirements in terms of reporting and prerequisite documents to allow for approval of the report once submitted.

- Public Forum/Meeting

The consultant's team undertook community engagement forums with the project beneficiaries and the communities where the project will be implemented. The main objective was to explain the project details and solicit broad community support and acceptability of the project. Separate meetings for Othaya and Mukurwe-ini central/urban and Mukurwe-ini West were held with the community members. The team explained to the community members about the project and other related information as discussed in the minutes. The meeting was then opened up for a plenary session.

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

- Focus Group Discussions

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 in regard to the proposed project. The key informants interviewed were from the following sectors;

1. Education sector:
   a) Mukurwe-ini Sub-County
      - Mr. Peter K. Muthara- Principal- Ngoru Orthodox Secondary School
      - Mr., Denis Mwangi-Teacher- Muhito Primary School
   b) Othaya Sub-County
      - Ms. Cecilia Maina- Head Teacher- Munaini Primary School
2. Health sector
   a) Mukurwe-ini sub-County
      - Dr. Kagwa Duncan- Medical Superintendent of Mukurwe-ini Sub- County Hospital
   c) Othaya Sub-County
      - George Kiongo- Medical Superintendent- Othaya Sub- County Hospital
3. Local Administration.
   a) Mukurwe-ini Sub- County
      - Mr. Tirimba Samuel- Assistant County Commissioner (Mukurwe-ini Central)
      - Mr. Simon Kibira- Acting Chief, Muhito Location
      - Ms. Loise Mumbi- Chief- Gakindu Location
   b) Othaya Sub-County
      - Mr. Steven Githaiga-Chief, Othaya Township
4. OMWASCO
      - Mr. Simon Murage- Officer- Department of Water, Environment and Climate Change

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 Nyeri, Kenya National Bureau of Statistics Reports among others. Primary data was collected from key informants and consultations which included public barazas, community profile forms and FGDs.

4.2.3.5 Assessment of Project Impact

The method used to identify and assess the Project impact rely primarily on extensive knowledge of the Project and its environment, as well as on experience in conducting environmental and social impact assessments for similar projects. Lessons learned from previous experiences provide relevant information on the nature and intensity of impact associated with this type of project, as well as on the real effectiveness

of mitigation and compensation measures generally applied. This section describes the step-by-step impact assessment process that leads to the final assessment of the significance of the residual impact. The process involved in assessing the potential impacts of the project used the following steps:

- **Identification:** The Potential environmental impacts were identified, classified and magnitude determined
- **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 Othaya-Mukurwe-ini 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 Othaya-Mukurwe-ini 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 7 and Table 8 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 14: 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 15: 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

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

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

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

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

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

4.2.3.6 Cumulative Impacts Assessment

Cumulative impacts refer to environmental changes arising from the combined effects of a project with past, present, and future human activities, potentially interacting over time or across locations. For this project, the cumulative impact assessment considered its interactions with other activities and projects, emphasizing water-related components within the broader water infrastructure network. This ensures a holistic understanding of impacts on water resources, ecosystems, and community well-being. The methodology involved reviewing baseline data, identifying relevant projects, consulting stakeholders, and using professional judgment and quantitative approaches to evaluate combined effects. This approach helps identify and address potential cumulative impacts to support sustainable project outcomes.

4.3 Gaps and Uncertainties

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

- Gaps in Project Description

At this stage it is unknown, although unlikely, whether heavy machineries material will be required for the construction of Project. Additionally, information on the detailed design of the rehabilitation project was not made available to the consultants.

- 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 Nyeri 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 baseline data collection 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 Nyeri County.
- ***Project Site:*** Secondary and primary information was collected along the Project Sites, specifically within Othaya town and Mukurwe-ini 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 Nyeri 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 30th and M1st May 2024, as well as between 19th to 20th and 25th 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 Othaya and Mukurwe-ini. The Othaya pipeline is located in Othaya Township Location, Nyeri South/Othaya Sub County, within Nyeri County. The Mukurwe-ini pipeline is in Muhito Location, Thiha, Gaturia and Murunduini sub-locations, Mukurwe-ini Central sub-county and a small section in Gakindu Location, Mbiu-ini sub-location, Mukurwe-ini West sub-county within Nyeri County.

Nyeri County is one of the 47 Counties in Kenya and is located in the central region of the country. It covers an area of 3,325 km^2 and is situated between longitude 36^0 38" and 37°20' east and between the equator and latitude 0^0 38' South. It boarders Laikipia County to the North, Kirinyaga county to the East, Murang'a County to the South, Nyandarua County to the West and the Meru County to the northeast as shown in Figure 1 overleaf.

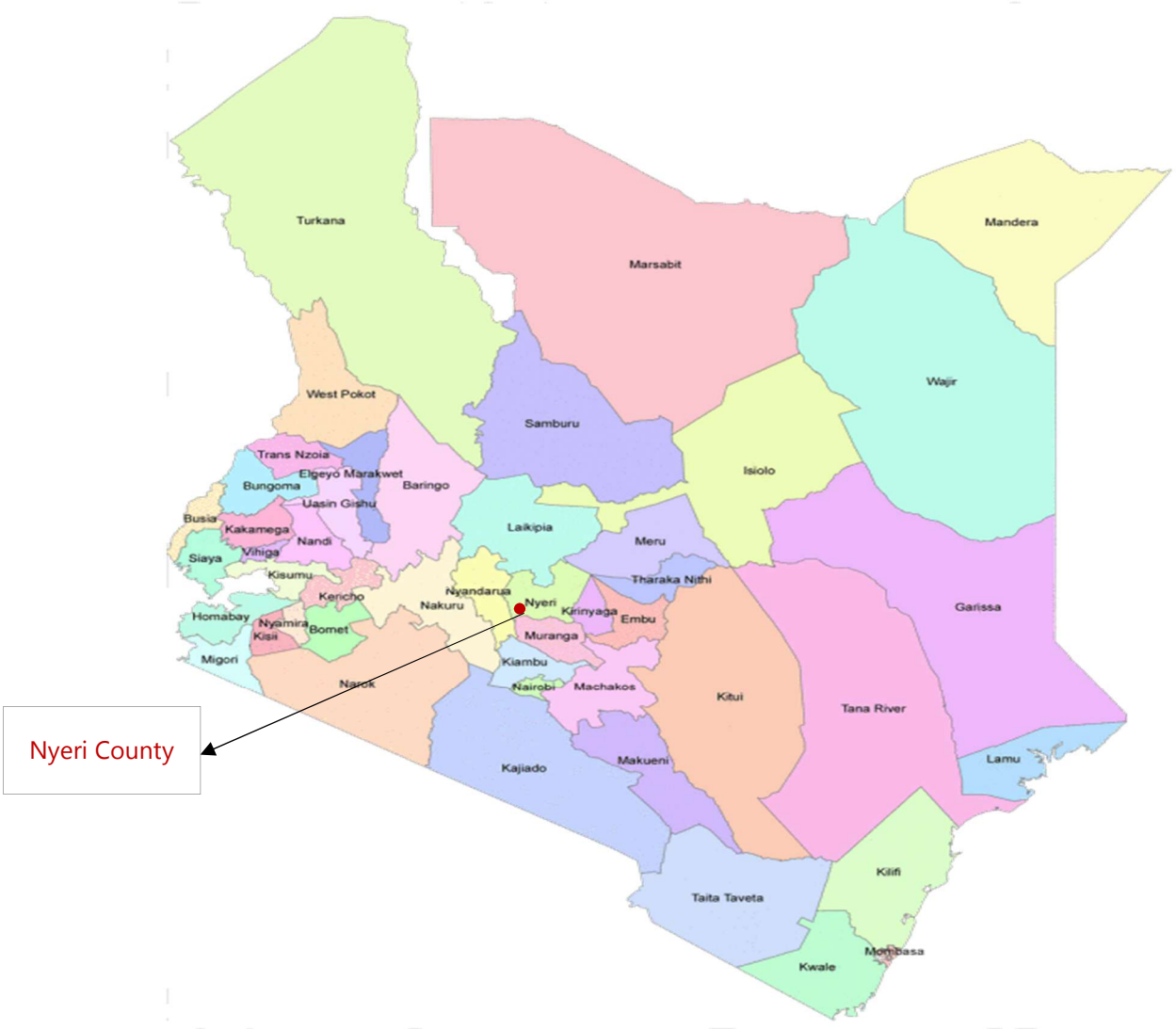


Figure 3: Map Showing the Counties of Kenya

The county is subdivided into eight administrative sub-counties: Kieni East, Kieni West, Mathira East, Mathira West, Nyeri Central, Mukurwe-ini, Tetu and Othaya. These sub-counties are further divided into 22 divisions, 82 locations, and 252 sub-locations. Nyeri County has 6 constituencies, namely Mathira, Kieni, Tetu, Mukurwe-ini, Nyeri Town and Othaya and 30 wards as highlighted in the table 16 below.

Table 16: Nyeri County Administrative Wards

Sub-County	Constituencies	No. of Wards	Wards by Name
Mathira East	Mathira	4	1. Ruguru
Mathira West		2	2. Kirimukuyu 3. Iriaini 4. Karatina 5. Magutu 6. Konyu
Kieni West	Kieni	4	1. Gakawa
Kieni East		4	2. Naromoru/Kiamathag

			3. Thegu River 4. Kabaru 5. Gatarakwa 6. Mugunda 7. Endarasha/Mwiyoga 8. Mweiga
Tetu	Tetu	3	1. Aguthi/Gaaki 2. Dedan Kimathi 3. Wamagana
Mukurwe-ini	Mukurwe-ini	2	1. Rugi 2. Gikondi 3. **Mukurwe-ini central** 4. **Mukurweini West**
Nyeri Central	Nyeri Town	5	1. Kamakwa/Mukara 2. Kiganjo 3. Rware 4. Ruringu 5. Gatitu/Muruguru
Othaya	Othaya	4	1. Chinga 2. Mahiga 3. **Iria-ini** 4. Karima

5.3 Physical Environment

5.3.1 Climatic Conditions

5.3.1.1 Rainfall

Nyeri County comprises the most western part of the moist windward side of Mt. Kenya, the drier western leeward side of this extinct volcano, the borders of the semi-arid Laikipia Plateau (in the rain shadow area), and the moist windward eastern slope of the Aberdare Range

The county being located within the highland zone of Kenya, receives conventional rainfall in most of its parts. The rains are experienced in two seasons, long rains occurring from March to May while the short rains are experienced from October to December. This pattern, however, has been adversely affected by the recent climatic changes being experienced globally.

The annual rainfall ranges between 1,200 mm-1,600 mm during the long rains and 500mm- 1,500mm during the short rains. In terms of altitude, the county lies between 3,076 meters and 5,199 meters above sea level. The precipitation is highest in April and lowest in the months from June to September.

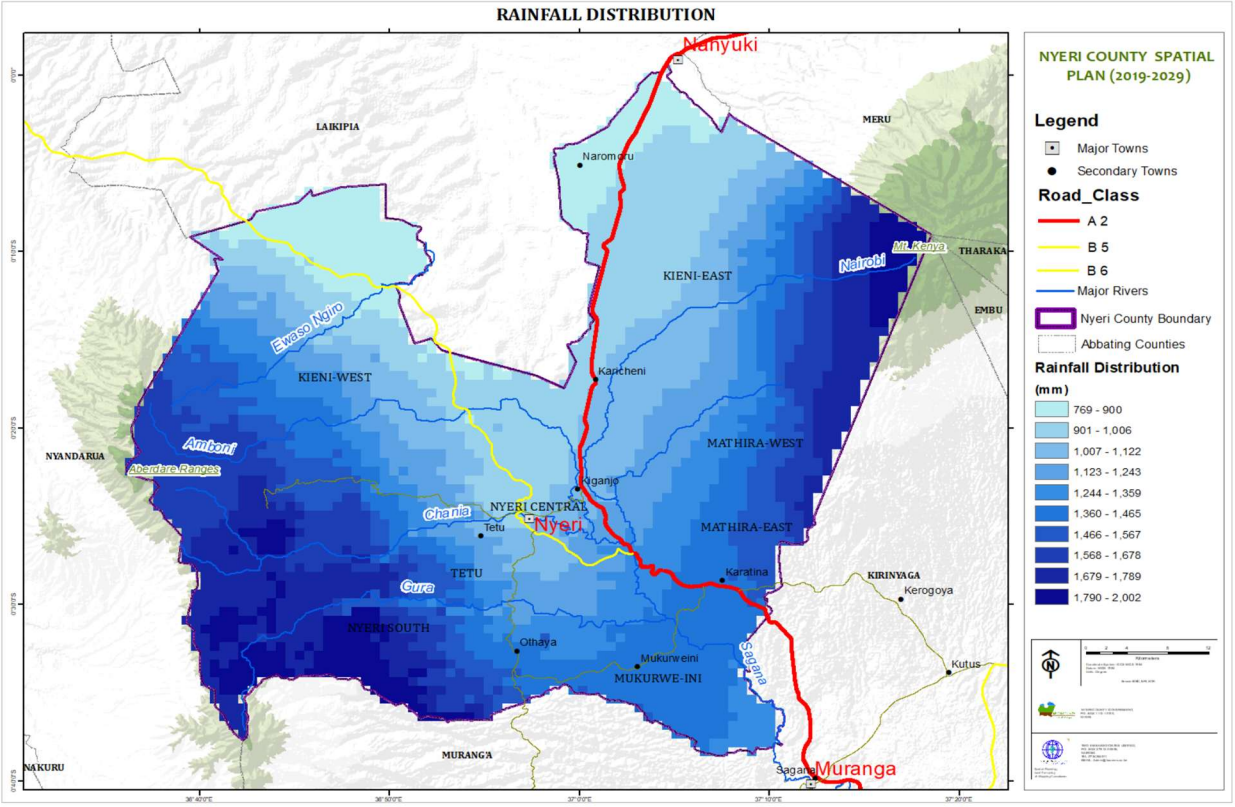


Figure 4: Rainfall distribution in Nyeri County

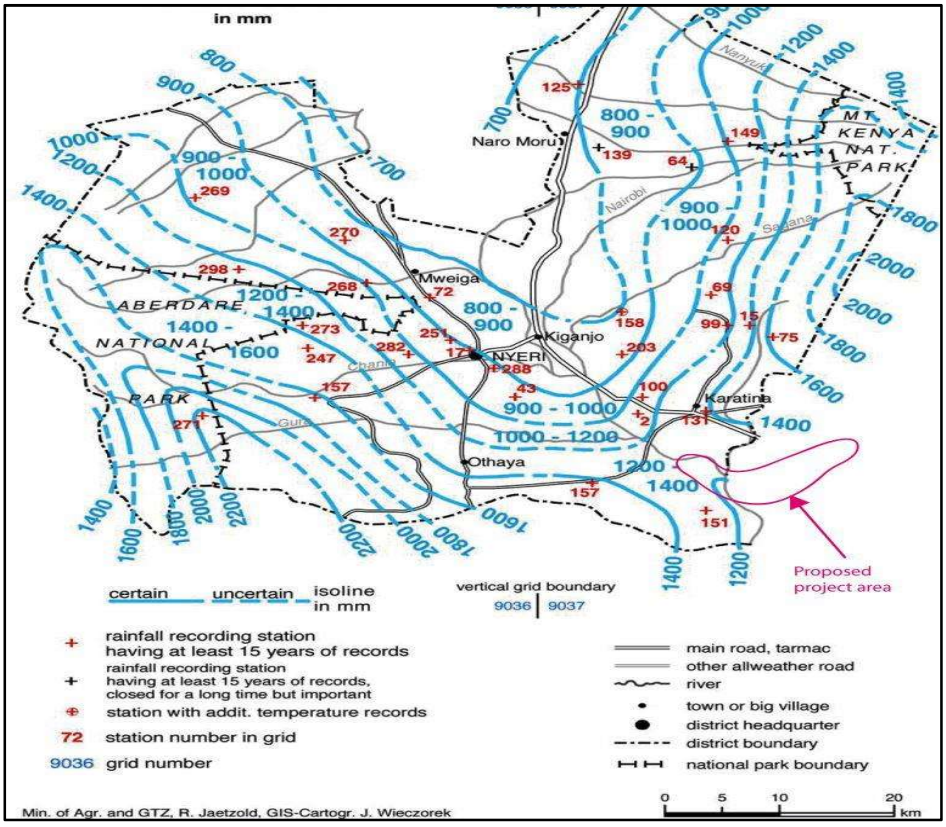


Figure 5: Nyeri County Rainfall Map

The average annual rainfall in Othaya is 1401mm. Even in the driest months, the average rainfall is above 40mm (Othaya Climate, n/d). The driest month is September, with 55 mm /2.2 inch of rain. The greatest amount of precipitation occurs in November, with an average of 235 mm. Othaya is considered sub-humid, and the vegetation consists of moist and dry forests.

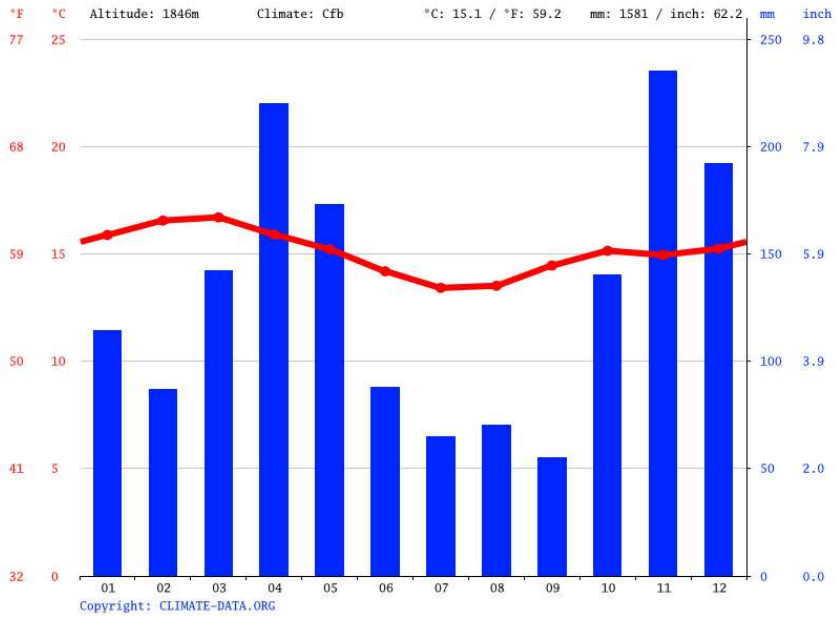


Figure 6: Othaya Climate Graph

The average annual rainfall received in Mukurwe-ini Sub County is 1,408mm. April and May are the wettest months, receiving 327mm and 301mm of rainfall respectively. This forms the long rainy season within the Sub-County. The month of October receives 177mm while November receives 212mm of rainfall forming the short rains period. The months of January and February receive 28mm and 35mm of rainfall on average. These are the two driest months within the sub-county. (https://weather.co.ke/). The high rainfall amounts favor agricultural activities for crops such as tea and coffee.

5.3.1.2 Temperature

The County's monthly mean temperature ranges from 12.8^{0}C to 20.8^{0}C with February and March being the hottest months while July is the coldest month of the year. However, areas around Mount Kenya experience low temperatures throughout the year.

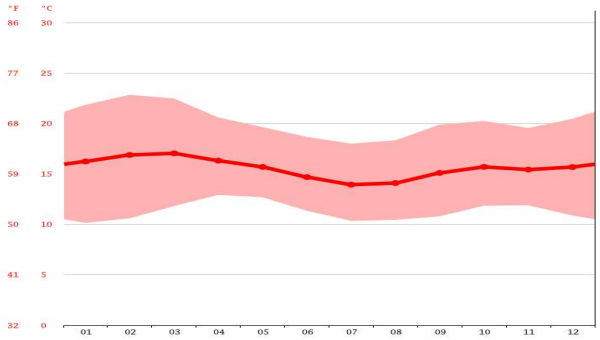


Figure 7: Average Temperature by Month in Nyeri County

The month of maximum warmth in a year is March. The average temperature during this period reaches up to 17.0 °C, making it the hottest time of the year. In July, the average temperature is 13.9 °C. It is the lowest average temperature of the whole year.

The elevation in Othaya is 1846 meters above sea level, and due to its high altitudes, the temperature is stable with an average temperature of 16.8^0 C.

The average annual temperature within Mukurwe-ini is 18.55^0C with the highest temperature recorded at 27.80C within January and February. The lowest recorded temperature is 9.3^0C during June and July. (https://weather.co.ke/). The low temperatures favor the growth of cash crops like coffee.

5.3.2 Topography and Landscape

Nyeri County lies within the central highlands of Kenya and is divided into two main topographic regions which are plains and highlands. The topographic features in the county include the mountain, rivers, water bodies and hills. The highest point in the County is Mount Kenya which is 5199m above sea level while the lowest point is at Sagana River in Mukurweini Central ward which is 1192m above sea level. The County has an average slope area of 8.8%.

The main physical features of the county are Mount Kenya on the eastern side and the Aberdare ranges (3,999m above sea level) to the west side of the County. The northern part is flat (Kieni East and Kieni West Sub counties), whereas the southern part of the county has steep ridges and valleys, with a few hills such as Karima, Nyeri, and Tumutumu.

These hills affect the pattern of rainfall, thus influencing the mode of agricultural production and the type of agricultural produce.

The county has a forest coverage of 38% which is above the recommended minimum level of 10%.There are two gazetted forests, Mt. Kenya Forest, and the Aberdare Ranges. The major rivers found in the county are Ewaso Ng'iro, Chania, Gura and Amboni from Aberdare Forest and Nairobi River from Mt Kenya. Sagana River is jointly fed by rivers from both Mt. Kenya and Aberdare rivers. Among other rivers found in the county are Ragati River.

The topography of Othaya varies with altitudes ranging from 1690 to 2350 meters above mean sea level. The western side of the area which borders the Aberdare Forest is generally higher in altitude than the rest of the area falls gently towards the Eastern side. The land surface consists of hilly terrain with deep river valleys and steep ridges across the landscape. The lowest area in Othaya is karima – gura area which has an altitude of 1699M asl.

The Mukurwe-ini urban area characteristic of high ridges and steep escarpments. The top of these ridges is generally flat and can support urban development while most escarpments dip at angles greater than 150 which is unsuitable for sustaining urban development as well as intense agricultural activities. The rural area is higher on the Western side rising at an altitude of between 1814 to 1860m above sea level (asl). The ridges form a fingerlike shape rising from Mirundu/Kaguma area at an altitude of 1760m asl through Gathukimundu and Kiahungu at the centre of the town. This elevated area also spreads to Ngoru to the North of Kiahungu as well as Muhuti to the East. The lowest areas include Nduma area stretching along the River Rualai to the areas around Mwati Primary School at an altitude of 1575m asl. Areas around Njege (Weru Primary School) are also low at altitudes of 1555m asl. The general landform of Mukurweini Urban

Area has affected the development patterns in the town with people settling on high grounds only. Settling on lower grounds has exposed some residents to frequent landslides and flooding exposing their lives to danger. This forms a clear indication of the structuring of the town along ridges and protection of the steep escarpments in the future.



Plate 1: Photo of Mukurwe-ini area (Murundu-ini) at Ground Level Showing Typical Landscape



Plate 2: Photo of Othaya Urban area showing typical landscape

Source: Consultant's site visit 20th and 25th June 2024

5.3.3 Geology and Soils

The County is characterized by volcanic rocks formed from the extrusions of Mount Kenya and the Aberdare Ranges. The highlands of the Aberdares and Mount Kenya consist of pyroclastic rocks characterized by fertile volcanic soils rich in humus content. The midlands are made up of basalt rocks, high in silica content good for ceramics and building stone. The lowlands of Kieni lie on phonolite, andesite and trachytes which extrude to the surface and hence easily accessed as building stones. The lower to upper midlands of Kieni East are characterized by igneous rocks good for interior and exterior decoration. The river valleys are characterized by the eolian rocks which erode to form high-quality construction sand. The gneiss rocks in lower Gikondi and Rugi are associated with thin soils and can be used for ornamental purposes.

There are six main types of soils in Nyeri County namely greyzems, luvisols, phaeozems, podzols, regosols, and vertisols. The soils are mainly black cotton soils in Kieni East and West, and red volcanic soils in Othaya, Karatina, Mukurwe-ini, and other areas within the County.

Some parts of Kieni are characterized by a bit of sandy soil. The soils in Nyeri County are generally well-drained and can support agriculture.

Mukurwe-ini Urban Area is mainly characteristic of basalt type of rocks. These rocks are essential in road construction. The rock structure is also favorable in the construction industry as it can serve as a strong base for setting foundations. The rural area has two types of soils. These are Nitosols and Cambisols. Nitosols are

formed within volcanic footbridges. The soils are fertile but very erodible. These soils cover approximately 98% of the planning area. Cambisols on the other hand are hill soils that are stony and shallow and must be covered by dense vegetation. The soils are excessively drained, moderately deep, red, very friable, sandy clay loam to sand clay, in places rocky. These soils are good for large-scale coffee production due to the altitude of the area as well as the average annual temperatures and rainfall received within the sub-county. However, areas such as Njege down to Karundu are highly susceptible to landslides and mudslides, although on a small scale, due to the type of soils characteristic within the Mukurweini Urban Area.

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

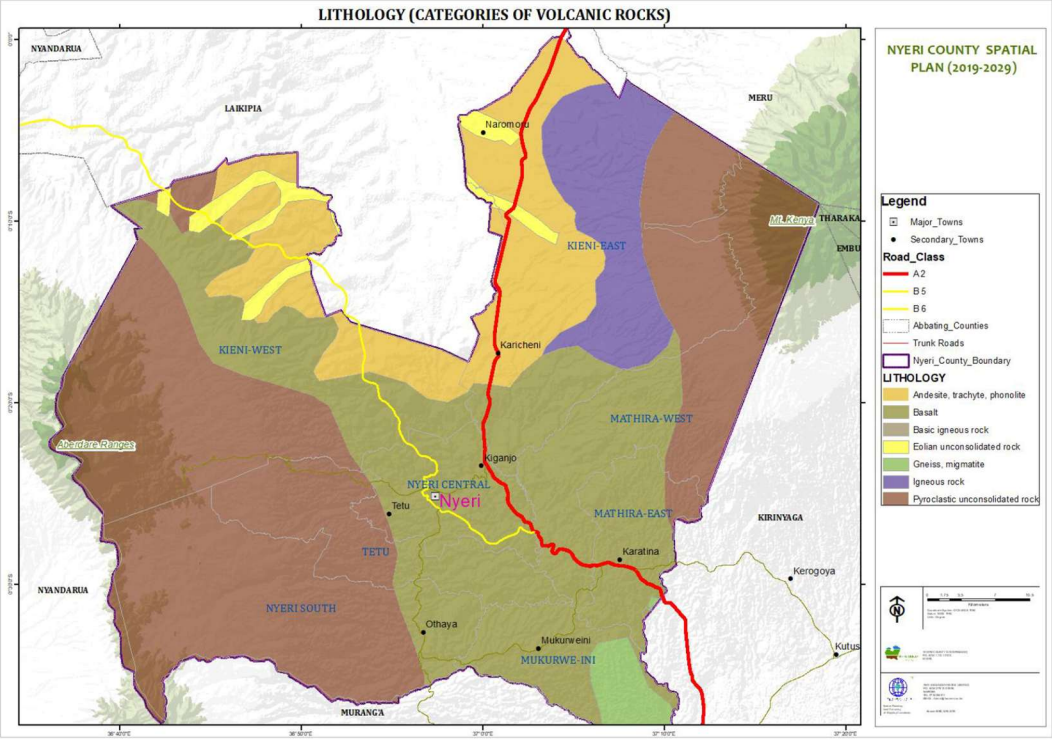


Figure 8: Geology of Nyeri County

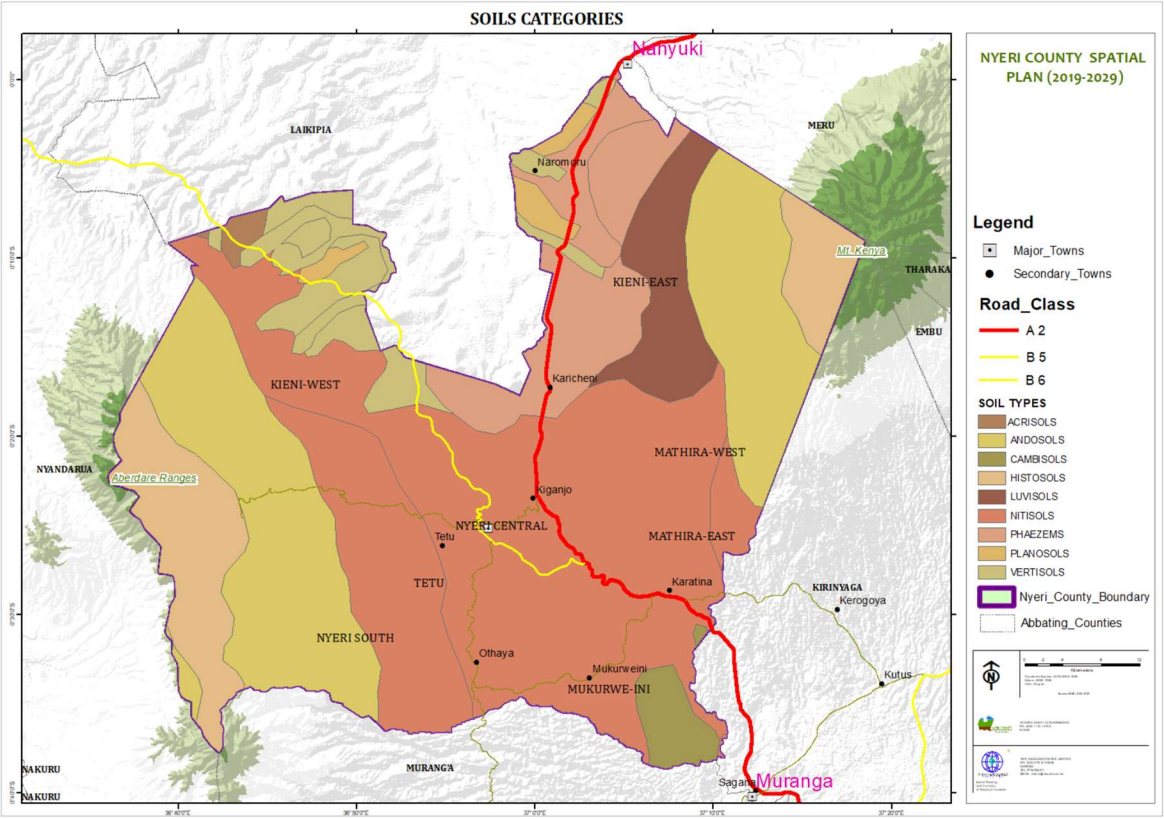


Figure 9: Soils Types in Nyeri County

5.3.5 Ecological Conditions

The County has a forest coverage of 38%, which is above the recommended minimum of 10%. It has two forest ecosystems, namely Aberdare and Mt. Kenya. The county has twelve (12) isolated forested hills such as Karima and Tumutumu under the management of the County Government. The major ones based on their sizes are Gachirichiri, Karima and Tumutumu. The forests are a valuable resource to the County as they are a source of products such as timber, fuel, fodder, and herbal medicine among others. In addition, these forests play vital roles which include maintenance of water cycle, and wildlife habitat and are also repository of a wide range of biodiversity. Since soil conditions in the county are almost similar, agricultural productivity is influenced by rainfall intensity and temperature conditions. However, the forest cover is decreasing due to increased deforestation and human encroachment.

Rangelands are found within sections of Kieni East and West sub-counties. The existing rangelands lie in semi-arid areas, characterized by minimal rainfall and dry weather conditions. However, the zones are suitable for ranching and wildlife conservation.

Nyeri County has different agro ecological zones hence different climatic conditions. The main agro ecological zones in the County are the Tropical Alpine zone, Upper highlands, lower highlands and upper midlands. The Tropical Alpine zones are characterized by the peak of Mt. Kenya and the Aberdare ranges which are National Parks. The Upper highlands are generally steep and occupied by forest cover and grazing land. The crops that flourish in this zone include pyrethrum, wheat and barley. The lower highlands have fertile soils and high yield potential for crops such as tea and maize. This zone also promotes dairy farming

and ranching. The upper midlands are in the central part of the County. Coffee and tea are the main crops produced in this zone as well as sunflower and maize.

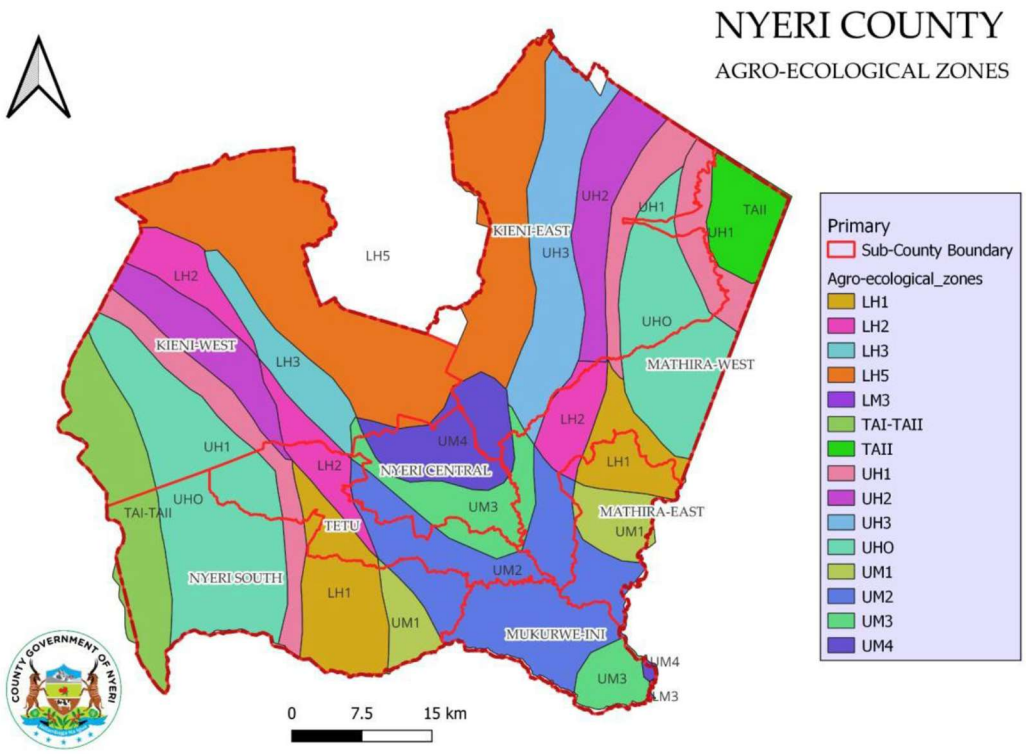


Figure 10: Agro-ecological zones in Nyeri County
Source: Nyeri County Participation Risk Assessment- May 2023-Nyeri County

UM1, also known as the Coffee-Tea Zone, receives 1100-1600 mm of mean annual rainfall and is 1710 - 1780 meters above sea level (Othaya and Mathira). UM2, also known as the Main Coffee Zone, receives about 950-1500 mm of mean annual rainfall and is 1460 -1710 meters above sea level (Mukurweini, Mathira, Othaya, and Tetu). UM3, also known as the Marginal Coffee Zone, receives about 870-1000 mm of mean annual rainfall and lies at an altitude of 1220-1780 meters.

According to agricultural Ecological zoning (https://www.infonet-biovision.org/EnvironmentalHealth/AEZs-Kenya-System), Mukurweini sub county falls under zone II which is generally restricted to the highlands of Kenya between 1980 and 2700 m asl and occurs as a forest or open grasslands. This zone is found in the surrounding of Mt Kenya (parts of Meru, Embu, Kirinyaga and Nyeri), isolated parts of the Rift Valley around Mau and Aberdares mountains (e.g. around Kericho and Nyahururu respectively) and the surrounding of Mt Elgon (e.g. around Kitale and Webuye). The main grasses are Pennisetum clandistenum (Kikuyu grass), Themeda triandra (Red oats), Andropogon Chrysostachyus, Andropogon pralonsia, Exotheca abysinica, Digiteria scalaram, Eragrostis lascantha, Seteria sphacelata, Pennisetum catabasis and Sporobolus filipes. The legumes include Trifolium johnstoni, Medicago sativa (Alfalfa or Lucerne), Sesbania sesban and Leuceana leucusephala.

Generally, the project area is dominated by agricultural crops, agroforestry trees, bushes and some nappier grass.

The Othaya pipeline alignment was observed to contain napier grass, eucalyptus trees, and bushes. Similarly, Mukurwe-ini pipeline includes coffee trees, banana trees, napier grass, and landscaped bushes and shrubs.

In Nyeri County, Mt Kenya and Aberdare National parks are the centers of tourist attraction with different wild animals ranging from Elephants, Buffaloes, Leopards, Lions, Rhinos and different birds species

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

5.3.6 Hydrology

In Nyeri County, water resources comprise of groundwater and surface water sources. Surface water consists of permanent rivers such as Nanyuki, Burguret, Naromoru, Thegu, UwasoNyiro, Karemeno, Rwarai, Gikira, Thuti, Kururu, Muthira, Sagana, Nairobi, Chania, Gura, Honi and Ragati among others. There are 49 permanent rivers, 77 water dams/ Pans, 72 boreholes and other sources including roof catchment, Shallow wells and springs. The main catchment area in Nyeri County for rivers is the Aberdare Ranges and Mount Kenya. The quality of water is good and suitable for domestic, livestock, wildlife and irrigation dedications. Majority of the population take between 5 and 29 minutes to fetch water for domestic usage.

The Aberdare Ranges and Mt. Kenya are part of Kenya's five water towers. The Aberdare Ranges are the source of Rivers Ewaso Ng'iro, Chania, Gura and Amboni. Mount Kenya water tower is the source of Nairobi River within the County. River Sagana is jointly fed by rivers from both Mt. Kenya and Aberdares Ranges. The Aberdare Ranges water tower faces challenges such as illegal logging, forest fires and encroachment from agricultural expansion. The Mount Kenya water tower, on the other hand, faces challenges such as overgrazing, forest fires and agricultural expansion. As a result, there has been drying of rivers and streams (compounded by climate change) in the highlands.

The major rivers found in the County are Sagana, Ewaso Ng'iro, Gura, Chania, Nairobi and Amboni, which have Mt. Kenya and Aberdare Ranges as their catchment areas. The permanent and seasonal rivers in the County are the main source of water for domestic and industrial use across the County.

The dominant hydrological features in the Mukurwe-ini project area are Gikira River (to the west) and Thiha Rivers. Other rivers that delineate Mukurwe-ini's main frontiers include the Gura River to the North, Mugono to the South and Tana River to the East. For the proposed project, the system will acquire water from the existing intakes at Gikira and Chinga Dam. Othaya is home to Chinga Dam, the largest water reservoir in Nyeri County. Chinga Dam was constructed in the late 1950s and is fed by the Gachinga River which rises in the Aberdares. Fishing is also practiced at the dam. The proposed Othaya urban system will be fed through existing intakes along Gikira and Thuti Rivers.

5.3.7 Water Resources and Water Quality

The major sources of water in Nyeri County are: Rivers, Rainwater and Ground water sources, i.e. springs, shallow wells, water pans and boreholes. With a population of 759,164 people as at 2019, Nyeri County needs approximately 27.709 million cubic meters of water per annum (according to WHO consumption rate standards of 100 litres per head) to satisfactorily meet the current demand. Therefore, the projected population in 2029 (852,774 people) shall require approximately 31.126 million cubic meters of water per annum.

There are five main water supply companies operating on behalf of Athi water services board and Nyeri County Government i.e. OMWASCO, NYEWASCO, TEAWASCO, MAWASCO, and NAROWASCO.

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 Nyeri County is briefly outlined, with a more detailed focus at the local level on Othaya and Mukurwe-ini areas, 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 Nyeri County Integrated Development Plan (CIDP) 2023-2027 and publicly available ESIA reports from other studies conducted in the area.

5.5.1 Administrative Structure

Nyeri County is one of the 47 counties in Kenya and is located in the central region of the country. It covers an area of 3,337.2 km2 and is situated between longitudes 36o, 38" east and 37°20" east and between the equator and latitude 0° 38° South. It borders Laikipia County to the North, Kirinyaga County to the East, Murang'a County to the South, Nyandarua County to the West and Meru County to the North East.

Nyeri County is divided into eight administrative sub counties namely; Kieni East, Kieni West, Mathira East, Mathira West, Nyeri Central, Mukurweini, Tetu and Nyeri South. Kieni East Sub County is the largest with a land size of 817.1 Km2 while Mathira East is the smallest with an area of 131 Km2. Mathira East has got the highest number of locations and sub-locations while Nyeri Town has got the least.

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.

Nyeri County has an estimated population of 828,805 persons consisting of 49% male and 51% female according to the projections by KNBS, 2022. Most of the inhabitants of the county are from the Kikuyu community who are predominantly farmers growing tea and coffee as cash crops.

Nyeri County is sub-divided into various administrative and political units. These units are the sub-counties, divisions, locations and sub-locations.

Table 17: Sub counties

Sub-County	Area (Km^2)	Population	Density Persons per Sq. Km	Divisions	Locations	Sub-Locations
Mathira East	130.4	99,065	760	4	16	44
Mathira West	162.3	59,895	369	3	9	31
Kieni West	517.8	88,525	171	2	6	26
Kieni East	448.7	110,376	245	2	10	33
Tetu	216.5	80,453	372	2	8	35
Mukurwe-ini	179.1	89,137	497	4	15	32
Nyeri Central	167.6	140,338	837	1	4	22
Othaya/Nyeri South	169.2	91,081	538	4	14	29

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

5.5.2.1 Specific Site Demographics

Being that the proposed project is linear, the project area covers a number of administrative areas starting from counties, sub-counties, wards, locations, sub-locations and villages. The smallest administrative area in the Country is the village which is headed by a village elder/headman under the authority of the Location Chief/ Assistant Chief.

The proposed development falls under two sub-counties i.e. Mukurweini Sub- County and Othaya/Nyeri South Sub- County of Nyeri County. Within the Mukurwe-ini sub-county, the project will be situated in two administrative wards i.e. Mukurwe-ini Central ward and Mukurwe-ini west Ward. Within the Nyeri South/Othaya ward, the project traverses through the Iria-ini ward.

The project is situated within the area of jurisdiction 3 sub-locations in Mukurwe-ini central ward namely Gaturia, Thiha, and Murundu-ini sub-locations under Muhito Location and Mbiu-ini sub-location- Gakindu location in Mukurwe-ini West ward. In the Othaya sub-county, the project is situated in the Gitundu sub-location under Othaya Township Location, Iria-ini ward,

Some of the affected villages in Mukurwe-ini sub-county include Gachiriro, Kiahungu, Thunguri, Ngoru, Gathukimundu, Mwireri, Gaikuru, Kangathe, Kiamungi, Gaturia, Kihate, Muoti, Gikuru, Kiragu, and Kanunga among others. In Othaya sub-county some of the affected villages include Kianjwe, Kanduma, Kanyange, Gitundu, Nyamari and Kerere among others,

The table overleaf shows the population densities and distribution of the areas that will potentially be affected by the water pipeline rehabilitation project in Othaya and Mukurwe-ini. The statistics have been obtained from the *2019 Kenya Population and Housing Census: Volume II-Distribution of Population by Administrative Units*.

Table 18: Population distribution in project administrative areas

Area	Total	Male	Female	Households Total	Land Area (sq. km)	Density (Persons per sq.km)
Nyeri County	759,164	374,288	384,845	248,050	3,325	228
Mukurweini Sub-County	89,137	43,975	45,156	27,040	179.1	498
Mukurweini Central Ward	29,034	14,043	14,631	9,056	58.4	497
Muhito Location	14,054	6,922	7,132	4340	17.2	817
Gaturia Sub-location	6,851	3,282	3,569	2,268	6.3	1088
Thiha sub-location	3,790	1,891	1899	1514	6.3	601
Murundu-ini sub-location	3,413	1,749	1,664	918	4.6	741
Mukurwe-ini West Ward	18,380	9,061	9,769	5770	32.7	576
Gakindu Location	3651	1,808	1,843	734	5.9	623
Mbiu-ini Location	2493	1,234	1,259	359	4.1	605

Area	Total	Male	Female	Households Total	Land Area (sq. km)	Density (Persons per sq.km)
Nyeri South/Othaya Sub-county	91,081	44,115	46,964	28,228	169.2	538
Iria-ini Ward	36,672	15,658	17,014	10,283	50.9	641
Othaya Township Location	17,888	8,556	9,332	5,855	19.3	928
Gitundu sub-location	6642	3,124	3,518	2,262	6.7	998

During the field visit, the current number of population and household size was estimated (by the area Chiefs) for each location to be as listed below.

Table 19: Population estimations for project-affected locations

Location	Total Population	Male	Female	Approx. No. of households	People per household
Muhito	15000	6750	8250	-	5
Gakindu	7500	2625	4875	800	2-3
Othaya township	24000	12000	12000	3756	5

Communities also indicated that the population has increased in the project area over the last 2 years due to urbanization, business, and employment opportunities.

5.5.3 Gender Roles

In both Othaya and Mukurwe-ini gender roles are strongly defined, with women generally serving as housewives and caretakers of children. For income generation the women engage in business activities i.e. selling farm produce such as vegetables.

In Mukurwe-ini women are also responsible for collecting water and firewood for cooking, as well as farming. Men typically work and acquire the income derived from farming of tea leaves and coffee.

In Mukurwe-ini, a notable number of households are female-headed (as reported in the women FGD) due to abandonment, divorce and spousal death. The majority of women reported having no ownership or control over productive assets such as land. All of 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 Othaya 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.

5.5.4 Land Use and Land Tenure

Nyeri County has a total area of 987.5 km2 of arable and 758.5 km2 of non-arable land. A larger portion of the arable land is used for food crop whilst the rest is used for cash crop farming, livestock rearing and, farm forestry. The mean holding size is one hectare for majority of the small holders.

Majority of the Nyeri County population possess title deeds for their land (85 per cent), the remaining population lack title deeds because of domestic wrangles while other landowners in settlement schemes have never been issued with title deeds.

An eight per cent of the County Population are landless, this is evidenced by Internally Displaces Persons (IDPs) in Kieni Constituency

There are two types of settlements in the county; clustered and scattered. Clustered settlement patterns are mainly found around towns and horticulture producing areas. Scattered settlement patterns are mainly found in Kieni which is semi-arid and were formally colonial settlement area. Apart from the major towns the county has witnessed ribbon type of development along the major highways which possess a challenge in service delivery especially in waste management as the centers are poorly planned.

Land in the project area is largely privately owned with some few parcels of public/government. Government land includes land occupied by public educational institutions, public hospitals and both national and county government offices. Private land ownership encompasses land under freehold ownership within the agricultural areas.

Land within Mukurweini Urban Area has been utilized for various uses including residential, commercial, public purpose, public utility, agriculture, education, and industrial. Agriculture forms the major land use within the town covering 82.8% of the planning area.

The predominant and use in the project area is agricultural and livestock keeping. The Farmers in the area own parcels of land that is used for horticultural farming and growing of fodder crops for their animals.

Farmers in the area cultivate three types of crops:

a) Cash crops: Coffee and Tea
b) Food Crops: Beans, maize, bananas, sweet potatoes, fruits such as Guavas, avocados, mangoes
c) Fodder crops; Napier grass for animal feed.

Due to the cool climatic conditions, reliable rainfall patterns and rich soils in the area, coffee plantations can thrive in the area. This is the major cash crop for communities in the area. The area supplies arrow roots to markets as far as Nyahururu and Nairobi.

Most of the crops in the area are rain-fed.

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

During the Focus Group Discussion (FGD), the men from Othaya and Mukurwe-ini reported that land disputes are rare and, when they do occur, the Chiefs and Elders are usually able to resolve them effectively.

Animals reared in the area include Dairy cattle, goats, chickens and sheep

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 Nyeri County, the main cash crops are coffee, tea and macadamia. Food crops grown are usually for subsistence use. The production is mostly below the demand of the County. Tea and coffee are mainly grown in the highlands while maize and beans are grown in the lowlands.

The total area under irrigation in the County is estimated at 2600 Ha and the total no. of households practicing irrigation is 10,400. The irrigation potential in the County is 20,620 Ha from 87 irrigation schemes which will benefit 80,600 households

From the field visit, the major crops observed in the project area is tea, coffee. Subsistence crops observed in the area include maize, beans, bananas and arrow roots.



Plate 3: Maize plantation for subsistence use observed in Mukurwe-ini area



Plate 4: Coffee bushes

Source: Consultant's site visit 20th June 2024

5.5.4 Infrastructure and Services

5.5.4.1 Transport

The transportation network in Nyeri County include road, rail, and air transport links. Nyeri County has approximately 3,092.73 Km of classified roads with 478.25 Km of bitumen, 2,492.85 Km gravel and 121.63 Km earth surface. Most of these roads within the County do not have designated lanes for NMT users. There are two airstrips in the County namely Mweiga airstrip, Mt Kenya airstrip, Nanyuki airstrip and Nyaribo airstrip. However, there are not fully operationalized to capacity.

Road transport is the major mode of transport. Nyeri County is traversed by one major highway; Thika-Nanyuki highway (A2 road) and B5 road with other several class C, D and E roads connecting through the centers within the County. The majority of the roads within the major urban areas are tarmacked and are of good condition while feeder roads within the rural areas are of gravel, murram and earth status.

There are approximately 17.4% of paved roads in the County. This is attributed to the steep/ harsh terrain and the vastness of the region which makes infrastructure development costly. Consequently, this has resulted in the inability to transport goods and services to the markets and the inaccessibility to public facilities like schools and health centres. Transport in the project area is both motorized and non-motorized. Non-motorized means of transport in the area include walking and use of bicycles while motorized transport includes the use of public vehicles, private cars, bodaboda and taxi.

Road is the main mode of transport in Mukurweini and Othaya. The Karatina – Othaya (B27) road is the main/primary road in the area and connects Karatina and Othaya via urban areas such as Kiahungu, Maganjo, Ngoru, Ichamara etc. The road is of bitumen standard and covers a distance of approximately 6.7 km within the planning boundary.

Primary roads are roads with a high traffic volume and link major urban areas. In this case, the Karatina–Othaya (B27) and Mukurwe-ini–Mihuti–Gakonya (C510) are primary roads. These roads inter-connect Mukurweini to Karatina, Othaya and Murang'a County. Local distributor roads distribute traffic within localities and neighborhoods. They are characterized by gravel and earth surfaces within the two urban areas. Collector roads provide access to residential properties. They are collecting traffic from access roads to local distributor roads. Local access roads are the roads in the urban area that provide direct access to land, households and buildings within neighborhoods and localities.









Plate 5: Condition of roads in the project area (Othaya and Mukurwe-ini)

Source: Consultant's site visit on 20th and 25th June 2024

5.5.4.2 Telecommunication

The county is fairly developed as a result of the advent of mobile telephony and internet hubs in the urban centers. The mobile phone coverage stands at 91 per cent and there are 384 cyber cafes. This has greatly revolutionized the way people communicate and improved efficiency in service delivery. There exist six Post Offices, 19 sub-post offices and 25 licensed stamp vendors. However, Post office faces stiff competition from 30 private courier services mainly G4S, Wells Fargo, 2NK Sacco, 4NTE etc.

Both Private institutions and Government departments have embraced the use of modern methods of communication through E-Government services by use of E-Mail and mobile phone technology. The county is expected to grow fast after the connection of a fiber optic cable, which will greatly revolutionize communication and information sharing. The project area is adequately served with telecommunication infrastructure in terms of communication and internet services. Telecommunication providers in the urban area include Safaricom, Airtel and Telkom.

The sub-county government offices in the urban area are well served with the optic fibre connections for ease in service delivery. In Othaya and Mukurwe-ini town, there are cybercafé services done by private individuals and this has also aided in the uptake and use of ICT in the urban area.

Mobile coverage in the two project areas is fairly good; this was confirmed by the local community. Both Othaya and Mukurwe-ini have postal services.

5.5.5 Economic Activities

The following are the economic activities practiced in the county

1. Agriculture

The majority of the people in Nyeri County are predominantly farmers growing tea and coffee as cash crops alongside food crops such as maize, beans, assorted vegetables, and sweet potatoes. Further, the County

lies between Mount Kenya and the Aberdare ranges with agriculture as the main economic activity. It is also renowned for horticultural farming. Other agricultural activities which act as a source of income include dairy farming and aquaculture. There are also several light industries, and tea and coffee factories providing a market and employment to the residents.

Agriculture currently employs 33% of Nyeri County population. With an agricultural potential of 758.5km2 of arable land, agribusiness is one of the main economic activities within the County. Other economic activities include; livestock rearing, tourism, trade and industry which are carried out by both large-scale industries and SMEs across the County.

The County predominantly consists of small holder farms. Medium and large-scale institutional farms are mainly in the form of the ranches and conservancies in the northern parts of the County in Kieni East and Kieni West Sub-Counties.

The economy of the project area can be structured into three major sectors which include Agriculture, Industrialisation and Service. Agriculture incorporates crop and dairy farming while industrialization incorporates agro-processing and informal industries including metal fabrication, juakali etc. Services on the other hand incorporate PSV transportation, finance and banking, wholesale and retail as well as tourism and hospitality. The economic structure is as presented in figure 10-1.

1. Agriculture; Crop Farming and Dairy farming
2. Industrialization: Agro-processing and Informal industry (Jua Kali and metal fabrication etc.
3. Service: Wholesale and retail; / PSV transport/finance and banking/tourism and hospital

Crop farming in Mukurweini is favored by optimal climatic conditions, fertile soils and availability of water from rivers such as Kiro, Ithemugi, Rwarai, Gafute, Gathanji, and Gatha.

According to the County Agricultural department, the most suitable crops in the project area are bananas, coffee, arrow roots, macadamia, and avocados. Agricultural production within Mukurwe-ini and Othaya is mostly rain-fed, but there are efforts to promote irrigation for crops such as arrowroots using water from dams.

Othaya has a commercial and agricultural function with coffee and tea as the main cash crops grown in the agricultural zones. There are numerous tea collection centers and coffee factories in the area.

2. Trade and Commerce

Agriculturally based Micro, small and medium enterprises (MSMEs) which are private sector driven contributes significantly to the trade in the County. Nyeri has various markets ranging from open air-markets, closed markets, roadside markets and periodic markets. Karatina Market, the biggest market in East and Central Africa is located in Nyeri County.

The major industries in the County are flour milling, soft drink processing, tea and coffee processing and milk processing.

The County has one Industrial Park at Karatina and 6 constituencies' industrial development centres at Gakindu, Kiawaithanji, Kariko, Othaya, Endarasha and Karatina KIE site. There are plans to develop Karatina light industries and 2 juakali sites in Mihuti and Mweiga. Nyeri County has two areas under the Kenya

Industrial Estates: one in Nyeri Town near the Majengo slum and the other in Naromoru. Most jua-kali activities occur on the roadside in the major urban areas like Othaya, Narumoru, Nyeri and Karatina. Additionally, there are numerous boda-boda sheds across the County. Othaya and Mukurwe-ini centers hosts a good number of industrial and commercial activities. According to field survey 2020, only 1.7% of the residents were employed in agro-processing industries. Agro-processing industries in the town entail milk processing and coffee pulping. The milk factory is located in Mukurwe-ini i.e. Wakulima Dairy Limited as well as coffee pulping factories such as Thunguri coffee factory and Maganjo coffee factory. Othaya town is also well endowed with tea buying centers such as Muringa Tea buying center, and Gitandara Tea Buying centers among many others. Notably, there is an Othaya's Farmers' Cooperative that is one of the project beneficiaries

Additionally small-scale trading thrives in the form of retail shops and formal markets such as the Othaya Town Market. Local residents also operate small businesses that cater to everyday needs such as groceries, household items, and basic services

3. Tourism

The main tourist attracting in Nyeri County are Mt. Kenya and the Aberdare National Park with hotels, lodges and guest houses for accommodation and, three airstrips to facilitate for transportation. Mt. Kenya and the Aberdares ecosystems have rich historical heritage and diversity in flora and fauna. Mt. Kenya has perfect topography and magnificent scenic views of inter-locking spurs ideal for film and photography. Heritage sites in the County include: Paxtu cottage at the Outspan Hotel which also houses a scout museum, Baden Powell graves and historical gardens, Kimathi trench at Kahigaini, Mau Mau caves in Naromoru, Italian war memorial church, and Dedan Kimathi tree post office among other attractions.

The high altitude, steep hills and valleys make this a perfect training ground for world class athletes. The county has an abundance of unique plant and animal species, spectacular waterfalls, moorlands, alpine deserts, jades and turns. The rivers are filled with trout and very ideal for fly fishing and picnics. Wild animals such as elephants, buffalos, leopards, lions, rhinos and a variety of bird's species can be found in the County.

The County has one 5-star hotel, two 4-star hotels, three 3-star hotels two 2-star hotels, two 1-star hotels and nine unclassified hotels. Other tourist attractions include Lord and Lady Baden Powell graves, Mau Mau hide out caves and the Aberdare forests.

According to field survey conducted in 2020, 3.3% of Mukurwe-ini urban residents are employed in the hotel and hospitality industry. Some of the hotel and lodging facilities include Zinc club and hotel, Kihuni lodge and hotel, Kim's hotel and Wananchi hotel.

The town however has a great potential in the tourism sector due to the presence of culturally and religiously significant areas including:

- The shrine of Nyaatha (Sr. Irene Stefani) located at the Our Lady of Divine Providence church (Gikondi Catholic Church).
- The Kaburi ya Mau (Mau Mau mass graves).
- The Iiga Ria Mau (the hiding caves for Mau Mau Soldiers)

The project areas in Othaya and Mukurwe-ini lack significant tourist attractions.

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.

Nyeri County has several museums, heritage and cultural sites which are unmapped. The gazetted sites include Kariba caves, Mau-Mau flag site, and Dedan Kimathi trench and Mau Mau mass graves. Therefore, there is need to develop and promote these sites as a source of revenue and income and the preservation of the Mau-Mau history.

Othaya and Mukurwe-ini project areas have no significant sites of archaeological and cultural heritage.

5.5.7 Health Access

Health services in Nyeri County are organized across 6 levels of service delivery that include: 1 National Referral, 1 County Referral Hospital, 10 Sub-County Hospitals, 26 Health Centres, 88 dispensaries and 251 Community Health Units. The County has a fair distribution of health facilities where the population can access a health facility within a radius of 7Km except in Kieni Sub Counties.

The average distance traveled to access the nearest health facility is 2-3km, which is well below the recommended distance given by the WHO standards of 5km. It indicates a good distribution of public health facilities in the County. The Public Health and Sanitation sub-sector has been able to train 365 Community Health Workers to assist households in maintaining good health status and sanitation.

There is a 28.8 % morbidity rate for the County with 27.03 % being male and 30.5% being female. Maternal mortality rates are 318 per 100,000 and child mortality rates at 10 per 1000. The most prevalent diseases in Nyeri County are upper repertory trachea infection, skin diseases rheumatic and joint pains, hypertension and, diarrhea. Trends further indicate an increase in non-communicable diseases such as cancer, diabetes, kidney failure and others.

HIV and AIDS has a prevalence of 3.7% amongst the Nyeri County population where about, 21,428 people are living with the disease. Statistics indicate that a larger per cent of women (5.5) than men (1.9) are living with HIV and AIDS. Youth between the ages of 15-34 years in pre-urban areas are mostly impacted. In 2017, approximately 26 children and 398 adults died because of HIV and AIDS. This illustrates a 26.6 per cent increase in child deaths (below the age of 15) compared to 2015 (Kenya HIV county Profiles, 2018)

Mukurwe-ini Town is served by several health facilities namely Mukurwe-ini Sub-County Hospital, Mihuti and Nyakhuo dispensaries, Avenue Hospital, Kimono Medical, Mukurwe-ini Health Services, Mihuti Clinic and Biolabs. Mukurwe-ini Sub-County Hospital, which is a level 4 hospital, is the main hospital in Mukurwe-ini which provides higher-order services such as outpatient and inpatient and laboratory testing. The hospital has 25 doctors and 64 nurses. It was reported by the medical superintendent that the hospital is understaffed and lacks adequate infrastructure to accommodate outpatients. The most common water-related disease in Mukurwe-ini is diarrhea. Prevalence for sexually transmitted illnesses and diseases was reported to be low

Othaya town plays a health function due to the existence of the Othaya Level 4 hospital and the newly opened Mwai Kibaki Teaching and Referral Hospital. During the KII with the Othaya level 4 medical superintendent, the consultant was informed that the hospital offers both in-patient and outpatient services, the hospital is understaffed with only 5 doctors and 36 nurses. The most common water-related diseases are rotavirus (which affects 90% of children in the area) and parasitic infections such as amoeba. HIV/AIDs and STIs in Nyeri County are generally low compared to other counties according to the medical superintendent and similarly sexual health issues are not common in the project area (Othaya).





Plate 6: Images of sample health facilities in the Project Area

5.6 Social Structure and Dynamics

5.6.1 Community Structure

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

1. **Ethnicity and Languages:** Most of the inhabitants of the County are from the Kikuyu community who are predominantly farmers growing tea and coffee as cash crops. They also engage in subsistence farming of crops such as maize, beans, assorted vegetables, and sweet potatoes as well as small scale livestock farming. Other communities living in the county include Luo, Meru, Kamba, Embu, Borana, Somali and virtually all Kenyan communities who are mostly engaged in own businesses or employed by the government.
2. **Governance and community development:** The County is divided into administrative units known as sub-counties (e.g., Mukurwe-ini, Nyeri South/Othaya, Kinei East, Kieni West, etc.). 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

Primary and Secondary Education follows the 8-4-4 education system and CBC system, with a network of primary and secondary schools spread across urban and rural areas. According to the CIDP (2023) there are 440 public Early Childhood Development Education (ECDE) centers in Nyeri County, serving approximately 20,000 pupils in 2019. There is a total of 800 ECDE teachers in the County, making the teacher/ pupil ratio to be 1:12. The rate of enrolment is approximately 59.2%.

There are 352 public primary schools distributed across the County with a total enrolment of 141,243 comprising of 72,227 boys and 69,016 girls while private primary schools total to 118 mainly located in Kieni East and Nyeri Central sub-counties. The completion rate stands at 89.4% while retention and transition stand at 91% among boys and 85% among girls. There are 225 public and 11 private secondary schools with a total enrolment of 38,731 students of whom 19,469 are boys and 18,962 girls. The teacher/ student ratio is 1: 27 for public secondary schools. The transition rates from primary school to secondary school is 83.5% among boys and 77.7% among girls.

There are 68 tertiary institutions in Nyeri County. Vast wards such as Mugunda, Endarasha Mwiyogo, Mweiga and Gatarakwa lack TTCs or TTIs (which offer diplomas). Moreover, the four wards share four polytechnics which are under-equipped to facilitate the quality of the skills offered. Mukurwe-ini Town is served by nine public and two private primary schools (e.g. Muhito Primary school, Maganjo primary school etc.). All public primary schools host respective ECDE facilities. It has nine public secondary schools e.g. Ngoru Orthodox Secondary School, All Secondary schools in Mukurweini have met the ideal teacher-student ratio of 1:40. Currently, there is an excess of six secondary schools based on the estimated population of 27,589. Within the project area, there is one functional tertiary institution namely Mukurwe-ini Technical Training Institute (TTI). Notable educational facilities in Othaya Town include; Othaya Teachers College, Othaya Boys Secondary school, Othaya Girls Secondary School among many others

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.



Plate 7: Sample Educational Facilities in Othaya and Mukurwe-ini Project Areas

6. STAKEHOLDER ENGAGEMENT AND CONSULTATIONS

6.1 Introduction

This chapter outlines the approach to stakeholder participation and communication in the Environmental and Social Impact Assessment (ESIA) for the proposed water distribution system upgrades under the OMWASCO WSP CLSG II program. Effective stakeholder engagement is essential for successful project delivery, fostering constructive relationships with local authorities, organizations, and communities affected by the project. By continuously engaging stakeholders throughout the project lifecycle, from implementation to operation and improvement phases, the process incorporates their views to minimize opposition, mitigate adverse effects, and adopt the most effective designs. Engagement also builds a foundation for future collaboration and partnerships. The approach aligns with Kenyan legal requirements under the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019, and international standards outlined in the World Bank OP/BP 4.01: Environmental Assessment.

6.2 Objectives of Stakeholder Engagement

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

- **Communication with stakeholders:** To identify the best methods for project developers to provide stakeholders with balanced and objective information on the proposed projects and to obtain their feedback;
- **Ensuring understanding:** An open, inclusive and transparent process of culturally appropriate engagement and communication is undertaken to ensure that stakeholders are well informed about the proposed project as it develops. Information is disclosed early, appropriately and as comprehensively as possible;
- **Involving stakeholders in the assessment**: Stakeholders are included in the scoping of issues, the assessment of impacts, and the generation of mitigation measures and the finalization of the ESIA Report. They also provide an important role in providing local knowledge and information for the baseline to inform the impact assessment;
- **Building relationships**: Develop a model for the project developers to use for enhanced community participation and collaboration through the project lifecycle, including environmental mitigation and management;
- **Managing Expectations**: It is important to ensure that the project does not create or allow unrealistic expectations to develop amongst stakeholders about Project benefits. The engagement process serves as one of the mechanisms for understanding and then managing stakeholder and community expectations, where the latter is achieved by disseminating accurate information;
- **Ensuring Compliance**: The process is designed to ensure compliance with both local regulatory requirements and international best practices on stakeholder engagement;
- **Grievance Redress**: To provide tools for effective resolution of community issues during project implementation.

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

- **Free:** engagement free of external manipulation or coercion and intimidation;

- **Prior**: engagement undertaken in a timely way, for example the timely disclosure of information; and
- **Informed**: engagement enabled by relevant, understandable and accessible information

6.3 Overview of Engagement Requirements

6.3.1 National Requirements

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

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

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

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

6.3.2 World Bank Requirements.

6.3.2.1 OP/BP 4.01: Environmental Assessment

This 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. Goal is to ensure that stakeholders are informed and have a chance to participate in the decision-making process.

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

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

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

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

a) The purpose, nature, and scale of the project;
b) The duration of the proposed project activities;
c) Potential risks and impacts of the project on local communities, and the proposals for mitigating these, highlighting potential risks and impacts that might disproportionately affect vulnerable and disadvantaged groups, and describing the differentiated measures taken to avoid and minimize these;
d) The proposed stakeholder engagement process highlighting how stakeholders can participate;
e) The time and venue of any proposed public consultation meetings, and the process by which meetings will be notified, summarized, and reported; and
f) The process and means by which grievances can be raised and will be addressed.

Meaningful consultations: Meaningful consultation is a two-way process, that:

a) Begins early in the project planning process to gather initial views on the project proposal and inform project design;
b) Encourages stakeholder feedback, particularly as a way of informing project design and engagement 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 critical first step in stakeholder consultation and engagement process carried out for the project. This section outlines the process of addressing the following:

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

As it is not practical and not necessary to engage with all stakeholder groups with the same level of intensity all of the time, a comprehensive stakeholder identification and analysis process was conducted where stakeholders were identified and mapped for planning and designing of successive stakeholder engagement activities. The stakeholder mapping was done based on the identification of individuals, communities, groups, and institutions who:

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

The stakeholder analysis process sought to prioritize identified stakeholder based on: interest and expectations in relation to the proposed project; required levels of participation for each stakeholder throughout the project lifecycle; degree of influence of each stakeholder group to the direction and success

of the proposed project; interrelationships between different stakeholders and the convergence/divergence between their interests and expectations.

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

'Power/Influence' refers to leverage a stakeholder may have in relation to decisions either taken by or affecting the project and the degree to which they can affect project success/failure. Table 20 below depicts the recommended stakeholder communication strategy based on their level of influence/power and interest concerning the proposed project.

Table 20: Communication strategy based on the stakeholder power/interest matrix

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

Table 21 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 Figure 1 below displays the stakeholder Power/Interest matrix.

Table 21: stakeholder Power/Interest matrix

I.D.	Stakeholder Group	Stakeholders	Area of interest	Influence/Power	Level of Interest	Power/Interest Rating	Periods of Active Engagement	Method of communication
PUS 1.	Project Implementing Agencies	- Ministry of Water, Sanitation and Irrigation (MoWS&I)	- Mobilizing of resources and ensuring efficiency in their utilization - Improved water provision	9	9		Throughout the project's lifetime	- **Official Letters** - **One on one meetings** - **Contractual Agreements**
PUS 2.		- Water Sector Trust Fund (WSTF)	- Contracting authority for the project - Disbursing of the conditional grants - Environmental and social sustainability of the project	7	9		Throughout the project's lifetime	- **Official Letters** - **One on one meetings** - **Contractual Agreements** - **Workshops**
PUS 3.		- Tana Water Works Development Agency (TWWDA)	- In charge of the design of the proposed project - Offer technical services to OMWASCO	6	8		Throughout the project's lifetime	- **Official Letters** - **One on one meetings** - **Contractual Agreements**
PUS 4.		- OMWASCO	- Beneficiaries of the project - Improved water supply - Increased revenue collection - Oversee project implementation - Environmental and Social	8	9		Throughout the project's lifetime	- **Official Letters** - **One on one meetings** - **Contractual Agreements** - **Website**
PUS 5.	National Regulatory Bodies and Government Agencies	- National Environment Management Authority (NEMA)	- Issues environmental-related permits (EIA License) and monitors compliance of operations - Inspect and monitor the impacts of the project on the environment - Grants or withdraws permits (such as EIA license, Effluent Discharge License) - Impose measures (Improvement Orders) to fulfil legal obligations	7	6		Throughout the project's lifetime	- **CPR Report** - **Annual Environmental Audits**
PUS 6.		- Directorate of Occupational Safety and Health Services (DOSHS)	- Issue Workplace Registration certificate to the fixed price contractor	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
			- Registers the upgrade works site as a 'construction site'					
PUS 7.	Ministry of Interior and Coordination of National Government (National Government Administrative Officers)	- Deputy County Commissioner (Mukurweini Sub-County) - Assistant County Commissioners (Mukurwe-ini Central and East Wards) - Area Chiefs for the affected locations - Assistant Chiefs for the affected sub-locations - Nyumba Kumi Officials/Opinion Leaders from various settlements within the affected sub-locations	- Are Representatives of local communities that fall within their jurisdiction. - Concerned with community socio-economic development and public participation & citizen engagement - Mobilization of Locally affected persons neighboring communities, business communities, etc.) for engagement - Security measures to be adopted	3	6		Throughout the project's lifetime	- **Official Letters** - **Tele conversations** - **Key Informant Interviews (KIIs)** - **Scheduled Public Barazas/ community meetings**
PUS 8.	County Government of Nyeri	Mukurwe-ini Sub-County Department of Public Health	- Compliance with the Public Health Act - Sanitary requirements for the workers - Welfare of labour force (medical conditions etc.) - Environmental and Social operations of the project	4	4		Pre-construction and construction phases	- **Official letters** - **One-on-one meetings** - **Key Informant Interviews** -
PUS 9.		Mukurwe-ini Sub-County Department of Physical Planning/Public Works	- Issues approvals on the structural plan of the project	5	5		Pre-construction phase	- **Official letters** - **One-on-one meetings** - **Design approvals**

I.D.	Stakeholder Group	Stakeholders	Area of interest	Influence/Power	Level of Interest	Power/Interest Rating	Periods of Active Engagement	Method of communication
PUS 10.		Mukurwe-ini 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**
PUS 11.	Roads Agencies	- Kenya Rural Roads Authority (KeRRA Kenya Urban Roads Authority (KURA)	- Seek approvals to utilize the road reserve in Othaya (KURA) and Mukurwe-ini (KeRRA) for the rehabilitation project	6	7		Pre-construction and construction phase	- **Website** - **Applications**
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 OMWASCO 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)	- Anticipated impacts (positive and negative) of the project - Employment opportunities - Increase in water supply	6	8		Throughout the project lifetime	- **Scheduled Public/community meetings (Barazas)** - **Public Posters** - **FGDs/KIIs**

I.D.	Stakeholder Group	Stakeholders	Area of interest	Influence/Power	Level of Interest	Power/Interest Rating	Periods of Active Engagement	Method of communication
		- The general public in the areas of influence	- Information sharing on the impact of the project on the community and its environs.					- **Public Meetings/Barazas** - **Media announcements** - **Surveys and questionnaires**
PRS 5.		- Women	- Employment opportunities - Gender consideration in labor recruitment - Increased water supply (responsible for fetching water when supply is interrupted)	4	7		Throughout the project's lifetime	- **Public baraza meetings** - **FGDS**
PRS 6.		- Youth	- Employment opportunities - Economic improvement	4	7		Throughout the project's lifetime	- **Public baraza meetings** - **FGDS**
PRS 7.		- Vulnerable Groups i.e. (to be identified)	- Employment opportunities - Economic improvement	4	7		Throughout the project's lifetime	- **Public baraza meetings** - **FGDS**
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**
PRS 9.	Utility Service Providers (ICT and Power)	- ICT companies i.e. Safaricom - Kenya Power	- Identification of their utilities along the proposed water pipeline wayleave	4	6		Pre-construction and construction phase	- **One-on-one meetings** - **Field Visits** - **Project GIS Maps**

NB: * The sub-counties affected include Mukurwe-ini Sub-County and Nyeri South/Othaya Sub-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

Dissemination of project information was done through verbal discussions. In addition, stakeholder invitation letters were prepared for stakeholder dialogue. The invitation letters contained a synopsis of the proposed project and the ESIA study.

The community public meetings/barazas and FGDs were conducted in both Kikuyu and English languages while the KIIs were conducted in English. Questions and comments were received and noted down.

6.4.3 Data Collection Tools

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

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

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

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

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

6.5 Stakeholder Consultations

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

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

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

6.5.1 Consultation and Message

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

- The message to convey to each group of stakeholders (in collaboration with OMWASCO 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 Stakeholder Engagement Activities in Mukurwe-ini

6.5.2.1 Preliminary consultations

In preparation for the Mukurweini water project, a two-week notice was issued on June 4, 2024, to the Ag. Deputy County Commissioners of Mukurweini Sub County, initiating a mobilization effort for community engagement. The notice, communicated through local Assistant Chiefs and village administrators, informed community members about the upcoming meeting via announcements at public gatherings and churches, ensuring widespread awareness.

On May 31, 2024, a crucial meeting was held with key stakeholders, including the Ag. DCC, ACCs and Chiefs of Mukurweini, to provide an overview of the project and gather their feedback. The stakeholders emphasized the importance of community consultations. Additionally, a visit to the NEMA office was conducted to confirm the necessary documentation and reporting requirements for ESIA approval, ensuring the project's compliance with environmental regulations.

6.5.2.2 Public Baraza Meetings

Two public baraza meetings was held in Mukurwe-ini sub county at Thunguri Coffee Factory on 19th June 2024 and at Kanunga Shopping Center (Chief's Camp) on 20thJune 2024. The meeting points were ideal venues for the baraza meetings because they were a convenient congregation point for the majority of the targeted stakeholders. The public baraza meeting at Thunguri Coffee Factory was attended by 68 participants while the baraza in Kanunga was attended by 42 individuals inclusive of the project team. The two barazas were held with communities from the Gaturia sub-location (Mukurwe-ini Central Ward) and Mbiu-ini sub location (Mukurwe-ini East 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 (OMWASCO) was represented by two 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 an opportunity to comment and give views on their perceptions of the proposed project. The verbal discussions were done in both Kikuyu and Swahili languages as it had been established through the Chiefs that the audience would be most comfortable with the two languages.

The respondents were able to comment on the project, highlight the potential positive and negative impacts of the project, and if they are for or against the project. All substantive issues raised with the Firm of Experts during the baraza were noted and responded to. The issues were then recorded in an Issues and Response Report. Table 22 below shows a summary of the views expressed by various stakeholders during the public meetings.

Table 22: Summary of the views expressed by various stakeholders during the public meetings

Subject	Issue	Response
Interruption of water supply	Inquiries on how long the water supply would be interrupted during project implementation	There is no anticipated interruption of water supply, however, if it is expected that there will be interruptions, the affected people will be notified well in advance to preserve some water
	Concerns that if the supply is interrupted for an extended period, they may be forced to start fetching water from the river which might be a strenuous task for elderly people	
Project Area	Inquiries on which particular areas in Mukurwe-ini will be affected	The project shall be implemented within the urban areas starting from Ngoru to OMWASCO's Gichecheni and Kanunga water tanks.
Project Costs	What are the cost implications for the water users	The affected water users will not incur any costs. All the rehabilitation costs will be catered for using the grants from the World Bank

Subject	Issue	Response
Land acquisition and compensation	Compensation process for landowners whose land will be acquired for the proposed project	The project will utilize the existing wayleave and therefore no land will be acquired for this project. However, some cabro blocks and concrete pavements will be demolished and reinstated post-construction.
Water supply disconnections	Complaints for lack of notification on water interruptions and scheduled water pipeline works	Assures that notifications will be issued well in advance to allow the affected persons to prepare accordingly
Grant repayment	Inquiries of increased billing costs for the customers to enable repayment of the loan from the World Bank	The agreement with the World Bank for the grant is that with the rehabilitation project, OMWASCO should be able to recover the project implementation costs within a year. However, if they are not able to then the grant becomes a loan which they will repay with the revenue collected. The costs will not be transferred to the customers.
Smart water Metering	Suggestions for the rehabilitation project to include the installation of smart water meters	The smart water meters are costly i.e. 1 meter currently costs Ksh. 15,000 and therefore it might not be feasible at the moment
Water for Irrigation	Requests for OMWASCO to provide water for irrigation	OMWASCO is only mandated to provide water for domestic use. The county is in charge of water for irrigation. The community can come together and make a proposal to the County Government for the provision of water for irrigation.
Project Area	Inquiry on whether the project will be implemented in the whole of Mukurwe-ini sub-county	The project will be implemented in phases and will eventually cover the whole sub-county. However, in this first phase, the rehabilitation will cover the urban areas i.e. Mukurwe-ini and Othaya town areas
Water overflows	Concerns with the current overflow pipeline leading to huge water losses	The new water pipeline will be fitted with ball valves to control the flow of water



Plate 8: Mukurwe-ini Central (Muhito Community) Public Participation Baraza



Plate 9: Mukurwe-ini West (Mbiu-ini Community) Public Participation Baraza

Source: Consultant's site visit on 19th and 20th June 2024

Table 23: Summary of Consultative Public Meetings Attendance in Mukurwe-ini

Pipeline	Area	Meeting Venue	Date	Participants	Male	Female	Youth	Total No.
Mukurwe-ini	Mukurwe-ini Central (Muhito Location-Thiha, Murundu-ini and Gaturia sub-locations	Thunguri Coffee Factory	19th June 2024	-Local administration (Assistant chiefs, elders) -Community members (men, women, youth) -OMWASCO representatives - EHS Consultants team	47	16	5	68
	Mukurwe-ini West (Gakindu Location-Mbiu-ini sub location)	Kanunga Shopping Center	20th June 2024	- Local administration (Chief, assistant chief, elders) -Community members (men, women, youth) -OMWASCO representatives -EHS Consultants team	16	21	5	42
	TOTAL				**63**	**37**	**10**	**110**

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 Muhito Community

Feedback from the Men:

Four male participants serving as household heads shared their perspectives in the FGD. They expressed a clear understanding of the proposed project. They highlighted its potential to:

- Availability of sufficient water
- Increase in property value
- Job creation for both the youths and adults

However, they also raised concerns

- Interruption of water supply during the implementation of the project
- Increase in population leading to competition for water resource

They presented the following requests:

- Install a durable water pipeline
- The project should be designed to cater to future water supply demand with the increasing population
- Ensure that the locals are given priority in job allocations

Their expectations from the project include;

- Collaborate with the community in implementing the project

- Ensure the project is implemented promptly

Feedback from the women

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

- Grateful to OMWASCO for their efficient services
- Acknowledged that the proposed project will lead to improved sanitation and water supply for domestic use
- Suggested to have the water gate valves relocated from the road to the plot boundaries to avoid destruction by motor vehicles
- Requested to increase water supply in Mukurwe-ini town to cater to the growing population.

Feedback from the Youth

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

Benefits:

- Improved water access and accountability of water consumption
- Employment opportunities (there are individuals with plumbing skills in the community)

Impacts:

- They expressed concerns about potential disruptions to water supply during the construction phase. They noted that such disruptions could compel affected residents to seek alternative water sources which is unprotected sources;

Suggestions:

- Promote irrigation practices by providing adequate water
- Avoid as much as possible disruption of water supply by undertaking the replacement works in the least time possible.

Expectations:

- More revenue collection for the Government
- Revenue collected will help the community through more development project



Plate 10: Male FGD with Mukurwe-ini Central Participants



Plate 11: Female FGD with Mukurwe-ini West Participants

Feedback from FGDs undertaken with Mbiu-ini Community

Feedback from the Men:

During the FGD engagement with Men, three participated and shared the following insights on the proposed project. They expressed a clear understanding of the proposed project. They were particularly optimistic about its potential to:

- Increase water supply; the proposed project will increase water supply to cater to their domestic needs including watering livestock
- Increase reliability; upgrade of the water pipelines will reduce occurrences of leaks and bursts and therefore improve the reliability of the water supply

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

- Ensure the safety of the workers during construction; and
- Restore the project area to its original state after the replacement works.

Feedback from the Women:

Three female participants contributed significantly to the FGD. The women expressed the following opinions:

- The project will reduce cases of water rationing
- It will improve sanitation in the project area
- Ease the burden of fetching water for the women
- Loss of huge volumes of water due to the poor condition of the water pipes
- OMWASCO will improve their customer service and respond promptly to water issues

Feedback from the Youth

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

Benefits:

- Job opportunities for the youths (both skilled and unskilled)
- Supply of adequate drinking water

Impacts:

- Damaging of the murram roads from trenching
- Interruption of water supply during construction

Suggestions:

- Implement proper soil erosion mitigation measures during construction
- Proper supervision of digging of trenches
- Proper timing of the activities

Expectations:

- The Project will minimize water wastage



Plate 12: Male FGD-Mbiu-ini Participants



Plate 13: Female FGD- Mbiu-ini Participants



Plate 14: Youth FGD Mbiu-ini 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 Ngoru Orthodox Secondary School (Mr. Peter K. Muthara- the Principal) and Muhito Primary School (Mr. Denis Mwangi- Teacher) and a medical practitioner from Mukurwe-ini sub-county hospital (Dr. Kagwa Duncan-Medical Superintendent).

Additionally, the Assistant County Commissioner for Mukurwe-ini Central Ward and an Officer from the County's 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 Gaturia Asst. Chief and Gakindu Area Chief 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 24: Summary of Feedback of the KIIs on Project Perception

No	Interviewee	Institution	Project Perception
1.	Teacher	Muhito Primary School	Benefits: - will increase the supply of water in homes and institutions - improve the economic and social welfare of the community Participation in the project - provide a conducive environment for the workers
2.	Principal	Ngoru Secondary School	Benefits - Efficient supply of water to the community - Reduce wastage of water - Creation of employment opportunities which will enable parents to sustain their children in school - Will improve sanitation in the school Suggestions - Stick to the road reserve to avoid disrupting economic activities Participation in project/Support for the project - Provide secure storage for construction equipment and materials - Relaying project-related information to the beneficiaries who were not present in the meeting
3.	Medical Superintendent	Mukurwe-ini sub-county hospital	Benefits - Improved water access Impacts - Disruption of water supply during construction may affect healthcare provision Suggestions - The project should be implemented in the shortest time possible
4	Water & Irrigation Officer	Department of Water, environment and climate change	Benefits - Improved water supply and sanitation - Reduction of water loss from pipe bursts Impacts - Interruption of water supply during construction Suggestions - Ensure continued water supply to consumers during project implementation Participation in Project/Support for the project - Provide skills during project implementation (knowledgeable in water-related projects)
5.	Assistant County Commissioner (ACC)-Mukurwe-ini Central Ward	National Government (OPP)	Benefit - Project will be resourceful to both OMWASCO and Mukurwe-ini community - OMWASCO will have dealt with water supply issues - Improve the livelihoods of the community members by providing adequate water which can be used for irrigation

			- Reduction in water loss and pipe breakages Impacts - Disruption of water supply during construction - Disruption of operations in affected institutions i.e. Wakulima Dairy, MTTI schools, coffee factories, hospitals etc. Suggestions - Notify the affected community members/institutions at least a week before construction and inform them how long the water supply will be disrupted to enable them to determine how much water they should store - Establish whether the institutions have enough water storage capacity and implement the project as fast as possible Support for the project - Provide security for the project workers and the infrastructure - Sensitize the community on the proposed project and its impacts

6.5.3 Stakeholder Engagement Activities in Othaya

6.5.3.1 Preliminary consultations

In preparation for the Othaya water project, a two-week notice was issued on June 4, 2024, to the. Deputy County Commissioners (Mr. Talaam) of Othaya Sub County, initiating a mobilization effort for community engagement. This notice marked the start of an organized community engagement process, coordinated through Senior Chiefs, Assistant Chiefs, and village administrators. Their concerted efforts ensured that community members were well-informed about the forthcoming meetings through targeted announcements at public gatherings and churches, fostering widespread community participation.

On May 31, 2024, a crucial meeting was held with key stakeholders, including the DCC, Snr Chief Othaya and Assistant Chiefs, to provide an overview of the project and gather their feedback. The stakeholders emphasized the importance of community consultations. Furthermore, a visit to the National Environment Management Authority (NEMA) office was undertaken to ensure that the ESIA would meet all regulatory requirements. This consultation was crucial in identifying the necessary documentation and understanding the reporting framework needed for the project's approval, reinforcing the commitment to environmental compliance and stakeholder engagement from the project's outset.

6.5.3.2 Public Baraza Meeting

A public baraza meeting was held in Othaya town at the CDF Hall on 12th July 2024. The public baraza meeting was attended by 47 individuals inclusive of the project team. The baraza was held with communities from Iria-ini Ward (Othaya Town). The area was representative of the stakeholders that would be affected by the proposed water pipeline rehabilitation project.

Table 25: Summary of Consultative Public Meetings Attendance in Othaya

Pipeline	Area	Meeting Venue	Date	Participants	Male	Female	Youth	Total No.
Othaya	Othaya Township location, Iria-ini ward, Nyeri South/Othaya Sub County	Othaya CDF Office Hall	12th July 2024	-Local administration (Assistant chiefs, elders) -Community members (men, women, youth) -OMWASCO representatives - EHS Consultants team	23	19	5	47
				TOTAL	23	19	5	47

The meeting was also attended by the National Government Administration Officers (NGAO) in charge of the area i.e. the area Chiefs together with the village elders. The area WSP (OMWASCO) was represented by two 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. The verbal discussions were done in both Kikuyu and Swahili languages.

All substantive issues raised with the Firm of Experts during the baraza were noted and responded to. The issues were then recorded in an Issues and Response Report. Table 26 below shows a summary of the views expressed by various stakeholders during the public meetings.

Table 26: summary of the views expressed by various stakeholders during the public meetings

Subject	Question/Concern	Response
Compensation on damaged infrastructure	Inquiries whose responsibility it will be to reinstate the pavements situated outside our business that will be destroyed during construction.	The contractor in charge of the project will do the repairs and reinstate the damaged infrastructure to its previous condition. The cost of reinstating the pavements has been catered for in the project budget
Quality of works	Inquiries on who will ensure that the quality of work by the Contractor is up to standard.	Quality control will be done by OMWASCO since they are the ones who are offering the jobs to the contractors
Costs Implications	Inquiries on whether they (the customers) would incur more costs for this project given that they had already incurred installation and fitting costs for connection with the piped water	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 project is going to lead to an increase in water tariffs	There will be no changes anticipated; the cost per unit of water remains the same.
Pipeline location	The likelihood of the pipeline passing through private land and compensation for land acquisition	The pipeline is designed to utilize the road reserves hence there will be no interference with private land





Plate 15: Public Baraza meeting in Othaya- Othaya CDF Hall

6.5.3.3 Focus Group Discussions

II. Feedback from the FGDs undertaken with the Iria-ini Community in Othaya

Feedback from the Men:

Seven male participants serving as household heads shared their perspectives in the FGD. They expressed a clear understanding of the proposed project. They highlighted its potential to:

- Improve the water supply for the population
- Create jobs for both the youths and adults

However, they also raised concerns

- Interruption of water supply during the implementation of the project

They presented the following requests:

- Repair damaged sections of the affected roads as soon as possible
- Provide alternative sources of water during construction

Their expectations from the project include;

- Provision of alternative sources of water during construction
- Ensure the project is implemented promptly

Feedback from the women

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

- The proposed project will minimize water wastage
- Acknowledged that the proposed project will lead to improved water service delivery
- Concerned with interruption of water supply during the construction period
- Concerned that the open trenches during the laying of the new pipes will pose safety issues for the community members
- Suggested to have the new pipelines deeply buried in the ground to avoid damage

Feedback from the Youth

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

Benefits:

- Improved water access by minimizing water loss and increased water pressure
- Employment opportunities
- Employment opportunities will keep the youths busy and therefore not have time to engage in drug abuse

Impacts:

- They expressed concerns on noise and accidents that may occur during construction

Expectations:

- Employment opportunities for the youth



Plate 16: Image of a Male FGD Session

6.5.3.4 Key Informant Interviews

Summary of Feedback of the KIIs on Project Perception

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

No	Interviewee	Institution	Project Perception
1.	Head Teacher	Munaini Primary School	Benefits: - Improved sanitation and hygiene - Reduced repair works on the water supply line Impacts - Interruption of water supply during construction will lead to deterioration of student hygiene and school sanitation Suggestion - Implement the project when schools have closed i.e. during the December holiday Participation in the project - Employ the school casual labourers during construction
2.	Medical Superintendent	Othaya Sub-County Hospital	Benefits - Efficient supply of water to the community Impacts - Interruption of water supply during construction Suggestions - Schedule the rehabilitation works and notify the affected parties Participation in project/Support for the project - Sensitizing the public on hygiene practices especially when water is not available
3.	Area Chief	Othaya Township	Benefits - Sustainable water supply for the increasing population in the project area - Improved standards of living - Improved health status for the community members Suggestions - Consider placing the water meters inside the homesteads to avoid theft (theft of scrap-metal theft common in the area) Support/Participation in the Project - Community sensitization on the project - Resolving project-related disputes



Plate 17: An ongoing KII

6.6 Grievance Redress

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

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

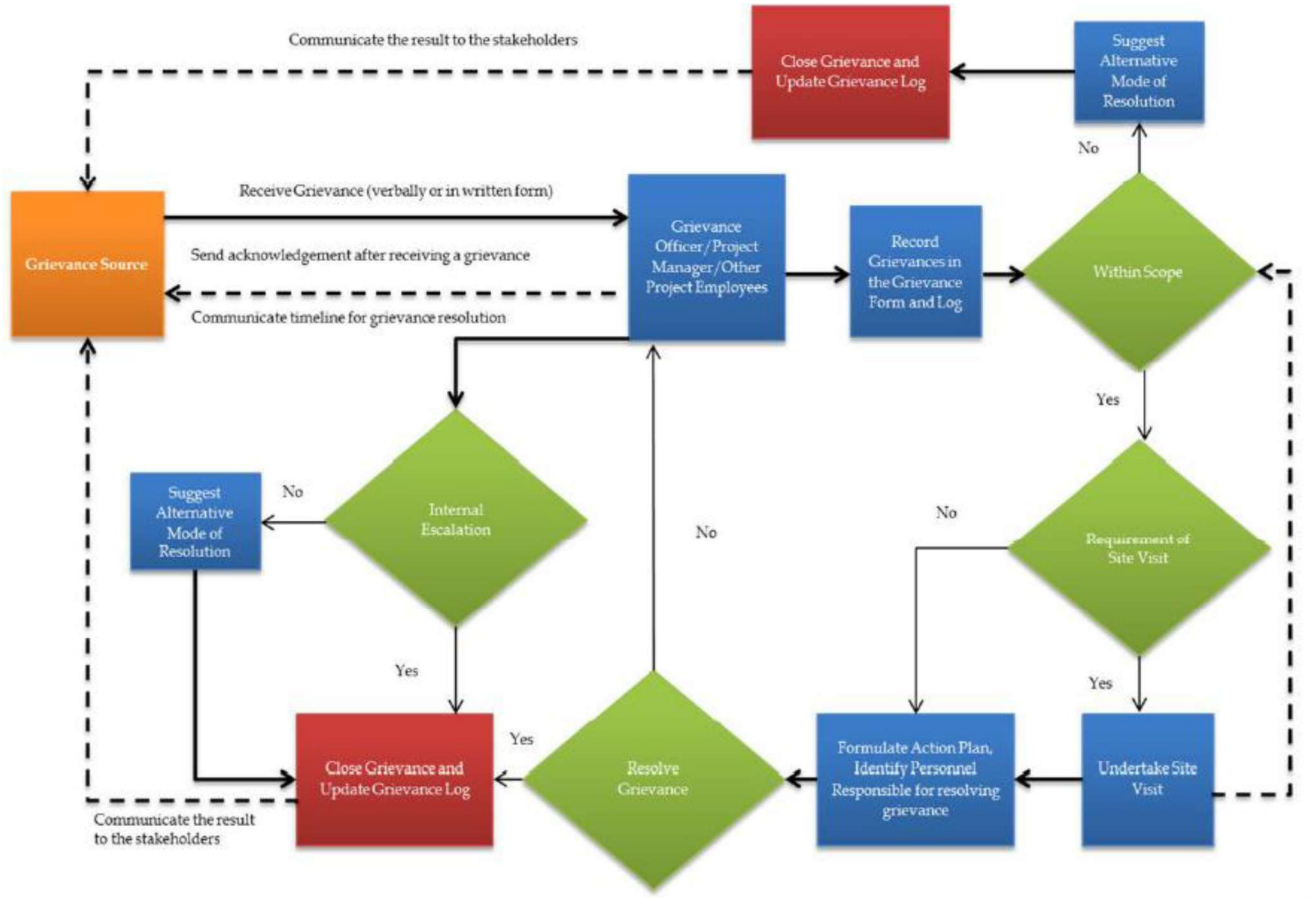
6.6.1 Principles of the GRM

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

1. **Equity** – Aggrieved parties will have a chance to be heard even in situations that require them to write their complaints when some cannot write. The project will put in place mechanisms to allow proxies draft complaints for community members who cannot write;
2. **Transparency** – grievances or complaints will be dealt with openly before local leaders or other formal institutions with facts being disclosed as and when required without favour;
3. **Language** – the language of discussion in the process of handling grievances shall be that that is used by the community members namely, Kikuyu. When community members cannot read or write in this language, they will be assisted by the project to grasp what is written that affects them;
4. **Options** – parties to any dispute or any person with a grievance will be given options openly to follow customary procedures or formal procedures. If they begin with customary procedures and are not happy with the outcomes, they will be allowed to proceed to formal processes. These options and courses of action will be made known to them beforehand; and
5. **Monitoring** – grievances and complaints will be monitored to have them settled within the shortest possible time. The project will facilitate the speedy resolution of grievances to the extent possible.

6.6.2 Grievance Procedures

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



6.6.2.1 Publicizing and Disclosure of the GRM

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

6.6.2.2 Receiving and Recording Grievances

As part of the GRM, the grievances from the stakeholder or their representatives may be communicated verbally (in person or over a telephonic conversation) or in written form (in the format given below) to the project representatives or to the GO directly. If the grievance is received directly by the GO or other project representatives, it will be recorded directly into the Grievance Form as soon as the personnel return to site. A sample grievance form is as presented in Annex 9.

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

6.6.2.3 Maintaining a Grievance Register

Each grievance thus received, shall be recorded in a grievance register. The format for the grievance register shall be as 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/OMWASCO proposes a resolution;
- ✓ Contractor/OMWASCO and the complainant jointly decide;
- ✓ Contractor/OMWASCO and the Complainant use traditional practices
- ✓ Complainant seeks legal redress

Legal Redress

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

6.6.2.6 Update or Records

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

6.6.2.7 GBV, SEA and SH GRM

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

6.6.3 Monitoring of the GRM Implementation

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

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

6.6.4 Reporting of the GRM

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

7. ALTERNATIVES ANALYSIS

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

- Laying of DN90mm water pipeline for Mukurwe-ini urban area (rehabilitating by replacing existing line which experiences frequent leakages with cases of water theft)
- Laying of DN90mm water pipeline for Othaya Urban Area ((rehabilitating by replacing existing line which experiences frequent leakages).

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.

OMWASCO WSP has for a long time been struggling with cases of non-revenue water and theft through illegal connections which arises primarily from physical losses like leaks in aging infrastructure. 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 their farms using domestic water.

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 feasible 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 OMWASCO 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 OMWASCO:** 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 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 not a viable alternative as the proposed rehabilitation works will increase the quality of water being supplied to the customers.

7.2 Fundamental Alternatives

Fundamental alternatives are developments that are totally different from the proposed project and usually involves a different type of development on the proposed site, or a different location for the proposed development.

7.2.1 Development Alternatives

The proposed development is for the provision of water for domestic purposes. The fundamental alternative of a development other than the proposed water supply project is therefore not feasible in this instance, for these reasons, no alternatives will be considered.

7.2.1 Location Alternatives

The proposed project supply area (Othaya and Mukurwe-ini) is located where the project customers reside. Under the circumstances the location cannot be changed.

7.3 Pipeline Material Alternative

Commonly used materials for water pipes include Galvanized Iron (G.I), 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.

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

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

7.5 Approaches to Water Pipeline Installation

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

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

The use of heavy machinery is associated with higher levels of air and noise pollution due to fuel combustion and mechanical operations. There is also a greater risk of soil compaction and vegetation disturbance.

Additionally, the use of heavy machinery limits local employment opportunities, as fewer workers are required. There may be concerns about the safety of operating machinery near populated areas. Heavy machinery is highly efficient, capable of handling large volumes of work quickly and accurately. It is suitable for complex and large-scale projects but requires skilled operators and regular maintenance.

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

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

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

8. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND MITIGATION MEASURES

The implementation of the water pipeline projects 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 Impacts Types and Definitions

An impact is any change to a resource or receptor brought about by the presence of a Project component or by the execution of a Project related activity. The evaluation of baseline data provides crucial information for the process of evaluating and describing how the Project could affect the biophysical and socio-economic environment. Impacts are described according to their nature or type, as summarised in Table 27

Table 27: Impact Nature, Type and Definition

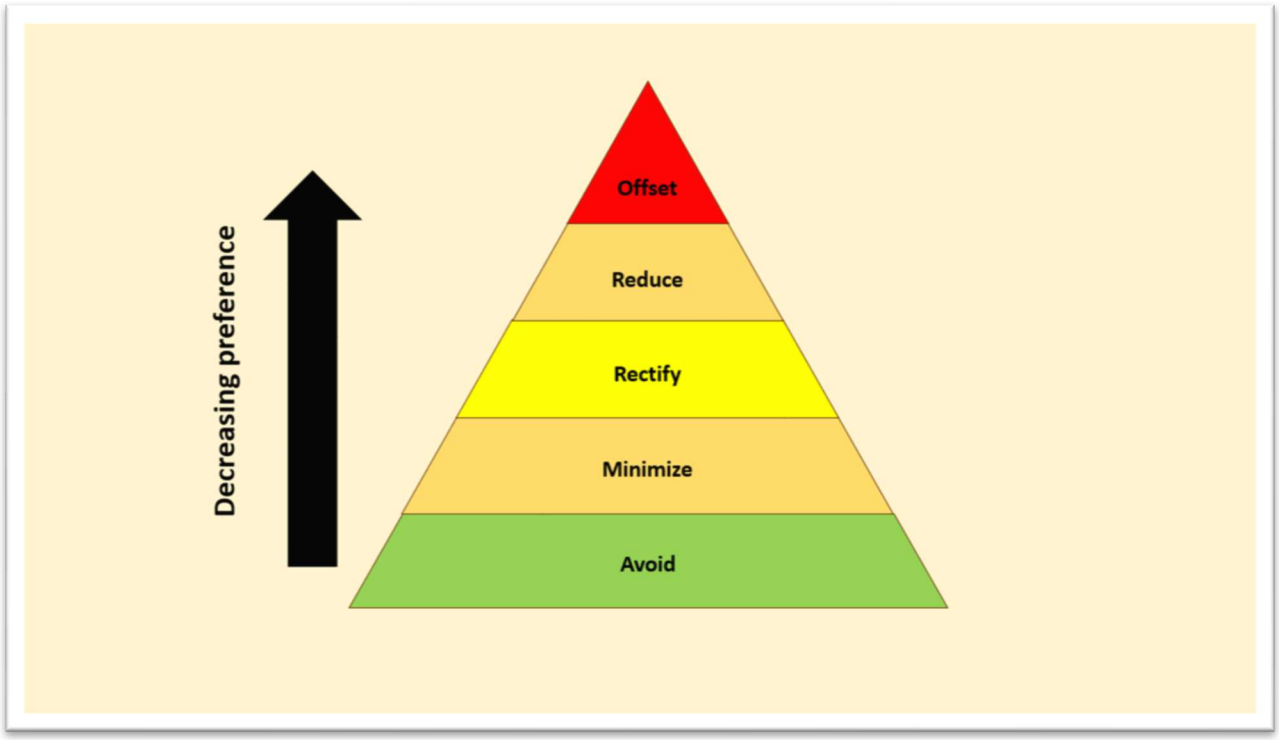
Nature or Type	Definition
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change
Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor
Direct impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (e.g. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality
Indirect impact	Impacts that result from other activities that are encouraged to happen 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 the Project 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. Contractor can compensate for this by engaging in conservation measures such as tree planting elsewhere within the project area.

The assessment conducted in this chapter is based on the methodology presented in section 4.2.3.5 of Chapter 4: Approach and Methodology. Further, the significance considered hereafter were previously defined in the same section. Further **Assessment of Significance** has been presented in Chapter 4: Approach and Methodology, Section 4.2.3.5 and matrix provided in Table 7 and Table 8

8.4 Sensitive Receptors Likely to be Impacted

The assessment identified several sensitive receptors located adjacent to the pipeline routes and within close proximity of 200m to 500m to the proposed water lines that might be affected by project civil activities during construction. These receptors could suffer damage and/or disruption associated with the project activities.

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 the general public. In the case of road users, open trenches can restrict the movement of vehicles, movement can also be restricted during emergencies. Dust pollution, triggered by the movement of plant and equipment on dusty roads, poses health risks, particularly respiratory illnesses. Noise and excessive vibrations beyond 60 decibels during the day can pose health risks, such as ear-related illnesses. Additionally, the disruption of existing public utilities, especially domestic water pipelines, can trigger grievances from users or lead to the contamination of the water supply.

8.4.1 Sensitive Receptors

The 35 km pipeline of DN90mm HDPE pipe passes through a fairly built-up area with residences, schools, business premises, churches, and farms while the 33km water supply pipeline in Mukurwe-ini town passes through a fairly built-up residential area adjacent to farms, coffee farms and schools. Table 28 below presents receptors identified along the two water supply pipelines.

Table 28: Sensitive Receptors along the Othaya-Mukurwe-ini Water Lines

Coordinates	Description	Approximate Length
OMWASCO WSP		
Line 1 – Othaya Urban-35km		
0° 33′ 35. 47″ S 36° 56′ 34′.86″ E	Munaini Primary school	**35km** **90 mm diameter HDPE Pipe**
0° 33′ 04. 28″ S 36° 56′ 36′.17″ E	St. Martin Othaya Catholic School	
0° 33′ 08. 52″ S 36° 56′ 41′.16″ E	Bewomi Children's Home	
0° 32′ 54. 40″ S 36° 56′ 40′.12″ E	Othaya Farmer's Co-operative,	
0° 33′ 06. 30″ S 36° 56′ 40′.93″ E	Muringa Tea Buying Center	
0° 32′ 52. 79″ S 36° 56′ 37′.50″ E	Othaya Town Market	
0° 33′ 04. 14″ S 36° 56′ 32′.97″ E	OMWASCO	
0° 33′ 21. 76″ S 36° 56′ 37′.44″ E	Green Hut Guest House	

0° 33' 09. 01" S 36° 56' 43'.73" E	Silver Brook Hotel	
Line 2 – Mukurwe-ini Urban-33km		
0° 34' 40. 40" S 37° 01' 38'.29" E	MTTI	**33km** **90mm diameter HDPE pipe**
0° 33' 38. 86" S 37° 01' 38'.29" E	Wakulima Dairy	
0° 32' 59. 42" S 37° 03' 40'.80" E	Ngoru Orthodox Secondary School	
0° 33' 17. 44" S 37° 03' 23'.89" E	Muhito Primary School	



Mukurwe-ini Wakulima Dairy



Ngoru Orthodox Secondary School



Munaini Primary School


Green Hut Guest House

Plate 18: Images of sensitive receptors along the Othaya- Mukurwe-ini water supply lines

8.5 Positive Impacts

This section enumerates and discusses the positive impacts associated with the proposed project during the 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. The majority of the interviewed persons are semi-skilled, while a smaller proportion is unskilled.

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

Analysis of Impact

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

Enhancement Measures: -

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

- *Injection of Money into Local Economy*

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

Analysis of Impact

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

Enhancement Measures: -

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

- *Skills Transfer*

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

Analysis of Impact

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

Enhancement Measures: -

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

- *Increased Revenue Generation for National/County*

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

Analysis of Impact

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

Enhancement Measures: -

- OMWASCO WSP should ensure that their contractors/suppliers remit taxes and have a tax compliance certificate.

8.5.2 Operation Phase Positive Impacts

- *Improved and reliable water supply for the residents of Othaya and Mukurwe-ini Urban Areas*

The operational phase of the water pipeline project will deliver improved and reliable water access to residents of Othaya and Mukurwe-ini, 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 Othaya urban and Mukurwe-ini central 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. 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 OMWASCO 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 proposed lines, 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 OMWASCO 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

8.6.2.1 Loss of Vegetation

Vegetation forms a crucial part of the natural environment, supporting a variety of fauna, including surface-dwelling organisms and soil microorganisms. It provides essential food and shelter for these organisms.

Clearing vegetation will not only affect plant species but also disturb the fauna inhabiting the area, leading to potential disruptions in the local ecosystem. The proposed project area has bushes and shrubs especially along the pipeline that are likely to be cleared during construction. 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

- 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 recovery;

Impact Significance After Mitigation

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

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

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

Analysis of Impact

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

Impact significance before mitigation

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

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

Mitigation Measures

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

Impact Significance after Mitigation

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

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

8.6.2.3 Impact on Local Air Quality (Dust Generation)

Construction activities will contribute to localized dust emissions, primarily from manual trenching, excavation, and pavement cutting in select areas. Dust generation will result from soil disturbances, drilling, and hammering of paved surfaces, as well as material transportation along access roads, particularly on murram sections. However, given the light construction footprint of the project, these emissions are expected to be minimal.

Key receptors of dust impacts include construction workers, road users, and nearby settlements. Appropriate mitigation measures will be implemented to minimize exposure and ensure compliance with air quality standards.

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 construction period. Additionally, workers at the project site will be exposed, and severity is predicted to be Medium hence moderate impact significance.

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

Mitigation Measures

- Regularly sprinkle water on dusty surfaces, particularly during excavation, drilling, and material transport;
- Provide appropriate PPE, such as dust masks, to construction workers, especially those involved in trenching and pavement cutting;
- Limit material deliverable vehicle speeds to 30 km/h or lower on unpaved roads to reduce dust emissions.;

- Keep construction sites tidy by promptly removing excavated materials and debris;
- Ensure construction tools, including jackhammers and drills, are well-maintained to minimize emissions and dust.

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

8.6.2.4 Noise and Excessive Vibration Generation

Noise levels within the project area vary, with Mukurwe-ini and rural sections of Othaya experiencing lower ambient noise, while Othaya town has relatively higher noise levels due to human activities and traffic. Construction-related noise and vibrations will primarily result from mechanical activities such as pavement cutting, breaking rocky surfaces, and drilling, rather than manual trenching, which produces minimal noise. Key sensitive receptors include construction workers, nearby schools, health centers, road users, and residents along access roads. Given the localized and intermittent use of handheld tools like jackhammers for hard surfaces, noise and vibration impacts will be temporary and manageable with appropriate mitigation measures.

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	

8.6.2.5 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. The waste generated will also include old pipes being replaced or rehabilitated, which will add to the overall construction waste.

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 that old pipes being replaced are securely stored and either recycled or disposed of properly to avoid environmental impact and reduce visual intrusion;
- Develop a spoil management plan to identify opportunities for reuse, recycling, or proper disposal of excavated materials based on site-specific conditions;
- Develop a pipe disposal plan to ensure old pipes are either reused, recycled, or disposed of in an environmentally responsible manner;
- All personnel shall be instructed to dispose of all waste in a proper manner;
- Ensure spoil from excavations is arranged according to the various soil layers. This soil can then be returned during landscaping and then rehabilitation, in the correct order which they were removed that is top soil last.

Impact significance after mitigation

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

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

8.6.2.6 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 in close proximity to 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 as a result of accidental occurrences, neglect of the use of protective gears among others. Accidents may also occur to members of public, and livestock from trenches left open.

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

Labour and working conditions: labour and working conditions, including occupational health and safety, 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 as a result 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;
- Ensure all workers including management staff are inducted on OHS
- Ensure there are sufficient, visible danger-sign posts put up at the site to warn passers-by or workers of potential accidents or incidents;

- Maintain adequate spacing of at least 2mbetween workers during excavation to prevent accidental injuries;
- Ensure all hand tools are inspected daily to confirm they are in good working condition and free from defects;
- All construction workers will be required to wear Personal Protective Equipment (PPE) i.e. helmets, gloves and safety boots during the construction phase;
- Provide shaded rest areas and ensure workers have access to ample drinking water. Schedule work to avoid peak heat periods;

Impact Significance After Mitigation

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

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

8.6.2.7 Risks Associated with Traffic on Site

Construction of the proposed pipelines will be outsourced to an independent contractor who might opt to use vehicles/machineries to 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. Turing of Vehicles

iv. Visibility, 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 trucks on the road (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 laborers 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 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

8.6.2.8 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 Othaya pipeline which is fairly built and with learning institutions along the pipeline route. For Mukurwe-ini West section of the pipeline which has rural set up, construction activities may pose risks to livestock, including potential injuries from open trenches or machinery. Further, lack of proper barriers may allow livestock, school-going children and the local populace to wander into construction areas, increasing the risk of accidents

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

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

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

Analysis of Impact

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

Impact Significance Before Mitigation

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

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

Mitigation Measures

- Inform the community in advance about construction schedules, road closures, and alternative routes through meetings, leaflets, and local media;
- Restrict noisy construction activities to daytime hours and avoid early mornings, late evenings, and weekends to reduce disturbance;
- Install clear and visible warning signs around the construction site indicating potential hazards, construction zones, and restricted areas;
- Co-ordinate with nearby schools to schedule construction activities that avoid peak times for school arrivals and departures;
- Excavation, pipe-laying, and backfilling will be conducted on the same day where feasible to minimize exposure from open trenches;
- Ensure that access routes for emergency vehicles are always kept clear and accessible;
- 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;
- - 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

8.6.2.9 Interference with movement due to trenches

The digging of trenches to accommodate the water pipeline will cause interference with movement in various ways:

1. Traffic Disruptions: Traffic flow will be disrupted mainly in the areas where the pipeline is being laid along/across the road reserves hence construction vehicles are likely to increase the traffic jams around these areas.
2. Pedestrian Movement: Trenches can block sidewalks, forcing pedestrians to take alternate routes, which may be less safe or less convenient.

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

Impact Significance Before Mitigation

The severity of impacts associated with interference with movement will be medium, hence leading to moderate significance of the 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

- Contractor should put up a notice to inform the affected road users of the likely inconvenience with specified dates and length of time for the construction works;
- Contractor should stick to the area designated for construction works
- Contractor should ensure excavated materials are not being hauled on the pavements or along the road to avoid blocking pathways and roads for both pedestrians and vehicles.
- Develop and implement a traffic management plan and minimize disruptions to movement.

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

SOCIAL IMPACTS

8.6.2.10 Spread of HIV/AIDS and STIs

Construction sites are potentially primary centers 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 Othaya-Mukuruwe-ini 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

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

Mitigation Measures

- The contractor will undertake sensitization of the HIV /AIDs AND STD awareness e.g. by use of posters etc.;

- Encourage workers to go for HIV voluntary counselling, testing and referral services;
- Contractor to institute HIV/AIDS awareness program and implemented as part of the Health and Safety Management Plan targeting both workers and the local community;
- The Contractor shall institute HIV/AIDS awareness and prevention campaign amongst his workers for the duration of the contract.

Impact Significance After Mitigation

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

SIGNIFICANCE						
			LIKELIHOOD			
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

8.6.2.11 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			
MAGNITUDE			Unlikely	Likely	Definite	
			1	2	3	
	Negligible	1	Negligible 1	Negligible 2	Minor	3
	Low	2	Negligible 2	Minor 4	Minor	6
	Medium	3	Minor 3	Moderate 6	Moderate	9
	High	4	Moderate 4	Major 8	Major	12

Mitigation Measures

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

Impact Significance After Mitigation

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

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

8.6.2.12 Child Labour/Exploitation

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

Analysis of Impact

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

Impact Significance Before Mitigation

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

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

Mitigation Measures

- Engage with local communities, schools, and parents to raise awareness about the importance of education and the risks of child labor;
- Establish mechanisms to monitor project activities for signs of child labor, such as age verification checks for workers;
- Collaborate with education authorities to monitor school attendance and identify any potential dropouts who may be at risk of child labor;
- Establish protocols for immediate response and support for children identified as victims of or at risk of child labor, including access to social services, counseling;
- Child abuse and labour will be prohibited; clear signages put up to clearly show that children are prohibited from works areas, including food vending

Impact Significance After Mitigation

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

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

8.6.2.13 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 setup of communities living in the project area thereby possible decay of morality, petty thieves and increased HIV/AIDS incidence and communicable diseases.

Emphasizing proactive community engagement and support initiatives to foster ethical behavior and discourage practices that could disrupt local norms is crucial. Further, through educational campaigns targeting the residents, highlighting responsible conduct and addressing risks such as HIV/AIDS and communicable diseases, any emerging challenges will be address. Additionally, the project's positive

economic contributions, including job creation and local economic development, are expected to bolster community resilience and stability.

Analysis of Impact

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

Impact Significance Before Mitigation

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

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

Mitigation Measures

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

Impact significance after mitigation

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

SIGNIFICANCE					
		LIKELIHOOD			
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	

8.6.2.14 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 possibility sexual exploitation of children, especially young girls. This impact may be committed by Project staff against communities and represents a risk at all stages of the Project, especially when employees and community members are not clear about prohibitions against SEA in the Project. Sexual exploitation and abuse (SEA) of community members by project workers and sexual harassment (SH) among project workers are forms of GBV that are a potential risk and impacts to this

proposed project. GBV has serious and far-reaching negative effects including physical injuries resulting in death or disfigurement, psychological trauma, infection with HIV/AIDS, unwanted pregnancies, social stigmatization and exclusion and economic deprivation among others. Consequently, it is incumbent that preventive measures be mooted to prevent occurrence of such cases.

Analysis of Impact

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

Impact Significance Before Mitigation

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

SIGNIFICANCE					
			LIKELIHOOD		
			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

- 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

8.6.2.15 Interruption of Existing Infrastructure and Services

The Othaya line traverses twice across the Kanyange-Munaini Road and once across the Othaya Town-Kihuri Road. Construction activities will disrupt existing supply and distribution pipeline networks, leading to interruptions in water supply services and business operations. These disruptions are critical as they may result in loss of income for businesses reliant on water, hinder daily activities, 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 and economic 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

- OMWASCO should obtain approval from the relevant road authorities (KeRRA and KURA) to utilize the road reserves
- 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 below.

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

8.6.2 Operation Phase

ENVIRONMENTAL IMPACTS

8.6.2.1 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 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		
			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 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

- Regularly inspect pipelines to identify and address wear, corrosion, or potential weaknesses;
- 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 Wayleave Encroachment

Wayleave encroachment presents a critical concern for the proposed water pipeline projects. 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 illustrate the width of the pipeline reserve.
- Regular patrol of the pipeline corridor for encroachment;
- Conduct outreach programs to educate local communities about the importance of preserving the designated corridor and the consequences of encroachment;
- Prosecution of encroachers as required by County By-Laws on wayleaves and road reserves maintenance;
- Provide marker posts along the pipeline corridor to clearly demarcate the boundaries and discourage encroachment;
- Conduct public sensitization programs on importance of not interfering with way leaves and public reserve land.

Impact Significance After Mitigation

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

8.6.3 Decommissioning Phase

8.6.3.1 Utilization of Untreated Sources of Water

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 Well-being

Access to reliable clean water is fundamental to sustaining livelihoods and ensuring the well-being of communities. 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					
MAGNITUDE			Unlikely		Likely		Definite	
			1		2		3	
	Negligible	1	Negligible	1	Negligible	2	Minor	3
	Low	2	Negligible	2	Minor	4	Minor	6
	Medium	3	Minor	3	Moderate	6	Moderate	9
	High	4	Moderate	4	Major	8	Major	12

Mitigation Measures

- Implement water 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 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

8.6.3.3 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 local residents, agricultural interests, and industrial users for alternative water sources. In densely populated areas like Othaya 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 Othaya, 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

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 OMWASCO, 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, it is high likely that the OMWASCO will lose revenue generated from water service provision. The intensity is graded high making the impact significance major.

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

Mitigation Measures

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

Impact Significance After Mitigation

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

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

8.6.3.5 Loss of Employment Opportunities

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

Analysis of Impact

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

Impact Significance Before Mitigation

With the decommissioning of the two pipelines, it is high likely that people working with OMWASCO 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 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

8.6.3.6 Waste Generation

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

Analysis of Impact

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

Impact Significance Before Mitigation

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

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

Mitigation Measures

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

Impact significance after mitigation

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

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

8.6.3.7 Visual Intrusion

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

Mitigation Measures

- Plan decommissioning in stages to limit the area affected at any one time;
- Restore each section promptly after decommissioning activities are completed;
- Implement comprehensive landscaping plans that include replanting native vegetation and restoring the natural contour of the land;
- Ensure that waste materials and debris are promptly removed after decommissioning activities.

8.6.5 Cumulative Impacts

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

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

- Water Resources: surface water quality
- Soils: Stability and erosion
- Physical wellbeing: health and safety of the local community/workers
- Over abstraction of water resources
- Competition for water resources

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

- Ongoing agricultural activities
- Implementation of the TWWDA (Tana Water Works Development Agency) Sewerage system in Mukurwe-ini

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

The cumulative impacts that would result from a combination of the proposed sub projects activities and other actual or proposed future developments is presented in the Table 29 below.

Table 29: Evaluation of Cumulative Effects on VECs

Potentially Affected VECs	Environmental/Social Impacts
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 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 for tea and coffee farming in the project area 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.

Cumulative Impacts Synergies and Conflicts:

Synergies:

- Collaborative Resource Management: Projects can collaborate to manage water resources more effectively, sharing benefits and reducing competition.

Conflicts:

- Resource Conflicts: Infrastructure Overload: Increased demand for existing infrastructure could lead to deterioration of services, impacting the quality of life for local residents.

Mitigation Measures

a) Water Resources:

- Implement water-saving technologies and promote efficient water use practices.
- Develop a regional water management plan to ensure sustainable water use among all projects.

b) Water Quality:

- Implement erosion control measures, such as terracing, contour plowing, and vegetation cover to prevent soil erosion and reduce sedimentation.
- Promote the use of environmentally friendly agricultural practices to reduce the use of harmful chemicals. Implement buffer zones along water bodies to filter runoff.
- Regularly monitor water quality to detect and address contamination from sedimentation and agricultural runoff.

c) Soil:

- Implement erosion control measures to prevent soil erosion and maintain soil health.
- Promote sustainable agricultural practices to maintain soil health, including crop rotation, reduced use of chemicals, and organic farming methods.
- Use lighter machinery and limit heavy machinery operation to designated areas to prevent soil compaction.

d) Infrastructure and Services:

- Upgrade and expand existing infrastructure to accommodate increased demand.
- Coordinate with local authorities to ensure services are evenly distributed.

e) Community Engagement:

- Engage local communities in decision-making processes and provide regular updates on project progress.

f) Conflict Resolution:

- Establish conflict resolution mechanisms to address disputes over resource use.

Monitoring and Follow-Up

Water Quality and Quantity:

- Regularly monitor groundwater and surface water levels, as well as water quality, to assess cumulative impacts on water resources.

Soil Health:

- Soil Monitoring: Regularly monitor soil quality and erosion rates to ensure the effectiveness of soil conservation measures.

Social Infrastructure:

- Monitor the usage and condition of local infrastructure and services to ensure they meet the needs of the growing population.

Community Feedback:

- Establish a feedback mechanism for residents to report issues and provide input on project management.

Conclusion

The cumulative impacts of the Othaya-Mukurwe-ini water pipeline projects, along with the TWWDA sewerage system project and other developments, have the potential to significantly affect environmental and social components in the region. Proactive management and continuous monitoring are essential to mitigate negative impacts and enhance positive synergies, ensuring sustainable development over the next 10-20 years.

8.7 Climate Change Vulnerability

As a part of the ESIA, a Climate Change Vulnerability Assessment was conducted to evaluate potential impacts and propose adaptation measures to enhance project resilience. Given Nyeri County's susceptibility to climate variability and projected climate change impacts, this assessment is vital. Climate data for the region was sourced from the World Bank's Climate Change Knowledge Portal (CCKP), an online database providing scientific insights into climate change and disaster risks to aid decision-making. Data from the CCKP, processed by the National Center for Atmospheric Research, the International Research Institute of Columbia University, and the European Space Agency, informed the exposure assessment.

Climate Risks Identified

Nyeri County faces significant climate hazards, including prolonged dry spells leading to drought, erratic rainfall, floods, pests, diseases, frost, and landslides, particularly near major rivers like Gura and Sagana. Drought has been identified as the most critical hazard; while recurring floods and droughts have caused substantial socio-economic impacts and high economic costs. Kieni East, Kieni West, and Mukurweini sub-counties are among the most disaster-prone areas, requiring extensive disaster risk investment. Vulnerability to these hazards challenges economic stability, with lower-income populations disproportionately exposed to risks, exacerbating social and fiscal vulnerabilities.

Landslides: Mukurwe-ini and Othaya sub-counties are prone to landslides due to steep slopes and human activities, leading to property destruction, infrastructure damage, household displacement, water distribution disruption, erosion, and impacts on agricultural production, such as loss of livestock and reduced fodder yields. The community mitigates these risks through measures like afforestation, agroforestry, terracing, stormwater management, and relocating from high-risk areas. Early warning systems from the National Disaster Management Authority also aid in managing landslide risks. Additionally, the region faces flood risks during the rainy season, further increasing soil erosion threats.



Figure 11: Community Members Anchoring a pipeline exposed by a landslide

Floods: Floods have affected all sub-counties in Nyeri County with parts of Nyeri Central and Othaya experiencing urban floods. In addition, the Othaya sub-county faces other several significant hazards, notably seasonal flooding, drought and exacerbating water shortages, landslides causing displacement, and soil erosion that detrimentally impacts soil fertility.

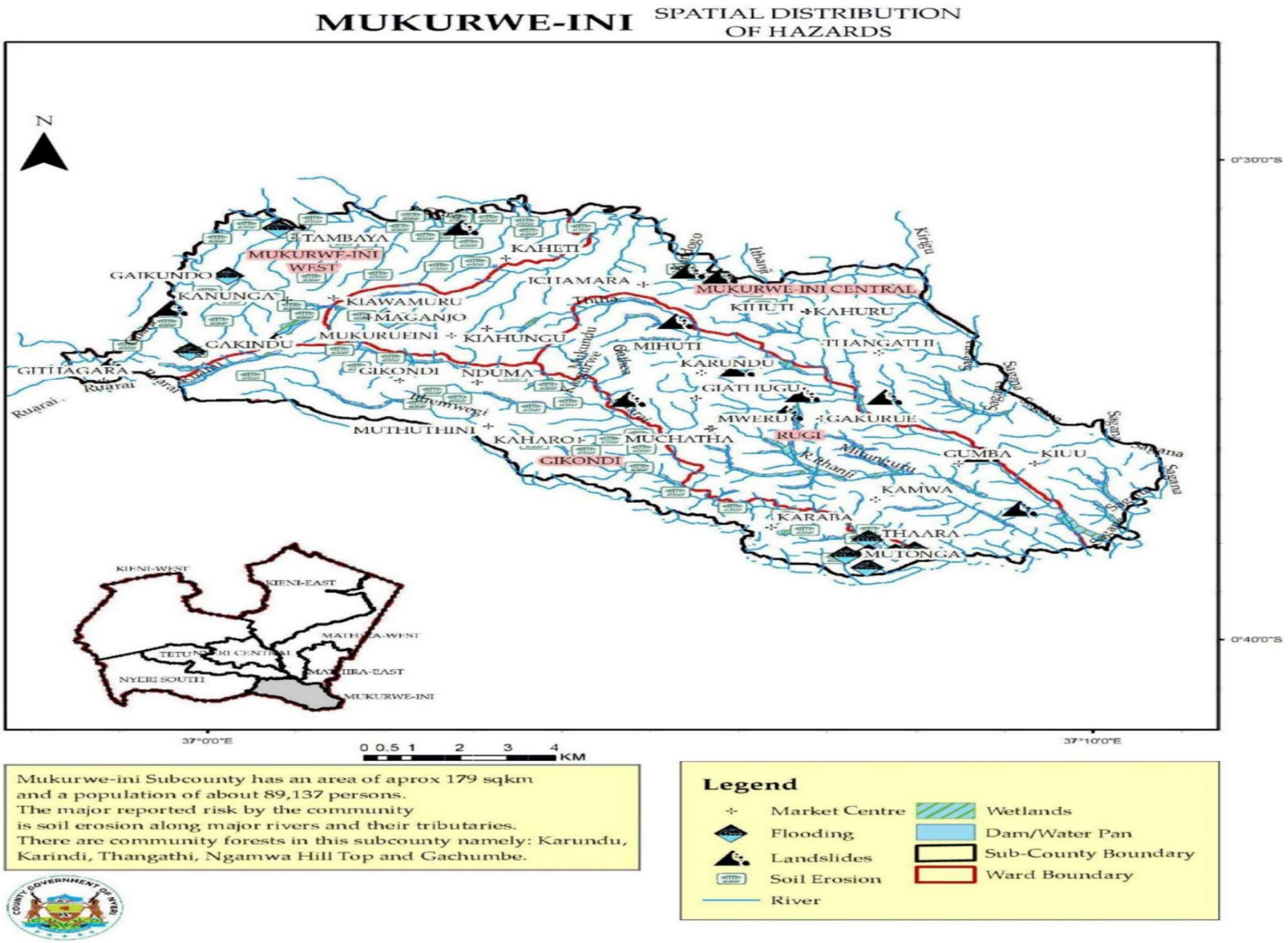


Figure 12: Distribution of Hazards in Mukurwe-ini

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 OMWASCO WSP Project.

9.1 Objectives

The purpose of the ESMMP is to ensure effective management of social and environmental impacts throughout the Project's lifecycle, aligning with Kenyan laws, World Bank safeguards, and EHSG. It outlines mitigation measures for inclusion in contractor contracts, defines financial and supervisory responsibilities, and provides a framework for implementing management initiatives. Guided by best practices, the ESMMP emphasizes preventing negative impacts and enhancing benefits. The key objectives of the ESMMP are to:

- Outline mitigation measures developed for the OMWASCO water Project that must be included in the selected Contractor's contract and procedures;
- Define financing responsibility for the implementation and 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 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 ongoing 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 concerning 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 OMWASCO

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

- Ensure including all standard and specific mitigation measures from the ESMMP in 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 OMWASCO 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 (Water Fund) 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 OMWASCO 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 is the process of systematically tracking the progress of ESMMP implementation, analyzing data, and addressing emerging issues. It includes routine monitoring to assess compliance with standards and periodic reviews to evaluate overall effectiveness and impact. During the construction phase, OMWASCO WSP will monitor the contractor's activities to ensure adherence to the ESMMP measures. In the operation phase, OMWASCO WSP will continue monitoring to ensure compliance with the management measures and operational procedures, including conducting the initial and annual environmental audits as required by ESIA/EA Regulations, 2003.

During the construction phase, OMWASCO will monitor the contractor's activities to ensure that management measures, procedures, and specifications are implemented as outlined in the ESMMP and design. Compliance will confirm that the contractor is fulfilling contractual obligations. During the operation phase, OMWASCO will oversee facility operations to ensure adherence to the ESMMP and operational procedures. As part of this monitoring, OMWASCO will conduct the statutory initial environmental audit as required by the ESIA/EA Regulations, 2003, followed by annual environmental audits.

To support these efforts, OMWASCO will assign interns under the supervision of the Technical Manager, who is NEMA-licensed, to oversee Environmental and Social (E&S) monitoring. The supervision of works, including ESMP implementation, will be managed by the WSP's technical department. Additionally, the contractor will be required to submit monthly reports on ESMP compliance, reinforcing the commitment to environmental and social safeguards throughout the project lifecycle.

Table 30: Environmental and Social Management and Monitoring Plan (ESMMP)

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
Pre-Preconstruction phase					
Interruption and/or disruption of businesses and Services	- Plan construction activities to minimize peak traffic hours. Only conduct major activities during off peak times to reduce traffic congestion and disruptions; - Maintain clear communication with local authorities, residents, and businesses about construction schedules, anticipated disruptions, and alternative routes; - Provide alternative water supply solutions, such as temporary water tanks or connecting affected households to alternative sources, to mitigate interruptions in water supply; - Engage with local communities to understand their concerns and incorporate feedback into mitigation strategies.	- Number of communications (meetings, notices, newsletters) with local authorities, residents, and businesses regarding construction schedules, disruptions, and alternative routes - Alternative water supply solutions during construction - No. of grievances received on interruption	Continuous	Contactor OMWASCO	138,659
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	- Area of vegetation cleared - Area of vegetation cleared/replanted	Throughout the construction period	- Contractor - OMWASCO	80,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	to affected community to harvest the targeted vegetation that are within the raw water mains if they so wish				
Impacts on Water Quality	- Use mulching, hydro seeding, or other ground cover methods to stabilize exposed soil and prevent erosion; - Regularly inspect and maintain construction machinery and equipment to prevent leaks of petroleum products; - Where possible construction activities close to these rivers should be scheduled for the dry seasons; - The removal of vegetation and soil cover will be restricted to only those areas necessary for excavation work. Particularly, the unnecessary removal of groundcover vegetation from the AoI will be avoided.	- Spills and leakages on the ground - Signs of soil erosion (soil washed down to water bodies) - Spoil material storage	Throughout the construction period	- Contractor	100,000
Soils and geological disturbance	- Excavated soil should be placed on flat surfaces and away from water ways (at least 100m away); - Ensure timely removal (reuse) of excavated materials from the project site to minimize soil exposure and erosion risk; - Avoid excavation in floodplains, near stream banks, or other sensitive areas prone to erosion;	- Placement area of excavated soil/spoil - Area of soil disturbed	Monthly	Contractor	80,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- 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;	- Frequency of dust suppression activities - PPE Provided to workers - Maintenance checks of construction equipment	Throughout the construction period	Contractor	200,000 Dust masks @ Ksh 250 each

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- 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.				
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;	- 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	90,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- 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.				
Waste Generation	- Provide litter collection facilities such as bins and create awareness campaigns to segregate as early as possible, using the appropriate bins - Temporary storage in stock piles for further use on site or removal; - Evaluate the suitability of spoil for non-critical backfilling or landscaping within the project area where permissible; - Ensure pipe cuts are returned to the store for future use; - Develop a spoil management plan to identify opportunities for reuse, recycling, or proper disposal of excavated materials based on site-specific conditions; - Store spoil in designated areas with secure covers or enclosures to prevent dispersion and minimize visual and environmental impacts; - All personnel shall be instructed to dispose of all waste in a proper manner; - Ensure spoil from excavations is arranged according to the various	- 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	100,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	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; - All construction workers will be required to be in full PPE i.e. helmets, gloves and safety boots during the construction phase; - Ensure all hand tools are inspected daily to confirm they are in good working condition and free from defects. - 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	150,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
Risks Associated with Traffic on Site	- Install clear and prominent signage indicating speed limits, right of way, and site rules; - Provide regular safety briefings and training sessions for all personnel on traffic management procedures and protocols; - Limit the number of vehicles and personnel on-site to essential operations only; - Recommend the contractor prioritize manual laborers for excavation and construction tasks where feasible, especially in areas where machinery may pose safety risks or environmental concerns;	- Number of clear and prominent signs installed indicating speed limits, right of way, and site rules - Number of safety briefings and training sessions conducted on traffic management procedures and protocols - Number of vehicles and personnel present on-site compared to the number of essential operations - Percentage of excavation and construction tasks performed by manual laborers in areas where machinery poses safety risks	Throughout the construction period	Contractor	Costs are under the responsibility of the contractor
Community Health and Safety Concerns	- Inform the community in advance about construction schedules, road closures, and alternative routes through meetings, leaflets, and local media; - Restrict noisy construction activities to daytime hours and avoid early mornings, late evenings, and weekends to reduce disturbance; - Install clear and visible warning signs around the construction site indicating potential hazards, construction zones, and restricted areas; - All chambers will be promptly covered to prevent accidents and unauthorized access;	- 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	Throughout the construction period	Contractor	100,000

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 - Coordinate with nearby schools to schedule construction activities that avoid peak times for school arrivals and departures; - - Excavation, pipe-laying, and backfilling will be conducted on the same day where feasible to minimize exposure from open trenches; - Ensure that access routes for emergency vehicles are always kept clear and accessible; - Temporary access ramps will be provided across open trenches at key access points to maintain mobility and safety.	their interactions with the community - Number of health campaigns conducted and the level of community participation			
Impact on Underground Infrastructure	-OMWASCO should formally engage with affected utility service providers and map out areas where these utilities pass-through Contractor to involve the affected service providers during "setting out" (determining the pipeline corridor, chainages, and quantities) before construction of the pipeline -Develop a reinstatement plan for the affected utilities and include a budget plan Ensure dissemination of relevant information to all of the affected parties	-Correspondences with the relevant agencies -Approved work plan	Throughout the construction phase	OMWASCO and Contractor	As per the BOQs

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	-A work plan with clear responsibilities for each party should be developed to ensure the smooth execution of the construction				
Interference with movement due to trenches	-The contractor should put up a notice to inform the affected road users of the likely inconvenience with specified dates and length of time for the construction works; -The contractor should stick to the area designated for construction works -The contractor should ensure excavated materials are not being hauled on the pavements or along the road to avoid blocking pathways and roads for both pedestrians and vehicles. -The excavation of trenches ahead of the pipe laying and backfilling shall be limited such that the period from the time of opening a trench to temporary reinstatement shall not normally exceed 48 hours unless exceptional circumstances agreed with the Contractor prevail; -The excavated areas shall be re-instated to the previous condition -Develop and implement a traffic management plan and minimize disruptions to movement.	No. of notices put up (vis a vis the number of sections of affected areas) to inform affected road users on No. of days/hours movement of pedestrians and vehicles has been disrupted	Throughout the construction phase	Contractor	100,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
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	120,000
Increase in cases of Gender Based Violence	- Proponent to develop and enforce a comprehensive policy against GBV, SEA, and SH that includes zero-tolerance principles; - Contractor will implement the approved code of conduct that has provisions in addressing GBV/SEA/SH; - Conduct regular awareness sessions for all project staff, emphasizing respectful behavior, and the consequences of GBV, SEA, and SH; - Implement transparent and fair recruitment practices to prevent instances where job seekers may	- 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	60,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	be coerced into providing sexual favors; - Ensure that recruitment processes are conducted in a gender-sensitive manner, promoting equal opportunities; - Engage with community leaders, women's groups, and local authorities to raise awareness about GBV, SEA, and SH; - The contractor to prepare a GBV/SEA/SH action plan that will guide implementation of GBV mitigations; - All workers will be inducted and sign the code of conduct before deployment to the work station; - All GBV, SEA, and SH allegations and cases will be reported promptly to relevant authorities; - The contractor will establish and maintain adequate referral mechanisms to address cases of Gender-Based Violence (GBV) reported at the community level related to project implementation.				
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;	- 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	Throughout the construction period	Contractor	20,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- 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 labor will be prohibited; clear signages put up to clearly show that children are prohibited from works areas, including food vending	- No of Grievances received on Child protection issues			
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 OMWASCO	50,000
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	- 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 OMWASCO	40,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	consequences for failure to comply with laws - Develop and implement a SEA action plan with an Accountability and Response; - Integrate provisions related to sexual harassment in 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.				
				TOTAL COST (CONSTRUCTION PHASE)	**1,428,659**
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	- Area reseeded or replanted with native vegetation after construction - Frequency and outcomes of inspections for erosion control measures and pipeline integrity	Monthly	OMWASCO	Costs are under the responsibility of OMWASCO

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	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.				
Risk of Water Pipeline Bursts Leading to Water Wastages	- Implement a proactive maintenance schedule to inspect pipelines regularly for signs of wear, corrosion, or potential weaknesses that could lead to bursts; - Install and maintain advanced leak detection systems along the pipeline network; - Optimize pressure levels within the pipeline system to reduce 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	- 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	OMWASCO	250,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	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	OMWASCO	Costs are under the responsibility of OMWASCO
Wayleave Encroachment	- Mapping and installation of beacons by KeRRA and KURA to 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;	- 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	OMWASCO	200,000

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	- 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.				
				TOTAL COST (OPERATION PHASE)	**450,000**
Decommissioning Phase					
Utilization of untreated water 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, and 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 OMWASCO
Impact on Livelihoods and Well-being	⁻ Implement water storage solutions like reservoirs or tanks to ensure continuous supply for domestic use⁻ Provide community education on efficient water use practices for livestock watering;	- No. and capacity of water storage solutions (e.g., reservoirs, tanks) implemented - No. of community education sessions conducted on efficient	Continuous	Contractor	Costs are under the responsibility of OMWASCO

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	⁻ 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	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; ⁻ 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;	- 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)
	⁻ 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.				
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	- No. of retraining programs and skill development initiatives implemented - No. of career counseling sessions conducted.	During decommissioning	Contractor	No additional costs

Potential Impacts	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Estimated Costs (Ksh)
	to assist displaced workers in finding new opportunities.				
Waste Generation	- Careful dismantling to ensure materials remain 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; - Cleaning and proper site rehabilitation by adhering to 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	120,000
Visual Intrusion	- Plan decommissioning in stages to limit the area affected at any one time; - Restore each section promptly after decommissioning activities are completed; - Implement comprehensive landscaping plans that include using native vegetation & restoring the natural contour of the land; - Ensure that waste materials and debris are promptly removed	- Timely restoration of decommissioned areas after activities are completed - Completion and effectiveness of landscaping plans, including native vegetation replanting and land contour restoration - Efficiency of waste removal processes post-decommissioning	During decommissioning	Contractor	200,000
				TOTAL COST (DECOMMISSIONING PHASE)	**320,000**
				TOTAL ESMP COST	**2,198,659**

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 of the

traffic related impacts described previously can be mitigated very effectively by the implementation of standard best practices in terms of environmental controls and management practices during construction. These measures will be detailed in the TMP, which will describe in detail the measures that the Contractor will implement during the construction of the project.

9.4.4 Health and Safety Management Plan

The Health and Safety Management Plan (H&S Plan) will provide a framework for planning health and safety, investigating accidents and incidents, and conducting health and safety audits. It will be developed in compliance with Kenya's national legislation, World Bank policies, and Environmental, Health, and Safety Guidelines (EHSG).

9.4.5 Rehabilitation and Site Closure Plan

Rehabilitation and Site Closure Plan will be developed by the contractor after construction activities are completed. It will include clearing the site of construction materials, proper waste disposal, removing temporary works, and planting grass on uncovered areas 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 (OMWASCO) 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 OMWASCO 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.

10. SUMMARY RESETTLEMENT ACTION PLAN

10. 1 Overview

Othaya-Mukurweini Water & Sanitation Company (OMWASCO), has proposed to implement the Othaya-Mukurweini Water Supply Project to improve and increase water supply to Othaya and Mukurweini Town. A segment of the project may result in temporary business disruptions in certain areas (both in Othaya and Mukurweini) during construction activities. Even though no structures are affected to trigger displacement of people, imminent loss of income is envisaged during construction. The pipeline will be on road reserve and there is no loss of land that would occur for use during construction. Even though not many businesses affected by the proposed pipeline, these issues have necessitated the client through the consultant to carry out an Abbreviated Resettlement Action Plan (A-RAP) which is included in this ESIA project report for the Water Sanitation Development Project under the Conditional Liquidity Support Grant II.

This ARAP aligns with local legislation, such as the Land Act No. 6 of 2012 (Revised 2019), and World Bank standard OP 4.12 - Involuntary Resettlement touching on Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement. The ARAP provides a framework for mitigating impacts on Project-Affected Persons (PAPs) by ensuring equitable and transparent compensation for losses incurred. The approach adopted minimizes resettlement impacts and facilitates the restoration of affected livelihoods and living standards.

The compensation value is hinged on the determination of the open market value. According to International Valuation Standards (IVS), 7th edition of 2005 Standard 1, open market value is defined as "—*the estimated amount for which a property should exchange on the date of valuation between a willing buyer and a willing seller in an arms-length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently, and without compulsion*".

The assets being acquired and/or destroyed by the proposed works include developments and assets that maybe affected. The basis of valuation for each class of assets is as follows:

- **Improvements/Developments** - Construction Cost Approach is premised on the understanding that cost is equal to value. The value of the property is, therefore, the cost of producing a similar property caring to note regional differences in aggregate costs, and age/condition of the materials.

In addition, we have loss of income/livelihood that will be payable to the business owners as follows.

Loss of Income/Livelihood is presumed to be the profit lost for seven days. Data collected from the business owners on daily profit was used in computing for loss of income for a maximum of seven days, this is the period required for laying the pipe and restoring the section to its initial condition.

The total compensation for OMWASCO County is Kshs. 311,736.50, with allocations of Kshs. 164,796.50 for Mukurweini and Kshs. 146,940 for Othaya. With Male 1 and Female 12 in Othaya and Male 14 and Female 2 in Mukurweini. The compensation rates as derived by a registered and licensed valuer, provides a standardized basis for assessing losses. Key rates are as presented in Table 33 overleaf.

Table 31: Compensation schedule

	ARAP for Water Sanitation Development Project- Conditional Liquidity Support Grant II. (Othaya-Mukurweini (Nyeri County)		
	WATER TRUST FUND		
	ASSET SURVEY & VALUATION - COMPENSATION SCHEDULE		
No.	**Item of Compensation**	**Unit of Compensation**	**Rate (Kshs.)**
1	Loss of Livelihood	Per Day (Lowest)	630

10.2 Grievance Redress

A Grievance Redress Mechanism (GRM) will be established to address any grievances arising from involuntary resettlement or wayleave acquisition, ensuring their timely resolution to support the efficient completion of the project. The GRM will include procedures for grievance submission, review, and escalation of unresolved issues. Potential grievances may include concerns over the valuation process, inventory errors, disagreements on compensation values, and disputes related to ownership (e.g., divorces, succession). These issues will be addressed through OMWASCO's grievance management system, guided by a standard operating procedure aimed at ensuring a systematic approach to complaint handling. Local chiefs will play a crucial role in resolving disputes, helping build trust and maintaining positive relationships with the affected parties.

10.3 Summary of Affected Plots

Thirteen (13) business for the affected persons were found along the wayleave in Othaya and Sixteen (16) in Mukurweini. In Othaya businesses affected include cosmetic shop, minimart, hotel, retail shops, hardware and nursery tree and landscaping business; in Mukurweini affected business include retail shops, animal feed shop, grocery, garage, agrovet and welding.

The size of businesses affected ranges from small kiosks to minimarts, with the majority being owned by female in Othaya and majority male in Mukurweini. Compensation for the affected businesses, inclusive of 15% contingencies, is detailed in Table 34 overleaf for Gatuto and Kangai.

Table 32: Summary table of RAP

	Gender		**Cost of Business Disruption (Income Loss (Ksh)**	**Cost of Transport Facilitation (Ksh)**	**Support to Vulnerable PAP (Ksh)**	**15% Disturbace Allowance**	**Total cost (Ksh)**
OTHAYA	Male	Female					
	1	12	53,970	1900	94.5	8095.50	64,060
MUKURWEINI	Male	Female	**Cost of Business Disruption (Income Loss (Ksh)**	**Cost of plantations affected (Ksh**			
	14	2	60,390	1700	450	9058.50	71,598.50
						Grand Total	135,658.50

11. CONCLUSIONS AND RECOMMENDATIONS

11.1 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 OMWASCO water project.

The potential impacts associated with the development are summarized 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, 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.

11.2 Recommendations

OMWASCO commits to diligently incorporate the mitigation measures identified during the ESIA process to the fullest extent 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 2	Pipeline Layout Maps
Annex 3	Proposed Lines Topographical Profile
Annex 4	Bill of Quantities
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Annex 1: Certificate of Incorporation

Annex 2: Pipeline Layout Maps

Annex 3: Proposed Lines Topographical Profile

Annex 4: Bill of Quantities

Annex 5: Minutes of meetings and List of Participants

Annex 6: Letter of Authorization from the Road Agencies

Annex 7: Chance Find Procedures

Regulatory and Other Requirements

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

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

Physical and Cultural Resources OP/BP 4.11 For purposes of this policy, "physical cultural resources" are defined as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above ground, underground, or underwater. During the excavation process, any chance finds encountered, chance find procedures will be followed to avoid damage and ensure suitable preventive or mitigation measures are executed.

The national agency responsible for cultural matters in Kenya is the National Museums of Kenya (NMK). Prior to commencement of excavation process, the proponent (OMWASCO) will contact NMK who would send representatives to review the site and prepare a report. The report will entail advice on professional approach to the proposed works to ensure minimal damage to any of the encountered items. In the event that chance finds are encountered the following procedure shall apply:

Procedures to Address Chance Finds

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

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

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

Measures for Care of Chance Finds

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

Chance Find Report

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

Annex 8: Environmental and Social screening Forms

Annex 9: Grievance Follow-up Template

Complaint/Grievance Form Sample

GRIEVANCE REGISTRATION	
CASE No.	**DATE**
Name of Complainant:	
Complainant's contact address:	
Phone Number:	
E-mail:	
DETAILS OF COMPLAINT/GRIEVANCE (What happened? Where did it happen? Who did it happen to? What is the result of the problem?)	
Date of Incident/Grievance:	
Complaint received by:	
Designation of Person Recording Grievance	
Proposed Date of Response to Grievance	
Signature of Recording Person	Signature of Complainant
GRIEVANCE REDRESSAL RESPONSE	
Date of Redress	
Decision of Grievance Officer	

Grievance Follow-up Template

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

Annex 10: Water Abstraction Permit

Annex 11: NEMA Lead EIA/EA Practicing License