

HORN OF AFRICA GATEWAY DEVELOPMENT PROJECT (HOAGDP)

ID NO. P161305

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED
EXTENSION OF MERU BYPASS ROADS IN MERU COUNTY, KENYA.**



Tender No. KeNHA/2558/2022

ESIA STUDY REPORT



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DECLARATION

We, experts at E-Cue Associates Limited, submit this Environmental and Social Impact Assessment (ESIA) study report for the proposed extension of Meru Bypass in Meru County, Kenya. This ESIA study was undertaken in accordance with the requirements of the EMCA, Cap 387 of the Laws of Kenya (as amended in 2015); the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019; World Bank OP/BP 4.01 on Environmental Assessment; and the Terms of Reference (ToR) provided by the Client (KURA).

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I, ..., on behalf of the Kenya National Highways Authority (KeNHA) submit this ESIA study report for the proposed Extension of Meru Bypass Project in Meru County, Kenya. The ESIA report has been prepared in accordance with the provisions of the EMCA (Cap 387), Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019; World Bank OP/BP 4.01 on Environmental Assessment; and the Terms of Reference (ToR) provided by the Client

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List of Abbreviations and Acronyms

AADT	Annual Average Daily Traffic
AIC	African Inland Church
AC	Asphalt Concrete
ADT	Average Daily Traffic
AIDS	Acquired Immunodeficiency Syndrome
AQ	Air Quality
AQG	Air Quality Guidelines
AQM	Air Quality Monitoring
AQMS	Air Quality Monitoring Station
BOD	Biochemical Oxygen Demand
BoQ	Bill of Quantities
BP	Bank Procedures
CBD	Central Business District
CBO	Community Based Organization
CEDAW	Convention on the Elimination of all forms of Discrimination Against Women
CEREB	Central Region and Economic Bloc
CESMMP	Contractor's Environmental and Social Management and Monitoring Plan
CFC	County Forest Conservator
CLC	Community Liaison Committee
CN	Cyanides
CO	Carbon Monoxide
CO₂	Carbon Dioxide
COD	Chemical Oxygen Demand
CoK	Constitution of Kenya
CREW	Centre for Rights Education and Awarenesses
CR	Critically Endangered
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
DCC	District County Commissioner
DOSHS	Directorate of Occupational Safety and Health Services
DWC	Deep Water Culture
EA	Environmental Audit
EAPC	East Africa Pentecostal Church
ECDE	Early Childhood Development and Education
EHS	Environment, Health, and Safety
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EN	Endangered
EPR	Extended Producer Responsibility
EPRA	Energy and Petroleum Regulatory Authority
ERPP	Emergency Response and Preparedness Plan
ESF	Environmental and Social Framework

ESIA	Environmental and Social Impact Assessment
ESMMP	Environmental and Social Management and Monitoring Plan
EWMS	Environmental Work Method Statement
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
GBV	Gender Based Violence
GCS	Graded Concrete Stone
GHGs	Green House Gases
GIIP	Good International Industry Practice
GPS	Global Positioning System
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
H₂S	Hydrogen Sulfide
HIV	Human Immunodeficiency Virus
HOAGDP	Horn of Africa Gateway Development Project
HQ	Headquarters
HTC	HIV Testing and Counselling
ICT	Information Communication and Technology
ID	Identification
IDA	International Development Association
IEC	Information Education Communication
ILO	International Labour Organization
INTP	Integrated National Transport Policy
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
JCT	Junction
JKIA	Jomo Kenyatta International Airport
KEBS	Kenya Bureau of Standards
KEMU	Kenya Methodist University
KeNHA	Kenya National Highways Authority
KeRRA	Kenya Rural Roads Authority
KFS	Kenya Forest Service
KII	Key Informant Interview
KMTC	Kenya Medical Training College
KNBS	Kenya National Bureau of Statistics
KPHC	Kenya Population and Housing Census
KPLC	Kenya Power and Lighting Company
KURA	Kenya Urban Roads Authority
KWS	Kenya Wildlife Service
LAR	Local Access Roads
LC	Least Concern
LGBTQ	Lesbian, Gay, Bisexual, Transgender, Queer or Questioning
LHS	Left Hand Side

MCA	Meru Conservation Area
MCK	Methodist Church in Kenya
MEA	Multilateral Environmental Agreements
MEFECAP	Meru Forest Land Environmental Conservation and Protection Association
MENANY	Meru-Nanyuki- Nyambene Sacco
MeTRH	Meru Teaching and Referral Hospital
MEWASCO	Meru County Rural Water and Sanitation Services Company
MNP	Meru National Polytechnic
MoR&T	Ministry of Roads & Transport
MOH	Ministry of Health
NBSAP	National Biodiversity Strategy and Action Plan
NCCAP	National Climate Change Action Plan
NCCRS	National Climate Change Response Strategy
NCPLWD	National Council for Persons Living with Disabilities
NDC	Nationally Determined Contribution
NEC	National Environment Council
NEMA	National Environment Management Authority
NET	National Environmental Tribunal
NGEC	National Gender Equality Commission
NGO	Non-Governmental Organization
NLC	National Land Commission
NMK	National Museums of Kenya
NML	Noise Monitoring Levels
NMT	Non-Motorized Transport
NO	Nitrogen
NO₂	Nitrogen Dioxide
NO₃	Nitrates
NPS	National Police Service
NRW	Non-Revenue Water
NSDCC	National Syndemic Diseases Control Council
NT	Near Threatened
NTSA	National Transport and Safety Authority
NUTRIP	National Urban Transport Improvement Project
O₃	Ozone
OP	Operational Policy
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Act
PAD	Project Appraisal Document
PAP	Project Affected Persons
PES	Payment For Environmental Services
PLWD	People Living with Disabilities
PM	Particulate Matter
PPE	Personal Protective Equipment

PSV	Public Service Vehicles
RAP	Resettlement Action Plan
RCMRD	Regional Centre for Mapping of Resources of Development
RCP	Representative Concentration Pathway
RE	Resident Engineer
RH	Relative Humidity
RHS	Right Hand Side
ROW	Right of Way
RPM	Respirable Particulate Matter
SDA	Seventh Day Adventist
SDG	Sustainable Development Goals
SEA	Strategic Environmental Assessment
SEP	Stakeholder Engagement Plan
SH	Sexual Harassment
SMHI	Swedish Meteorological and Hydrological Institute
SO₂	Sulphur Dioxide
SOP	Standard Operating Procedure
SPM	Suspended Particulate Matter
SSTMP	Site Specific Traffic Management Plan
STI	Sexually Transmitted Infections
STP	Sewage Treatment Plant
TMP	Traffic Management Plan
ToR	Terms of Reference
TSP	Total Suspended Particles
TVOC	Total Volatile Organic Compounds
UCR	Urban Collector Roads
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UTM	Universal Transverse Mercator
VCT	Voluntary Counselling and Testing
VOC	Vehicle Operating Costs
VOL	Volume
VU	Vulnerable
WB	World Bank
WMP	Waste Management Plan
WCMA	Wildlife Conservation and Management Act
WHO	World Health Organization
WIBA	Work Injury Benefits Act
WRA	Water Resources Authority

Executive Summary

Introduction

The Government of Kenya through Kenya National Highways Authority (KeNHA) with funding from the World Bank's International Development Association (IDA) under the Horn of Africa Gateway Development Project, is proposing construction of the extension of Meru Bypass (approximately 17.5 km) to interlink roads previously financed under National Urban Transport Improvement Project (NUTRIP). The project is designed to enhance traffic flow, regional connectivity, and urban mobility in Meru Town and surrounding counties. This Environmental and Social Impact Assessment (ESIA) study has been prepared in compliance with Kenya's EMCA, Cap 387, and World Bank OP/BP 4.01. The study has identified potential environmental and social impacts and proposed corresponding mitigation measures to enhance sustainability.

The study employed a mixed-methods approach combining field-based observations, parameter tests and stakeholder consultations alongside a robust review of relevant literature materials. The study established the relevant prevailing baseline conditions, identified potential risks, evaluated alternatives, and proposed mitigation measures through an Environmental and Social Management and Monitoring Plan (ESMMP). The scope of the study included legal and institutional reviews, climate risk analysis, and the establishment of a Grievance Redress Mechanism (GRM) framework. In the study, the views, perspectives and opinions of the community were captured through a robust public consultation and stakeholder engagement process and incorporated into the report. Overall, this ESIA study report provides a practical framework for sustainable implementation of the proposed extension of Meru Bypass.

Project Description

The proposed extension of the Meru Bypass project is located within Meru Municipality, Imenti North Sub-County, Meru County. The project entails upgrading 12 No short-distance roads and 2 No. footbridges as outlined in (Table 2-1) from gravel and earth surface to bitumen standard, incorporating adequate measures to enhance structural integrity and climate resilience.

Extension of Meru Bypass Roads

No.	Name of the Road	GPS Coordinates (UTM, 37N)		Approximate Distance (Km)
		Start	End	
KEMU-KAMBAKIA ROADS				
1	3 Steers – Kambakia.	348730.37 m E, 6470.00 m N	347579.00 m E, 7661.00 m N	2.4
2	Kambakia - Kagotone/KEMU C91.	347354.23 m E, 7423.57 m N	349923.88 m E, 8936.06 m N	3.3
3	Kagotone - KEMU C91.	349845.98 m E, 8953.69 m N	349937.05 m E, 9153.93 m N	0.3
4	Kongoacheke JCT - Kwa Mukuru JCT.	348328.08 m E, 7459.21 m N	349997.75 m E, 8753.62 m N	2.5
5	Kongo Gardens - Kambakia JCT.	349250.46 m E, 8107.59 m N	348970.62 m E, 8445.89 m N	0.4
RUNOGONE				
6	Runogone – Kaithe.	350607.36 m E, 9115.42 m N	351803.40 m E, 8093.15 m N	1.75
HOSPITAL ROADS				
7	Hospital - Kiramburine JCT Road.	350033.16 m E, 5609.34 m N	351766.52 m E, 5595.35 m N	1.95

No.	Name of the Road	GPS Coordinates (UTM, 37N)		Approximate Distance (Km)
		Start	End	
8	Link 1 - Meru Bus Terminus.	350727.56 m E, 5628.55 m N	350594.60 m E, 5210.84 m N	0.46
9	Link 2 - Gakoromone Market.	351034.75 m E, 5585.24 m N	351069.09 m E, 4963.60 m N	0.6
10	Link 3 - MeWASSCO JCT.	351541.68 m E, 5495.11 m N	351523.32 m E, 5184.83 m N	0.3
WESTERN BYPASS MATE ROADS				
11	Western Bypass - Link Road.	351936.25 m E, 3200.17 m N	352357.38 m E, 2721.48 m N	0.7
12	Western Bypass Link (Gikumene) - Mate Road.	350759.83 m E, 2976.19 m N	353206.43 m E, 2647.91 m N	2.84
FOOT BRIDGES				
13	Kaaga Boys High School.	350482.00 m E, 7030.00 m N	350485.58 m E, 7043.14 m N	
14	Meru National Polytechnic.	347569.00 m E, 6855.00 m N	347539.00 m E, 6827.00 m N	
Total				17.5

The design parameters of the project roads were informed by technical studies including geotechnical investigations, hydrological survey and traffic survey among others. The construction phase of the project will require a set of inputs to ensure successful implementation, key of which include human resources, permits and approvals, adequate land for road construction and material inputs.

Construction materials such as cement, steel, aggregates, and gravel will be sourced locally. Construction equipment such as bulldozers, pavers, and compactors will be mobilized by the Contractor to support earthworks and road surfacing. Human resources will comprise both skilled professionals (engineers, surveyors, safeguard officers, electricians, mechanics, drivers' equipment operators, etc.) and unskilled workers. Construction activities will include site preparation, earthworks, and installation of drainage structures to ensure proper stormwater management and road stability. Subsequent works will involve laying of sub-base and base layers, pavement surfacing, and finishing works such as road marking, signage installation, and landscaping to enhance safety and aesthetics. Finally, statutory permits and approvals from county and national authorities, including compliance with EMCA (Cap 387) and sector-specific clearances from DOSHS, WRA, KFS, and KWS.

Policy, Legal, Regulatory, Administrative, Institutional Framework, and International Conventions and Treaties.

Policy Framework

Relevant policies that were reviewed are Kenya Vision 2030, the National Environmental Policy 2014, the Wildlife Conservation and Management Policy 2017, the National Water Policy (Sessional Paper No. 1 of 2021) and the Kenya Health Policy (2014 – 2030) among others.

Legal framework

A comprehensive review of applicable legal frameworks was undertaken for the project's compliance with both national and international environmental standards. It is worth noting that in Kenya, the principal law underpinning environmental governance is the Environmental Management and Coordination Act (EMCA), CAP 387, along with its subsidiary regulations. Additionally, Article 69(1) of the Constitution of Kenya (2010) underscores the imperative

to safeguard and sustainably utilize natural resources for the benefit of both present and future generations. Other than EMCA other primary laws that were considered relevant and reviewed were:

- Water Act 2016
- Wildlife Conservation and Management Act 2013
- Forest Conservation and Management Act 2016
- Occupational Safety and Health Act 2007
- Climate Change Act Cap 387A.
- Kenya Roads Act No. 2 of 2007
- Lands Act, 2012

Administrative and Institutional Framework

Given the scope of the project and in accordance with applicable legal frameworks, an administrative and institutional review was undertaken to align the project with best practices in environmental and social management. The institutions listed below, among others, will play important roles in overseeing project execution and the implementation of environmental and social safeguards.

- KURA- The project proponent,
- NEMA- National authority responsible for Environmental management responsible of ESIA licencing,
- KWS and KFS- National agencies responsible for management of National forests and wildlife conservation areas. Kambakia- Kagotone road will affect Upper Imenti forest and
- Water Resources Authority—Authority responsible for water abstraction permits and management of water resources.

Financiers' Requirements

According to World Bank OP 4.01, the project is classified as high-risk, necessitating the preparation of a comprehensive Environmental and Social Impact Assessment (ESIA). Based on the classification, additional OPs were activated, and they include:

- OP 4.11 Physical Cultural Resources- The policy aims to protect cultural and physical resources such as archeological sites, religious monuments and culturally significant landscapes/trees. Along the project roads there are Mogumo (*ficus thonningii*) trees that have cultural significance to the Meru community.
- OP 4.12 Involuntary Resettlement- This policy intends to avoid and where never possible minimize involuntary resettlement of Project Affected Persons. The project will acquire land and displace roadside traders. Due to this, the use of the policy will enable appropriate compensation for the affected PAPs
- OP 4.36 Forests- This policy supports sustainable management, conservation and restoration of forest ecosystems while reducing poverty and protecting environmental services. It is worth noting that one of the project roads Kambakia-Kagotone runs adjacent to Upper Imenti forest. Due to the expansion of the road an estimated 2.47 ha of forest land will be annexed
- OP 4.04 Natural Habitats- The policy recognizes the importance of protecting, maintaining, and rehabilitating natural habitats and their functions. The roads are within semi-built, fairly built and forested environments, and due to this proper management and control of invasive species should be implemented

Environmental and Social Baseline

The climate of Meru town is influenced by its proximity to Mount Kenya on the southwest and the Nyambene ranges to the northeast. The town experiences temperature variations ranging from 12°C in July to 30°C in March, with an average annual rainfall of 1,500 mm. The prevailing wind direction is from the southeast to the northwest, with peak wind speeds between 10–20 km/h. The project area soils are predominantly red volcanic soils. River Kathita serves as the primary drainage channel within Meru Town, originating from the Ithangune and Rutundu catchments and flowing in a south-easterly direction. Water quality assessments conducted on Rivers Mpuone and Gasioma indicated general compliance with the *Environmental Management and Coordination (Water Quality) Regulations, 2024*, across most parameters. However, elevated nitrates and cadmium levels were detected in both river Gasioma and Mpuone respectively.

The vegetation in the project area is characterized by indigenous trees majorly in Upper Imenti forest and exotic planted on private lands. Within the project area, the most threatened tree species are *Prunus africana*, *Premna maxima* and *Vitex keniensis*, however the overall population and existence of the two species within the forest will not be impacted by the project. The faunal diversity and composition of the project area is expectedly low being urban and peri urban. Major parts of the proposed Kambakia-Kagotone/KEMU C91 run adjacent to the Upper Imenti Forest. The ambient air quality of the project area is mainly influenced by vehicle emissions, poor solid waste management, and suspended dust from unpaved surfaces. During the study, baseline surveys for air quality recorded acceptable EMCA limits of PM_(2.5 and 10) apart from one case that exceeded WHO standards. Ambient Noise and vibration levels were also compliant with EMCA standards apart from two monitoring points that exhibited significantly higher nighttime noise levels compared to the EMCA limits.

The project is in Imenti North sub- county with a population of 177,567 the population density of the area is 767 persons per square kilometer. According to the traffic survey studies, data indicate that motorcycle traffic dominates motorized transport at 50% while non-motorized pedestrians are the predominant NMT mode at 85%. The settlement pattern of the area is comprised of mixed-use development and high-density housing typical of urban and semi-urban areas. The sub-county has a total of 170 health facilities and several institutions of learning. Being urban and peri-urban, land use in the project area is commercial and industrial while some sections have agricultural and residential use. Meru county has approximately 1,259 Km of road networks, while the nearest airstrip is in Isiolo county. The average value of goods and services produced per capita of Meru County is Ksh 148,366 with an average population growth of 1.3 % and overall poverty levels of 26.3 %. The agriculture sector is the most dominant economic activity and source of livelihood with employment opportunities in cash crop farming, animal husbandry and food production.

Public Consultations and Stakeholder Engagements

Public consultation and stakeholder engagements are fundamental requirements under the Constitution of Kenya (2010) and in the ESIA permitting process in Kenya. Moreover, the World Bank's OP/BP 4.01 on Environmental Assessment emphasizes meaningful engagement with affected groups, including the public and the relevant stakeholders. A total of five public consultation meetings were held within the project area between 14th and 17th April 2025. A Stakeholder Engagement Plan (SEP) was developed to guide the stakeholder engagement process during the study. A total of 15No. Key stakeholders were consulted among them being Meru County Government, National government authorities, utility service providers and transport sector players. Additionally, five (5No.) Focus Groups Discussions were held with selected representatives from Meru National Polytechnic, Kenya Methodist University, Gakoromone traders, youth and women groups in the project area.

Key issues of concern that dominated consultation meetings were as follows:

- **Employment:** Members of the public and stakeholders urged the project to have a transparent hiring process for workers. They also stressed the need to prioritize locals for employment opportunities, especially for casual workers
- **Disruption of services:** The public was concerned that road construction activities will disrupt the flow of services including access to water and electricity considering that facilities for the services are currently within the road reserve. The Consultant responded that a utilities relocation plan will be prepared to guide in the relocation of services within the road reserve and to ensure that interruption of services is minimized as much as possible during construction
- **Corporate Social Responsibility:** The meetings pointed out that the proposed project did not comprehensively consider other developmental needs of the area. As such, it was proposed that the project consider Corporate Social Responsibility (CSR) activities in the area.
- **Health and Safety:** The community urged the project to ensure that adequate health and safety measures are put in place to protect workers and the public from construction-related risks and hazards.
- **Compensation for acquired properties:** The public informed the meetings that all the affected properties should be compensated before commencement of construction activities. The Consultant responded to all the questions surrounding compensation of acquired properties along the project roads.

- **Environmental concerns.** Project stakeholders requested the project to mitigate dust pollution on the project roads and ensure that the water bodies in the area are not polluted during construction.
- **Analysis of Environmental and Social Impact Assessment:** An Environmental and Social Impact analysis was carried out to determine the magnitude and intensity of the potential risks arising from the project. The analysis ranked impacts based on their significance, which was established by evaluating the nature of each project activity, the magnitude of the resulting events, the likelihood of occurrence and the sensitivity of the receptors affected. The analysis ensured that the measures proposed to avoid, minimize and mitigate the risks were proportionate to the impacts identified while remaining environmentally and socially viable. Determination of event magnitude entailed the identification and quantification (as far as practical) of the sources of potential environmental and socio-economic effects from project activities. The approach to evaluating the significance of potential environmental and socio-economic impacts entailed the following aspects. Project area of influence – for analysis of impact zones.
 - **Impact Type:** whether beneficial or adverse.
 - **Nature of Impact:** whether reversible or irreversible.
 - **Event Magnitude:** assessed on the impact extent, frequency, duration, intensity, likelihood and reversibility.
 - **Receptor sensitivity:** assessed the type, presence and resilience of the receptor.
 - **Impact significance:** function of magnitude and receptor sensitivity.

Project Alternatives

Alternatives considered include “No Project” scenario, alignment and route alternative, technology and construction material alternatives, solid waste management options, alternative modes of transportation, transport efficiency and cost alternatives and road design and engineering options.

Grievance Redress Mechanism

The Grievance Redress Mechanism (GRM) for the Extension of Meru Bypass project is a structured framework developed alongside the ESIA and ESMMP to address complaints from stakeholders, communities, and workers. It complements existing government redress systems while ensuring accessibility and responsiveness to project-related concerns managed by Environmental and Social Specialists with support from sub-county and community structures. The GRM is tailored to the project's scale and risks, it includes a three-tier structure: Tier 1 at the Resident Engineer level, Tier 2 at the locational level chaired by the area chief, and Tier 3 at the sub-county level led by the Deputy County Commissioner. If grievances remain unresolved, they may be escalated to judicial processes or external bodies.

The GRM committee comprises representatives from government agencies, project contractors, community leaders, and other stakeholders, ensuring inclusive and gender-balanced participation. The Resident Engineer coordinates the GRM, oversees complaint registration, facilitates resolution, and monitors progress. Complaints are logged, assessed, and addressed through meetings and documented decisions. A publicly accessible registry tracks grievance statistics, including resolution rates and mediation outcomes, helping refine the GRM and enhance the project's environmental and social accountability.

Climate Change

Meru town has a cool and wet climatic condition that is influenced by its location at the slope of Mount Kenya and proximity to the equator. Due to climate change, extreme weather events like storms and heavy rainfall may increase, and the road transport infrastructure must be adapted to them. Road construction contributes to Greenhouse Gas (GHG) emissions, primarily from material production like cement, steel and aggregates, and fuel use from heavy machinery and transportation. Estimated emissions from the proposed road project are approximately 14,875 tonnes of CO₂ equivalent. Mitigation measures include:

- Use recycled aggregates, fly ash, and other industrial by-products to reduce embodied carbon.
- Favor locally sourced materials to minimize transport emissions.
- Deploy modern energy efficient construction equipment and optimize fuel use.
- Require contractors to meet sustainability benchmarks in tenders and contracts and

- A complementary project that the Contractor can support is a tree planting exercise within the Upper Imenti Forest.

For this study, two Green House Gas emission scenarios were used to project future climatic changes, i.e. Representative Concentration Pathway (RCP) 8.5 scenario representing business as usual and RCP 4.5 scenario representing medium level climate change mitigation measures. The projections were for long term (year 2011-2040) and medium term (year 2041 – 2070). RCP 8.5 scenarios indicate that precipitation is projected to increase by about 2% in the short term and 4% in the medium term and water runoff by +8% and +13% respectively. RCP 4.5 scenarios indicate that precipitation should increase by about +5% in the short term and 1% in the medium term respectively and water runoff by +7% and +4% respectively. The changes in these parameters are all below 25%, hence considered small but potentially significant to road. A model, *Think Hazard!* was used to project an array of hazards that can potentially occur in the region. The Hazard analysis highlights low risk for urban floods, river floods and extreme heat, medium risk for landslides and water scarcity, and High for wildfires. Adaptation measures recommended include:

- Designing drainage structures to handle at least 10% more runoff.
- Raising pavements and reducing slope gradients.
- Re-vegetating catchments with drought-tolerant species.
- Incorporating climate-proofing and maintenance strategies into design.

Positive Impacts

Construction of the proposed Extension of the Meru Bypass is overall expected to improve traffic efficiency while supporting sustainable urban growth in Meru town and its peri-urban regions. The project is also expected to bring other positive impacts in various phases of project cycle which include construction, operation and decommissioning phases. The following are the anticipated positive environmental and socio-economic impacts.

- Knowledge and Skills Transfer.
- Provision of Market for Supply of Construction Materials.
- Increased Land Value and Housing Rates.
- Improved Drainage and Its Environmental Benefits.
- Improved Security and Safety.
- Reduction in Travel Time and Costs.
- Increased Business Opportunities.
- Creation of Employment Opportunities.
- Increased Revenue to the County Government.

Potential Construction, Operation and Decommissioning Phase Negative Impacts

The key negative impacts and proposed mitigation measures for the proposed project are summarized in Table below

Summary of Environmental and Social Negative Impacts and the Proposed Mitigation Measures

Parameter	Magnitude	Impact	Mitigation Measures
Noise Pollution and Excessive Vibration	Major (Partially mitigatable)	Increased noise and vibration levels affecting sensitive receptors	• Comply with the Environmental Management and Co-Ordination (Noise and Excessive Pollution) (Control) Regulations, 2009 by providing appropriate PPE, construction activities to be restricted to daytime near the 15 noise sensitive receptors identified.

Parameter	Magnitude	Impact	Mitigation Measures
			Develop standard operating procedures including early notifications prior to major activities and public sensitization as appropriate.
Air Quality	Major (Mitigatable)	Increased dust emissions and exhaust fumes	- Adhere to the Air Quality Regulations, 2024 and ensure particulate matter is mitigated around the 20 air sensitive receptors identified and any other sensitive sites by, sprinkling of water whenever dust generation is high: covering stockpiles and haulage trucks. - If the contractor acquires a crusher, then practice wet crushing.
Water Resources	Major (Mitigatable)	Siltation and contamination water resources	- All installations should be at the recommended safety distance from water resources. - Implement appropriate sediment protection measures around all active work areas.
Soil Resources	Major (Mitigatable)	Soil erosion, siltation, land degradation and possible contamination of soil	- The dominant soil types are acrisols and ferralsols which tend to have high erosion potential hence a detailed plan for erosion control and revegetation should be developed by the Contractor. - Environmental and engineering solutions should be implemented to minimize erosion and limit vegetation clearance to project footprint.
Socio Economic Impacts	Major (Partially mitigatable)	Possible loss of livelihoods, land acquisition and displacement and business disruption.	- Prepare RAP aligned with the Land Act (2012) and World Bank OP 4.12; ensure fair, documented compensation of Project Affected Persons (PAPs) before displacement. - Conduct inclusive consultations as per the Stakeholder Engagement Plan (SEP) and develop a Livelihood Restoration Plan. - Operationalize a Grievance Redress Mechanism (GRM), resolve complaints promptly, and implement GBV/SEA/SH safeguards including Codes of Conduct and confidential reporting.
Occupational Safety and Health	Major (Mitigatable)	Injuries and illnesses to workers	- Develop OHS plans, Health and Safety Policy Statements, and enforce Codes of Conduct for managers and workers. The OHS plan should adopt safety risk mitigation hierarchy, which are Elimination, Substitution, Engineering Controls and Personal Protective Equipment. - Establish a trained Health and Safety Committee, conduct routine training by DOSHS-certified professionals, and ensure availability of first aiders, well equipped kits, and safe drinking water. - Provide appropriate PPEs, proper lighting, fleet safety plans, and SOPs for work at height.
Community Health and Safety	Major (Mitigatable)	Injuries and illness resulting from the	Provide pedestrian walkways, safety signage, temporary road signs, and traffic marshals; restrict access to borrow pits and prevent unauthorized entry, especially by children and onlookers.

Parameter	Magnitude	Impact	Mitigation Measures
		construction activities	Limit construction to daytime hours, maintain vehicles to reduce emissions and noise and conduct community sensitization on safety.
Sexual Exploitation and Harassment	Medium	Trauma Increased prevalence of STIs	- Prepare a SEA/SH Prevention and Action Plan - Workers to sign a Code of Conduct prohibiting SEA and SH
Waste Management (solid and liquid)	Medium (Mitigatable)	Environmental pollution from poor handling and disposal of solid, liquid and hazardous waste.	- Adhere to EMCA (Waste Management) Regulations 2024 and Water Quality Regulations 2006 Amended 2024; prepare and implement a Construction Waste Management Plan with a three-bin waste segregation system. - Adhere to standards for discharge of effluent into the sewer and aquatic environment. - Prepare a waste management plan that at a minimum should define how different types of waste should be managed. Management of hazardous waste should be contracted out to a licensed hazardous waste handler while general waste should be disposed of at the designated waste disposal site within Meru Town.
Existing Utilities	Minor (Partially mitigatable)	Disruption of services	- Affected utilities should be mapped and relocated before commencement of works - Affected users should be informed of planned interruptions before relocation - Provide temporary solutions where existing systems are rerouted or disconnected e.g. water for the community.
Flora	Minor (Mitigatable)	Loss of 1.2Ha of Upper Imenti Forest land and other vegetation resources	- Limit vegetation clearance to the project footprint and obtain necessary approvals from Kenya Forest Service (KFS) under the Forest Management and Conservation Act, 2016. - Plant indigenous trees (compensatory trees) along road reserves and in 3.6Ha of degraded Upper Imenti Forest and track survival rates. - Rehabilitate borrow pits and access routes with native vegetation.
STIs and HIV/AIDS	Minor (Mitigatable)	Possible new cases of HIV/AIDS infections	- Collaborate with local health authorities and implement awareness programs, offer voluntary HIV Testing and Counselling (HTC), and distribute free condoms at camps and work sites. - Sign Code of Conduct prohibiting sexual exploitation and conduct regular sensitization and peer education campaigns for workers and surrounding communities.
Existing Structures	Minor (Mitigatable)	Damage of structures	Carry out a pre-construction structural integrity assessment of structures close to the road and monitor during construction.

Parameter	Magnitude	Impact	Mitigation Measures
			Exercise strict control over construction activities that produce ground vibrations near structurally vulnerable buildings.
Traffic Management	Minor (Mitigatable)	Construction site accidents	- Implement general and site-specific Traffic Management Plans (TMPs)/Site Specific Traffic Management Plans (SSTMPs), install safety signages, and apply speed calming measures; restrict truck speeds to 40 Km/h or less. - Deploy trained traffic marshals, install concrete barriers in high-fill zones, and limit site access to authorized personnel only.

ESMMP Estimated Cost

Environmental / Social aspect	Description	Indicative Cost Estimate (Kenya Shillings)
Air quality	Sprinkle water as need arises during dusty conditions.	0.00
	Air quality Monitoring.	1,000,000.00
	Provision of appropriate dust protecting PPE.	440,000.00
Noise and excessive vibration	Acquisition of Noise and Excessive Vibrations Pollution Control Permit.	50,000.00
	Provision of appropriate ear-protection equipment in noisy workstations.	340,000.00
Waste management (solid and liquid)	Strategically install colour coded waste receptacles within the campsite.	0.00
	Seek the services of a NEMA approved hazardous waste handler.	100,000.00
	Biodigester installation.	750,000.00
Water resources	Acquire stream/river diversion permits from the Water Resources Authority.	45,000.00
	Acquire water abstraction permits from the WRA.	100,000.00
Flora	Plant indigenous trees along the edge of the road reserve.	200,000.00
	Planting trees in at least 3.6Ha within Upper Imenti Forest for compensatory tree planting.	1,000,000.00
Socio Economic Impacts	Stakeholder engagements.	200,000.00
	Constituting and training Health and Safety Committee.	500,000.00

Occupational health and safety	First Aid training.	150,000.00
	Fire safety training.	150,000.00
	Well stocked first aid kits	150,000.00
	Provision of appropriate and adequate PPEs and worn-out PPE to be replaced promptly.	4,200,000.00
Community Health and safety	Temporary site safety signages.	200,000.00
	Temporary road signs and speed calming measures.	
	Prepare and implement road safety management plans	Contractual
	Separate pedestrian walkways from active construction areas	Contractual
Sexually transmitted Infection (HIV&AIDS and STIs)	HIV/AIDS sensitization and awareness campaign.	0.00
	Stock male and female condom.	3,210,000.00
	HIV/AIDS awareness IEC materials.	300,000.00
Traffic Management	Temporary road safety signages.	400,000.00
	Temporary site safety signages.	
Wildlife	Relocation of electric fence along the Kambakia-Kagotone/KEMU C19 Road.	800,000.00
	Sensitize and create awareness to workers on encounter with wildlife at work.	100,000.00
Audits	Annual EHS audits.	5,000,000.00
	Labour audits.	3,000,000.00
Facilitation	Contractor's E&S Management vehicle.	7,000,000.00
	Consultant's E&S management supervision vehicle.	7,000,000.00
	Contractor's Vehicle operational cost.	2,100,000.00
	Consultant's vehicle operational cost.	2,100,000.00
Grievance Management	Formation and training of GRCs.	500,000.00
	GRCs operations.	1,800,000.00
Grand Total		75,920,000

Conclusion and Recommendations

The findings of the ESIA study for the proposed Extension of Meru Bypass project demonstrate that the project is environmentally and socially sound, provided that the recommended safeguards are adhered to. The study highlights key benefits of the project including better connectivity, economic growth, and improved access to services, while also addressing risks such as workers and community health and safety, land acquisition and disruption of livelihoods. Public and stakeholder consultations showed strong community support, provided that fair compensation and adequate grievance mechanisms are in place. With full compliance with the Environmental and Social Management and Monitoring Plan as well as the identified relevant laws, the project can sustainably be implemented.

Consequently, it is strongly recommended that the project consider implementing complementary initiatives to off-set some of the impacts and adapt to climate change while maximizing socio-economic benefits. Potential areas for intervention include afforestation of degraded sections of the Upper Imenti Forest, installation of electric fence in open sections along the Kambakia–Kagotone Road to reduce human–wildlife conflicts, and improvement of facilities at Gakoromone Market. In addition to this, the following recommendations are proposed:

- Given that flooding along the Three Steers–Kambakia Road (Km 0+200 – 0+400) is primarily aggravated by stormwater inflows from the Meru–Nanyuki Highway, we recommend that KURA explore options to reroute this stormwater so it no longer drains toward the project road. In addition, we advise the Client to implement outfall improvement works at Km 0+240 to increase capacity and better accommodate projected stormwater volumes.
- The Contractor should, in consultation with KFS, carryout a comprehensive tree inventory based on the final designs along the Kambakia – Kagotone/KEMU C91 Road bordering Upper Imenti Forest before vegetation clearance. This data could be useful in designing complementary tree planting schemes. Furthermore it is proposed that the project plants indigenous trees in an area three times, approximately 7.41 Ha, of the excised portion in a degraded part of the forest
- Ensure that the ESMMP is implemented fully and the necessary resources allocated for compliance with the national and international regulations and policies.
- Due consideration should be given to the youth, women and PLWDs in employment opportunities arising from road construction activities. Further, the hiring process for workers should be fair, transparent and based on merit.
- The environmental and social safeguards team should be mobilized early enough to ensure that the necessary structures/frameworks are prepared and available for implementation. In addition, the team should be adequately facilitated with a dedicated vehicle for their use.

1 INTRODUCTION

1.1 Project Background

The Government of Kenya, through its implementing agency, Kenya National Highways Authority (KeNHA), has contracted E-Cue Associates Ltd to undertake Environmental and Social Impact Assessment (ESIA) for the extension of Meru Bypass (approximately 17.5km). This proposed extension will connect the Meru Bypass Roads that were financed under the National Urban Transport Improvement Project (NUTRIP). The project aims to pave and interlink the Meru bypass roads. The project falls under the Horn of Africa Gateway Development Project (HoAGDP) using credit from the International Development Association (IDA), a member of the World Bank. KeNHA will implement the project on behalf of Kenya Urban Roads Authority (KURA), the Beneficiary Agency, under the Ministry of Roads and Transport (MoR&T).

To ensure sound environmental and social performance throughout the project's lifecycle, an ESIA Study for the project was undertaken in compliance with Kenya's Environmental Management and Coordination Act (EMCA), Cap 387, and the World Bank's safeguard requirements under Operational Policy and Bank Procedures (OP/BP) 4.01. The study was conducted as per the World Bank Operational Policies as opposed to the newly adopted World Bank Environmental and Social Framework (ESF) Policies since the project was conceptualized and planned prior to the year 2018 when the ESFs came into force. The objective of the study was to identify and address potential adverse environmental and social impacts early in the project planning process, thereby supporting informed decision-making and sustainable project outcomes.

1.2 Project Justification and Significance

The proposed Extension of the Meru Bypass Project is expected to improve traffic efficiency while supporting sustainable urban growth in Meru town and its peri-urban regions. By enhancing connectivity and reducing congestion, the project will bolster economic activities, facilitate access to services, and reduce vehicle emissions, thereby contributing to improved air quality. Pedestrian footbridges at Meru National Polytechnic and Kaaga Boys School are expected to enhance student movement and safety. These measures promote inclusive access, mitigate accident risks, and contribute to a safer learning environment. Its multifaceted impact positions it as a strategic intervention for socio-economic advancement and urban resilience in Meru Municipality.

1.3 Objective of the Project

The objective of the proposed project is to connect the recently completed Meru Eastern and Western bypasses, thereby improving traffic flow in and around Meru Town's Central Business District (CBD). The project aims to enhance regional connectivity, support trade, and facilitate mobility for residents of Meru and neighboring counties, including Isiolo, Tharaka Nithi, and Laikipia.

1.4 Scope of the ESIA Study

This ESIA study was undertaken in accordance with the requirements of the EMCA, Cap 387 of the Laws of Kenya; the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019; World Bank OP/BP 4.01 on Environmental Assessment; and the Terms of Reference (ToR) provided by the Client. The study covered the following components:

- A non-Technical Summary outlining the ESIA process, key findings, significant environmental and social impacts, proposed mitigation measures, monitoring plans and recommendations.
- A detailed description of the proposed project including location, design elements, inputs, outputs, technology as well as ancillary facilities necessary for the smooth implementation of the project.
- A review of applicable national and international policy, legal, regulatory, and institutional frameworks, including relevant Multilateral Environmental Agreements (MEAs), World Bank safeguard policies, Health and Safety Guidelines, and the Client's internal standards.
- A comprehensive assessment of baseline environmental, socio-economic and cultural conditions of the project area, used to inform impact prediction and mitigation measures.
- An assessment of potential environmental and social risks and impacts associated with the project.

- An evaluation of project alternatives, including the ‘no project option’, along with justification for selecting the proposed design and approach.
- A summary of stakeholder engagement activities, including public consultations, key concerns raised, and how they were addressed.
- An analysis of climate change risks, with consideration of adaptation and mitigation measures relevant to the project.
- A proposed Grievance Redress Mechanism (GRM) to manage and resolve project - related complaints.
- An Environmental and Social Management and Monitoring Plan (ESMMP) detailing mitigation measures, institutional responsibilities, cost estimates, timelines, and monitoring protocols across all project phases.

1.5 Approach and Methodology

The study applied a mixed-methods approach to facilitate the collection of both primary and secondary data. Primary data were gathered through field visits, site observations, photography, and stakeholder consultations. Secondary data was obtained through an extensive review of relevant literature, including technical reports, policy documents, and official statistics. This approach enabled a comprehensive assessment of the project’s environmental and social context.

The study was guided by the requirements of the Environmental Impact Assessment and Audit (EIA/EA) Regulations 2003 (Revised 2019) and other regulations under EMCA (Cap 387). It focused on understanding the project context, including preliminary designs and the implementation plan. Primary data were collected through site visits, stakeholder consultations, and photography. Secondary data were sourced through a literature review of relevant technical reports, policy documents, and other published and unpublished materials.

1.5.1 Methodology

1.5.1.1 Environmental Screening and Scoping

The proposed project was screened in accordance with the Second Schedule of EMCA (Cap 387), which identifies road infrastructure as a project category requiring mandatory Environmental Impact Assessment (EIA). The screening also considered the provisions of World Bank Operational Policy (OP/BP) 4.01 and the General Environmental, Health, and Safety (EHS) Guidelines.

Given the scale of the proposed project, the significance of its potential environmental and social impacts, and its interaction with sensitive biophysical and socio-economic features, the project has been classified as **High Risk** under EMCA (Cap 387), and as a **Category A** project under the World Bank Safeguard Policies (OP/BP 4.01). This classification reflects the potential for significant, diverse, and possibly irreversible impacts that may extend beyond the project footprint. In accordance with these criteria and considering that road infrastructure is listed under the Second Schedule of EMCA as requiring mandatory environmental assessment, a full ESIA was deemed necessary.

To define the extent and scope of the ESIA study, the Consultant conducted environmental and social reconnaissance visits to the proposed project roads, footbridges and relevant sections of the road corridor from 19th to 26th February and 4th to 7th March 2025. These visits facilitated the identification of environmentally sensitive areas along the road alignments and proposed footbridge locations that may be affected by the project.

During the site assessments, the Consultant also identified and mapped key stakeholders within the project area for targeted consultation and engagement during the study. In addition to field observations, a review of secondary data sources was undertaken, including the Project Appraisal Document (PAD), preliminary design reports, relevant World Bank Safeguards Policies, and the applicable Kenyan legal framework.

The scoping phase established the geographical and thematic boundaries of the ESIA and identified the key components to be assessed. It also defined the methodology to be applied in line with the ToR and in accordance with the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019. The outputs from the scoping phase, primarily the Inception Report and finalized ToR, broadly informed the following elements of the ESIA:

- Project location and area of influence

- Construction zones and areas potentially affected by project activities
- Applicable legal, policy, and administrative frameworks
- Baseline environmental and social conditions
- Preliminary stakeholder engagement outcomes
- Assessment of project alternatives, including rationale for the preferred option

1.5.1.2 Desktop Study

A desktop study was conducted through the review of relevant published and unpublished secondary data. The objective was to establish baseline context and regulatory alignment for the proposed project, focusing on:

- Identification of relevant policies, legislation, and administrative structures;
- Outline of necessary approvals and associated conditions;
- Summary of baseline environmental and social existing conditions, including any documented sensitive receptors in the project area;
- Anticipated waste types and proposed handling, treatment, and disposal measures;
- Overview of potential positive and negative impacts to inform further assessments.

1.5.1.3 Field Assessment and Baseline Survey

Detailed field surveys for this study were undertaken within the proposed project area and its surrounding from the 8th to 30th April 2025. The ESIA team traversed the project area to identify the status of the environment and socio-economic indicators. This enabled the team to establish the following:

- **Baseline data on the bio-physical and socio-economic and socio-cultural environment.** Baseline conditions were established through primary data collection covering bio-physical, socio-economic, and socio-cultural aspects. Water samples were analyzed in a NEMA accredited laboratory, field surveys inventoried trees, vegetation, habitats, and invasive species, while interviews with service providers and authorities captured insights on waste, water, sanitation, and public health. Socio-cultural issues were assessed through focus group discussions and public meetings (see chapter 5 and Appendix 5). Detailed information on baseline data collection are provided in this report in chapter 4 as well as Appendix 6 and Appendix 7
- **The level of project impacts on affected persons and the receiving bio-physical environment.** The level of project impacts on the affected persons and the biophysical environment was done using matrices and significance ranking to determine magnitude, extent, duration, and reversibility. The results were then used to develop appropriate mitigation measures for the project impacts.
- **The opinion of the stakeholders on the proposed project including the local communities** (see chapter 5 and Appendix 5); and
- **The project alternative considerations.** Project alternatives were evaluated by defining feasible options, including the “no project” scenario, and screening them against environmental, social, technical, economic, and legal criteria. The preferred options were selected to inform decision making and optimize project sustainability

1.5.1.4 Public Consultation and Stakeholder Engagement

Stakeholder engagement and public consultations were undertaken to ensure transparent, inclusive, and meaningful participation of affected and interested parties. The process facilitated early disclosure of project information and integration of stakeholder perspectives, with particular attention to vulnerable groups. Public consultative meetings were announced through notices issued one week in advance, and the area administration supported outreach at religious gatherings and market centres. Posters were prepared in both English and local Ameru language to maximize community awareness and participation. In addition, key stakeholders were notified through phone calls and direct appointment bookings, ensuring broad representation and effective involvement in the consultation process.

1.5.1.5 Data Analysis and Evaluation of Alternatives

Data analysis was undertaken using structured tools, including checklists, impact matrices, modelling, and expert judgment. The evaluation of alternatives considered technology options, project scale, environmental and social impacts, capital and operational costs, and monitoring requirements. This process informed the selection of the most viable and least impactful project design.

1.5.1.6 Preparation and submission of the ESIA Study Report

This ESIA report was prepared by EIA experts accredited by the National Environment Management Authority (NEMA), with demonstrated expertise in the application of relevant Kenyan environmental laws and regulations, as outlined in the legal context of the study. The team also possesses extensive experience in implementing the World Bank's environmental and social safeguard policies in similar project contexts, ensuring full alignment with both national requirements and international best practices.

Upon finalization, the ESIA report will be submitted to NEMA for review in accordance with regulatory requirements. Subject to approval, the Authority (NEMA) will issue the necessary environmental license prior to the commencement of construction activities.

1.6 Structure of the ESIA Study Report

This ESIA Study Report is designed to ensure that the proposed development project complies with the provisions of the EMCA (Cap 387) and the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019. The report is organized into 16 chapters, each addressing a key aspect of the assessment process:

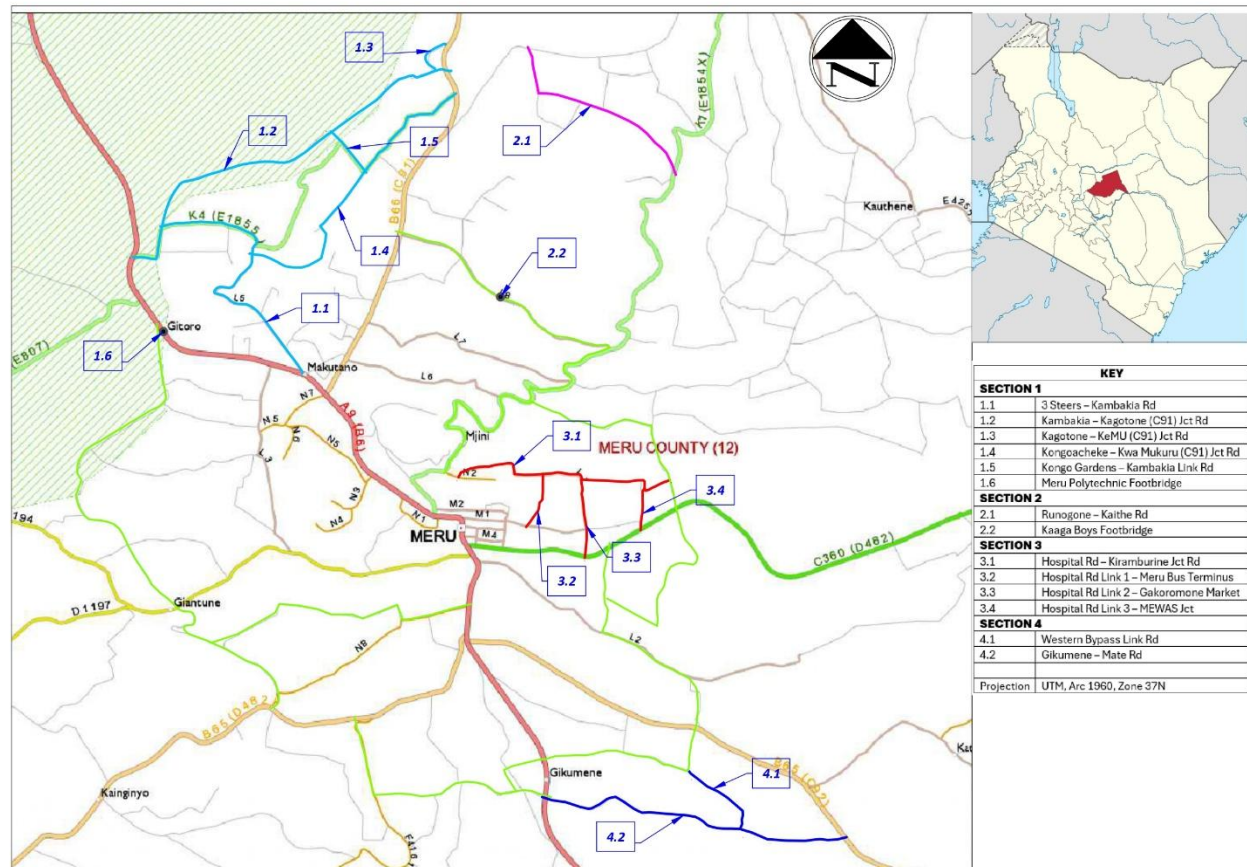
- Chapter 1: Introduction** - Provides the project background, objectives and scope of the ESIA, the approach and methodology employed, and the structure of the report.
- Chapter 2: Project Description** - Describes the project components condition of the roads, project inputs and outputs, location, design, implementation phases and related activities as well as the estimated cost of the project.
- Chapter 3: Policy, Legal, Regulatory, Administrative and Institutional Framework and International Conventions and Treaties** - Outlines applicable national environmental and social legislation, institutional and regulatory frameworks, and administrative procedures, as well as World Bank Safeguards Policies triggered by the project.
- Chapter 4: Environmental and Social Baseline** - Presents the existing biophysical (climate, topography, geology and soils, drainage, flora, fauna, air quality, noise and excessive vibrations and waste management) and socio-economic(demography, settlement, healthcare, livelihood, education, land use, security, infrastructure, poverty and archeology, religion and cultural heritage) conditions of the project area to establish the context for impact assessment.
- Chapter 5: Public consultation and Stakeholder Engagement** - Describes the consultation objective and summarizes the objectives, approach and outcomes of the consultation process. This section also provides information on the stakeholder engagement framework including the engagement strategies and methods including public forums, key informant interviews and focus group discussions. It also provides feedback on stakeholder concerns and how they were addressed in project planning.
- Chapter 6: Analysis of Project Alternatives.** Examines feasible alternatives considered to the proposed project (No-project' scenario, alignment and route, technology and construction materials alternatives, solid waste options, air quality management alternatives, mode of transportation and transport cost alternatives, and finally road design and engineering alternatives) with a focus on technical, environmental, and socio-economic considerations.

- Chapter 7: Grievance Redress Mechanism** - Describes the grievance jurisdiction and mechanisms established to receive, address, and resolve grievances throughout the project lifecycle (GRM structure, key staff coordinating grievance, receiving of complaints and registry and monitoring)
- Chapter 8: Analysis of Environmental and Social Impacts** –Provide mechanisms to manage and monitor the associated potential environmental and social risks and impacts, thereby ensuring the project is sound and sustainable.
- Chapter 9: Potential Positive Impacts** – This chapter highlights the anticipated environmental and social benefits that the project is expected to deliver. It provides a balanced view of how the project contributes to sustainable development and community well-being.
- Chapter 10: Potential Construction Phase Negative Impacts-** This chapter identifies and assesses the environmental and social impacts associated with construction activities. It emphasizes the need for proactive mitigation to minimize disruption and ensure compliance with regulatory standards.
- Chapter 11: Potential Operation Phase Negative Impacts** - This chapter focuses on identifying and evaluating adverse environmental and social impacts that could occur once the project becomes operational. It emphasizes the importance of anticipating these impacts to ensure proper mitigation and long-term sustainability.
- Chapter 12: Potential Decommissioning Phase Negative Impacts** - This chapter evaluates the environmental and social impacts associated with the closure, dismantling, or removal of project infrastructure. It highlights the importance of planning for safe and sustainable decommissioning to minimize immediate and long-term harm. **Chapter 13: Climate Change** - Assesses the project's vulnerability to climate change and proposes adaptation measures to enhance resilience. Green House Gases (GHG) emissions are estimated and mitigations measures given. Climate change projections are analysed and proposals for adaptation are given.
- Chapter 14: Potential Cumulative Impacts** – The project may give rise to cumulative impacts such as increased pressure on material and water resources, risks to community health and safety, land use changes, and economic displacement. The potential cumulative consider how numerous smaller or successive activities, from multiple sources, interact and build on each other to create larger consequences that might not be apparent from analyzing each action in isolation.
- Chapter 15: Environmental and Social Management and Monitoring Plan.** Presents the proposed mitigation, management, and monitoring measures to address identified impacts, including roles, responsibilities, and performance indicators for the Construction, Operation and Decommissioning Phases of the project. It also covers estimated costs for the proposed mitigation measures during the construction, operation and decommissioning phases of the project.
- Chapter 16: Conclusion and Recommendations** -Provides a summary of key findings, the project's environmental and social viability, and recommendations for implementation.

2 PROJECT DESCRIPTION

2.1 Project Location

The proposed Extension of the Meru Bypass Project is located within Meru Municipality, Imenti North Sub-County, Meru County. The project area is illustrated in Figure 2-1 below.



No.	Name of the Road	GPS Coordinates (UTM, 37N)		Length (Km)
		Start	End	
3	Kagotone - KEMU C91.	349845.98 m E 8953.69 m N	349937.05 m E 9153.93 m N	0.3
4	Kongoacheke JCT - Kwa Mukuru JCT.	348328.08 m E 7459.21 m N	349997.75 m E 8753.62 m N	2.5
5	Kongo Gardens - Kambakia JCT.	349250.46 m E 8107.59 m N	348970.62 m E 8445.89 m N	0.4
RUNOGONE				
6	Runogone – Kaithe.	350607.36 m E 9115.42 m N	351803.40 m E 8093.15 m N	1.75
HOSPITAL ROADS				
7	Hospital - Kiramburine JCT Road.	350033.16 m E 5609.34 m N	351766.52 m E 5595.35 m N	1.95
8	Link 1 - Meru Bus Terminus.	350727.56 m E 5628.55 m N	350594.60 m E 5210.84 m N	0.46
9	Link 2 - Gakoromone Market.	351034.75 m E 5585.24 m N	351069.09 m E 4963.60 m N	0.6
10	Link 3 - MeWASSCO JCT.	351541.68 m E 5495.11 m N	351523.32 m E 5184.83 m N	0.3
WESTERN BYPASS MATE ROADS				
11	Western Bypass - Link Road.	351936.25 m E 3200.17 m N	352357.38 m E 2721.48 m N	0.7
12	Western Bypass Link (Gikumene) - Mate Road.	350759.83 m E 2976.19 m N	353206.43 m E 2647.91 m N	2.84
FOOT BRIDGES				
13	Kaaga Boys High School.	350482.00 m E 7030.00 m N	350485.58 m E 7043.14 m N	
14	Meru National Polytechnic.	347569.00 m E 6855.00 m N	347539.00 m E 6827.00 m N	
Total				17.5

2.3 Description of Project Roads Conditions

2.3.1 KEMU-Kambakia Roads

3 Steers – Kambakia- 3 Steers-Kambakia Road begins at the 3 Steers junction along the Meru – Nairobi Highway (B6) Road (348730.37 m E, 6470.00 m N) and terminates at Kambakia-Kagotone Road junction (347579.00 m E, 7661.00 m N). The road is predominantly gravel, with approximately 750m of cabro paving extending from the Three steers Hotel to an area near Consolata Hospital Gitoro.



Plate 2-1: 3 Steers Road Section cabros



Plate 2-2: Gravel Road sections of 3 Steers-Kambakia Road

Kambakia - Kagotone/KEMU C91 and Kagotone - KEMU C91- The road begins at Meru – Nairobi Highway (B6) Road at coordinates (347354.23 m E, 7423.57 m N) and terminates at Kagotone with a loop extending to KEMU University and connecting to the Meru-Maua Road (C91) at 349937.05 m E, 9153.93 m N). sections of the Road abuts Upper Imenti Forest and Meru International Showground. The road is predominantly gravel with several drainage structures including cross and access culverts along its length. Some segments, particularly those on steep gradients are visibly eroded due to surface water runoff.



Plate 2-3: Gravel Road Section of Kambakia-Kagotene (C91) Road



Plate 2-4: Road Section abutting the Upper Imenti Forest.

Kongoacheke JCT - Kwa Mukuru JCT and Kongo Gardens - Kambakia JCT- The road begins at a Kongoacheke JCT at coordinates (348328.08 m E, 7459.21 m N) at 3 Steers- Kambakia Road and terminates at Kwa Mukuru JCT (349997.75 m E, 8753.62 m N) on Meru-Maua Road (C91) Road. The Kongo Gardens -Kambakia Begins at Kongo Gardens along Kongoacheke JCT – Kwa Mukuru Road at (349250.46 m E, 8107.59 m N) and terminates at Kmbakia-Kagotone JCT at (348970.62 m E, 8445.89 m N). The roads are predominantly gravel along the entire length and are serviced by limited number of culverts, including several privately installed structures that provide access to adjacent properties and residences.



Plate 2-5: A gravel section of the Road



Plate 2-6: A steep section of the road.

2.3.2 Runogone -Kaithe Road

Runogone – Kaithe- The road begins at Runogone (350607.36 m E, 9115.42 m N) and terminates at (351803.40 m E, 8093.15 m N) Meru Eastern Bypass to Kaithe town which is under construction. The road is generally gravel and traverses predominantly rural areas with a few private access culverts.



Plate 2-7: A section of the road at the beginning.



Plate 2-8: Road section at the end.

2.3.3 Hospital Roads

Hospital - Kiramburine JCT Road, Link 1-Meru Bus Terminus, Link 2- Gakoromone Market and Link 3- MeWASSCO JCT Roads- The hospital roads are a collection of one major road with three links connecting to Njuri Ncheke Street. The main road Hospital-Kiramburine JCT begins at (350033.16 m E, 5609.34 m N) the Meru Teaching and Referral Hospital (MTRH) and terminates at (351766.52 m E, 5595.35 m N) Kiramburine JCT along Eastern Bypass Road. The link roads begin from the Hospital- Kiramburine JCT Road and the names are derived from the section where they terminate along the Njuri-Ncheke Street hence, Link 1-Meru Bus Terminus, Link 2-Gakoromone Market and Link 3- MeWASSCO JCT forming a fork-like shape. The roads are generally gravel roads with few drainage structures (access and cross culverts). The roads traverse through a populated and settled area in terms of business and residential places. The Hosiptal-Kiramburine JCT Road has a section with carbros about 350 meters and passes through the Meru Teaching and Referral Hospital, Kenya Medical Training College (KMTC) Meru which is a sensitive place.



Plate 2-9: A section of Hospital Road Kiramburine JCT Road under construction



Plate 2-10: A cross culvert on Link 3-MeWASSCO Junction Road

2.3.4 Western Bypass Roads

Western Bypass Link (Gikumene) - Mate Road and Western Bypass Link Road- The Western Bypass (Gikumene)-Mate Road begins at (350759.83 m E, 2976.19 m N) Gikumene Junction along the Meru – Nairobi Highway (B6) and terminates at (353206.43 m E, 2647.91 m N) Mate Road and the Western Bypass Link begins at (351936.25 m E, 3200.17 m N) Western Bypass Road and terminates at along the Western Bypass Link (Gikumene)-Mate Road(352357.38 m E, 2721.48 m N). The Western Bypass is one of the roads where “Do-nuo” technology was used during construction by the County Government of Meru. "Do-nou" technology is a Japanese method that uses gunny bags filled with local soil, sand, or gravel to construct and maintain rural roads and other infrastructure. It is a

labor-intensive technique that can be adopted by local communities, which helps create employment, improves mobility, and provides sustainable solutions for challenging roads.



Plate 2-11: Exposed gunny bags filled with gravel



Plate 2-12: Gunny bags filled with gravel showing signs of erosion.

2.3.5 Footbridges

Meru National Polytechnic- The main purpose of the footbridge is to serve as a connection for pedestrians especially from the polytechnic to accommodation areas due to the busy junction between Meru Western Bypass and Meru-Nairobi Highway (B6). One of the landings of the footbridge is within the Polytechnic compound and the other is on private land that is developed opposite the polytechnic. The developments include retail shops, fast food restaurants, gaming areas, butcheries and nyama choma zone.



Plate 2-13: Photograph showing the location where the footbridge is proposed to be constructed



Plate 2-14: A business premise that will be affected during the bridge construction

Kaaga Boys High School Footbridge- The major reason for the construction of the bridge is to serve as a bridge between the classrooms and dormitories as currently the students are forced to cross the road to the dormitories area and back to classrooms. This is because a road separates the tuition block and dormitories. Also, Kaaga school for the blind can access the bridge.



Plate 2-15: A view of the road that the proposed footbridge will span across.

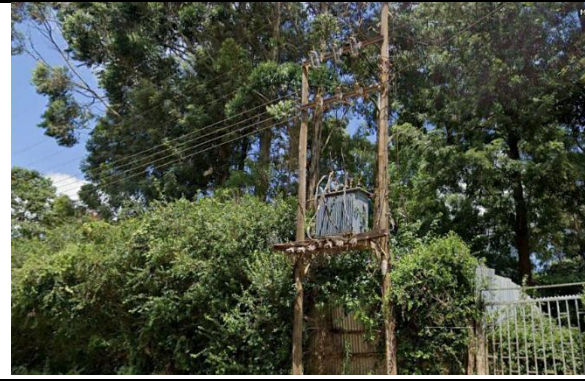


Plate 2-16: Powerlines and transformer to be relocated during bridge construction

2.4 Site Works and Construction Activities

2.4.1 Construction Scheduling

Based on the scope of work which involves construction of 12No. short distance roads and 2No. footbridges, the construction period is estimated to take a total of 24 months.

Construction scheduling provides timelines and sequences for efficient execution of works while incorporating environment and social safeguards. The Contractor should prepare a detailed work schedule covering all project phases, including mitigation measures, environmental monitoring, and health and safety provisions. This schedule should be submitted to the RE for review and approval prior to commencement of works.

2.4.2 Location of Contractor's Camp site

The location of the Contractor's camp will be proposed by the Contractor and approved by the Resident Engineer (RE) and the Client. Camp siting should avoid environmentally sensitive areas such as watercourses, schools, and forest edges. The Contractor should ensure the camp is equipped with adequate sanitation, waste management systems, water supply, and security measures, and that it complies with local authority requirements and the EMCA.

2.4.3 Construction Approach / Equipment

The construction phase will require mobilization of heavy machinery such as graders, drum rollers, sheep foot rollers, pneumatic rollers, asphalt plants, dumper trucks, concrete mixers, batching plants, excavators, bulldozers, wheel loaders, and compactors. The exact number will be determined by the approved work program.

Labor requirements will vary with the work schedule and will prioritize local employment where possible. The Contractor should ensure gender inclusivity in recruitment, occupational health and safety compliance, and provide appropriate welfare facilities for all workers.

2.5 Construction Activities

2.5.1 Construction of Coordination Camp Site

A coordination camp (construction camp) will be established as the operational hub for project management, supervision, and logistics. It will accommodate offices, material storage, workshops, laboratories, worker accommodation (if required), and parking for equipment.

To minimize environmental and social risks, the camp location should be approved by the RE and should avoid ecologically sensitive areas, watercourses, and densely populated zones. The Contractor should ensure the camp is equipped with adequate sanitation, First Aid facilities, waste management facilities, potable water, and security measures, and complies with occupational health and safety standards. Separate, gender-sensitive amenities should be provided for workers, and community relations should be managed through engagement and grievance mechanisms.

2.5.2 Workshops

This refers to on-site facilities within a coordination campsite where equipment, vehicles, tools, and small parts are repaired, maintained, and stored. Workshops play a vital role in ensuring that construction machinery is operational, safe, and efficient, minimizing downtime and delays.

The types of workshops in a coordination campsite are:-

- Mechanical Workshop.
 - Repair of construction vehicles, excavators, rollers, and machinery.
 - Engine overhauls, hydraulic system repairs, welding.
- Electrical Workshop.
 - Maintenance of lighting systems, wiring, control panels.
 - Repair of electric tools and generators.
- Fabrication/Welding Workshop.
 - Manufacture or modification of metal parts.
 - Repair of guards, brackets, structural steel.
- Tyre & Battery Section.
 - Tyre changing.
 - Battery charging and replacement.
- Tool & Equipment Store.
 - Safe storage of hand tools, spare parts, lubricants, personal protective equipment (PPE), etc.

The workshop areas especially the mechanical areas should be paved and banded to prevent contamination of soils with hydrocarbons.

2.5.3 Asphalt Plants

This is a facility used to manufacture hot mix asphalt, which is the primary material used for constructing flexible pavement roads. It blends aggregates, bitumen, filler, and sometimes additives at controlled temperatures to produce asphalt concrete (AC).

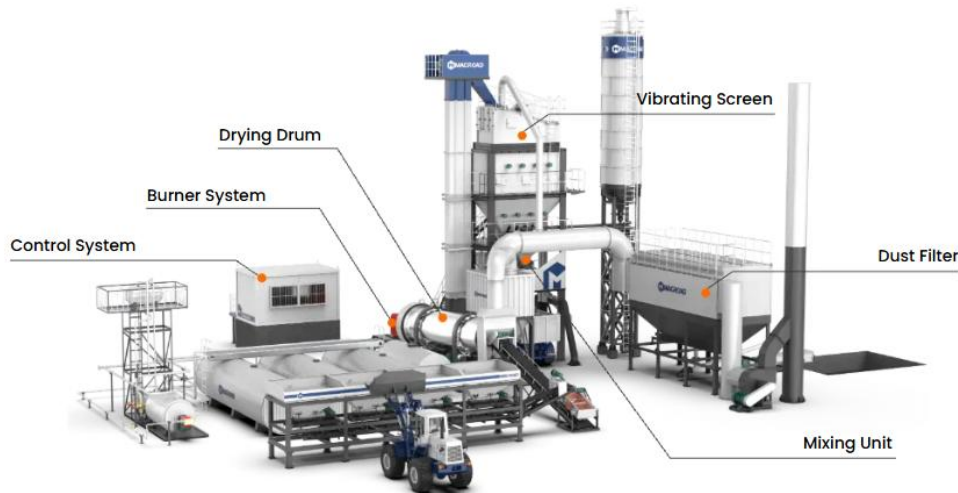


Figure 2-2: Schematic Diagram of an Asphalt Plant

The Table 2-2 below shows the components of typical asphalt plant and their functions.

Table 2-2: Components of Asphalt Plant

Component	Function
Cold Aggregate Feeders	Feed and proportion raw aggregates

Component	Function
Drying Drum	Heat and dry aggregates
Burner System	Provides heat using diesel, gas, or coal
Vibrating Screening Unit	Separates hot aggregates into sizes (batch plant only)
Bitumen Tank	Stores and heats bitumen
Mixing Unit	Separate storage & weighing system Ensure uniform mixing for durable asphalt mixtures
Dust Collector	Controls pollution by collecting dust
Control cabin/system	Digital control of temperature, mix ratios, and output

Bitumen storage area should be on paved and banded surfaces to minimize contamination of soils in case of any leakage

2.5.4 Concrete Batching Plant

This is a facility used to combine various ingredients (cement, aggregates, water, and admixtures) to produce ready-mix concrete in controlled proportions. It ensures consistent quality and is essential for constructing rigid pavements, drainage structures, bridges, and roadside infrastructure.

The batching plant comes in two forms.

- Stationary Batching plant.
- Mobile Batching Plant.

2.5.5 Site Preparation

Site preparation will involve bush clearing, grubbing, and survey/staking activities. Bush clearing entails removal of vegetation, trees, stumps, roots, and debris to prepare a stable work surface. This activity may cause noise, dust emissions, and soil erosion. To mitigate these impacts, the Contractor should limit clearing to the designated Right of Way (ROW), avoid unnecessary tree cutting, apply dust suppression measures, and implement erosion control techniques such as silt traps and re-vegetation of exposed areas.

Survey and staking will involve accurate marking of road alignment and elevations based on design drawings to ensure construction adheres to planned geometry. This activity should be carried out in a way that prevents encroachment beyond the ROW and respects all sensitive areas, including schools, health facilities, and cultural sites.

2.5.6 Earthwork

Refers to the process of cutting, filling, moving, and compacting soil or rock to form the desired shape and elevation of the roadbed. It's one of the most critical and labour-intensive phases in road construction, forming the foundation for all subsequent layers. It uses basically most of the construction equipment and is likely to create disturbance to the communities around the project area, especially in terms of noise and excessive vibrations, air pollution with fumes and dust and traffic interruption.

2.5.7 Drainage works

This involves designing and installing structures to collect, control, and direct water (rainwater, surface runoff, and groundwater) away from the road structure. Proper drainage is essential to prevent road damage, erosion, and premature failure. Some of these structures are and not limited to:

- Construction of side drains and culverts.
- Installation of Storm water drainage.
- Slope protection (e.g., gabions, retaining walls).

2.5.8 Sub-base and Base Layer Construction

These are structural layers placed between the natural ground (subgrade) and the pavement surface (asphalt or concrete). These layers provide strength, stability, and drainage to support traffic loads and extend the pavement's lifespan. These layers include:

- Graded Crushed Stone (GCS).
- Stabilization layer.

2.5.9 Pavement Construction

This involves the process of laying the topmost layers of a road that directly carry vehicle loads. The pavement structure distributes traffic loads to the base and subgrade beneath while providing a smooth, durable, and safe surface for travel. The material is mixed at the asphalt plant and transported to site where it is laid at a specific temperature. The process of laying is as indicated below

- Prime coat application (on base).
- Tack coat application (for bonding).
- Laying of asphalt or concrete pavement using pavers.
 - Asphalt layers: Binder course and wearing course.
 - Concrete slab: Jointing and curing (for rigid pavements).
- Compaction using rollers.

2.5.10 Quality Control and Testing

It ensures that materials, workmanship, and construction processes comply with design specifications, standards and project requirements. It helps achieve a safe, durable, and long-lasting road. The material is collected from material sites and tested to check the quality of the material then once used on the road it is retested for quality control. This exercise is continuous throughout the construction phase of the project.

2.5.11 Finishing Works

Finishing works are the final construction activities that complete a road project, making it functional, safe, and aesthetically acceptable.

- Road markings and signages.
- Guardrails and crash barriers.
- Kerbs and footpaths.
- Street lighting.
- Landscaping.

Note: Based on engineering designs the project is not expected to acquire material sites but will source material from existing commercial suppliers within the locality.

2.6 Project Inputs

2.6.1 Land

KURA is responsible for securing sufficient way leave for the road improvements. Due to existing encroachments by businesses and private developments along several narrow road sections, a Resettlement Action Plan (RAP) process has been commissioned to guide the acquisition of additional land in accordance with applicable laws and international safeguards. Separately, the Contractor will be required to identify and secure land for ancillary project facilities, such as construction camps, borrow pits, quarries, and, where applicable, asphalt plant sites.

2.6.2 Materials

Construction of the proposed roads will require substantial quantities of materials, to be sourced both from commercial suppliers and directly by the Contractor. Key materials include cement, steel, asphalt, aggregates, ballast, hardstones, timber, signage, and fuel. Readily available items will be procured locally, while materials such as aggregates and

hardstones will be obtained from licensed quarries and approved borrow sites, in compliance with environmental and regulatory requirements.

2.6.3 Construction Equipment

Road construction is equipment-intensive, requiring specialized machinery for material transport, earthworks, asphalt laying, and concrete batching. The Contractor will be responsible for mobilizing appropriate construction equipment, including but not limited to bulldozers, excavators, asphalt pavers, motor graders, compactors, rollers, haulage trucks, compressors, and forklift trucks.

2.6.4 Human Resource

The project will require a mix of skilled and unskilled labour to support various construction activities. Skilled personnel will include engineers, land and quantity surveyors, equipment operators, environmental and social safeguard officers, occupational health and safety officers, and site security staff. Unskilled labour will be sourced locally, where feasible, to promote community participation and socio-economic benefits.

Consultant's Team		
No.	Position	Estimated Number
1.	Resident Engineer	1
2.	Deputy Resident Engineer	1
3.	Road inspectors	4
4.	Secretary	2
5.	Project safeguards	2
6.	Survey Team	10
7.	Materials	10
8.	Drivers	7
Contractor's Staff		
9.	Project manager and the deputy	2
10.	Environment and social Safeguards	4
11.	Foremen	4
12.	Plant Operators	10
13.	Drivers	30
14.	Traffic marshals	4
15.	Survey Team	10
16.	Security	8
17.	Labourers	50
Total		159

2.6.5 Permits and Approvals

Implementation of the project will require various statutory permits and approvals from both the County Government of Meru and the National Government, as well as relevant regulatory agencies. County-level approvals will include development and building permits, issued in accordance with applicable physical and land use planning regulations, to ensure alignment with the County's spatial development plans.

At national level, the project must obtain sector-specific authorizations from designated regulatory bodies. These include approvals from the Directorate of Occupational Safety and Health Services (DOSHS) for workplace safety compliance; the Water Resources Authority (WRA) for any abstraction, diversion, or alteration of water resources; the Kenya Forest Service (KFS) for activities within or adjacent to gazetted forests; and the Kenya Wildlife Service (KWS) for any interactions with wildlife corridors or related infrastructure.

All permitting processes will comply with applicable national legislation, including the EMCA (Cap 387), and construction activities will only proceed once all required approvals have been obtained.

2.7 Project Outputs

2.7.1 New Road infrastructure

Upon completion, the project will deliver upgraded road infrastructure within Meru Municipality, comprising paved carriageways equipped with adequate drainage systems, pedestrian walkways, speed control measures, and essential road furniture to support safe and efficient mobility.

2.7.2 Increased accessibility and connectivity

Completion of the proposed extension of Meru Bypass will enhance access to previously underserved areas, improving connectivity across Meru Municipality. The integration of these roads into the existing network will facilitate more efficient movement, reduce localized congestion, and optimize the functional benefits of the entire bypass network.

2.7.3 Reduced travel time

The upgraded roads will significantly reduce travel time by improving surface conditions and traffic flow. This will translate to lower vehicle operating costs, reduced wear and tear, and overall improved efficiency for road users within the municipality.

2.7.4 Employment

Employment opportunities will be created during and after the construction of the project. During the operation phase of the project, competent road maintenance experts will be hired to ensure that the roads remain in better conditions.

2.7.5 Economic development

The completion of the roads and the footbridges will catalyze economic growth in the area by enabling flow of goods and services, security, and reduction of resources committed to maintenance of motor vehicles. The footbridges will contribute to an increase in student enrolment and safety with direct impacts on the economies of the areas especially around the Meru National Polytechnic.

2.7.6 Wastes

The construction of roads and associated infrastructure is expected to generate significant quantities of both solid and liquid waste, necessitating proper management to prevent adverse environmental and social impacts. Anticipated waste streams include packaging materials, used tyres, spent containers and tanks, scrap metal, used oil and hydrocarbons, blackwater from sanitation facilities, greywater from wash areas, and organic waste, among others.

2.8 Project Design

2.8.1 Classification of the Project Roads

According to the preliminary design report, the project roads have the main function of linking traffic from local access roads to the arterial network as well as providing access to abutting land and properties. As such, the roads can be categorized into two functional classes of Urban Collector Roads (UCR) and Local Access Roads (LAR). The functions and characteristics of the identified classes of roads are summarized in Table 2-3 below.

Table 2-3: Functions and Characteristics of Road Classes

S/No	Functions	Road Functional Class	
		Local Access	Urban Collector
1.	Traffic movement	Secondary to access	Equal to access
2.	Flow conditions	Interrupted flow	Interrupted flow
3.	Design speed	30-40 (km/h)	50-70 (km/h)
4.	Running speed	20-40 (km/h)	30-70 (km/h)

S/No	Functions	Road Functional Class	
		Local Access	Urban Collector
5.	Road reserve width	9-15m	20-60m
6.	Carriageway width	5-7m	7-7.5m
7.	Property access	Primary	Equal to traffic movement
8.	Connections	Collectors, locals	Arterials, collectors, locals
9.	Parking	Accepted	Accepted/restricted
10.	NMT Provision	Provided	Provided (segregated)

2.8.2 Traffic Demand of the area

To establish the traffic demand for the project area, a traffic survey was conducted to establish among other things:

- Capture Base Year Traffic (2024), i.e. Average Daily Traffic (ADT), and Annual Average Daily Traffic (AADT) duly adjusted with the appropriate seasonal adjustment factor(s)
- Traffic movement patterns in the project area(s)
- Incidence of generated traffic on account of reduced transportation costs due to the improved transport facilities
- Traffic forecasting model and subsequent traffic projection on the project road.
- Establish axle loads for heavy buses as well as medium, heavy and Articulated Trucks using the existing roads in Meru Town

The feasibility study report, preliminary engineering design and ESIA study for the Meru Town Roads Project were analyzed to understand the traffic conditions of the project area.

2.8.2.1 Motorized Traffic

The traffic survey data indicate that motorcycle traffic dominates motorized transport across the project roads, consistently accounting for over 50% of total motorized volumes. Saloon cars are the second most prevalent vehicle type, particularly in commercial and residential zones, representing more than 25% of traffic on access roads. Goods vehicles constituted 13.1% of traffic on distributor roads and 10.3% on collector roads, highlighting the presence of moderate freight movement.

2.8.2.2 Non-Motorized Traffic (NMT) Count and Composition

Pedestrians were the predominant NMT mode with more than 85% representation at all collectors and access roads within Meru town. There were very few cyclists in Meru town, and this was somewhat attributed to the steep terrain and the lack of cycling infrastructure in the town that discourages cycling. A comparison of the NMT peak hourly volumes against the peak hour volumes for motor vehicles showed a modal split of 35% for motorized traffic and 65% for non-motorized traffic.

2.8.2.3 Road Crash Data

Most of the crashes involved cars (34%) followed by motorcycles (20%) and pedestrians (18%). The proportion of goods vehicles, i.e., light, medium and heavy trucks together with matatus were also notably high.

Most road crashes were a result of operational speed-related factors which accounted for 62% of the total crashes on the project road. Pedestrian-related issues accounted for only 8%. Gitoro Forest ranked the top among the blackspots with a crash severity of 62, followed by Makutano (57), Gikumene (45), Naari (40) and Three Steers (30).

2.8.2.4 Axle Load

The Design Engineer carried out an axle load survey to gather information on the magnitude and distribution of axle loading on the existing pavement. The information obtained was used to establish a basis for the design of the pavement to the existing carriage way that will provide sufficient capacity to withstand the estimated traffic loading over the design period.

A total of 60 vehicles were surveyed at Kambakia during the data collection exercise. The results indicated that Medium Goods Vehicles (2 Axle, 3 Tonnes) were the most surveyed at 65% followed by Light Goods Vehicles (2 Axle) (17%), Heavy Goods Vehicle (3 or 4 Axles) (15%), Large Bus (>25 Passengers) (2%), and Heavy Goods Vehicles (5 or More Axles) (2%).

2.8.2.5 Design Speed

The design speed recommended for the project roads is 50km/h for the Urban collector roads and 30km/h for local access roads and speed calming in areas with of high density. The design speed is as shown in the Table 2-4below

Table 2-4: Schedule of Design Speed

S/No	Road Name	Design Speed (km/h)
1.	3 Steers - Kambakia Rd	50
2.	Kambakia - Kagotone (C91) JCT	50
3. s	Kagotone - KeMU (C91) JCT	50
4.	Kongoacheke - Kwa Mukuru (C91) JCT	50
5.	Kongo Gardens - Kambakia Link	30
6.	Runogone - Kaithe Rd	30
7.	Hospital - Kiramburine Rd	50
8.	Hospital Link 1 - Meru Bus Terminus	30
9.	Hospital Link 2 - Gakoromone Market	30
10.	Hospital Link 3 - MEWAS	30
11.	Western Bypass Link Rd	50
12.	Gikumene - Mate Rd	50

2.8.2.6 Right of Way (ROW) and Road corridor width

Measurements of the existing road corridor widths and the road Right-of Way (ROW) from the registry index maps (RIM) was carried to document the available corridor widths and map out the extent of additional land required for right-of-way acquisition for the designed project roads. Table 2-5 summaries the road corridor widths.

Table 2-5: Meru Bypass existing and designed road corridors

No.	Name of Road	Design sections	Existing ROW from the cadastral Maps (m)	Available road corridor width (m)	Designed Road cross section
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			Min	Max	Min	Max	Carriage way Width (m)	Shoulder width (m)
1.	Runogone Kaithe Road	Runogone- Kaithe	0	9	7	12.35	6.5	1
2.	KEMU- Kambakia Road	Kambakia- Kagotone/KEMU link C91	3	24	4	35	7	1.5
		Kongoacheke JCT- Kwa Mukuru Junction	3	15	6	17	7	1.5
3.	KEMU/Kambakia Link to C91 Road	Kongo gardens- Kambakia Link	8	9	6.5	15.6	7	1.5
4.	Three Steers- Kambakia road	Three steers- Kambakia Road	3	18	6	21	7	1.5
5.	Eastern Bypass- Hospital Roads	Hospital roads- Kiramburine JCT	6	15	8	15	7	1.5
		Link 1- Meru Bus terminus	6	15	8	15	7	1.5
		Link 2- Gakoromone Market	9	12	9	34	7	1.5
		Link 3- MEWAS JCT	6	12	7	21	7	1.5
6.	Western Bypass- Mate road	western Bypass- link road	3	9	6	13	7	1.5
		Wesern Bypass- Mate Road	6	9	6	15	7	1.5

2.9 Estimated Project Cost and NEMA Licensing Fee for the Proposed Extension of Meru Bypass Roads

Preliminary construction costs for the project have been estimated based on current design proposals and prevailing construction rates in Kenya. The scope of works entails upgrading 12No short-distance roads from gravel and earth surfaces to bitumen standard, as well as constructing 2No footbridges at Kaaga Boys High School and Meru National Polytechnic.

The total construction cost for the Extension of Meru Bypass Roads is **KSH 4,472,814,000.00**. In accordance with the Environmental (Impact Assessment and Audit) Regulations of 2003 and Gazette Notice No. 13211, which reintroduced EIA licensing processing fees at 0.1% of the project cost, the total cost for EIA processing amounts to **KSH 4,472,814.00**.

3 ANALYSIS OF ENVIRONMENTAL AND SOCIAL IMPACTS

3.1 Introduction

An Environmental and Social Impact analysis was carried out to devise mechanisms to manage and monitor the associated potential risks and impacts, thereby ensuring the project will be environmentally and socially sound and sustainable. Potential negative environmental and social impacts of the project are considered and classified as either positive or negative, and followed by rating of their significance, which can be described as insignificant, low, medium or high. Stakeholder consultations also assisted in efforts to prioritize and analyze the anticipated impacts.

The consultant analyzed data and information from desktop and field surveys/assessment including consultations feedback to inform the ESIA, ESMMP and applicable sub-plans.

3.2 Impact Assessment Methodology

The ESIA process ranked impacts according to their significance determined by considering project activity, event magnitude and receptor sensitivity. Determination of event magnitude entailed the identification and quantification (as far as practical) of the sources of potential environmental and socio-economic effects from project activities. The approach to evaluating the significance of potential environmental and socio-economic impacts entailed the following aspects.

- (1) Project area of influence – for analysis of impact zones.
- (2) Impact Type: whether beneficial or adverse.
- (3) Nature of Impact: whether reversible or irreversible.
- (4) Event Magnitude: assessed on the impact extent, frequency, duration, intensity, likelihood and reversibility.
- (5) Receptor sensitivity: assessed the type, presence and resilience of the receptor.
- (6) Impact significance: function of magnitude and receptor sensitivity.

The approach and criteria for the above aspects are described below.

3.3 Environmental Impacts

The environmental impacts were evaluated using the criteria below.

3.3.1 Magnitude

Table 3-1: Event Magnitude Scoring Table

EVENT MAGNITUDE		
Extent/Scale	Events range from those where the effect extends across an area:	
	Near to the source (in the range of tens to hundreds of metres).	3
	At intermediate distance from the source (in the range of hundreds to thousands of metres).	2
	At far distance from the source (in the range thousands of metres and above).	1
Frequency	Events range from those occurring:	
	Once or twice.	1
	Repeatedly but intermittently.	2
	Frequently and persistently.	3
Duration	Events range from those where effects occur over.	
	Instantaneous/short term (i.e., hours to days).	1
	Medium term (between a week and 3 months).	2
	Long term (more than 3 months to permanent).	3

Intensity	Concentration of an emission or discharge with respect to standards of acceptability that include applicable legislation and international guidance, its toxicity or potential for bioaccumulation, and its persistence in the environment. Also, the degree/permanence of disturbance or physical impact (e.g., disturbance to species, loss of habitat or damage to cultural heritage). Ranges from:	
	A low intensity event.	1
	A moderate intensity event.	2
	A high intensity event.	3
Likelihood	Likelihood is estimated on the basis of experience and/or evidence that such an outcome has previously occurred. The likelihood of impact occurring was assessed:	
	Unlikely.	1
	Possible.	2
	Likely.	3
Reversibility	This characteristic denotes the possibility of the system to return to its original condition. Can be characterized as 1 (short-term, easily reversible), 2 (medium term, partially reversible if mitigated) and 3 (irreversible).	
	Short term, easily reversible.	1
	Medium term, partially reversible.	2
	Irreversible.	3

The event magnitude was scored from low (1) to high (18) by adding the individual parameter scores. Resulting individual ratings were summed to give the overall event magnitude ranking. *Table 3-2* presents the score ranges for magnitude rankings of Low, Medium and High.

Environmental Event Magnitude Rankings

Table 3-2: Impact Ranking

Event Magnitude	Score (Summed Parameter Rankings)
Low	1 - 6
Medium	7 - 12
High	13 - 18

3.3.2 Receptor Sensitivity

The Receptor Sensitivity considered the type of receptor (namely, biological/ecological, human, and physical receptor/feature); and was determined based on the following parameters, which are equally weighted and are each assigned a rating of 1, 2, or 3:

Table 3-3: Receptor Sensitivity Rating

RECEPTOR SENSITIVITY SCORING BY CATEGORY		
Biological/Ecological Receptors	Presence ranges from:	
	Presence of species which is none of the below.	1
	Internationally threatened species/protected area within the area impacted by the project activities outside of period of high sensitivity or during routine or reliably predictable peak presence.	2
	Internationally near threatened species within the area impacted by the project activities during period of high sensitivity and/or during routine or reliably predictable peak presence.	
	Nationally protected species and/or species which are of importance to the local and regional ecosystem within the area impacted by the project activities.	

	Internationally threatened species/protected area within the area impacted by the project activities during period of high sensitivity and during routine or reliably predictable peak presence; to	3
	Resilience (to the identified stressor) ranges from:	
	Species and/or population has high capacity to absorb or adapt to change (i.e., has capacity to move away from or adapt to the project impact) and is potentially unaffected or marginally affected.	1
	Species and/or population which has moderate capacity to absorb or adapt to change (i.e., has capacity to move away from or adapt to the project impact), leading to potential temporary but sustainable effect which does not substantially alter character or result in significant loss of ecological functionality.	2
	Species and/or population which has little or no capacity to absorb or adapt to change (i.e., little or no capacity to move away from or adapt to the project impact), leading to potential for substantial change of character and/or loss of ecological functionality.	3

Human Receptors	Presence ranges from:	
	People being uncommon in the geographical area of anticipated impact.	1
	People being present some of the time (e.g., commercial property).	2
	People being permanently present (e.g., residential property) in the geographical area of anticipated impact.	3
	Resilience (to the identified stressor) ranges from:	
	People being least vulnerable to change or disturbance (i.e., ambient conditions such as air quality are well below applicable legislation and international guidance).	1
	People being vulnerable to change or disturbance (i.e., ambient conditions such as air quality are below adopted standards).	2
	Most vulnerable groups (i.e., ambient conditions such as air quality are at or above adopted standards).	3

Physical Receptors/Features	Presence ranges from:	
	Feature which is none of the below.	1
	Feature with local or regional value and is sensitive to disturbance.	2
	Presence of feature which has, in reverse order, national or international value (e.g., state protected monument).	3
	Resilience (to the identified stressor) ranges from:	
	Feature/receptor is unaffected or marginally affected (i.e., resilient to change).	1
	Undergoes moderate but sustainable change which stabilises under constant presence of impact source, with physical integrity maintained.	2
	Highly vulnerable (i.e., potential for substantial damage or loss of physical integrity).	3

The overall impact receptor sensitivity was scored on a scale from low (1) to high (6) by adding the individual parameter scores. The Table below presents the score ranges for sensitivity rankings of Low, Medium and High

Environmental Receptor Sensitivity Ranking

Table 3-4: Receptor Sensitivity Ranking

Receptor Sensitivity	Score (Summed Parameter Rankings)
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Low	1 - 2
Medium	3 - 4
High	5 - 6

3.4 Socio-economic Impacts

The socio-economic impact assessment used a semi-qualitative assessment approach to describe and evaluate potential impacts based on the event magnitude and receptor sensitivity rankings set out in the tables above. Indirect socio-economic impacts (i.e. induced effects) were also assessed using a similar approach.

3.4.1 Socio-economic Event Magnitude Rankings

Table 3-5; Event Magnitude Ranking Table for Social Impacts

Magnitude	Criteria
Low	Changes in social, economic or cultural dynamics with slight and temporary effect on any given sector performance and/ or population wellbeing. These impacts are unlikely to result in concerns being raised by governmental bodies or stakeholders. Events may include: • Minor disruption to livelihoods or living conditions resulting in a localized, reversible and temporary nuisance. • Temporary disruption to businesses that does not result in a loss of revenue or any reputational damage. • No change in the health status of local communities; and • Temporary disruption to public infrastructure (such as a road closure) that results in minor inconveniences to affected communities.
Medium	Changes in social, economic or cultural dynamics with moderate and noticeable adverse effect on any given sector performance and/or population wellbeing. Such impact may result in concerns being raised by governmental bodies or stakeholders. Events may include: • Negative change in livelihood status, household assets/income or living conditions. • Temporary disruption to businesses resulting in a small drop in business revenue. • Increased risk to public health that can be controlled using detailed mitigation measures; and • Disruption to public infrastructure that results in an inconvenience to other users.
High	Changes in social, economic or cultural dynamics with major adverse effect on any given sector performance and/or population wellbeing. Such impacts may result in immediate intervention by governmental bodies and stakeholders. Events may include: • Negative change in livelihood status, household income/assets or living conditions affecting a high proportion of people resulting in economic loss and protests on the project. • Reputational damage and/or drop in business revenue that threatens the future viability of the economic activity. • Increased risk to public health leading to a fatality or injury to a member of a community; and • Damage to public infrastructure leading to environmental or socio-economic impacts to other users.

3.4.2 Socio-economic Receptor Sensitivity Ranking

Table 3-6; Receptor sensitivity ranking for social impacts

Sensitivity	Criteria
Low	Receptor sensitivity will be considered low when there is a moderate to high capacity and means to adapt to a given change and maintain / improve quality of life. Receptors of low sensitivity may include: - Individuals who are able to quickly adapt to temporary disruption in their living conditions, livelihood status or a change in the status of public infrastructure (such as a road closure); and - Businesses with a robust economic model that are able to adapt easily to any restrictions placed upon their activities, or who are able to gain economically from such changes.
Medium	Receptor sensitivity will be considered medium when there is limited capacity and means to adapt to a given change and maintain / improve quality of life. Receptors of medium sensitivity may include: - Individuals who rely heavily on their livelihood to maintain their socio-economic status and have a limited ability to adapt to change; and - Businesses that have a limited ability to adapt to change and are sensitive to any reduction in economic revenue or reputation.
High	Receptor sensitivity will be considered high in the case of vulnerable receptors, who have little capacity and means to adapt to a given change and maintain / improve quality of life (e.g. homeless persons, Internally Displaced Persons community in temporary accommodation, persons with low access to recourse (e.g. no land titles), persons with no or low representation (e.g. migrants, seasonal herders with no permanent assets in the area). Receptors of high sensitivity may include: - Individuals with a marginal livelihood, low socio-economic income or poor-quality living conditions. - Individuals who are vulnerable due to their age, disability, or other reason and who may require special assistance during engagement activities; and - Businesses with a marginal economic existence which are not able to easily adapt to change.

3.5 Impact Significance

For both environmental and socioeconomic impacts, impact significance, as a function of event magnitude and receptor sensitivity, was ranked as Negligible, Minor, Moderate or Major as presented in *Table 3-7* below.

Table 3-7: Impact Significance

		Receptor Sensitivity		
		Low	Medium	High
Event Magnitude	Low	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	High	Moderate	Major	Major

3.6 Environmental Impact Analysis

The environmental aspects were rated and scored against a scale as shown in Table 3-8 and

Table 3-8: Impact Scoring for the Magnitude of Environmental Aspects

Impact Magnitude									Score; Low 1-6: Medium 7-12: High 13-18.
No	Environmental	Extent/Scale	Frequency	Duration	Intensity	Likelihood	Reversibility	Total	
1	Noise and vibration	1	2	2	2	3	1	11	Medium
2	Air quality	1	2	2	2	3	1	11	Medium
3	Flora	1	1	3	1	3	2	11	Medium
4	Waste management	3	2	2	1	3	1	12	Medium
5	Wildlife (Reduced Habitat)	2	1	3	1	3	2	12	Medium
6	Soil	3	2	2	2	3	1	13	High
7	Water sources	3	2	2	2	3	1	13	High

Table 3-9: Impact scoring for Receptor Sensitivity for Environmental Aspects

Receptor Sensitivity									Score; Low 1-2: Medium 3-4: High 5-6.
No.	Environmental	Biological/Ecological Receptors		Human Receptors		Physical Receptors/Features		Total	
		Presence of Biological/ecological receptors	Resilience to identified stressors	Presence of human	Resilience to identified stressors	Presence of Physical Receptors	Resilience to identified stressors		
1	Noise and Vibration			3	3			6	High
2	Air quality			3	2			5	high
3	Flora	3	1					4	Low
4	Waste					2	2	4	Medium
5	Wildlife (reduced Habitat)	1	1					2	Low
6	Soil					2	1	3	Medium
7	Water sources					2	2	4	Medium

To understand the impact significance for the identified social aspects, rating for both impact magnitude and receptor sensitivity was carried out as shown in Table 3-10 below.

Table 3-10: Impact Significance of Environmental Aspects

Environmental aspect	Impact Magnitude	Receptor Sensitivity	Impact significance
Noise and Vibration	Medium	High	Major
Air quality	Medium	High	Major
Flora	Medium	Low	Minor
Waste	Medium	Medium	Moderate
Wildlife (Reduced Habitat)	Medium	Low	Minor
Soil	High	Medium	Major
Water sources	High	Medium	Major

3.7 Social- economic Impact analysis

The table below provides a summary of the social-economic impacts of the proposed extension of Meru Bypass.

Table 3-11: Impact Significance for Social Aspects

Social aspect	Impact Magnitude	Receptor sensitivity	Impact significance
Impact on existing infrastructure	Medium	Low	Minor
Occupational Health and Safety Concerns	High	Medium	Major
Community health and safety	High	Medium	Major
Spread of STIs and HIV/AIDS	Medium	Low	Minor
Traffic management	Medium	Medium	Moderate
GBV/SEA/SH	Medium	Low	Minor
Disruption of Livelihood	High	High	Major
Security	Medium	low	Minor

4 POLICY, LEGAL, REGULATORY, ADMINISTRATIVE, AND INSTITUTIONAL FRAMEWORK AND INTERNATIONAL CONVENTIONS AND TREATIES

4.1 Policy Framework

4.1.1 Vision 2030

Kenya Vision 2030 is Kenya's long-term development blueprint which seeks to transform the country into a newly industrializing, middle income status nation by the year 2030 through provision of high-quality life to its citizens in a clean and secure environment. The Vision 2030 identified three pillars: economic, political and social as key drivers necessary for realizing quality living standards for the Kenyan people.

Under the Social Pillar, Vision 2030 seeks to achieve a just, cohesive and equitable society living in a clean and secure environment. This is to be realized through transformation in six (6) key sectors namely: Education and Training; Health; Environment, Water, Sanitation and Regional Development; Population, Urbanization and Housing; Gender, Youth and Vulnerable Groups; and Sports, Culture and the Arts. The Economic Pillar aims to achieve and sustain an average economic growth rate of 10 percent per annum until the year 2030. To promote trade, which is one of the priority sectors identified by the Vision 2030, the government of Kenya has partnered with various development bodies to improve road infrastructure and improve transport efficiency in the country.

Relevance

Kenya Vision 2030 underpins the principle of sustainable development and safeguards quality of life by providing for a clean and secure environment. The project will be required to institute the necessary environmental and social safeguards measures during the implementation and operation phases.

4.1.2 National Environment Policy, 2014

This policy seeks to provide a framework for integrated approach to planning and sustainable management of Kenya's environment and natural resources by promoting research and capacity development. By this policy, use of innovative environmental management tools such as incentives, disincentives, total economic valuation, indicators of sustainable development, Strategic Environmental Assessments (SEAs), EIAs, Environmental Audits (EAs) and Payment for Environmental Services (PES) are encouraged.

Section 5.6 on Infrastructural development and environment gives responsibility to the government to:

- Ensure SEA, EIA, Social Impact Assessment and Public participation in the planning and approval of infrastructural projects.
- Develop and implement environmentally friendly national infrastructural development strategies and action plan.
- Ensure that periodic EAs are carried out for all infrastructural projects.

Relevance

This ESIA study has been conducted in fulfilment of the provisions of the Policy. Separate ESIA studies will be required for ancillary projects such as quarry sites, Contractor's camp site, concrete batching plants and asphalt batching plants. The project will equally be required to conduct annual audits to monitor compliance of the project to environmental and social parameters.

4.1.3 The National Land Use Policy, 2017

The promulgation of the new Constitution of Kenya in 2010 cemented the need to have a harmonized policy document for land use management in the country. Chapter 3 of the National Land use policy provides the guidelines, principles and strategies relating to sustainable land use, land management and administration, degradation of rangelands, marginal lands and fragile ecosystems, biodiversity conservation, climate change and transboundary issues among others.

Under section 3.13, the policy identifies environmental conservation as vital for the realization of proper socio-economic development in the country. It provides for the conservation of forests, wetlands, water catchment areas and

cultural areas. The succeeding section 3.14 advocates for the conservation and management of the country's biodiversity resources. Specifically, it demands that wildlife corridors, forests, mountains and marine dispersal areas be identified, mapped and gazetted. Further, the national land use policy advocates for the promotion of climate resilient land use practices across the country.

Relevance

The proposed extension of Meru Bypass will traverse areas with environmentally and socially sensitive resources, including biodiversity hotspots and livelihood zones. In compliance with the National Land Use Policy (2017), the project will incorporate sustainable and climate-resilient land use practices, prioritize the protection of ecological and cultural assets, and adhere to Meru Municipality's physical and land use plans, particularly in the location and design of permanent infrastructure.

4.1.4 National Climate Change Policy Framework (Sessional Paper No.5 of 2016)

This policy was initiated and developed under the framework of the National Climate Change Action Plan (NCCAP, 2013 -2017)¹ to provide a framework to guide the development and implementation of specific, detailed and costed climate change interventions through regular and periodic Climate Change Action Plans. It identifies climate change as a challenge in realizing sustainable economic growth as the economy of the country is dependent on the utilization of natural resources.

Relevance

The proposed Kambakia - Kagotone/KEMU Road borders the Upper Imenti Forest, a critical biodiversity area. Construction activities along this and other project roads are expected to lead to the loss of vegetation cover. Additionally, material sourcing and the development of ancillary facilities such as borrow pits and campsites pose risks of disturbing previously undisturbed ecosystems. To mitigate these impacts, the project will minimize vegetation clearance within the road corridor, prioritize the use of energy-efficient technologies, and avoid sitting material extraction or ancillary facilities in ecologically sensitive or densely vegetated areas.

4.1.5 National Climate Change Action Plan (NCCAP) III 2023-2027

Kenya's NCCAP III (2023–2027) presents the detailed priority actions that Kenya will embark on to address climate change during the 2023– 2027 medium-term planning period. To further Kenya's sustainable development, the plan outlines strategic actions to address climate change across sectors, with infrastructure development playing a central role in the country's economy. The plan seeks to promote low-carbon development, disaster risk reduction, and sustainable land use all which are critical for road design, construction, and maintenance in climate-sensitive regions.

Relevance

The proposed extension of Meru Bypass will traverse areas which are environmentally sensitivity to climate change impacts such as land slides and flooding. To mitigate these impacts relating to climate change, the designs of the roads and bridges will put into considerations future variation in climatic variables such as precipitation and temperatures changes to avoid, reduce and mitigate associated impacts.

4.1.6 National Climate Change Response Strategy (NCCRS) 2010

The NCCRS 2010 was Kenya's first comprehensive framework to address climate change and outlined key adaptation and mitigation actions that directly supported climate-resilient road infrastructure. To achieve this, NCCRS promoted:

- Climate vulnerability assessments during project feasibility studies to identify risks like landslides and flash floods common in project areas.
- Mainstream climate change into infrastructure planning and development, by ensuring roads are designed to withstand extreme weather events.
- Support research and adoption of climate-resilient construction materials and techniques.
- Promote soil conservation and afforestation along road alignments to stabilize slopes and reduce erosion

These strategies were aimed at ensuring a climate resilient infrastructure that was to be durable, safe and aligned with Kenya's long-term climate resilience goal.

¹ A periodic five-year plan designed to encourage low carbon climate resilient development in Kenya

Relevance

This ESIA study will align with NCCRS objectives by undertaking a climate risk assessment. The results of the assessment will inform the design of cross drainage structures to ensure a robust and efficient designs that takes into consideration future climate changes and ensure sustainable and land management practices.

4.1.7 National Adaptation Plan 2015- 2030

This national adaptation plan (NAP) builds on the foundation laid by the NCCRS and the NCCAP whose aim was to consolidate the country's vision on adaptation supported by macro-level adaptation actions that relate with the economic sectors and county level vulnerabilities to enhance long term resilience and adaptive capacity. It emphasizes risk-informed planning, sustainable land use, and resilient design for roads in climate-sensitive areas like Meru. The NAP 2015–2030 aims to enhance climate resilience across sectors, aligning with Kenya's Vision 2030.

Relevance

This ESIA study will align with the objective of NAP by undertaking a climate risk assessment to allow for informed road and bridge designs that capture changes in climate and the associated impacts.

4.1.8 Sustainable Development Goals (SDGs) 2015

The Sustainable Development Goals (SDGs) 2015 promote road development that is environmentally responsible, socially inclusive, and economically sustainable. Environmental Impact Assessment (EIA) is a key tool for aligning road projects with SDG targets, especially those related to infrastructure, climate action, biodiversity, and community well-being.

Relevance

The 2030 Agenda for Sustainable Development, adopted in 2015, outlines 17 interconnected goals. Road infrastructure plays a pivotal role in achieving many of these goals, but only when developed with environmental and social safeguards. Environmental Impact Assessment (EIA) is the mechanism that ensures road projects contribute positively to sustainable development.

4.1.9 The National Biodiversity Strategy and Action Plan 2007

The National Biodiversity Strategy and Action Plan (NBSAP) 2007 was developed in response to Kenya's obligations under the Convention on Biological Diversity (CBD). It provides a framework for conserving biodiversity while promoting sustainable development. The plan integrates Environmental Impact Assessments (EIAs) for all major infrastructure projects, including roads, to evaluate potential harm to ecosystems and species, calls for the avoidance of ecologically sensitive areas and restoration of disturbed habitats. It emphasizes protection of endangered and endemic species that may be affected by any projects and recommends wildlife crossing along road projects to help in reducing road kills.

Relevance

This ESIA study has been conducted in fulfilment of the provisions of the Policy. In addition to this one of the roads Kambakia- Kagotone Road runs on the edge of Upper Imenti Forest which is a protected area providing habitat for various faunal species. Due to this, the ESIA study will strive to ensure that appropriate conservation and mitigation measures are documented and suggested to help avoid, reduce and mitigate any negative impacts that may impact the local biodiversity while enhancing the positive impacts that will be associated with road construction.

4.1.10 Environmental Guidelines for Roads and Bridges 2010

The Environmental Guidelines for Roads and Bridges 2010 serve as a reference for road infrastructure projects, offering in-depth evaluations of environmental challenges and outlining mitigation strategies informed by proven practices from both Kenya and abroad. Published by the International Labour Organization and Kenya's Ministry of Roads, these guidelines aim to ensure that road and bridge projects are environmentally sustainable, socially responsible, and technically sound.

Relevance

The ESIA study will use the recommendations provided to undertake a comprehensive EIA study proposing detailed mitigation measures that are appropriate for the project to ensure compliance to the project being sustainable both in the environmental and social context.

4.1.11 Guidelines for Prevention and control of soil Erosion in Road Works 2010

Finalized in 2010, Kenya's Guidelines for Prevention and Control of Soil Erosion in Road Works serve as a critical blueprint for integrating environmental and social safeguards into the road construction sector. Developed with support from the International Labour Organization, the guidelines provide a structured approach to planning, designing, and implementing erosion control measures that protect landscapes, preserve soil integrity, and ensure the long-term sustainability of road infrastructure. By addressing both construction-phase and post-construction risks, the guidelines help engineers and planners build roads that are not only functional but also environmentally responsible and resilient to climate impacts.

Relevance

The ESIA will use appropriate recommendations and mitigation measures that are project specific and based on the guidelines to help in mitigating soil erosion along the road corridor.

4.1.12 Integrated National Transport Policy 2009

Kenya's Integrated National Transport Policy (INTP) 2009 laid the groundwork for a unified and sustainable transport system across road, rail, maritime, air, and pipeline sectors. It recognizes the urgent need to harmonize transport development with land-use planning and ecological integrity. By promoting sustainability, safety, and service efficiency, INTP encourages road projects that not only enhance mobility but also safeguard natural habitats, reduce carbon emissions, and support long-term environmental resilience. It also serves as a strategic pillar for the 50-year National Transport Master Plan, guiding infrastructure decisions that align with Kenya's broader development and conservation goals. The policy strives to ensure that road infrastructure supports ecological integrity while meeting mobility needs by avoiding ecologically sensitive zones, promoting community engagement and monitoring environmental performance.

Relevance

The ESIA study will entail detailed environmental and social baseline whose results will be used in monitoring environmental performance while both stakeholders and local community will be engaged in both formal and informal meetings to capture their views and opinions to be used during project design and implementation.

4.1.13 National Occupational Health and Safety Policy 2012

Kenya's National Occupational Health and Safety (OSH) Policy of 2012 is a cornerstone for safeguarding the dignity, health, and well-being of workers across all sectors. Rooted in the principle that every worker has the right to a safe and healthy working environment, the policy goes beyond reactive measures—it champions a culture of prevention. By clearly defining the responsibilities of government, employers, and workers, it establishes a collaborative framework that integrates safety into every stage of the work process. Through robust regulatory systems, functional safety committees, and incentive-driven compliance, the policy seeks not only to reduce workplace accidents and occupational diseases but also to foster environments where productivity and human welfare go hand in hand. In doing so, it aligns labor practices with Kenya's broader goals of social justice, sustainable development, and economic resilience.

Relevance

This policy will be used to ensure that road construction workers are not only protected from accidents but also able to work in safe and secure environments.

4.1.14 Wildlife Conservation and Management Policy 2017

This policy seeks to ensure that Kenya's wildlife resources are sustainably managed through proper integrated systems for social, economic, ecological, cultural and spiritual needs of the present and future generations. It seeks to address threats to wildlife decline and put measures for sustainable management of the available resources. To realize this, the government is mandated to pursue the following objectives:

- Develop a coordinated framework for wildlife management taking into account other sectoral policies and the roles of various agencies.
- Conserve wildlife resources in national parks, national reserves and national sanctuaries in an effective and equitable manner.

- Ensure maintenance and enhancement of ecological integrity of wildlife and their habitats through the integration of private and community lands into protected area systems.
- Harness the contribution of wildlife resources into the national economy and enhance the benefits to all; and
- Enhance policy implementation through participatory planning, research, knowledge management and capacity building.

Relevance

The Upper Imenti Forest Reserve which is a critical wet season habitat for the African Elephant is closely bordered by the Kambakia – Kagotone and KEMU Link Roads whose construction may adversely impact on the wildlife resources in the forest. The project will be required to work closely with the KWS in sensitizing workers against hunting and in responding to wildlife attacks and incidents. In addition, necessary approvals should be sought from the KWS and KFS before utilizing any natural resources within protected areas.

4.1.15 National Water Policy (Sessional Paper No. 1 of 2021)

The National Water Policy seeks to guide sustainable management, development and use of water resources in Kenya. It provides a framework for sustainable management and financing of water resources; water harvesting and storage through equitable and efficient supply of water. The policy aligns the water sector to the Constitution of Kenya 2010 especially with respect to the establishment of mechanisms to guide intergovernmental and institutional coordination for better delivery of respective functions.

Section 5 of the paper entrenches water quality management, conservation and protection of water catchment areas and sustainable utilization of water resources.

Relevance

The project area hosts several natural springs and rivers that form part of the upper catchment of the Tana River, which serves as a primary water source for communities in Meru. As such, the project will be required to obtain the necessary water abstraction permits from the Water Resources Authority (WRA) and implement robust soil erosion control measures to safeguard the integrity of surface water bodies and surrounding ecosystems throughout the construction phase.

4.1.16 The Kenya Health Policy (2014 – 2030)

The policy entrenches various articles of the constitution of Kenya especially article 43, which defines rights to:

- a) the highest attainable standard of health, which includes the right to healthcare services, including reproductive healthcare;*
- b) reasonable standards of sanitation;*
- c) be free from hunger and have adequate food of acceptable quality; and*
- d) Clean and safe water in adequate quantities.*

The policy advocates for the elimination of communicable conditions, minimize exposure to health risks, and reduce the burden of violence and injuries among others.

Relevance

The project is expected to apply the provisions of the policy to set up appropriate public health conditions that safeguards both workers and the project community. Further, the project will be required to develop an acceptable emergency response plan and maintain acceptable sanitation levels during the project implementation cycle.

4.2 Legal Framework

4.2.1 The Constitution of Kenya, 2010

Article 42 of the Constitution guarantees every person in Kenya the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of both present and future generations. Article 69 (1) requires the Government to take measures for the protection of the environment and for proper use of natural resources for the benefit of the present and future generations. Article 69(2) of the Constitution requires the people of

Kenya to work with the government and all other relevant actors in conserving and protecting the environment and natural resources.

Article 35 and 69(1)(d) of the Constitution requires the participation of the public in all decision-making processes such as the EIA process, and that accurate information regarding any intended decision be provided to the public in a timely and open manner.

Relevance

This ESIA report has been prepared in fulfillment of Article 42 of the Constitution of Kenya, 2010, which guarantees every person the right to a clean and healthy environment. In line with this constitutional mandate, the project will be required to uphold environmental integrity throughout its implementation by identifying, mitigating, and monitoring adverse impacts associated with construction activities. Furthermore, the provisions of Article 69(1)(d) of the Constitution, which emphasize the need for public participation in environmental governance, will guide the project's stakeholder engagement processes, both prior to commencement and during the construction phase.

4.2.2 Environmental Management and Coordination Act, Cap 387

The Environmental Management and Coordination Act (EMCA) was enacted in the year 1999 to provide a legal and institutional framework for environmental management in the country. The 1999 Act has since been amended and revised in the year 2015 and the year 2019 (Updating the 2nd schedule) respectively in order to align it with the Constitution of Kenya (CoK), 2010. Section 7 of the Act establishes the NEMA as a semi-autonomous body that is charged with the management and coordination of all environmental activities in the country.

Section 58 of the law provides that development projects that are likely to generate adverse effects on the environment should be subjected to the ESIA process. A full list of these Projects is provided under the Second Schedule of the Act, and they are classified into low, medium and high risk, depending on magnitude of impacts. Further, such projects are required to undertake environmental monitoring and auditing to ensure better environmental and social outcomes. Further, considerations have been made on various subsidiary legislations enacted under EMCA, Cap 387 to regulate the management of various aspects of the environment in the country.

Relevance

This ESIA report has been prepared in line with the provisions of EMCA, Cap 387 to enhance the sustainability of the project. The project will be required to initiate appropriate mitigation/safeguards to protect the environment from foreseen negative impacts.

4.2.3 The Kenya Roads Act No. 2 of 2007

This Act provides for the establishment KURA among other Authorities with clear and separated mandates. Part IV gives powers to the KURA and section 22(1a) gives authority to maintain, operate, improve and manage the roads under its jurisdiction. Section 22(2a) further gives the authority to construct any road, bridge, building, drainage structure, drain, river channeling or any other necessary or desirable works required for the purposes of the Authority.

Section 26 grants the Authority power to enter any land and to alter position of any pipes, electric, telephone, telegraphic, fibre optic or other wire of whatsoever nature, or the position of any drain or sewer. Section 27 (2) provides that where any infrastructure utility is located within a road reserve, the provider or operator of such infrastructure utility shall, upon written request by the responsible Authority, relocate such infrastructure utility to a location or alignment approved by the Authority, at no cost to the Authority.

Relevance

Duties, powers and responsibilities of KURA are provided in the Roads Act.

4.2.4 Traffic Act Chapter 403 of 2013

This Act consolidates the laws relating to traffic on all public roads. It also prohibits the encroachment on and damage of roads including land reserved for roads.

Relevance

The proposed project is essentially under the provision of this Act. The project design shall include road furniture that will assist motorists comply with the Act.

4.2.5 Public Roads and Roads of Access Act (Cap. 399)

Section 8 and 9 of the Act provides for the dedication, conservation or alignment of public travel lines including construction of access roads adjacent to lands from the nearest part of a public road. Section 10 and 11 allow for notices to be served on the adjacent landowners seeking permission to construct the respective roads.

Relevance

The Contractor will be allowed to utilize existing public roads to access construction sites, subject to compliance with applicable vehicle licensing and road maintenance regulations. All required permits or approvals from the relevant authorities must be obtained in advance. Where access routes may affect local communities, such as through traffic disruptions or increased safety risks, appropriate notification and stakeholder engagement will be undertaken to minimize inconvenience and maintain community safety.

4.2.6 Climate Change Act, 2023

The Climate Change Act provides the legal and institutional framework for steering Kenya's transition to a low-carbon, climate-resilient development pathway. It mandates the mainstreaming of climate change considerations across all sectors and levels of government and establishes systems for coordination, monitoring, and reporting of climate action. The Act further supports the development and implementation of national and county-level strategies aimed at enhancing the resilience and adaptive capacity of both human and ecological systems to the adverse impacts of climate change.

Relevance

The Act is directly relevant to the proposed road project, which must incorporate climate-resilient design elements and construction practices to mitigate risks associated with climate variability, including flooding, erosion, and extreme weather events. Project implementation will be expected to align with the national climate change response strategy and relevant county-level climate action plans.

4.2.7 Physical and Land Use Planning Act, 2019

This Act makes provision for the planning, use, regulation and development of land and for connected purposes. Section 5 requires every person engaged in physical and land use planning and regulation to ensure development activities are planned in a manner that integrates economic, social and environmental needs of present and future generations. Section 56 of the Act provides that County governments have the power to consider and approve all development applications and grant all development permissions, among other functions within their areas of jurisdiction.

Relevance

The proponent should apply for development permissions from the County Government of Meru, failure to which heavy fines will ensue.

4.2.8 The County Governments Act 2012

An Act of Parliament to give effect to Chapter Eleven of the Constitution; to provide for county governments' powers, functions and responsibilities to deliver services and for connected purposes. In the Fourth Schedule of the Kenyan Constitution 2010 Part 2 County governments, one of the functions of the County governments is stated as "County public works and services, including - (a) storm water management systems in built-up areas; and (b) water and sanitation services.

Relevance

All development permissions should be sought from the County Government of Meru. Relevant County laws and bylaws should be applied to the Project.

4.2.9 Water Act, 2016

The Water Act recognizes that water-related functions are a shared responsibility between the national government and the county government. It gives priority to use of abstracted water for domestic purposes over irrigation and other

uses. The WRA is created under the Act, with the primary responsibility of protecting, conserving, controlling and regulating use of water resources in Kenya. WRA is also responsible for formulation and enforcement of standards, procedures and regulation for the management and use of water resources; policy development; planning and issuing of water abstraction permits; and setting and collecting permits and water use fees.

Relevance

All contractors should be advised to apply for permits from the WRA before undertaking abstraction of water (both surface and underground). Effective drainage and sediment control plan should be developed to contain excessive sediments that may be washed into the adjacent streams/ rivers e.g. R Gasioma and R. Mpuone.

4.2.10 Forest Conservation and Management Act, 2016

The is Act of Parliament to give effect to Article 69 of the Constitution with regard to forest resources; to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socioeconomic development of the country and for connected purposes.

Section 42 of this Act provides that all indigenous forests and woodlands shall be managed on a sustainable basis for purposes of - (a) conservation of water, soil and biodiversity; (b) riparian and shoreline protection; (c) cultural use and heritage; (d) recreation and tourism; (e) sustainable production of wood and non-wood products; (f) carbon sequestration and other environmental services; (g) education and research purposes. (h) Habitat for wildlife in terrestrial forests and fisheries in mangrove forests.

Relevance:

Project implementation should be advised to prohibit logging of trees or firewood collection along Upper Imenti Forest.

4.2.11 Wildlife Conservation and Management Act, 2013

This Act governs wildlife conservation and management in Kenya. It aims to create a fair and just relationship between people and wildlife by ensuring that there are opportunities for people to benefit from wildlife without threatening ecosystems and habitats. The law defines roles, responsibilities, offences and penalties for violations. The law is enforced primarily by the KWS, with support from the police and other government agencies.

Relevance:

Kambakia - Kagotone Road is adjacent to Upper Imenti Forest which harbours several species of wildlife. The Project Contractor should liaise with KWS to plan for wildlife protection measures to be applied in the Project.

4.2.12 Sustainable Waste Management Act, 2022

The objective of the Sustainable Waste Management Act are to - promote sustainable waste management; improve the health of all Kenyans by ensuring a clean and healthy environment; reduce air, land, fresh water and marine pollution; promote and ensure the effective delivery of waste services; create an enabling environment for employment in the green economy in waste management, recycling and recovery; establish an environmentally sound infrastructure and system for sustainable waste management; and promote circular economy practices for green growth; mainstream resource efficiency principles in sustainable consumption and production practices; and, inculcate responsible behaviour in waste management.

County Governments are a key component in realizing sustainable waste management given that among the devolved functions waste management has been allocated to the counties. Key functions of County governments include to - (a) ensure that the disposal of waste generated within the County is done within the county's boundaries except where there is an agreed framework for inter-county transportation and disposal of waste; provide central collection centres for materials that can be recycled; establish waste management infrastructure to promote source segregation, collection, reuse, and set up for materials recovery; maintain data on waste management activities and share the information with the Authority (NEMA); mainstream waste management into county planning and budgeting; develop, manage and maintain designated disposal sites and landfills; and to maintain a register of all waste service providers operating within their boundaries.

Relevance

The Project should collaborate with the Meru County Government to ensure timely collection, transportation, and disposal of project-generated waste. Waste should be disposed of at designated waste management sites and be carried out by entities duly licensed by NEMA, in accordance with applicable waste management regulations.

4.2.13 National Museums and Heritage Act, 2006

Section 30 of the Act requires notification of discovery within 7 days, where a person discovers a monument or object of archaeological or paleontological interest indicating the precise site and circumstances of the discovery, to the National Museums.

Relevance

In the event chance archaeological or paleontological finds are encountered during excavation or construction activities, the Proponent will be required to adhere to these requirements.

4.2.14 Mining Act, 2016

The Act requires that mining operations comply with provisions of existing water rights law, occupational health and safety laws, land use laws, and environmental management and protection law. Section 187 provides that operators undertaking prospecting or mining operations should comply with the requirements of the Occupational Safety and Health Act (OSHA), 2007.

Relevance

Any borrow pits and quarries used for the project, whether commercial or new establishment, should be approved by relevant Government Authorities.

4.2.15 Energy Act, 2019

The Act provide the framework for the regulation of energy sector in Kenya. Under Section 92 of the Act, any person intending to construct or operate bulk storage facilities for petroleum products must obtain a license, with strict adherence to prescribed safety, technical, and environmental standards to mitigate risks associated with fuel handling during infrastructure projects such as road construction. Further, under Section 160, the Act requires that electrical installation works be undertaken only by licensed and certified electrical workers or contractors.

Relevance

The contractor will be required to comply fully with the requirement of this act when setting up his camp and accommodation facilities. All the necessary permits and licenses will be obtained from the Energy and Petroleum Regulatory Authority (EPRA) prior to the commencement of bulk fuel storage on site and electrical installations.

4.2.16 Explosives Act Cap 115

The Act regulates the manufacture, storage, possession, transport, sale, and use of explosives within Kenya. Under the Act, Contractors are required to acquire among other things a permit to possess explosives, storage license for onsite magazines and a permit to transport explosives before commencing blasting activities.

Relevance

The project Contractor will be expected to acquire all the necessary permits and licenses for blasting activities in the quarry and or any other site within his jurisdiction including commercial. It is also expected that the project will adhere to the acceptable safety measures in the transport and storage of explosives.

4.2.17 The Occupation Safety and Health Act, 2007

This Act applies to all workplaces and workers associated with it; whether temporary or permanent. The main aim of the Act is to safeguard the safety, health and welfare of workers and any persons visiting the site.

Relevance

It is recommended that all Sections of the Act related to this Project, such as provision of adequate personal protective equipment (PPE), adequate sanitary facilities, clean drinking water, and insurance cover are observed so as to protect all from work-related injuries or other health hazards.

4.2.18 Work Injury Benefit Act, 2007

This Act provides guidelines for compensating employees on work-related injuries and diseases contracted in the course of employment and for connected purposes. It includes the provision of compulsory insurance for employees.

Relevance

All Project Contractor(s) shall be required to comply with WIBA by ensuring that all employees and site workers are covered under a valid work injury insurance scheme prior to engagement in any project-related activities.

4.2.19 Public Health Act Cap. 242

This Act provides for the protection of human health through the prevention and control of infectious diseases from outside Kenya, aiming to promote public health and prevent, limit, or suppress infectious, communicable, or preventable diseases within the country. It offers incentives for a healthy environment and establishes regulations for waste management, pollution, and human health.

Relevance

The Act provides that all waste (liquid and solid Wastes) emanating from the project should be managed in a way not to cause nuisance to the community as well as stagnation of water at borrow pits.

4.2.20 Employment Act, 2007 (Amendment 2022)

This Act outlines employees' fundamental rights, establishes basic employment conditions, and regulates the employment of children. The Act prohibits forced labor, employment discrimination, and sexual harassment.

Relevance

The Project is expected to comply with the provisions of this act and ensure a safe and healthy work environment.

4.2.21 HIV and AIDS Prevention and Control Act, 2006

The purpose of this legislation is to promote public awareness about the causes, modes of transmission, consequences, means of prevention, and control of HIV and AIDS. Additionally, the Act aims to protect the rights of people living with HIV and AIDS. Public awareness should be achieved through education, public campaigns and workplace initiatives. The project-appointed contractors should comply with the law by implementing a regular HIV and AIDS sensitization program at the workplace.

Furthermore, the Act seeks to eliminate and positively address factors that exacerbate the spread of HIV infection, as well as to promote safety and universal measures in practices and processes that carry the risk of HIV transmission.

Relevance

The spread of sexually transmitted infections (STIs) through transport and infrastructure projects is well documented across the world. It is recommended that a qualified technical staff or HIV and AIDS consultant should be hired as part of the Design Supervision team, who can create awareness and sensitization on HIV and other identified health and social issues can be raised and positive behaviour changes among the Project workers and the host communities.

4.2.22 Sexual Offences Act, 2006 (Amendment, 2012)

The Act defines sexual offences and makes provisions for prevention and the protection of all persons from harm from unlawful sexual acts. Types of sexual offences punishable by law includes rape, attempted rape, assault, defilement, gang rape, and indecent act with a child or adult, promotion of sexual offence with children, child trafficking, child sex tourism, and child prostitution, child pornography, and sexual harassment, cultural and religious sexual offences among others.

Relevance

The managers and workers code of conduct should include clauses requiring project workers to adhere to provisions of this law.

4.2.23 The National Gender and Equality Act, 2011

This law established the National Gender Equality Commission (NGEC) as a successor commission to the Kenya National Human Rights and Equality Commission pursuant to Article 59 of the Constitution. NGEC derives its

mandate from Articles 27, 43, and Chapter 15 of the Constitution; and section 8 of NGECA Act (Cap. 15) of 2011, with the objectives of promoting gender equality and freedom from discrimination.

Relevance:

The Project Document specified targets of 30% women employees and 50% youths (Age 18 - 35 years). Gender mainstreaming in the road project will ensure that the concerns of women and men form an integral dimension of the project design, implementation, operation.

4.2.24 Persons with Disability (Amendment) Act, 2019

This Act protects the rights of people with disabilities ensuring they are not marginalized and that they enjoy all the necessities of life without discrimination. The Act guarantees that (1) No person shall deny a person with a disability access to opportunities for suitable employment, and (2) A qualified employee with a disability shall be subject to the same terms and involved conditions of employment and the same compensation, privileges, benefits, fringe benefits, incentives or allowances as qualified able-bodied employees. (3) An employee with a disability shall be entitled to exemption from tax on all income accruing from his employment. A person with disability is entitled to exemptions which apply with respect to exemptions and deductions as described in Schedule 42 subsection (2) of the Act, among other provisions within this act that should be complied with by all parties involved.

Relevance.

This Act will help to reduce the chance of discrimination in employment for persons living with disability in the project

4.3 Regulatory Framework

4.3.1 Environmental (Impact Assessment and Audit) Regulations Legal Notice 101 of 2003 (Amendment, 2019)

Environmental (Impact Assessment and Audit) Regulations Legal Notice 101 of 2003 were developed under section 147 of the EMCA Cap 387 to provide the general guidelines for undertaking ESIA, environmental auditing (EA) and monitoring in Kenya. They apply to all policies, plans, programs, projects and activities specified in Part IV, Part V and the Second Schedule of the EMCA, 1999. The regulations were amended through subsidiary legislation, legal Notice No. 32 of 2019 to classify projects as either “Low Risk”, “Medium Risk” or “High Risk”. The proposed Extension Meru Bypass roads project falls under the ‘High Risk Projects’ category under Section 3 (4) and requires the proponent to prepare and submit an Environmental and Social Impact Assessment study report to NEMA for approval and licensing before commencement of construction activities.

Relevance

This ESIA report has been prepared in compliance with the requirements of the legal notice 101 of 2003. Detailed ESIA study has been conducted after categorization of the project as a high-risk project, impacts identified and appropriate mitigation measures proposed for implementation. During the project implementation stage, environmental monitoring and annual audits should be conducted as per the Regulations.

4.3.2 Environmental Management and Coordination (Water Quality) Regulations, 2024

These Regulations apply to drinking water, water used for industrial purposes, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife, and water used for any other purposes. They provide rules relative to the use and discharge of water for domestic, agricultural and industrial purposes, make provision for the protection of water resources from pollution, and define water quality standards.

Regulation 4 prohibits anyone from engaging in an activity or activities that are likely to cause immediate or subsequent water pollution, directly or indirectly, regardless of whether the water resource was polluted before the enactment of the regulation. Regulation 5 provides that all sources of water for domestic uses should comply with the standards set out in the First Schedule to these Regulations. Regulation 6 covers protection of lakes, rivers, streams, springs, wells and other water sources prohibit anyone from:

- Discharging effluent from sewage treatment works, industry or other point sources into the aquatic environment without a valid effluent discharge license issued in accordance with the provisions of EMCA.

- Abstracting ground water or carrying out any activity that is likely to have any adverse impact on the quantity and quality water, near any lakes, rivers, streams, springs and wells, before obtaining an EIA license from NEMA.
- Cultivating or undertaking any development activity within a minimum of 6 m and a maximum of 30 m from the highest ever recorded flood level, on either side of a river or stream, and as may be determined by the NEMA, from time to time.

According to Regulation 7, NEMA in consultation with the relevant lead agency may impose bans and restrictions and other measures on the use of sources of water for domestic use in order to prevent and control their degradation.

Regulations 11 and 24 prohibit anyone from discharging or applying any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards set out in the Third Schedule of these Regulations. Table 4-1 and Table 4-2 below present NEMA guidelines for discharge of waste into surface water bodies and land respectively.

Table 4-1: Guidelines for Discharge of Waste into Surface Water Bodies

Parameter	Maximum Allowable Limits
Arsenic (Ag) (mg/L)	0.1
Biochemical Oxygen Demand (BOD 5 Days, 20 °C) (mg/L)	30
Cadmium (Cd) (mg/L)	10
Chemical Oxygen Demand (COD) (mg/L)	100
Chromium (Cr) (mg/L)	< 001
Lead (Pb) (mg/L)	< 001
Oil and grease (mg/mL)	0.05
pH (pH scale)	5.0 -9.0
Phenols total (mg/L)	0.05
Sulphide (S) (mg/L)	2,0
Total Suspended Solids (mg/L)	30
Temperature (in °C) based on ambient temperature	± 5
Cyanides (CN) (mg/L)	< 0.2
Nickel (Ni) (mg/L)	< 2.0
Detergents (ABS) (mg/L)	< 5.0
Mercury (Hg) (mg/L)	< 0.01

Total Phosphorous (P) (mg/L)	2
Total Nitrogen (N) (mg/L)	10
Total pesticide residues (µg/L)	0.05

(Source: Water Quality Regulations, 2021)

Table 4-2: Guidelines for Discharge of Waste onto Land (with Impacts on Groundwater)

Parameter	Maximum Allowable Limits
pH	5.5 – 9.0
Boron (mg/L)	2.0
BOD (mg/L)	500
Chloride (mg/L)	600
Total Dissolved Solids (mg/L)	2100
Oil and grease	30
Sulphates (mg/L)	1000
Sodium (as a percentage of total cation concentration)	60

(Source: Water Quality Regulations 2021)

Relevance

The project area has natural surface water resources such as River Gasioma and River Mpuone, which are vital in supporting domestic and agricultural water needs of the people within Meru Municipality. The project shall be required to obtain the necessary approvals from WRA before abstraction of water (both surface and ground) or instream works. In addition, the project is expected to implement proper effluent management practices as well as install soil erosion control measures to protect water resources from sedimentation and pollution

4.3.3 Environmental Management and Coordination (Waste Management) Regulations, 2024 (Legal Notice No. 178)

The Waste Management Regulations are meant to streamline the handling, transportation and disposal of various types of waste. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source. The regulation requires licensing of transporters of waste and operators of disposal site (sections 7 and 10 respectively). Of immediate relevance to proposed development for the purposes of this project report is Part II Sections 4(1-2), 5 and 6. Section 4 (1) states that “No person shall dispose of any waste on a public highway, street, road, recreational area or any other public place except in a designated waste receptacle”. Section 4(2) and 6 explain that the waste generator must collect, segregate (hazardous waste from non-hazardous) and dispose of waste in such a facility that shall be provided by the relevant local authority. Section 5 provides method of cleaner production (so as to minimize waste generation) which includes the improvement of production processes through conserving raw materials and energy. It is recommended that the Proponent shall ensure that:

- A site Construction Waste Management Plan is developed and enforced.

- All hazardous wastes within site should be properly labeled as provided for under section 24 of the regulation.
- A licensed waste handler is contracted to handle all wastes emanating from the project activities.
- Implement cleaner production principles of waste management namely reduce, reuse and recycle.
- Wastes should only be deposited at designated points that are approved by the authority.

Relevance

This legislation assigns responsibilities to various parties in the management of waste within the workplace. It ensures that waste is properly handled from source to final destination. The construction of the Extension of Meru Bypass Roads will generate substantial amount of solid and liquid waste which if not properly managed will negatively impact the immediate environment. This ESIA report has identified the existing and expected waste streams in the project area and proposed appropriate mitigation measures.

4.3.4 Environmental Management Coordination (Noise and Vibration) (Control) Regulations, 2009

These Regulations provide guidelines for acceptable levels of noise and vibration for different environments during the construction and operation phase. Regulation 5 prohibits operating beyond the permissible noise levels. Regulation 6 provides guidelines on the control measures for managing excessive noise. Part III gives directions on provisions on noise related to certain sources, No. 11, 13 and 14 which gives directives on noise from machineries, work at night and construction, demolition, mining or quarrying sites. The Second Schedule of the Regulations provides the maximum permissible level of noise at construction sites as outlined in the Table 4-3 below.

Table 4-3: Maximum Permissible Noise Levels for Construction Sites

Facility		Maximum Noise Level Permitted (Leq) in dB(A) Measured within the facility	
		Day 6.01 am - 6.00 pm (Leq 14h)	Night 6.01 pm - 6.00 am (Leq 14h)
1	Health Facilities, educational facilities, homes for the disabled etc.	60	35
2	Residential	60	35
3	Areas other than those listed in (1) and (2)	75	65

*Leq: equivalent continuous sound level

Source: Noise and Vibration Control Regulations 2009

The Regulations states that a day starts from 6.01 a.m. to 8.00 p.m., while night starts from 8.01 p.m. – 6.00 a.m. Construction sites near the silent zones are allowed maximum noise level of 60 dB (A) during the day, whilst night levels are maintained at 35 dB (A). The time frame for construction sites is adjusted and the day is considered to start at 6.01 a.m. and end at 6.00 p.m., while night duration starts from 6.01 p.m. and ends at 6.00 a.m.

Part III of the Regulations provides guidelines on noise and vibration management from different sources. Sections 11, 12 and 13 outline the guidelines on noise and vibration management from machines, motor vehicles and night - time construction, respectively. Section 15 requires owners of activities likely to generate excessive noise to conduct ESIA and propose abatement measures.

Relevance

The Project shall be required to ensure compliance with the above regulations in order to promote a healthy and safe working environment throughout the construction phase. This should include regular inspection and maintenance of equipment and prohibition of unnecessary hooting of vehicles.

4.3.5 Environmental Management and Coordination (Air Quality) Regulations, 2024

These Regulations cover air quality standards that are requisite to protect human health and allow an adequate margin of safety. They specify priority air pollutants, mobile and stationary sources as well as emission standards. The First Schedule of the regulation provide the ambient air quality tolerance limits (Table 4-4) that should be used to monitor the baseline air quality conditions. The emissions likely to result from road construction activities (such as dust and exhaust emissions from running vehicles and equipment engines) and particulate matter are likely to pollute the immediate environment. Bush clearing, earthworks and bulk delivery of construction material may also result in generation of dust.

Table 4-4: Ambient air quality tolerance limits

No.	Pollutant	Time Weighted Average			
			Industrial area	Residential, Rural and Other area	Controlled areas
1.	Sulphur Dioxide (SO ₂)	Annual Average	80 g/m ³	60 g/m ³	15 g/m ³
		24 hours	125 g/m ³	80 g/m ³	30 g/m ³
		Annual Average		0.019ppm/50g/ m ³	
		Month Average			
		24 Hours		0.048ppm/125g/ m ³	
		One Hour			
		Instant Peak		500 g/m ³	
		Instant Peak (10 min)		0.191 ppm	
2.	Oxides of Nitrogen (NO _x)	Annual Average	80 g/m ³	60 g/m ³	15 g/m ³
		24 hours	150 g/m ³	80 g/m ³	30 g/m ³
		8 hours			
		Annual Average		0.2 ppm	
		Month Average		0.5 ppm	
		24 Hours		0.4 ppm	
		One Hour		0.8 ppm	

No.	Pollutant	Time Weighted Average			
		Instant Peak		1.4 ppm	
3.	Nitrogen Dioxide	Annual Average	150 g/m ³	0.05 ppm	
		Month Average		0.08 ppm	
		24 Hours	100 g/m ³	0.1 ppm	
		One Hour		0.2 ppm	
		Instant Peak		0.5 ppm	
4.	Suspended particulate matter (SPM)	Annual Average	360 g/m ³	140 g/m ³	70 g/m ³
		24 hours	500 g/m ³	200 g/m ³	100 g/m ³
			Industrial area	Residential, Rural and Other area	Controlled areas
		mg/Kg			
		Pollutant	Time weighted Average		
		Annual Average		100 g/m ³	
		24 hours		180 g/m ³	
5.	Respirable particulate matter (<10m) (RPM)	Annual Average	70 g/m ³	50 g/m ³	50 g/m ³
		24 hours	150 g/Nm ³	100 g/Nm ³	75 g/Nm ³
6.	PM2.5	Annual Average	35 g/m ³		
		24 hours	75 g/m ³		
7.	Lead (Pb)	Annual Average	1.0 g/Nm ³	0.75 g/Nm ³	0.50 g/m ³
		24 hours	1.5 g/m ³	1.00 g/m ³	0.75 g/m ³
		Month Average		2.5	
8.	Carbon monoxide (CO)/ carbon dioxide (CO ₂)	8 hours	5.0 mg/m ³	2.0 mg/m ³	1.0 mg/m ³

No.	Pollutant	Time Weighted Average			
		1 hour	10.0 mg/m ³	4.0 mg/m ³	2.0 mg/m ³
		mg/Kg			
		24 hours			
9.	Hydrogen Sulphide	24 hours	150g/m ³		
10.	Nonmethane hydrocarbons				
		instant Peak	700ppb		
11.	Total VOC	24 hours	600ppb		
12.	Ozone	1-Hour	200 g/m ³	0.12 ppm	
		8 hours (instant Peak)	120 g/m ³	1.25 ppm	
13.	Odour				

Relevance

The project implementation will be expected to carry out regular air quality monitoring to prevent possible air pollutants and managing sources at site as is provided for in the ESMMP.

4.3.6 Environmental Management and Coordination (Controlled Substances) Regulations, 2007

These Regulations controls the production, and consumption, as well as exports and imports of controlled substances. Products containing controlled substances include: air conditioners, air coolers, refrigerants, portable fire extinguishers, heat pump equipment, dehumidifiers, insulation boards, panels and pipe covers, pre-polymers etc.

Relevance

It is recommended that these Regulations be observed so as to ensure that material inputs such as chemicals containing such components are not imported for Project use.

4.3.7 Water (Resources) Regulations, 2025

These regulations provide for among other things, a) regulation of water resources and water use activities and (b) registration of water sector professionals. Section 9 (1) of the regulation requires that a water use permit be obtained from the authority for all water use activities listed in First Schedule. Under section 10, the law provides that: Where the activity for which the water is intended to be used is temporary in nature, an applicant may apply for a temporary water use permit for a period of one year or such longer period, not exceeding two years as the Authority may consider appropriate, considering the nature of the activity.

Relevance

The Contractor will be required to acquire water use permits for all the water abstraction points. He will also be required to acquire river diversion permits from the authority for all the instream works.

4.3.8 The Sustainable Waste Management (Extended Producer Responsibility) Regulations, 2024

The regulation seeks to operationalize the polluter pays principle, extend the responsibility of a producer over a product and to provide a framework for mandatory extended producer responsibility schemes. Section 5 of the law spells out the obligations of producers to among other things:

- establish a take back scheme which may include a deposit refund system.
- set up and register an individual or a collective extended producer responsibility compliance scheme; and
- put in place circular economy initiatives and any other measures to reduce impact of their product on health and environment.

The First Schedule of the regulation provide a list of products and packaging that are subject to extended producer responsibility compliance scheme

4.4 Administrative and Institutional Framework

This section describes the roles and responsibilities of the key institutions and players and their relationship with respect to environmental and social roles in this Project as relates to risks assessment, management.

4.4.1 Kenya National Highways Authority (KeNHA)

The Kenya National Highways Authority (KeNHA) is a statutory body established under the Kenya Roads Act of 2007 to manage and maintain national trunk roads across Kenya.

Relevance

KeNHA is the overall HOAGDP contract manager though the implementing agency is KURA

4.4.2 Kenya Urban Roads Authority (KURA)

KURA is a statutory body established by the Kenya Roads Act, 2007 responsible for managing, developing, rehabilitating and maintaining national trunk roads in urban areas in the country.

Relevance

KURA will be the beneficial road agency that will be responsible for the road maintenance post construction

4.4.3 EMCA Institutions

4.4.3.1 National Environment Management Authority (NEMA)

The Authority is established under Section 7 of EMCA (Cap 387) to be the principal agency of Government charged with the overall supervision and co-ordination over all matters relating to the environment as well as implementation of all policies relating to the environment. NEMA has a mandate to implement EMCA and to coordinate overall matters relating to environmental protection with other government agencies.

The principal role of NEMA in this project will be to review this ESIA report and issue a license (EIA) for the project. During the implementation of the project (construction and operation phase), NEMA will supervise and monitor the Project to ensure that the mitigation measures as specified in the ESIA are being followed and adhered to. The Authority will issue improvement orders to contractors in the event that non-compliance to the ESMMP is observed. During operations phase, NEMA will review Environmental Audit reports of the Project Road as required by the environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019.

Relevance

NEMA will be responsible for the review and licensing of the ESIA report in compliance to EMCA and its subsidiary regulations.

4.4.3.2 The National Environment Council

The National Environment Council (NEC) is established under Section 4 of EMCA. NEC which is chaired by the Minister in charge of the environment, is the highest policy making body under EMCA (Cap 387). NEC is responsible for policy formulation and directions for purposes of EMCA.

4.4.3.3 National Environmental Tribunal

This tribunal is established under Section 125 of the EMCA (Cap 387) for the purpose of hearing appeals from administrative decisions by organs responsible for enforcement of environmental standards. An appeal may be lodged by a project proponent upon denial of an EIA license or by a local community upon the grant of an EIA license to a project proponent. NEMA may also refer to any matter that involves a point of law or is of unusual importance or complexity to NET for direction.

Relevance

The National Environmental Tribunal may be involved in case of any issue that may arise either from the licensing condition or community grievance based on the project operations

4.4.4 The County Government of Meru

Development approvals should be obtained from the County Government of Meru. The County Environment Committee contributes to decentralization of activities undertaken by NEMA and thus enables local communities to have access to environmental management information.

Relevance

During construction, the contractor will have to acquire development permits from the County Government of Meru for contractor's site.

4.4.5 Water Resource Authority

This Authority is established under Section 11 of the Water Act, 2016. It is mandated to safeguard the right to clean water by ensuring that there is proper regulation of the management and use of water resources in Kenya, in order to ensure sufficient water for everyone- now and in the future.

Relevance

WRA will be responsible for issuing water abstraction permits and maintain the hygiene of the all the natural water resources within their administrative jurisdiction.

4.4.6 Kenya Wildlife Service

The Kenya Wildlife Service (KWS) is a state corporation that was established by the Wildlife Conservation and Management Act (WCMA), 2013, with the mandate to conserve and manage wildlife in Kenya, and to enforce related laws and regulations. The project area of influence particularly Upper Imenti Forest which is bordered by the Kambakia-Kagotone/KEMU C91 Road is a habitat for wildlife, therefore, project implementation is expected to avoid and liaise with KWS whenever wildlife is affected.

Relevance

During construction, the project implementation team will be expected to regularly liaise with KWS to help in safe relocation of the electric fence along the Kambakia-Kagotone/KEMU C91.

4.4.7 Directorate of Occupational Safety and Health Services

The State Department of Labour and Skills Development carries out health and safety services through the DOSHS. These services are carried out to ensure that every workplace is free of any hazards and complies to laid down standards to assure safety of employees. Some of these services include but are not limited to registration of workplaces, registration of plant, registration of approved persons and institutions, workplace inspection and audits, examination and testing of plants, accident investigation and processing of WIBA claims.

Relevance

The Directorate of Occupational Safety and Health Services (DOSHS) shall be responsible for registering workplaces, particularly contractor campsites and associated facilities. In addition, DOSHS will play a key role in handling work-related accidents and incidents, as well as in processing claims under the Workers Injury Benefits Act (WIBA). DOSHS will be responsible for registering workplaces particularly the contractor's campsite and other associated facilities. The directorate will also play a key role in handling work-related accidents and incidents as well as in processing claims under the the Workers Injury Benefits Act (WIBA).

4.4.8 National Museums of Kenya

The National Museums of Kenya (NMK) is a multi-disciplinary institution whose role include being a repository for things that are of scientific, cultural and human value; research and document natural and cultural heritage; promoting sustainable utilization of Kenya's heritage for development and information dissemination. During the construction phase, NMK will be involved in the project by providing guidance in the event that Chance Finds are encountered.

Relevance

In the event of a chance discovery of artifacts with potential archaeological or historical significance, the National Museums of Kenya (NMK) shall assume responsibility for their management and protection, in accordance with applicable laws and regulations

4.5 Permits and Licenses Required Prior to Commencement of the Project

Table 4-5 provides key environmental and social permits and licenses required by the Project.

Table 4-5: Permit and License Requirements

Project Phase	Legislation	Authority	Permits /Licenses	Comments
Construction	EMCA, 1999 (Amendment 2015) Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019.	NEMA	EIA Licenses for road and bridge construction project, borehole drilling (if any), contractor's camp and construction material sources (borrow pits).	This ESIA report has been prepared to enable processing of an EIA license.
	EMCA (Waste Management) Regulations, 2006.	NEMA	Waster handlers License (for transportation and disposal).	All waste handlers contracted by the Project should have valid waste handlers license from NEMA.
	Water Act, 2016 Water (Resources) Regulations, 2025 EMCA (Cap 387).	WRA NEMA	Water Abstraction Permit. Effluent Discharge Permit / Effluent Discharge License.	To be obtained after making a final decision on the preferred source of water.
	Land Act, 2012 Land Laws (Amendment) 2016	NLC	Title deeds.	Amendments to title deeds of properties if required.
	Physical Planning and Land Use Act, 2019	Meru County Government .	Development approval.	Prior to construction.
	OSHA 2007 and subsidiary legislations	DOSHS	Workplace Registration.	Prior to construction.

Project Phase	Legislation	Authority	Permits /Licenses	Comments
	Mining Act 2016	State Department of Mining	Mining license	Prior to construction
	Explosive Act Cap 115	State Department of Mining	Blasting permit	Prior to construction
Operation	EMCA (Cap 387) EIA/EA (Amendment) Regulations 2019.	NEMA	Environmental Audit.	Annually or at times determined by NEMA.

(Source: Consultant)

4.6 Financier Requirements

4.6.1 World Bank Operational Policies

The World Bank's OPs which are triggered by the project are as discussed in the Table 4-6 below.

Table 4-6: World Bank OPs Triggered by The Project

Environmental and Social Standards	Objectives	Relevance to the Project
<i>OP 4.01 - Environmental Assessment underscores the importance of environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable thereby improving decision making.</i>	To identify and assess social and environmental impacts, both adverse and beneficial, in the project's area of influence. To avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment. To ensure that affected communities are appropriately engaged on issues that could potentially affect them. To promote improved environment and social performance of projects through the effective use of management system.	The proposed project will be associated with a number of environmental and social impacts which will need to be appropriately managed.
<i>OP 4.11 Physical Cultural Resources It emphasizes the protection of physical cultural resources through identification of project's potential impacts on these resources at the earliest possible stage of the project</i>	To identify presence of any physical cultural resources through consultations and field observations. To manage, conserve and protect any physical cultural resources within the project environment.	This policy will enhance protection of any physical cultural resources that will be identified within project roads and its environment.

Environmental and Social Standards	Objectives	Relevance to the Project
<i>planning cycle to enhance their protection</i>		
OP 4.12 Involuntary Resettlement <i>It requires the borrower to avoid involuntary resettlement and, when it is not feasible to avoid such resettlement, to minimize the scale and impacts of resettlement</i>	To assess the nature and magnitude of the likely displacement. To explore all viable alternative project designs to avoid, where feasible, or minimize displacement. To assess the legal framework covering resettlement and the policies of the government and implementing agencies (identifying any inconsistencies between such policies and the Bank's policy). To review past borrowers and likely implementing agencies' experience with similar operations. To discuss with the agencies responsible for resettlement policies and institutional, legal, and consultative arrangements for resettlement, including measures to address any inconsistencies between government or implementing agency policies and Bank policy. To discuss any technical assistance to be provided to the borrower.	Three Steers-Kambakia, Hospital – Kiramburine Road, Runogone – Kaithe and the Gikumene Junction – Mate Road have been heavily encroached by settlements and businesses. This policy will therefore guide the resettlement that will be required along these sections.
OP 4.36 Forestry <i>Requires management, conservation, and sustainable development of forest ecosystems and their associated resources to ensure long lasting poverty reduction and sustainable development, whether located in countries with abundant forests or in those with depleted or naturally limited forest resources.</i>	To integrate forests effectively into sustainable economic development and protect the vital local and global environmental services and values of forests. To manage, conserve and sustainable use of forest resources. To restore forest through tree planting to meet growing demand of forest goods and services.	This policy will ensure protection of forest ecosystem that are close to Kambakia-Kagotone Road.
OP 4.04 Natural Habitats <i>Recognizes the importance of protecting, maintaining, and rehabilitating natural habitats and their functions in its economic and sector work, project financing, and policy</i>	To protect, manage and conserve natural habitats. To promote sustainable management and use of natural resources through the adoption of practices that integrate	Meru bypass roads are within semi-built, fairly built and forested environment. It is important that reference be made to this standard when designing mitigation measures

Environmental and Social Standards	Objectives	Relevance to the Project
<i>dialogue. Therefore, a precautionary approach to natural resource management should be adopted by the borrower to ensure opportunities for environmentally sustainable development.</i>	conservation needs and development priorities.	such as those for the appropriate management of invasive plant species.

(Source : <https://www.worldbank.org/en/projects-operations/environmental-and-social-policies>)

4.6.2 World Bank Group Environmental, Health, and Safety Guidelines

The World Bank Environmental, Health and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). These Guidelines contain the performance levels and measures that are normally acceptable to the World Bank Group, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology.

General EHS Guidelines

The General EHS Guidelines contain information on cross-cutting environmental, health, and safety issues potentially applicable to all industry sectors (Table 4-7).

Table 4-7: Organization of the General EHS Guidelines

SR No.	Topic	Components / Subtopics
1	Environmental	Air emissions and ambient air quality; Energy conservation; Wastewater and ambient water quality; Water conservation; Hazardous materials management; Noise; Contaminated land.
2	Occupational health and safety	General facility design and operation; Communication and training; Physical hazards; Chemical hazards; Biological hazards; Radiological hazards; PPE; Special hazards environment; Monitoring.
3	Community health and safety	Water quality and availability; Structural safety of project infrastructure; Life and fire safety; Traffic safety; Transport of hazardous material; Disease prevention; Emergency preparedness and response.
4	Construction and decommissioning	Environment; Occupational health and safety; Community health and safety.

(Source: <https://documents1.worldbank.org/curated/en/157871484635724258/pdf/112110-WP-Final-General-EHS-Guidelines.pdf>)

The EHS General Guidelines should be used together with the relevant industry sector guidelines, which are highlighted below.

- *EHS Guidelines for Toll Roads*, which include information relevant to construction, operation and maintenance of large, sealed road projects, including associated bridges and over passes.
- *EHS Guidelines for Construction Materials Extraction*, which cover issues associated with sourcing of construction materials; and
- *EHS Guidelines for Retail Petroleum*, which related to vehicle service areas.

4.7 International Conventions and Treaties

Kenya is a signatory to the international agreement and treaties listed below, which are relevant to this Project.

4.7.1 United Nations Framework Convention on Climate Change, 1994

The UNFCCC provides a global framework for addressing climate change by stabilizing greenhouse gas concentrations in the atmosphere to prevent harmful anthropogenic interference with the climate system. It establishes a foundation for international cooperation on climate mitigation, adaptation, and capacity building. The Convention was adopted on 9th May 1992 and entered into force on 21st March 1994. Kenya ratified the Convention on 30th August 1994, with NEMA being designated as the national focal point for its implementation.

Relevance

This convention will ensure integration of climate change aspects into the project thereby enhancing the Extension of Meru Bypass roads sustainability for a longer period through withstanding extreme temperatures and rainfall changes.

4.7.2 United Nations Convention on Biological Diversity, 1992

The purpose of this convention is to ensure the conservation and sustainable use of biodiversity. Kenya signed the convention on 5th of June, 1992 and ratified it on 26th July 1992. NEMA is the national focal point to this Convention. The provisions of this Convention have been integrated in many laws of Kenya.

Relevance

Kambakia-Kagotone/KEMU C91 Road is adjacent to Upper Imenti Forest; this convention will ensure protection of flora and fauna which maybe within this road reserve.

4.7.3 The 1985 Vienna Convention for the Protection of the Ozone Layer

The Vienna Convention for the Protection of the Ozone Layer, 1985 was adopted after consensus was reached on 22 March 1985. Kenya ratified the convention on November 9, 1988. Main objective of the Vienna Convention is to protect human health and the environment against the effects of ozone depletion. The convention establishes a general obligation upon the parties to protect the ozone layer (article 2) and emphasizes the need for international cooperation.

Relevance

KURA and the contractor will be required to observe the above convention in all its operations throughout the project cycle in reducing emission of Greenhouse Gasses which could cause ozone depletion.

4.7.4 The Paris Agreement, 2015

The Paris Agreement was an agreement within the United Nations Framework Convention on Climate Change (UNFCCC), dealing with greenhouse-gas-emissions mitigation was adopted on 12 December 2015 and entered into force on 4 November 2016 requiring required both developing and developed nations to reduce their greenhouse emissions (Carbon dioxide, Methane, Nitrous oxide, Hydro chlorocarbons, Perfluorocarbons and Sulphur hexafluoride) to fight against rising global temperatures. Kenya is a signatory to the agreement (April 2016) and submitted its Updated Nationally Determined Contribution (NDC) in December 2020 committing to abate Green House Gases (GHGs) by 32% by 2030.

Relevance

The project will be required to carry out regular inspection and maintenance of construction equipment in order to reduce the levels of GHGs emissions into the atmosphere.

4.7.5 Convention on the Rights of the Child, 1989

This Convention acknowledges children as individuals with rights and responsibilities according to their age and development (rather than the property of their parents or as victims), as well as members of a family and community. Underlying the Convention are four main principles: non-discrimination, the best interests of the child, the right to life, survival and development and the right to participation. It is the most widely ratified international human rights treaty.

Relevance

This convention will ensure children living within the project area are protected against any form of violence or discrimination by project workers during project implementation phase.

4.7.6 Convention on the Elimination of all forms of Discrimination against Women (CEDAW), 1979

The Convention on the Elimination of all forms of Discrimination against Women (CEDAW) places explicit obligations on states to protect women and girls from sexual exploitation and abuse. Universal Declaration of Human Rights (Article 7), the UN Charter (Articles 1, 13, 55, and 76) and the International Covenant on Civil and Political Rights (Article 24) reaffirm the freedoms and rights of all children, including internally displaced children. It provides the basis for realizing equality between women and men by safeguarding women's equal access to, and equal opportunities in, political and public life including the right to vote and to stand for election as well as education, health and employment.

Relevance

This convention will ensure inclusion and participation of women in all project implementation from public participation, stakeholder engagements and employment opportunities.

4.7.7 Convention Concerning the Protection of World Cultural and Natural Heritage, 1972

The Convention requires parties to adopt effective measures that include the assessment of the feasible project alternatives to prevent, minimize or compensate for adverse impacts. It also provides for the assessment of the nature and extent of potential impacts on natural heritage resources, and the designing and implementing of mitigation plans. It also protects threatened plants.

Under this convention, the following are considered cultural heritage; monuments with architectural works, monumental sculptures/paintings, structures that are archaeological in nature, inscriptions, cave dwellings and combinations of features e.g. art or science; groups of buildings which because of their architecture, homogeneity or their place in the landscape, are of historical, sites which include works of man or the combined works of nature and man, and areas including archaeological sites which historical, aesthetic, ethnological or anthropological point of view.

The convention also includes natural features consisting of physical and biological formations or groups of such formations, which are of historical value from the aesthetic or scientific point of view; geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation and natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty.

Relevance

This convention will ensure the protection of all cultural and heritage significant artifacts, monuments, and trees that the project may interfere with.

5 ENVIRONMENTAL AND SOCIAL BASELINE

5.1 Biophysical Environment

5.1.1 Climate

5.1.1.1 Temperature and Precipitation

The climate of Meru town is influenced by its close proximity to Mount Kenya on the southwest rising to 5,199 m above sea level (asl) and the Nyambene ranges to the northeast. Due to its proximity to these land masses, rainfall in the project area is largely orographic in nature. The seasonality in rainfall is influenced by the inter-tropical convergence zone owing to the project area's proximity to the equator². The area exhibits a bimodal rainfall pattern characterized by two distinct long and short rainy seasons. The area receives an average annual rainfall of about 1,500 mm with the long rains occurring from March to May while the short rains fall between October and December. In the months of March and September, the sun is directly over the equator in Meru town. This in effect results in warming up of the air mass near the earth's surface which expands and rises thereby creating an area of low pressure. Consequently, the northeast and southeast trade winds converge in the low-pressure area leading to high precipitation as illustrated in Figure 5-1 below.

Temperatures range from a minimum of 12°C in July to a maximum of about 30°C in March, with an average mean temperature of 21°C. July typically marks the coldest month, with a mean daily minimum temperature of 15°C.

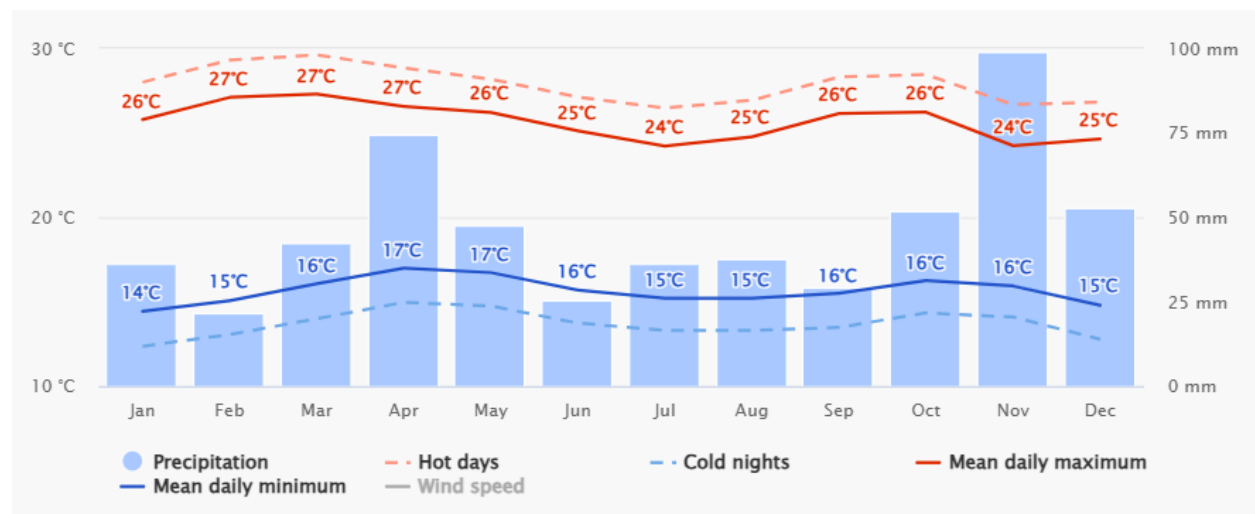


Figure 5-1: Mean temperature and precipitation

Source: https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/meru_kenya_186827

5.1.1.2 Humidity

Meru town has high Relative Humidity with an annual average of 77%. November is the most humid while February and March are the least humid as shown in Figure 5-2 below.

² Oduor O. Ngetich K. *et al.* 2020. Suitability of different data sources in rainfall pattern characterization in the tropical central highlands of Kenya Heliyon, Volume 6, Issue 10 <https://www.sciencedirect.com/science/article/pii/S2405844020322180>

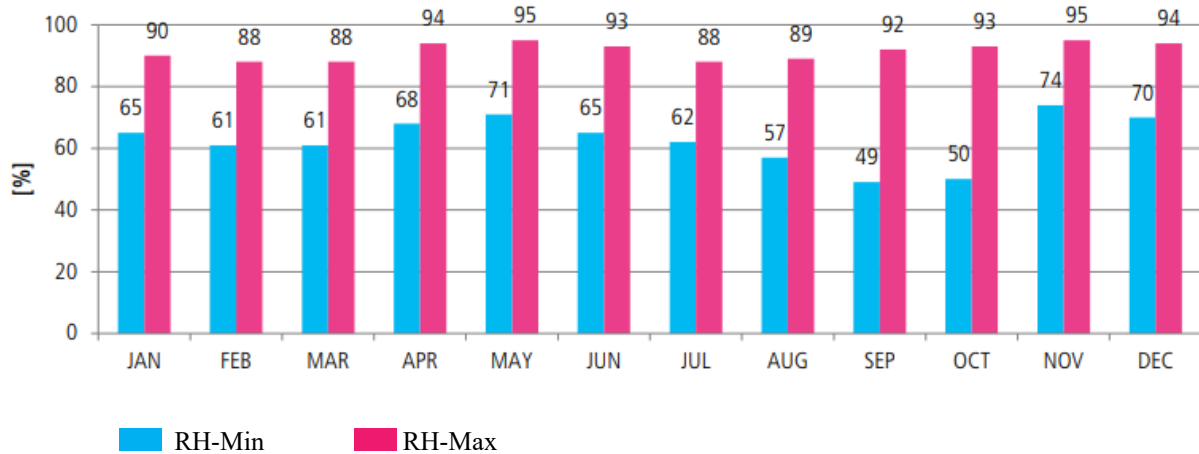


Figure 5-2: Mean monthly Relative Humidity
Source: UN-Habitat 2016³

5.1.1.3 Wind Speed and Direction

The horizontal and vertical wind flow patterns in the Mount Kenya region is influenced by its unique topography and varying nature of surfaces⁴ Meru County receives top wind speeds of between 10-20km/h for 327 days within a year. The strongest winds occurs between December and April, while calm winds occur between June and October (Figure 5-3).

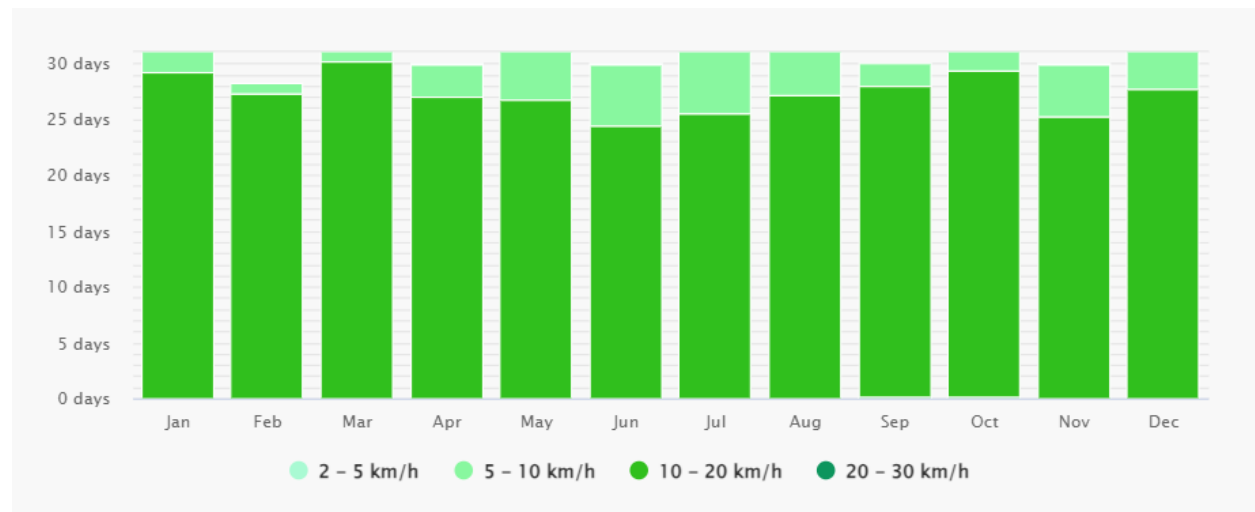


Figure 5-3: Mean wind speeds
Source: https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/meru_kenya_186827

³ Ngungui, J. (2016). East Africa Climate Data and Guidelines for Bioclimatic Architectural Design (S. Ball, Ed.; p. 84) [Review of East Africa Climate Data and Guidelines for Bioclimatic Architectural Design]. United Nations Human Settlements Programme (UN-Habitat). https://unhabitat.org/sites/default/files/2020/06/gh050e_compressed.pdf

⁴ Oludhe C. 2007. Assessment and utilization of Wind Power in Kenya – Review; J.Kenya Meteorol. Soc

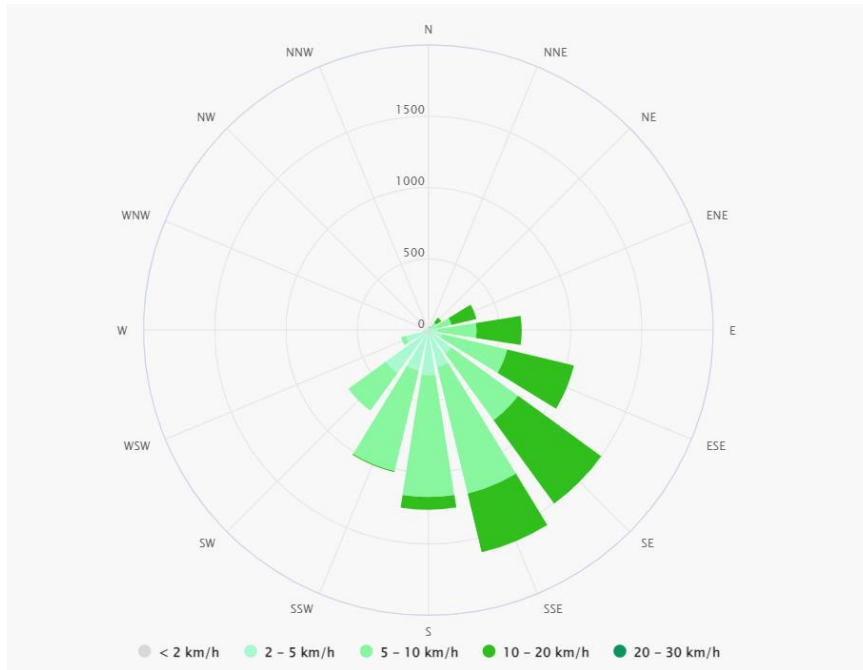


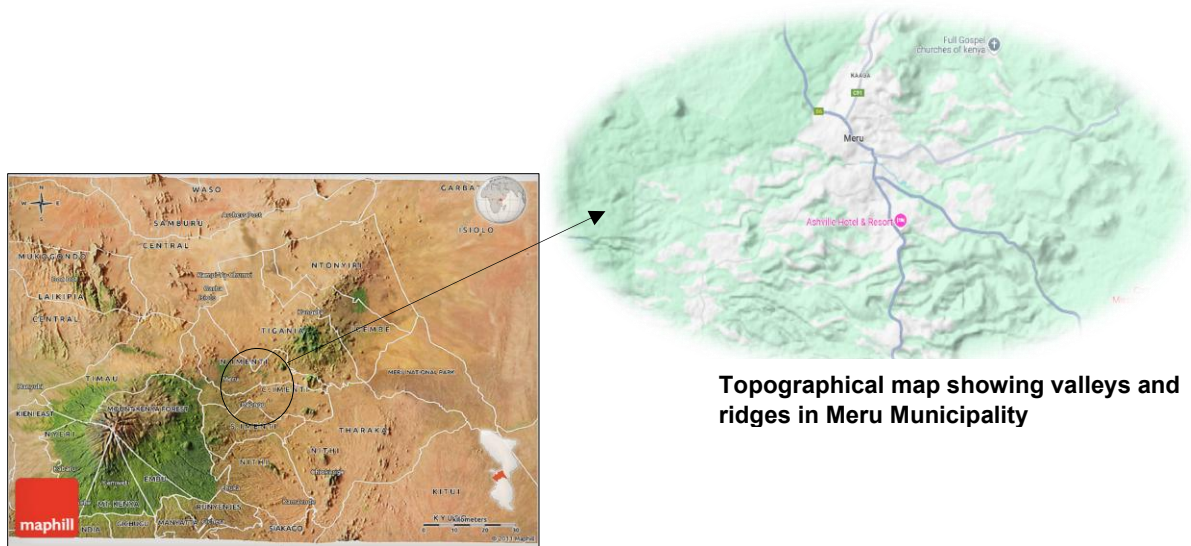
Figure 5-4: Wind direction

Source: https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/meru_kenya_186827

The predominant wind direction in Meru is from Southeast to Northwest as illustrated in Figure 5-4 above. Wind direction and speed in Meru town is as a result of the atmospheric pressure differences caused by the inter-tropical convergence zone at the equator.

5.1.2 Topography

The topography of Meru attests to the volcanic nature of both Mt. Kenya and the Nyambene ranges. Lying on the eastern slopes of Mount Kenya, the project area has a striking diversity of physical landscape comprising of valleys and ridges.



Topographical map showing valleys and ridges in Meru Municipality

Figure 5-5: Topographical Map of Meru and surrounding areas

Source: <http://www.maphill.com/kenya/eastern/meru/location-maps/satellite-map/>

Based on Food and Agriculture Organization of the United Nations (FAO) slope gradient classification (Table 5-1), the general terrain of Meru can be described as gently sloping to sloping with an average slope of between 4.1 – 7.4% as illustrated in Figure 5-6 below.

Table 5-1: Slope Gradient Classes

SLOPE GRADIENT CLASSES		
Class	Description	Percentage
1.	Flat	0-0.2
2.	Level	0.2-0.5
3.	Near Level	0.5-1.0
4.	Very Gently Sloping	1.0-2.0
5.	Gently sloping	2-5
6.	Sloping	5-10
7.	Strongly Sloping	10-15
8.	Moderately steep	15-30
9.	Steep	30-60
10.	Very Steep	>60

Source: FAO 2006

The general terrain of the project area can be described as sloping from the southwest to the east-southeast direction as illustrated by Figure 5-6 below.

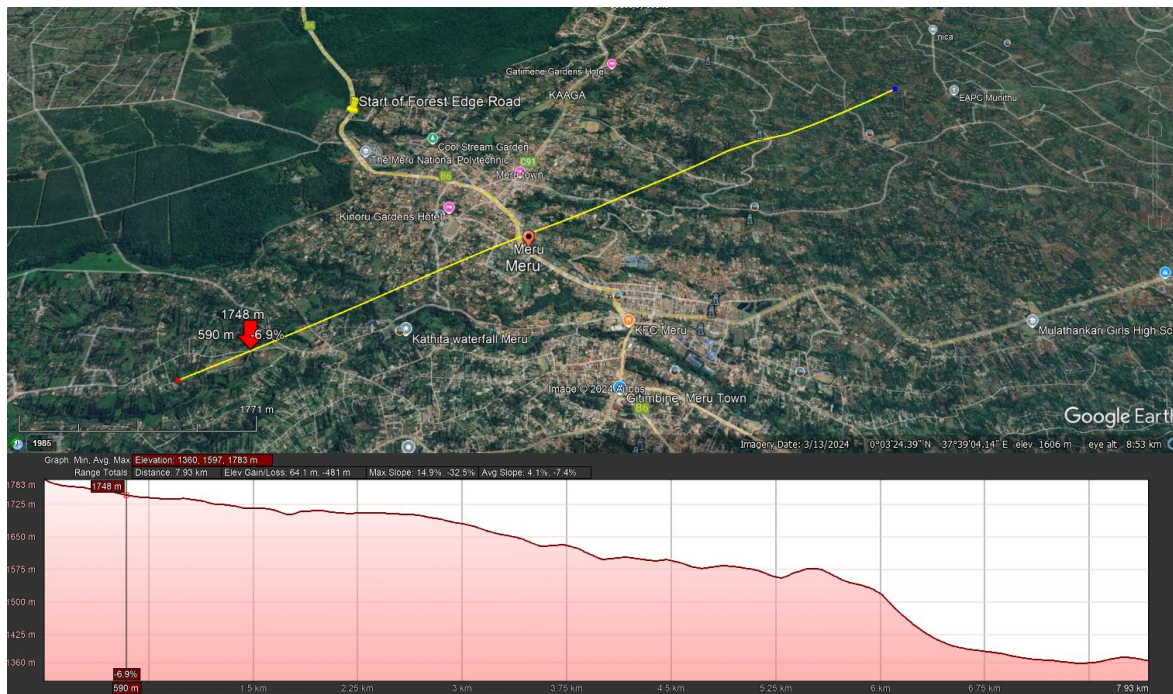


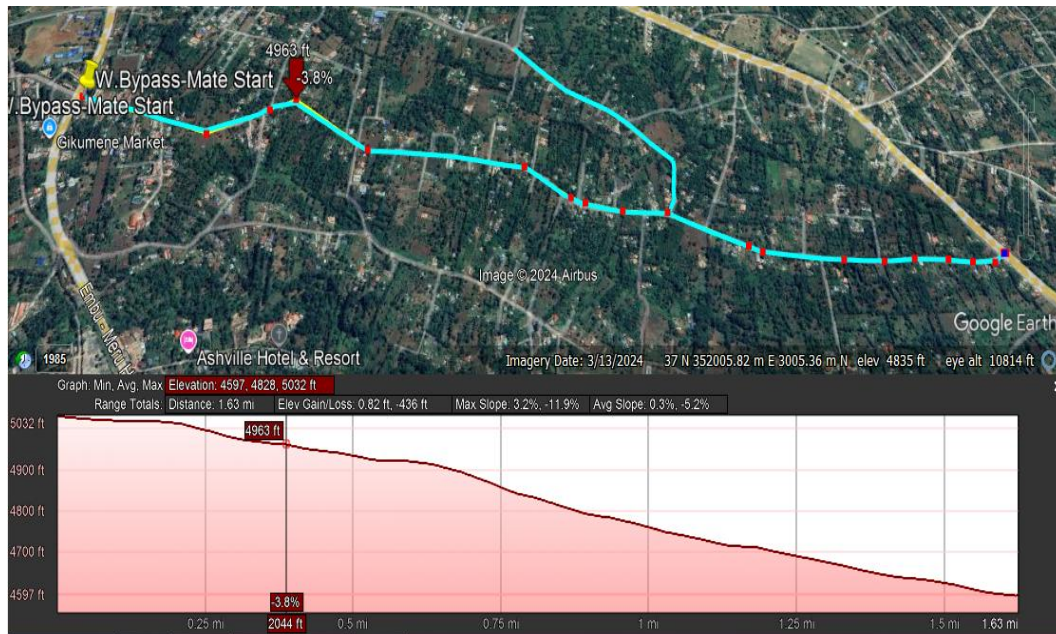
Figure 5-6: General Terrain of the project area

Source: Google Earth

Based on the classes provided in Table 5-1 above, the general terrain of the project roads are as follows:

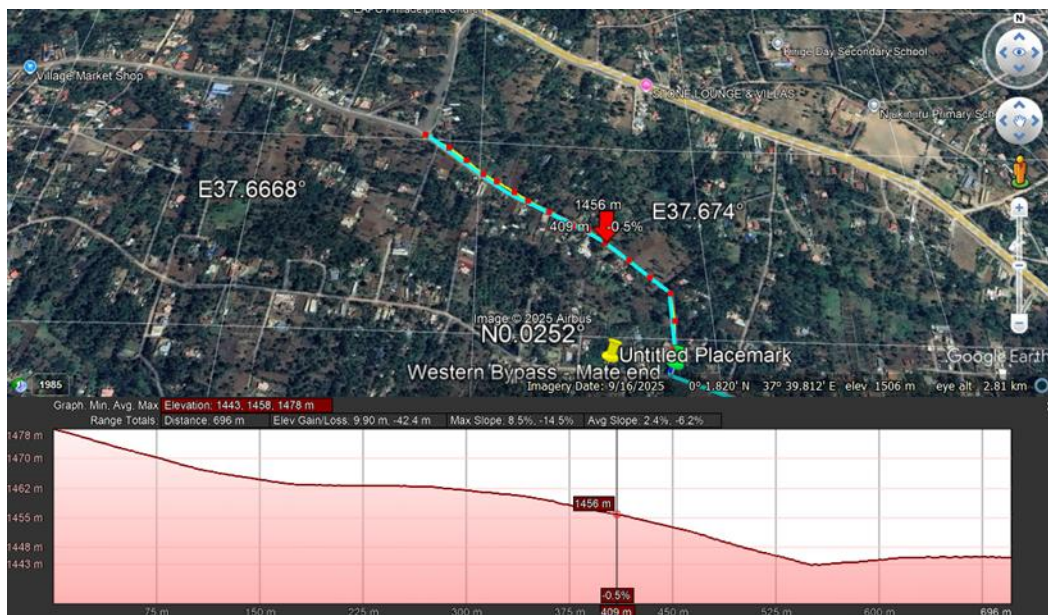
Western Bypass- Mate Road

The road has an average slope of between 0.3 – 5.2% which is categorized as sloping.



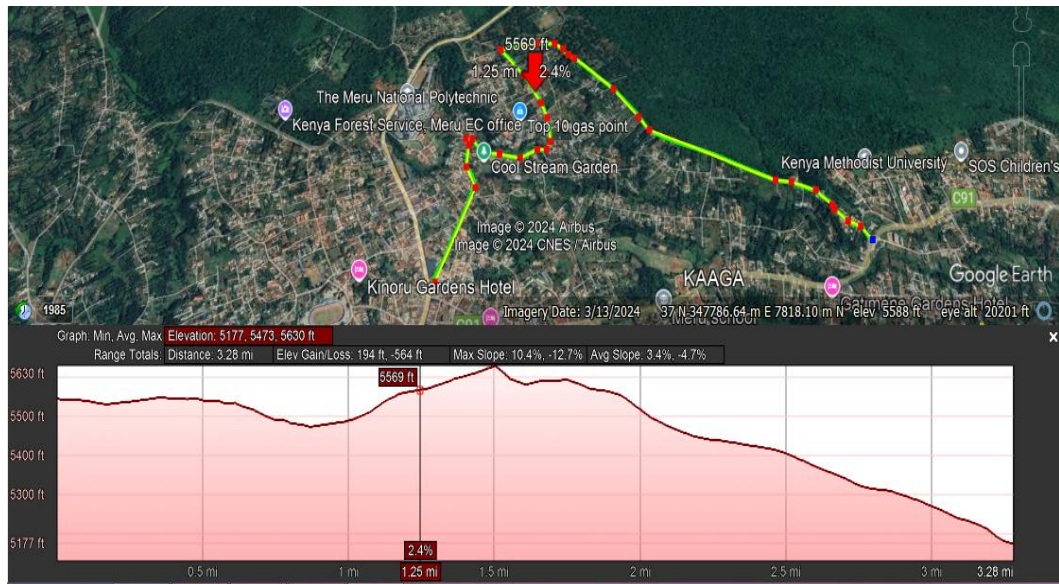
Western Bypass- Link Road

The road has an average slope of between 2.4% – 6.2% which is categorized as sloping.



3-Steers -KEMU Road

The road has an average slope of between 3.4 – 4.7% which is gently sloping



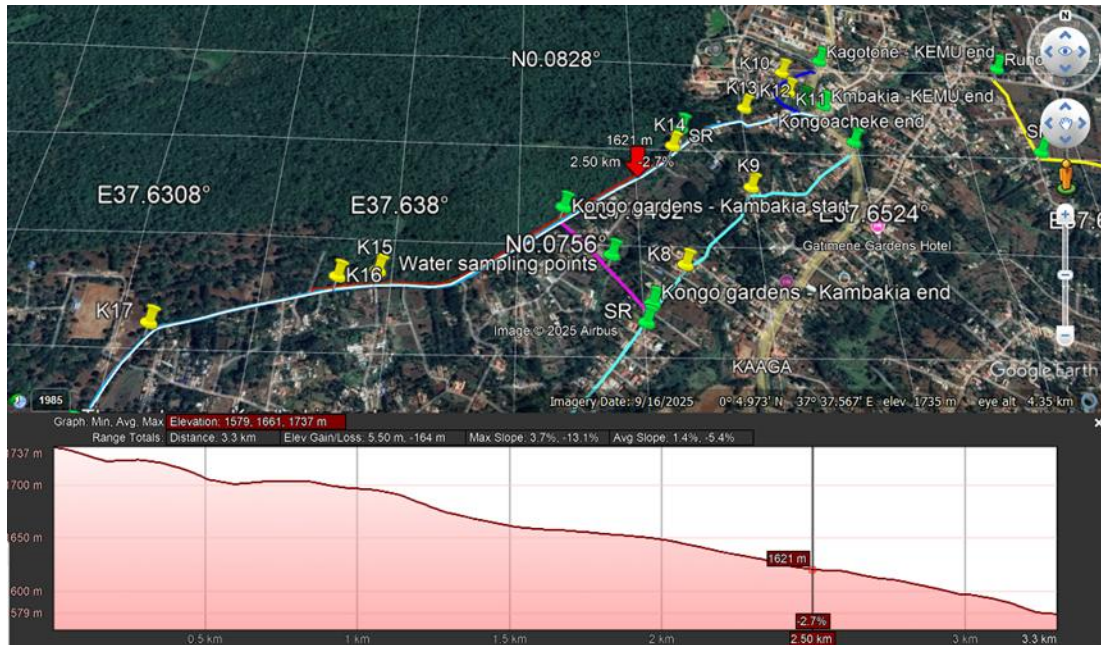
Kongoacheke JCT - Kwa Mukuru JCT Road

The road has an average slope of between 1.2% – 3.8% which is gently sloping



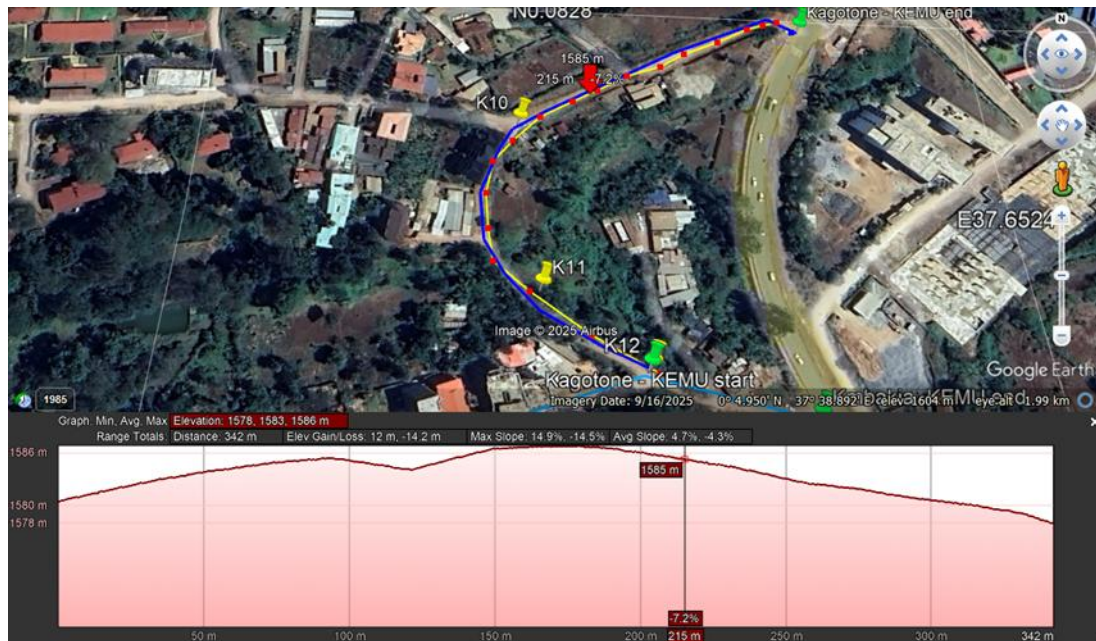
Kambakia- Kagotone/KEMU C91 Road

The road has an average slope of between 1.4% – 5.4% which is gently sloping



Kagotone KEMU C91 Road

The road has an average slope of between 4.7% – 4.3% which is sloping



Kongo Gardens- Kambakia JCT

The road has an average slope of between 3.1%– 3.6% which is gently sloping



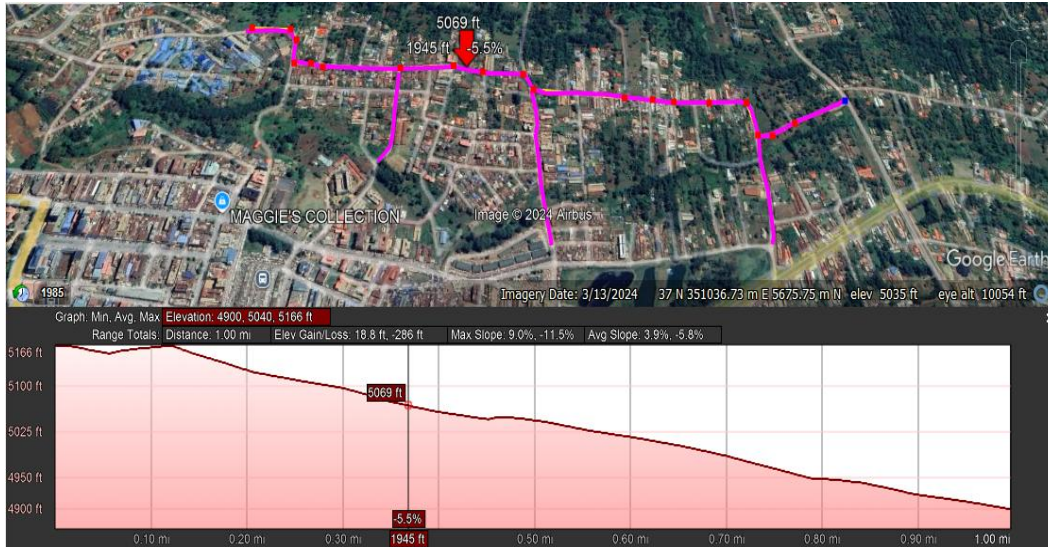
Runogone –Kaithe Road

The road has an average slope of between 0.6 – 6.4% which is gently sloping.



Eastern Bypass - Hospital Road

The road has an average slope of between 0.6 – 6.4% which is gently sloping.



Link 1 - Meru Bus Terminus Road

The road has an average slope of between 4.6% – 6.2% which is sloping.



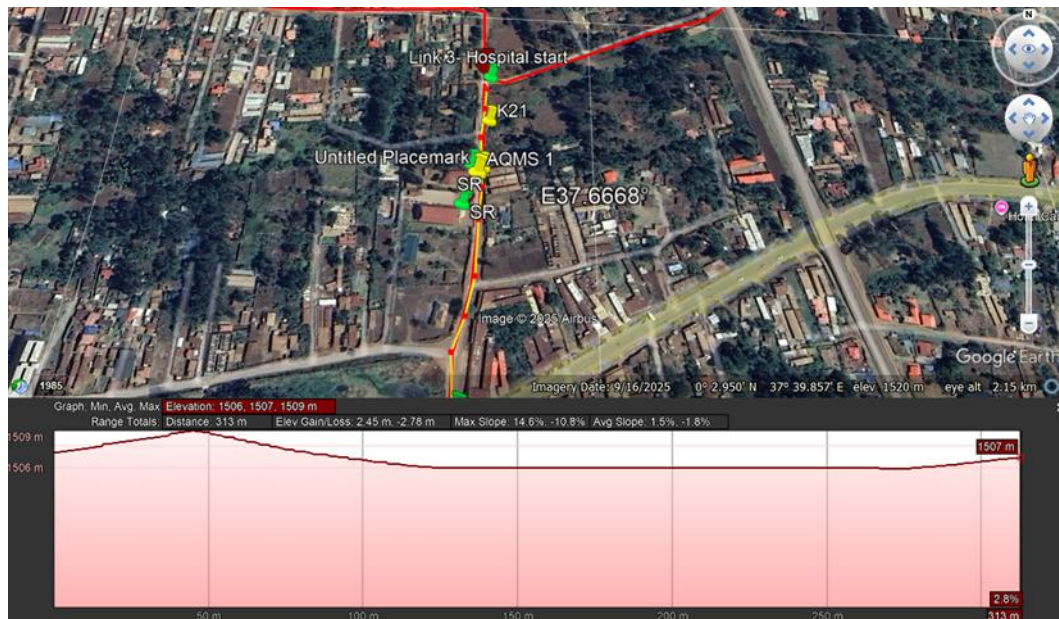
Link 2 - Gakoromone Market Road

The road has an average slope of between 3.6% – 6.4% which is sloping.



Link 3 - MeWAS JCT Road

The road has an average slope of between 1.5% – 1.8% which is very gently sloping



5.1.3 Geology and Soils

The project area is at the foot of Mt Kenya to the east. Mt Kenya is an ancient extinct volcano, which during its period of activity is thought to have risen to 6500 m. The entire mountain is deeply dissected by valleys radiating from the peaks, which are largely attributed to glacial erosion. The volcanic origins of Mount Kenya are rooted in the ejection of molten rock from the Earth's interior. These eruptions contributed to the initial shape of the peak, leaving behind a mosaic of volcanic deposits that laid the groundwork for its characteristic cone-like structure⁵. The upper and middle-slopes of the mountain are underlain by basalts, phonolites and kenytes which flowed from the central and subsidiary

⁵ <https://museums.or.ke/about-us/>

vents of the volcano. Due to the volcanic eruptions, quaternary and tertiary volcanic rocks, olivine basalts, nepheline phonolites and basement rocks were deposited in the area.

As a result of these formations, the dominant soil type within the project area comprises mainly of volcanic soils, which are dark red and well drained. These soils are moderately fertile suitable for agricultural development. There are also patches of black clay loamy soils characterized by the prevalence of sandy soils along riverbanks resulting from the decomposition of indistinct Basement rocks.

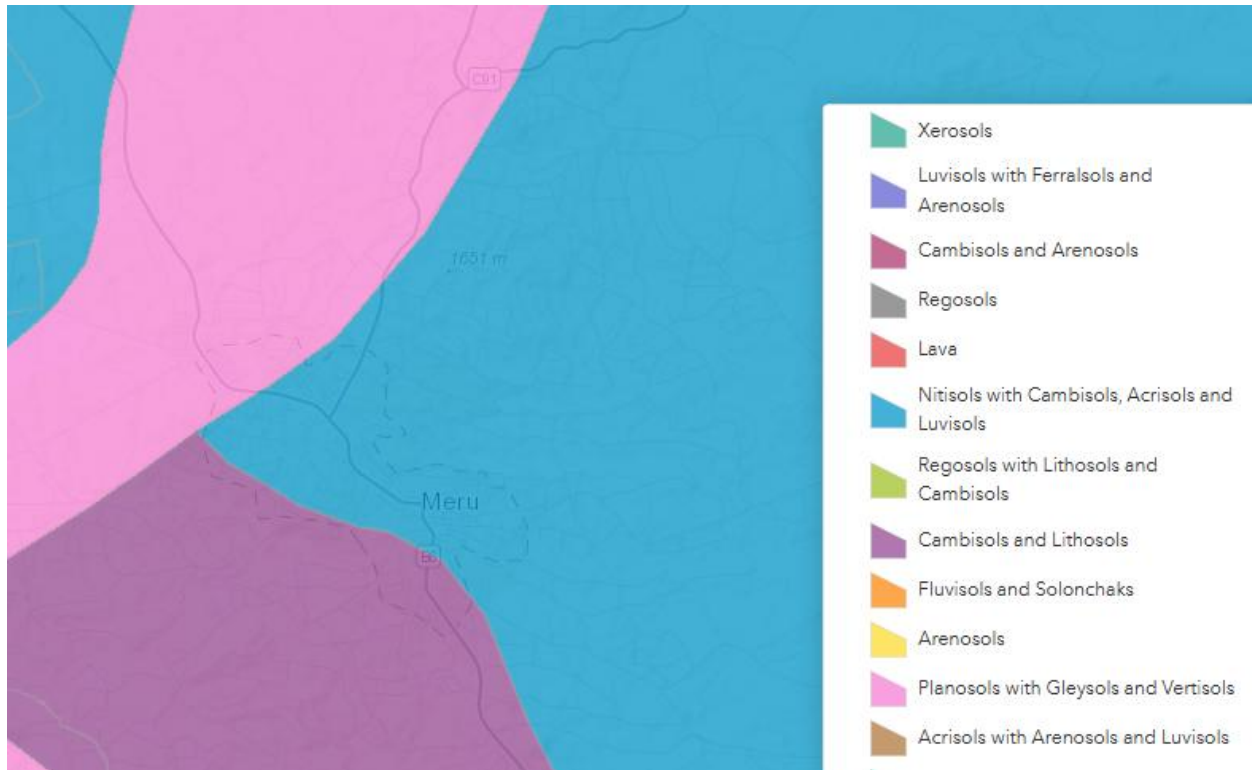


Figure 5-7: Soils Map of Meru

Source: [Kenya Soils Map | RCMRD Open Data Site](#)

Based on the soil characteristics of the project area, the following sections have been identified as vulnerable to soil erosion as shown in Table 5-2 below.

Table 5-2: Sections Prone to Soil Erosion

No.	Name of the Road	Description of the road section	Chainage
1.	Three Steers - Kambakia	The area has a steep slope and is located at the confluence of the natural drainage channel of River Gasioma. To the left of the alignment towards Kongoacheke JCT, there is a swamp that will be affected during by eroded soils when benching will be done to allow for road construction.	1+200 to 1+700
2.	Kambakia - Kagotone/KEMUC91	This section has a steep slope with no defined natural water way. During field survey, it was noted that water flows from the adjacent area to the flat section below the incline.	0+500 - 0+700

No.	Name of the Road	Description of the road section	Chainage
		The section has a natural water channel cutting across the road. To achieve the design speed, there was recommendation for a box culvert to be constructed. Due to the elevation challenges, there is expected a fill of between 5 - 6 meters in height. During the fill process, there may be a potential of the fill material being eroded into the natural water course.	2+600 – 2+700
		Along this section, there are privately owned student accommodation facilities for the KeMU university students. The section has a very steep incline of about 6.5- 9.5 °. The section lacks vegetation to help in water infiltration and prevent soil erosion thus presence of huge gullies formed.	3+100 – 3+250
3.	Kongoacheke JCT – Kwa Mukuru JCT	Along this section, the road runs parallel to a permanent stream which by nature of the terrain, may be silted.	0+600 – 0+800 LHS
		This section has a steep slope incline with single and multiple residential buildings lining the corridor.	2+000 – 2+200
4.	Kongo Gardens – Kambakia	This section has a steep sloping and climbing terrain that is likely to experience soil erosion phenomena.	0+200
5.	Runogone – Kaithe	The section is steep sloping with evidence of gullies terminating on a natural dry water course.	1+500 – 1+750
6.	Hospital road – Kiramburine JCT	This section is sloping substantially towards River Mpuone	1+700 – 1+958
7.	Link 1 – Meru Bus Terminus	The section has a steep slope that starts at St Andrews MCK school crossing River Gasioma rising towards Full Gospel Church.	0+200 – 0+350
8.	Link 2 – Gakoromone Market	The slope starts from the junction of the market, MeWASSCO sewage treatment facility and Gakoromone Police Post towards River Mpuone. There is need to install appropriate soil erosion measures in the area.	0+200 – 0+400
9.	Link 3 - MeWASSCO	This section has a valley formed by steep sloping and climbing terrain with Mpuone River at the lowest point of the terrain.	0+000 – 0+100
10.	Western Bypass Link Road	This section slopes towards chainage 0+600 with no properly defined natural drainage.	0+000 – 0+600

No.	Name of the Road	Description of the road section	Chainage
11.	Western Bypass (Gikumene) – Mate Road	The section slopes towards 0+600 which is the lowest point in the road.	0+400 – 0+600

	
Plate 5-1: Exposed Red Volcanic soil along the Kambakia - Kagotone Road	Plate 5-2: Steep sloping section of the Kambakia - Kagotone (Km 0+500 – 0+700)

5.1.4 Drainage

Mount Kenya region has two major drainage basins being River Tana on the southern part and Ewaso Nyiro on the Northern part. Within Meru town, River Kathita is the main drainage system with its catchment in Ithangune and Rutundu, from which it flows in a south-easterly direction through Meru town and drains into River Tana on the Southeastern side. Other river courses within Meru Municipality that drains into River Kathita include Mpuone, Gasioma, Kiogo, Karumanthi, Kunungu and Gachoge and others. Other water resources within the project area include shallow wells, protected springs, water pans and public and private boreholes.

5.1.4.1 Water Quality

According to Meru County Integrated Development Plan (2023-2027), water quality for surface and underground water resources is impacted by agricultural activities, urbanization and environmental degradation. These activities have contributed to increased sedimentation of rivers by eroded soil and pollution of underground water aquifers by hydrocarbon fluids, leached fluorides and poor waste management practices.

About 60% of diseases reported in health facilities across the county are related to water and sanitation with 92% of the households using pit latrines. Currently, Meru town has an elaborate network of trunk sewer lines of over 50Km ranging from DWC 600 - 250DN in various sections and a Wastewater Treatment Plant in Rwanyange. During the study, water quality tests were conducted at two surface water sources as presented in *Table 5-3* below:

Table 5-3: Water sampling points

S/N	River	GPS Coordinates for the Sampling points (UTM, 37N)	
		Easting (m.E)	Northing (m.N)
1.	River Gasioma	349122.82	8273.59
2	River Mpuone	351554.00	5449.00

Water samples were collected on 2nd May and 22 May 2025 for River Gasioma and River Mpuone respectively and quality tests conducted as per the First Schedule (*Quality Standards for Sources of Domestic Water*) of the Environmental Management and Coordination (Water Quality) Regulations, 2024. The results are as presented in Table 5-4 below.

Table 5-4: Water Quality Test Results

No	Parameter	Test Results for R. Gasioma	Test Results for R. Mpuone	EMCA Standards for Source of Domestic Water
1.	*pH	6.89	7.68	6.5-8.5
2.	Total Dissolved Solids	106.0 mg/L	169 mg/L	1200 Max
3.	*Copper (Cu)	<0.01 mg/L	<0.01 mg/L	0.05 Max
4.	Fluoride (F-)	0.22 mg/L	0.40 mg/L	1.5 Max
5.	*Total Coliform Count	50 cfu/100 ml	110 cfu/100 ml	
6.	Nitrates (NO ₃)	4.40 mg/L	36.80 mg/L	10 Max
7.	Zinc (Zn)	<0.01 mg/L	<0.01 mg/L	1.5 Max
8.	Nitrites (NO ₂)	<0.03 mg/L	<0.003 mg/L	3.0 Max
9.	Arsenic (As)	<0.01 mg/L	<0.01 mg/L	0.01 Max
10.	Cadmium (Cd)	<0.003 mg/L	<0.003 mg/L	0.01 Max
11.	Selenium (Se)	<0.01 mg/L	<0.01 mg/L	0.01 Max
12.	Total Suspended Matter	15.20 mg/L	2.0 mg/L	30 Max
13.	Phenols	Nil	Nil	NIL
14.	Permanganate Value	Nil	Nil	1 Max
15.	Alkyl benzyl sulphonates	Nil	0.0 mg/L	0.5 Max

From the results obtained, all the parameters are within the EMCA standards except for nitrate concentration in the sample collected in River Mpuone and cadmium in both rivers.

5.2 Biodiversity Assessment

5.2.1 Flora

The vegetation of the project area is highly modified due to settlements and urban land use. However, the Kambakia - Kagotone/KEMU C19 Road road runs along the eastern boundary of the protected Upper Imenti Forest, which is an indigenous evergreen forest that extends from Mt. Kenya Forest ecosystem to the East of the project area, with an estimated area of 10,375.8 hectares. The forest is managed by the KFS in collaboration with Meru Forest and Environmental Conservation and Protection Association (MEFECAP). The forest serves as a crucial habitat for a diverse array of flora and fauna (Table 5-5). The common indigenous trees include the Meru Oak, *Cordia abyssinica*, *Olea africana*, *Croton megalocarpus* and *Prunus africana* while exotic species are cypress, Grevillea, eucalyptus, macadamia and fruit trees. Meru Oak is one of the common known tree species in the region because of its high quality of timber. It is commonly used for the production of furniture and decorative veneers but also for firewood and general timber. As a consequence of its highly valued timber, the species has been severely over-exploited and is now very rare⁶. Shrubs mainly comprise of *Lantana camara* which is an invasive species in the forest ecosystem.

Upper Imenti Forest has been and continues to be threatened by expansion in urbanization, agriculture sand harvesting, settlements and illegal exploitation. Community members access the forest for various products such as firewood, grazing and other forest products. The main challenge in the forest area is the high demand for wood products that is exceeding supply due to high value of timber and population pressure.

⁶ <https://www.bgci.org/wp/wp-content/uploads/2023/02/Meru-Oak-Global-Trees-PDF-version.pdf>

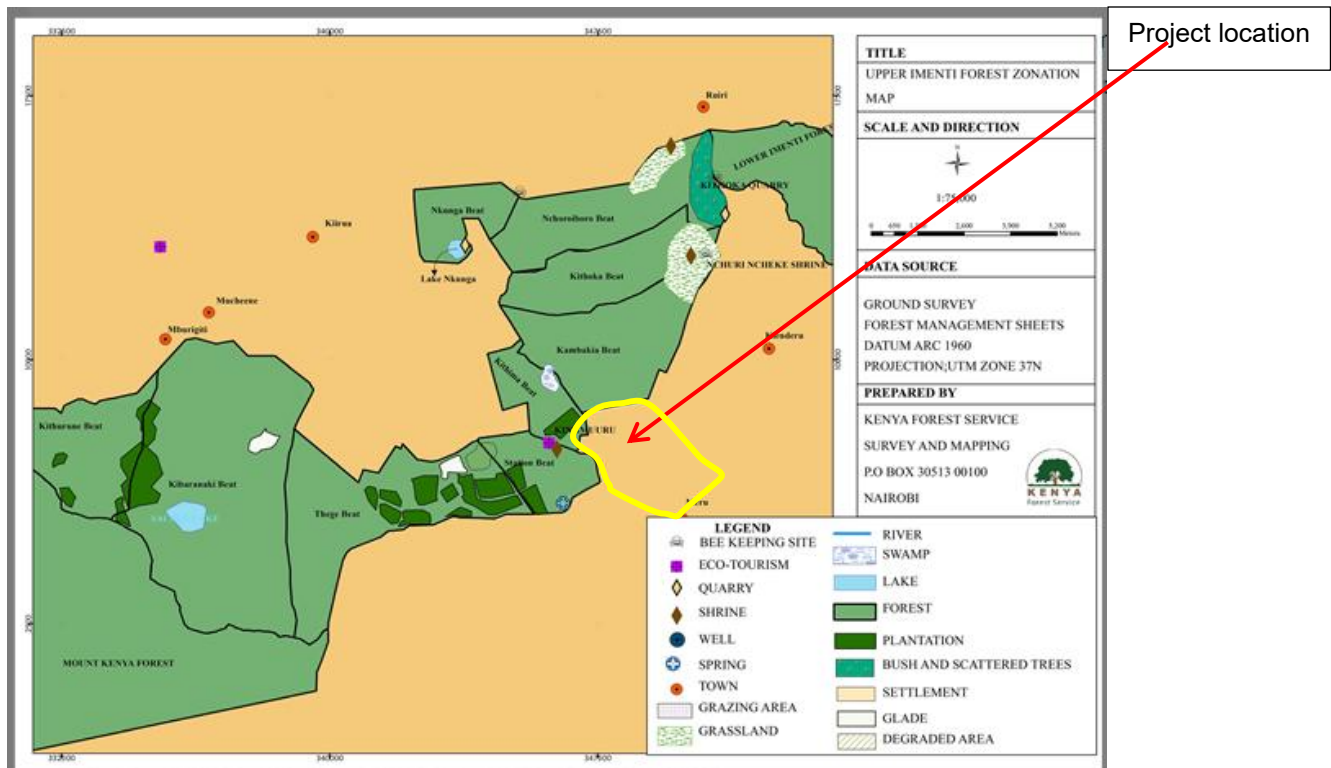


Figure 5-8: Map showing the location of the project in relation to the Upper Imenti Forest

Source: <https://www.scirp.org/journal/paperinformation?paperid=133238>

Table 5-5: Common Trees and Shrubs Within the Project Area

No.	Common Name	Scientific Name	IUCN Status
1.	Sacred Fig Tree	<i>Ficus thonningii</i>	Least Concern
2.	Sudan Teak	<i>Cordia abyssinica</i>	Least Concern
3.	Eucalyptus	<i>Eucalyptus Spp</i>	Least Concern
4.	Mexican Sunflower	<i>Tithonia diversifolia</i>	Least Concern
5.	Silky Oak	<i>Grevillea robusta</i>	Least Concern
6.	Sodom Apple	<i>Solanum incanum</i>	Least Concern
7.	Avocado	<i>Persea americana</i>	Least Concern
8.	East African cordia	<i>Cordia abyssinica</i>	Least Concern
9.	Red stinkwood	<i>Prunus africana</i>	Vulnerable
10.	Peacock flower	<i>Albizia gummifera</i>	Least Concern
11.	East African Croton	<i>Croton megalocarpus</i>	Least Concern
12.	Meru Oak	<i>Vitex keniensis</i>	Endangered
13.	Mauritius thorn	<i>Caesalpinia decapetala</i>	Least Concern
14.	Nile Tulip	<i>Markhamia lutea</i>	Least Concern
15.	African tulip tree	<i>Spathodea campanulata</i>	Least Concern
16.	Caribbean Raintree	<i>Ehretia cymosa</i>	Least Concern
17.	Lantana	<i>Lantana camara</i>	Invasive
18.	Bougainvillea	<i>Bougainvillea glabra</i>	Least Concern
19.	African Wild Olive	<i>Olea africana</i>	Least Concern
20.	Sausage Tree	<i>Kigelia africana</i>	Least Concern
21.	Water Pear	<i>Syzygium guineense</i>	Least Concern
22.	Silky Oak	<i>Grevillea robusta</i>	Least Concern
23.	Yellow Dodder	<i>Cuscuta campestris</i>	Not Evaluated

No.	Common Name	Scientific Name	IUCN Status
24.	Kei apple	<i>Dovyalis caffra</i>	Least Concern
25.	Napier grass	<i>Cenchrus purpureus</i>	Least Concern
26.	Mexican Cypress	<i>Cupressus lusitanica</i>	Least Concern
27.	African hackberry	<i>Celtis durandi</i>	Unknown

With a population growth rate of over 3.2%, demand for local resources such as fuelwood and wood for construction has been increasing, and with only 20% of the land being arable the pressure for space to cultivate has been intense. Natural vegetation has suffered from exploitation with some species now facing a real threat of extinction⁷. In the project area, tree species of conservation concern are *Prunus Africana*, *Premna maxima* and *Vitex keniensis*. These tree species are threatened due to high demand for their high value hardwood primarily used for furniture and fittings. The other species have various uses such as, fuelwood, poles, fencing materials and herbal medicine. The Table below presents an inventory of tree species along each road.

Table 5-6: Trees and Shrubs along the project sites

No.	Name of the road	Description	Trees/shrubs identified
1	Three Steers-Kambakia Road	The section between Km 0+000 to about Km 1+000 is predominantly within an urban setup with isolated ornamental and natural growing trees. From Km 1+000 onwards, the road is aligned with a mixed vegetation comprising of both indigenous and exotic trees. The vegetation structure predominantly comprises of shrubby bushes and isolated medium to large sized trees.	• Sacred Fig Tree (<i>Ficus thonningii</i>) • Sudan Teak (<i>Cordia abyssinica</i>) • Eucalyptus Spp. • Mexican Sunflower (<i>Tithonia diversifolia</i>) • Silky Oak (<i>Grevillea robusta</i>) • Sodom Apple (<i>Solanum incanum</i>) • Avocado (<i>Persea americana</i>)
2	Kambakia-Kagotone/KEMU C91 Road	The road runs along the Upper Imenti Forest from Kambakia to Kagotone centre. There are mature indigenous and exotic trees along the road. Forested areas along the project road have spatial distribution of trees with shrubby undergrowth.	• East African cordia (<i>Cordia abyssinica</i>) • Red stinkwood (<i>Prunus africa</i>) • Peacock flower (<i>Albizia gummifera</i>) • East African Croton (<i>Croton megalocarpus</i>) • Meru Oak (<i>Vitex keniensis</i>) • Mauritius thorn (<i>Caesalpinia decapetala</i>) • Nile Tulip (<i>Markhamia lutea</i>) • African tulip tree (<i>Spathodea campanulata</i>) • Caribbean Raintree (<i>Ehretia cymosa</i>) • Lantana (<i>Lantana camara</i>) • Bougainvillea (<i>Bougainvillea glabra</i>) • African Wild Olive (<i>Olea Africana</i>) • Sausage Tree (<i>Kigelia Africana</i>) • Water Pear (<i>Syzygium guineense</i>)

⁷Useful Trees and Shrubs in Kenya. Technical Handbook No. 35
<https://apps.worldagroforestry.org/downloads/Publications/PDFS/B13601.pdf>

No.	Name of the road	Description	Trees/shrubs identified
			- Yellow Dodder (<i>Cuscuta campestris</i>) - Silky Oak (<i>Grevillea robusta</i>)
3	Kagotone- KEMU C91 Road	The link road is aligned on both sides by majorly exotic trees and shrubs.	- Silky Oak (<i>Grevillea robusta</i>) - Yellow Dodder (<i>Cuscuta campestris</i>) - Eucalyptus Spp. - Lantana (<i>Lantana camara</i>)
4	Kongoacheke JCT- Kwa Mukuru JCT Road	The rich vegetation resources along this road mainly comprises of shrubby bushes and clusters of planted exotic trees with few isolated indigenous trees. Nappier grasses are common on the edges of the road.	- Silky Oak (<i>Grevillea robusta</i>) - Eucalyptus Spp. - Lantana (<i>Lantana camara</i>) - African tulip tree (<i>Spathodea campanulata</i>) - Meru Oak (<i>Vitex keniensis</i>) - African tulip tree (<i>Spathodea campanulata</i>) - Kei apple (<i>Dovyalis caffra</i>)
5	Kongo Gardens- Kambakia JCT Road	The road is aligned on both sides by planted exotic trees, shrubs and isolated indigenous tree species.	- Silky Oak (<i>Grevillea robusta</i>) - Eucalyptus Spp - Mexican Sunflower (<i>Tithonia diversifolia</i>)
6	Runogone- Kaithe Road	Trees within the area are largely exotic with few isolated indigenous trees. Crop cultivation is the main economic activity in the area.	- Mexican Sunflower (<i>Tithonia diversifolia</i>) - East African cordia (<i>Cordia abyssinica</i>) - Mauritius thorn (<i>Caesalpinia decapetala</i>) - Silky Oak (<i>Grevillea robusta</i>) - Sodom Apple (<i>Solanum incanum</i>) - Napier grass (<i>Cenchrus purpureus</i>)
7	Hospital - Kiramurine JCT Road	This road is located in an urban setup. Vegetation largely comprises of shrubs and isolated planted exotic trees.	- Silky Oak (<i>Grevillea robusta</i>) - Sodom Apple (<i>Solanum incanum</i>) - Mexican Sunflower (<i>Tithonia diversifolia</i>) - Eucalyptus Spp - Mexican Cypress (<i>Cupressus lusitanica</i>) - Napier grass (<i>Cenchrus purpureus</i>)
8	Link 1- Meru Bus Terminus Road	The road is situated in a peri-urban environment with vegetation mainly comprising of grasses and planted exotic trees.	- Eucalyptus spp - Silky Oak (<i>Grevillea robusta</i>) - Napier grass (<i>Cenchrus purpureus</i>) - African tulip tree (<i>Spathodea campanulata</i>)

No.	Name of the road	Description	Trees/shrubs identified
		There is, however, natural vegetation along the Mpuone River	
9	Link 2- Gakoromone Market Road	While the road is in a peri-urban environment, vegetation is minimal due to the existence of the busy Gakoromone market. Some isolated trees exist on both sides of the road.	• Eucalyptus spp • Silky Oak (<i>Grevillea robusta</i>) • Palm spp.
10	Link 3- MeWASSCO JCT Road	The road is located in a peri-urban area with vegetation on both sides.	• Mexican Sunflower (<i>Tithonia diversifolia</i>) • Silky Oak (<i>Grevillea robusta</i>) • East African cordia (<i>Cordia abyssinica</i>) • Eucalyptus spp
11	Western Bypass - Link Road	The road is in a rural set-up with a mix of indigenous and exotic trees.	• Macadamia (<i>Macadamia integrifolia</i>) • Silky Oak (<i>Grevillea robusta</i>) • Avocado (<i>Persea americana</i>) • Eucalyptus spp
12	Western Bypass (Gikumene)- Mate Road	The road is situated in a peri-urban to rural setting. Vegetation comprises of both indigenous and exotic species.	• Macadamia (<i>Macadamia integrifolia</i>) • African tulip tree (<i>Spathodea campanulata</i>) • Silky Oak (<i>Grevillea robusta</i>) • Meru Oak (<i>Vitex keniensis</i>) • Sudan Teak (<i>Cordia abyssinica</i>) • Eucalyptus Spp.
13	Kaaga Boys High School	Most of the vegetation in this locality comprise of mainly planted exotic trees used as live fence and isolated indigenous trees.	• Silky Oak (<i>Grevillea robusta</i>) • Kei apple (<i>Dovyalis caffra</i>) • Avocado (<i>Persea americana</i>) • Eucalyptus spp
14	Meru National Polytechnic	Located in a built-up environment with few ornamental trees.	• Kei apple (<i>Dovyalis caffra</i>) • Candelabra tree (<i>Euphorbia candelabrum</i>) • Nile Tulip (<i>Markhamia lutea</i>) • Monkey puzzle tree (<i>Araucaria araucana</i>) • Green Ash (<i>Fraxinus pennsylvanica</i>) • Palm spp.



Plate 5-3: Mature trees at Km 1+800 along Kambakia – Kagotone Road



Plate 5-4: Planted vegetation along the Western Bypass Link Road

5.2.2 Fauna

The faunal diversity and composition of the project area is influenced by the existence of natural habitats within the larger Mount Kenya ecosystem. The area is bordered closely by the Upper Imenti Forest, Mount Kenya National Park on the Southwestern part, the Nyambene ranges on the Northeastern side and the Meru National Park on the Eastern side. The Meru National Park sits within the wider Meru Conservation Area (MCA) which also comprises of the Bisanadi National Reserve, Mwingi National Reserve and the Kora National Park. These wildlife conservation areas are jointly managed by KWS and KFS.

The Upper Imenti Forest, along which the proposed Kambakia-Kagotone/KEMU C91 Road creates a boundary, is a critical wet-season habitat for elephants and a historic wildlife migratory link to the Laikipia – Samburu ecosystem. The forest also provides an ideal habitat for breeding of elephants due to the soil properties which form a sticky mud which prevent insect bites (Pers comm Upper Imenti KWS Station Warden). However available literature differs markedly with this observation, stating that elephants mainly migrate to the Meru ecosystem from the northern rangelands in the dry season and primarily to the Meru National Park. Furthermore, it is reported in literature that the western region of Meru National Park, towards the Nyambene Hills, is the most critical breeding area for elephants⁸. This area is characterized by Combretum and Terminalia woodland and remains green throughout much of the year, providing essential sources for nursing mothers and it is quite far from the project area. In addition, the only vast swampy area which would suit elephant breeding is in the centre of the forest, approximately 2.5 km from the road as shown in Figure 5-9. It is therefore our considered opinion that elephant breeding will not be impacted by the project. Other mammals within the forest are squirrel, mongoose, dik-dik, porcupines, various species of monkeys, wild pigs and in some rare cases buffaloes. In the recent past, the Cassin's Hawk-Eagle, a forest dependent species, has been sighted in the forest. Other common birds in the forest include the Mountain Buzzard, African Crowned Eagle, Scarce Swift, Hartlaub's Turaco, White-eared Barbet and the Rameron Pigeon among others⁹.

⁸ <https://www.savetheelephants.org/wp-content/uploads/2022/12/2003DemographStatus>

⁹ <https://www.conquestadventures.co.ke/tour/imentiforest/>

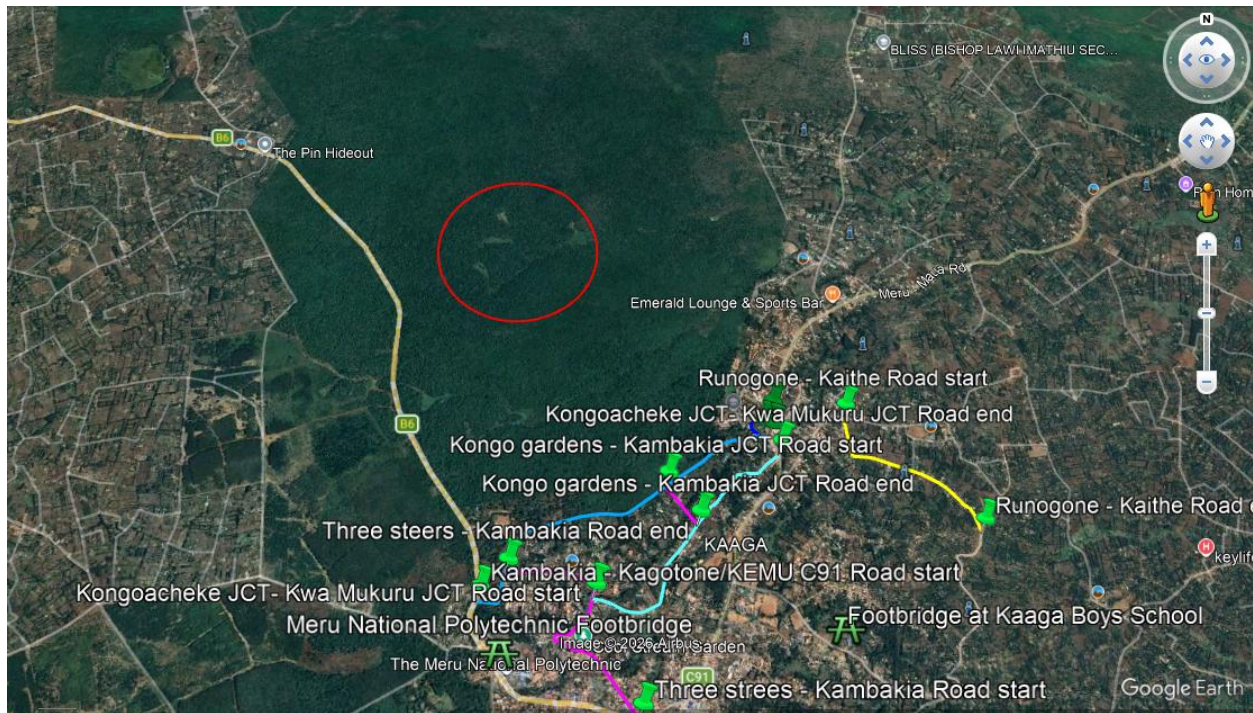


Figure 5-9: swampy section of the Forest with ideal for elephant breeding

Source: Google earth

Mount Kenya National Park is home to diverse species of wildlife including black rhino, African elephant, genet cat, giant forest hog, black - fronted duikers, rock hyrax and the spotted hyena among others. The park has over 130 species of birds including rare species such as Kenrick's starling, Scarlet-tufted Sunbird, long-tailed window bird, African Crowned Eagle, the lesser kestrel and the Ayres's hawk eagle among others.

The MCA (Approximately 40km from Meru town) comprises a wide range of species from the wet mountain species to the bushed savannah grasslands to the species of the arid and the semi-arid areas. The area provides habitat for large populations of mammals, including the threatened African Elephant (*Loxodonta africana*), Cheetah (*Acinonyx jubatus*) and Grevy's Zebra (*Equus grevyi*), which is now practically confined to Kenya. Black Rhinoceros (*Diceros bicornis*) and the introduced Square-lipped or White Rhinoceros (*Ceratotherium simum*)¹⁰.

¹⁰ Kenya Wildlife Service. 2010. World Heritage Convention <https://whc.unesco.org/en/tentativelists/5509/>

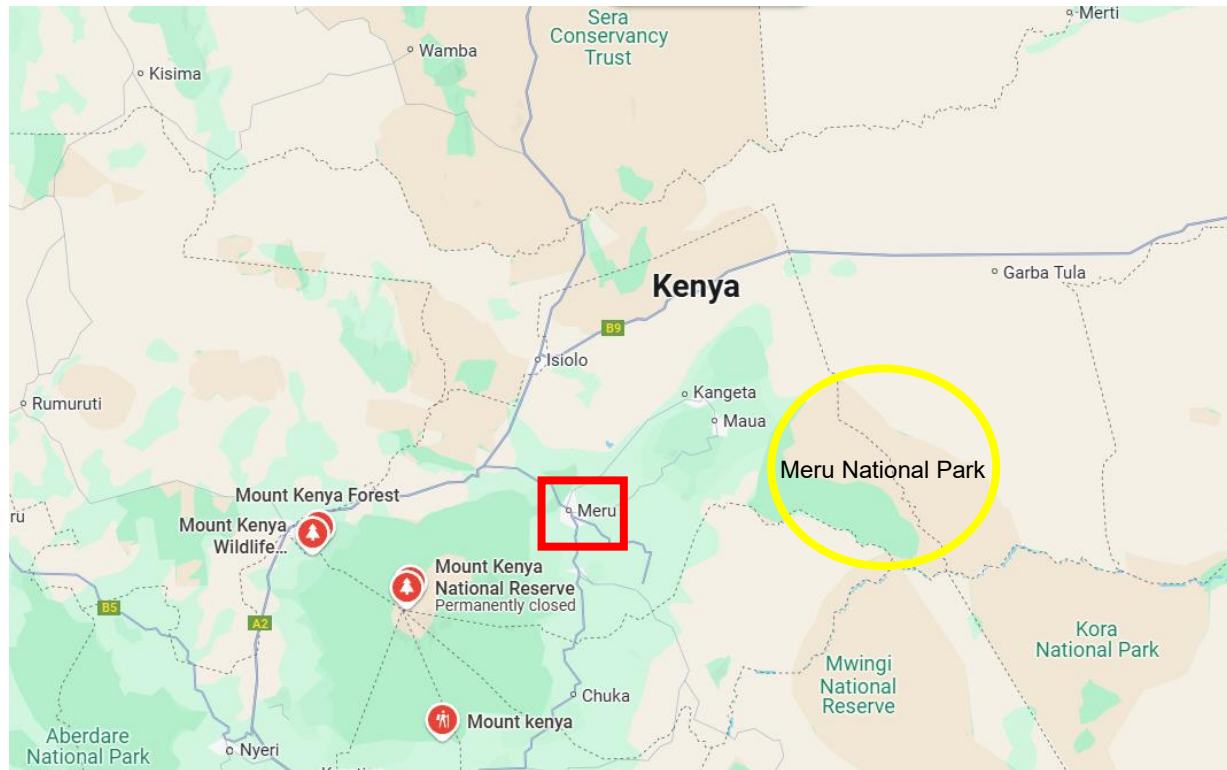
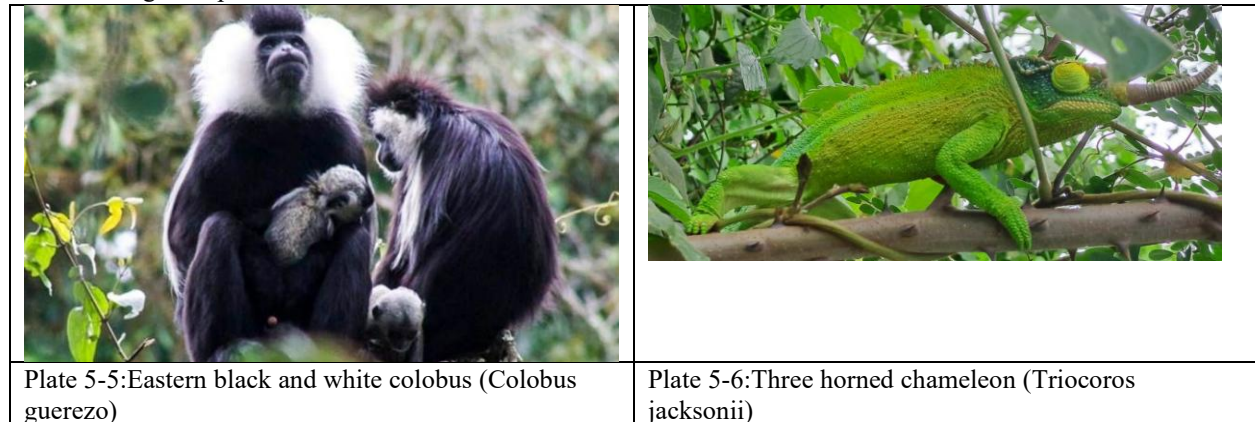


Figure 5-10: Critical conservation areas neighbouring Meru
Source: Google Maps



IUCN Status of Mammals and Birds within the project area

Table 5-7: Faunal species within the project area

S/No.	Common Name	Scientific Name	IUCN Status	Kenyan Conservation status
Mammals				
1.	African Savannah elephant	<i>Loxodonta Africana</i>	Endangered (EN)	Endangered (EN)
2.	Black rhinoceros	<i>Diceros bicornis</i>	Critically Endangered (CR)	Critically Endangered (CR)
3.	White rhinoceros	<i>Ceratotherium simum</i>	Near Threatened (NT)	Endangered (EN)

S/No.	Common Name	Scientific Name	IUCN Status	Kenyan Conservation status
4.	Grevy's Zebra	<i>Equus grevyi</i>	Endangered (EN)	Endangered (EN)
5.	Mountain Bongo	<i>Tragelaphus eurycerus isaaci</i>	Critically Endangered (CR)	
6.	Sykes monkey	<i>Cercopithecus mitis</i>	Least Concern (LC)	
7.	Cheetah	<i>Acinonyx jubatus</i>	Vulnerable (VU)	Endangered (EN)
8.	Unstriped ground squirrels	<i>Xerus rutilus</i>	LC	
9.	Eastern Grey squirrel	<i>Sciurus carolinensis</i>	LC	Unknown
10.	Wild pigs	<i>Sus scrofa</i>	LC	Unknown
11.	White-tailed mongoose	<i>Ichneumia albicauda</i>	LC	Unknown
12.	Marsh mongoose	<i>Atilax paludinosus</i>	LC	Unknown
13.	Dwarf mongoose	<i>Helogale parvula</i>	LC	Unknown
14.	Egyptian mongoose	<i>Herpestes ichneumon</i>	LC	Unknown
15.	Brush-tailed porcupine	<i>Atherurus africanus</i>	LC	Unknown
16.	Black and white Colobus	<i>Colobus guereza</i>	LC	Unknown
17.	Hippopotamus	<i>Hippopotamus amphibius</i>	VU	Unknown
18.	Hartebeest	<i>Alcelaphus buselaphus</i>	LC	Unknown
19.	Buffalo	<i>Syncerus caffer</i>	NT	Unknown
20.	Reticulated giraffe	<i>Giraffa reticulata</i>	EN	Unknown
21.	Leopard	<i>Panthera pardus</i>	VU	Endangered (EN)
22.	Lion	<i>Panthera leo</i>	VU	Endangered (EN)
23.	Rock Hyrax	<i>Procavia capensis</i>	LC	Unknown
24.	Dik-dik	<i>Madoqua kirkii</i>	LC	Unknown
25.	Eastern black-and-white colobus	<i>Colobus guereza</i>	LC	Unknown
Avifauna				
26.	Ayres's Hawk-eagle	<i>Hieraaetus ayresii</i>	LC	Unknown
27.	Cassin's Hawk-Eagle	<i>Aquila africana</i>	LC	Unknown
28.	Crowned hawk eagle	<i>Stephanoaetus coronatus</i>	NT	Unknown
29.	Hartlaub's Turaco	<i>Tauraco hartlaubi</i>	LC	Unknown
30.	Jackson's Spurfowl	<i>Pternistis jacksoni</i>	LC	Unknown
31.	Scaly Spurfowl	<i>Pternistis squamatus</i>	LC	Unknown
32.	Silvery cheeked-hornbill	<i>Bycanistes brevis</i>	LC	Unknown
33.	Eastern Bronze-naped pigeon	<i>Columba delegorguei</i>	LC	Unknown
34.	African Goshawk	<i>Accipiter tachiro</i>	LC	Unknown
35.	Hamerkop	<i>Scopus umbretta</i>	LC	Unknown
36.	Green ibis	<i>Mesembrinibis cayennensis</i>	LC	Unknown
37.	Olive pigeon	<i>Colomba arquatrix</i>	LC	Unknown
38.	Giant kingfisher	<i>Megaceryle maxima</i>	LC	Unknown
39.	Crowned hornbill	<i>Lophoceros alboterminatus</i>	LC	Unknown
40.	Grey-headed kingfisher	<i>Halcyon leucocephala</i>	LC	Unknown
41.	Mountain Buzzard	<i>Buteo oreophilus</i>	NT	Unknown
42.	African Crowned Eagle	<i>Stephanoaetus coronatus</i>	NT	Unknown
43.	Scarce Swift	<i>Schoutedenapus myoptilus</i>	LC	Unknown

S/No.	Common Name	Scientific Name	IUCN Status	Kenyan Conservation status
44.	White-eared Barbet	<i>Stactolaema leucotis</i>	LC	Unknown
45.	Rameron Pigeon	<i>Columba pollenii</i>	LC	Unknown
46.	Moustached Green Tinkerbird	<i>Pogoniulus leucomystax</i>	LC	Unknown
47.	Montane Oriole	<i>Oriolus percivali</i>	LC	Unknown
48.	Kenrick's Starling	<i>Poeoptera kenricki</i>	LC	Unknown
49.	Sharpe's Starling	<i>Pholia sharpii</i>	LC	Unknown

5.2.2.1 Analysis of the biodiversity habitat bordered by the Kambakia – Kagotone/KEMU C91 Road

Based on World Bank Group Environmental and Social Standard 6 on Biodiversity Conservation and Sustainable Management of Living Resources, critical habitat is defined as areas with high biodiversity importance or value, including:

- Habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent national approaches
- Habitat of significant importance to endemic or restricted-range species
- Habitat supporting globally or nationally significant concentrations of migratory or congregatory species
- Highly threatened or unique ecosystems
- Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d).

The proposed Kambakia- Kagotone/KEMU (C91) road runs parallel to the Upper Imenti Forest and does not cross any known wildlife migratory corridor. Due to this, the section to be annexed (2.47 Ha) does not meet the criteria for a **Critical Habitat** as defined by the World Bank's **ESS 6**, based on the following justifications:

- **Absence of Critical Life-Cycle Support:** While broader parts of Upper Imenti Forest is a recognized habitat for the Endangered *Loxodonta africana* (African elephant), desktop studies and field interviews confirm that the specific section to be annexed for the road construction does not support "critical" life functions (breeding) of the elephants. The wet season breeding grounds and other core congregatory areas are located deep within the forest interior which are geographically isolated from the project footprint.
- **Existing Anthropogenic Degradation:** The proposed Kambakia- Kagotone/KEMU (C91) corridor has been subject to significant human development and encroachment. It was also observed that degradation of the forest and the presence of existing fencing have significantly caused a behavioural shift in megafauna species such as the elephants, buffalo's and rhinos. Most of the animals have moved away from this section thus, it no longer serves as a primary movement corridor or essential habitat.
- **Non-Viability for Floral Conservation:** Although the Endangered *Vitex keniensis* is present in the forest, the specific road alignment lacks the density and ecological connectivity required to be considered a "site of high importance" for the survival of the species. Due to this, the annexation will not jeopardize the global or national population viability of this floral species.
- **Threshold Analysis:** Under ESS 6, a habitat is "critical" only if the project area significantly impacts the global population or a distinct unit of a species. Given the localized nature of the impact and the degraded state of the forest edge, the section to be annexed does not support the recurrent, long-term maintenance, or evolutionary potential of the mentioned endangered species at a level that triggers CH status.

In conclusion, the proposed Kambakia–Kagotone/KEMU (C91) road alignment traverses the edge of the Upper Imenti Forest but does not intersect any recognized wildlife migratory corridor or area of unique ecological sensitivity. Although a few endangered tree species may be affected, the section to be excised is already heavily denuded due to

ongoing human activities and therefore does not meet the criteria for designation as Critical Habitat under Environmental and Social Standard (ESS) 6. Furthermore, the wet season elephant breeding grounds are located deep within the forest, far from the project footprint, and will not be impacted by the road construction. Consequently, appropriate mitigation measures for the affected trees have been incorporated in this ESIA report. The area does not require the preparation of a Biodiversity Management Plan, and standard environmental safeguards are sufficient to address potential impacts.

5.2.3 Air quality

Ambient air quality is influenced by the concentration of particulate matter (PM) and gaseous pollutants, which originate from both natural and anthropogenic sources, including vehicular traffic, agricultural activities, and industrial operations. In Meru Town, key contributors to air pollution include vehicle emissions, poor solid waste management, and resuspended dust from unpaved surfaces. According to the World Health Organization (WHO), pollutants of primary public health concern include particulate matter (PM), ozone (O₃), nitrogen dioxide (NO₂), and sulphur dioxide (SO₂).

To establish baseline ambient air quality in the project area, monitoring was conducted from 24th to 29th April 2025 at selected locations (Table 5-8), using a calibrated air quality monitoring device (Plate 5-7).

Table 5-8: Air Quality Monitoring points

Site ID	GPS location	Description of Monitoring Location
AQ MS 1	351501.85m E 5389.81 m N	Link 3 – MeWAS Junction: The monitoring location is within the Gakoromone Dispensary compound, approximately 20m from a nearby feeder road. The surrounding area features several sensitive receptors, including a church, a resort facility, and nearby residential dwellings. The primary sources of air pollutants at this location are intermittent vehicular and motorcycle emissions from the adjacent road.
AQ MS 2	350175.15 m E 5691.73 m N	The monitoring location is within the Meru County Teaching and Referral Hospital. This is a vibrant area characterized by mixed land uses, including residential estates, educational institutions, and healthcare facilities. The area is surrounded by other key establishments such as the Meru KMTC, Meru Cancer Treatment Center, and several schools. The measurement point is located approximately 50m from a busy road that serves as a primary route for both vehicular and motorcycle traffic. In addition, a hospital incinerator located within the Meru County Referral Hospital compound presents a potential point source of localized air emissions.
AQ MS 3	349757.22 m E 8931.79 m N	Kambakia - Kagotone: The monitoring location is within a residential apartment complex in a generally quiet environment. The area is predominantly residential with limited sources of air pollution. However, intermittent emissions may arise from vehicle and motorcycle movements along a nearby feeder road and a major road approximately 170 meters away. Routine residential activities contribute minimally to local emissions. Overall, the site presents a low-background air quality setting suitable for baseline assessment.
AQ MS 4	351059.40 m E 5168.70 m N	The monitoring location is within Gakoromone Market, a major commercial hub in Meru characterized by intense human activity and multiple potential sources of air pollution. The area is consistently active with trading, as well as the loading and unloading of goods, which contribute to increased vehicular and localized emissions. Significant contributors to air pollution at this site include: - Motorcycles. - Jua Kali Sector: Approximately 50m from the monitoring location, this area hosts informal metalworking activities. These operations may release particulate emissions and combustion-related pollutants, especially during

Site ID	GPS location	Description of Monitoring Location
		welding, cutting. Sewage Trucks and Sewage Treatment Plant (STP) Activities: Trucks regularly access the area to offload sewage at a nearby (STP), and a Public Toilet nearby. This process poses a potential source of hydrogen sulfide (H₂S) emissions, especially during unloading. Due to the combination of mobile sources (motorcycles and trucks), informal industrial activities, and sewage handling, this location presents environment for exposure to both particulate and gaseous pollutants. Open burning of waste was also observed here.
AQ MS 5	348615.96 m E 6642.90 m N	Three Steers – Kambakia: The monitoring location is situated in the Kambakia area, near Three Steers Hotel, and in proximity to Elsa Hotel, AIC Meru, and Njeru Industries. The area is characterized by mixed land use, comprising hospitality, institutional, and light industrial establishments. The site is located adjacent to a feeder road with occasional traffic and approximately 200m from a major road, both of which serve as the primary sources of air pollutants in the area. Emissions are mainly attributed to vehicular activity.



Plate 5-7: AQM-09 Air Quality Monitor



Plate 5-8: Setting up of AQM-09 Air Quality Monitor at a sampling point along the Kambakia -Kagotone Road

5.2.3.1 Air Quality Monitoring Results

The measured concentrations of key gaseous pollutants -NO₂, SO₂, O₃, H₂S, CO and TVOCs were compared against the applicable 24-hour EMCA limits and relevant WHO guideline limits where applicable.

Particulate Matter

Table 5-9: Particulate Matter Monitoring Results

Monitoring Location	Dates	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	TSP (µg/m ³)
AQMS 1	27-28 Apr 2025	17	28	45
AQMS 2	24-25 Apr 2025	26	38	65
AQMS 3	25-26 Apr 2025	13	26	39
AQMS 4	26-27 Apr 2025	24	35	59
AQMS 5	28-29 Apr 2025	21	29	50
EMC Limits 24-hour		-	100	200
WHO AQ guideline limit 24-hour		15	45	-

Gaseous Pollutants

Table 5-10: Gaseous Pollutants Monitoring Results

Monitoring Points	Dates	NO ₂ (µg/m ³)	SO ₂ (µg/m ³)	O ₃ ppm	CO (µg/m ³)	H ₂ S (ppb)	TVOCs (µg/m ³)
AQMS 1	27-28 Apr 2025	43	17	0.04	392	<10	133
AQMS 2	24-25 Apr 2025	62	23	0.02	475	<10	350
AQMS 3	25-26 Apr 2025	36	9	0.01	107	<10	105
AQMS 4	26-27 Apr 2025	68	35	0.02	487	11	391
AQMS 5	28-29 Apr 2025	48	10	0.02	296	<10	200
EMC Limits 24- hour *8-hour average value)		80	80	1.25*	2000*	-	-
WHO AQG limit 24-hour		25	40	0.05*	4000	-	-

From Table 5-9 and Table 5-10 above, the following findings were made:

- Nitrogen Dioxide (NO₂) levels remained within the 24-hour limit of 80 µg/m³ across all sites. The highest concentration was recorded at AQMS 4 (68 µg/m³), while AQMS 3 had the lowest value at 36 µg/m³.
- For Sulfur Dioxide (SO₂), the highest level was also at AQMS 4 at 35 µg/m³, which is within the EMC limit of 80 µg/m³. The lowest SO₂ reading was 9 µg/m³ at AQMS 3.
- Ozone (O₃) concentrations remained significantly below the 8-hour limit of 1.25 ppm at all sites, with the highest reading of 0.04 ppm at AQMS 1, and the lowest at AQMS 3 (0.01 ppm).
- In terms of Carbon Monoxide (CO), all measured concentrations were well within the 8-hour limit of 2000 µg/m³. The highest CO level was found at AQMS 4 (487 µg/m³), while the lowest was recorded at AQMS 3 (107 µg/m³).
- Hydrogen sulfide (H₂S) was highest at AQMS 4 with a concentration of 11 ppb. All other locations reported values below detectable limits (treated as zero for analysis).
- Total Volatile Organic Compounds (TVOCs) were highest at AQMS 4 (391 µg/m³) and lowest at AQMS 3 (105 µg/m³). Although no regulatory standard is provided under EMC for TVOCs, elevated levels may indicate the presence of combustion activities or solvent use in the vicinity.
- The highest PM_{2.5} concentration was recorded at AQMS 2 (26 µg/m³), which exceeds the WHO recommended limit of 15 µg/m³. The lowest PM_{2.5} level was observed at AQMS 3 (13 µg/m³), the only location compliant with the WHO guideline.
- All locations reported PM₁₀ concentrations well within the EMC limit of 100 µg/m³. The highest PM₁₀ value was 38 µg/m³ at AQMS 2, while the lowest was 26 µg/m³ at AQMS 3.
- TSP concentrations were also within the regulatory threshold of 200 µg/m³ across all sites. The highest TSP level was found at AQMS 2 (65 µg/m³), with the lowest at AQMS 3 (39 µg/m³).

Overall, AQMS 2 recorded the highest particulate concentrations across all three parameters, suggesting greater pollutant loading potentially linked to nearby activities such as traffic and incineration. AQMS 3 consistently reported the lowest values, indicating relatively cleaner ambient conditions.

These results confirm that AQMS 4 has the highest baseline concentrations of most gaseous pollutants, likely due to surrounding land use activities such as market operations, sewage offloading, and traffic movement. However, all observed levels, except for NO₂ at AQMS 4, remain within applicable regulatory limits.

5.2.4 Noise and Excessive Vibrations

The proposed Extension of Meru Bypass Extension project traverses key sections of Meru township, cutting across diverse land uses, including commercial areas, residential neighbourhoods, places of worship, and public spaces. As such, the project intersects both densely populated and moderately developed zones, presenting a varied acoustic environment. The dominant noise sources within the area include vehicular traffic, primarily comprising both light and heavy vehicles. The project area also has high volume of motorcycles which generate significant noise due to their engine characteristics, frequent acceleration, and honking. During the Baseline survey, sensitive noise receptors were identified in the project area and their approximate distance from the project roads determined as presented in *Table 5-11*.

Table 5-11: Sensitive Noise Receptors in the project area

Receptor	Classification	Distance (m)	Coordinates UTM Zone 37N
Gitoro Inter Denominational Church	Place of worship	18	347401.52 m E, 7447.44 m N
Residential Homes and Student Hostels	Residential	18	347573.44 m E, 7509.97 m N
MCK St. Andrews Church	Place of worship	30	349392.50 m E, 8811.67 m N
Residential Apartments and Student Hostels	Residential	06	349723.75 m E, 8896.55 m N
Kongoacheke	Mixed residential	12	349960.70 m E, 8693.03 m N

Kongo gardens	Commercial	17	349239.64 m E, 8020.19 m N
Three steers hotel	Commercial	67	348761.90 m E, 6552.75 m N
Meru AIC Nursery School	Silent	13	348643.86 m E, 6633.88 m N
Consolata Hospital Gitoro	Silent	91	347917.61 m E, 7088.71 m N
Mosque	Place of worship	10	350163.66 m E, 5698.21 m N
MeTRH	Silent	33	350188.97 m E, 5665.18 m N
Meru Cancer Treatment Center.	Silent	39	350021.66 m E, 5629.07 m N
KMTC Meru Campus	Silent	37	350105.14 m E, 5630.01 m N
Full gospel and Shalom academy	Silent	29	350650.26 m E, 5342.25 m N
CCM Good Shepherd Primary School	Silent	11	350750.95 m E, 5462.22 m N
Kooje Catholic Church	Place of worship	18	351527.38 m E, 5513.57 m N
Gakoromone Dispensary	Silent	07	351529.47 m E, 5397.80 m N
Deliverance Church Runogone	Places of Worship	37	350668.13 m E, 8722.26 m N
MCK Gakoromone Church	Places of worship	21	351513.69 m E, 5364.66 m N

The assessment of environmental noise for the proposed project was conducted in accordance with the standards outlined in ISO 1996-1:2016 and in line with the provisions of the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 between 24th and 28th April 2025. A model Larson Davis LxT Type I integrating sound level meter was used to collect the measurements and sound recordings at each site. Measurements were undertaken from four pre-identified points around the proposed project area as presented in Table 5-12 below.

Table 5-12: Details of Noise Monitoring Locations

Site ID	GPS location	Description
NML1	351534.00 m E 5386.74 m N	Link3- MeWAS Junction. The monitoring location is situated within a resort, positioned opposite a church, and approximately 20m from a nearby road. This area features a mix of sensitive receptors, including the Gakoromone Dispensary, FC Resort, and adjacent residential homes. The primary source of noise at this location is attributed to motorcycles, which frequently ply the route, generating high noise levels. Additionally, occasional vehicular traffic from the nearby road also contributes to the overall noise levels.
NML2	350160.93 m E 5715.07 m N	Madrasa Raudha/ Masjid Mjini. The monitoring location is situated near the Mjini Mosque, within a vibrant area characterized by mixed land uses, including residential estates, educational institutions, and healthcare facilities. The area is surrounded by key establishments such as the Meru County Referral Hospital, Meru KMTC, Meru Cancer Treatment Center, and several schools. The measurement point is located approximately 50m from a busy road, which serves as a primary route for both vehicular and motorcycle traffic. The most consistent noise sources are vehicles and motorcycles, with motorcycles being particularly loud due to the removal or absence of silencers. In addition to these continuous noise sources, the location experiences intermittent noise from the following: • Emergency vehicles from the nearby hospital, especially ambulances, which frequently use sirens. • School activities, including children playing, contribute to variable noise levels. • Prayer notifications broadcast through loudspeakers from the Mjini Mosque, typically occurring during prayer times and creating short bursts of high noise intensity. The combination of continuous road traffic noise and intermittent acoustic events from emergency vehicles, school activities, and mosque loudspeakers contributes to a complex and variable noise environment at this location.
NML3	349757.22 m E 8931.79 m N	Kambakia- Kagotone, the monitoring location is situated inside a residential apartment complex, characterized by a generally quiet environment. The area primarily serves as a residential zone, with minimal external noise disturbances. However, intermittent noise levels are observed due to the following sources: • Vehicles and Motorcycle movements along the adjacent feeder road and a major road located approximately 170 meters away. • Residential activities, including routine movements, social interactions, and domestic chores within the apartment complex, also contribute to the reported noise levels, albeit at lower intensities.

Site ID	GPS location	Description
		Overall, the acoustic profile of this location is relatively quiet.
NML4	351059.40 m E 5168.70 m N	Link 2- Gakoromone market. The monitoring location is situated inside a major market area, characterized by high levels of human activity and diverse noise sources. The area is bustling with commercial activities, including trading, loading, and unloading of goods. Key noise contributors at this location include: • Market Activities: The constant presence of traders, shoppers, and vendors generates a persistent ambient noise level, typical of busy market environments. • Motorcycles: The area is heavily populated with motorcycles, which frequently maneuver through the market. Many of these motorcycles lack silencers, producing loud and often disruptive noise. • Jua Kali Sector: Located approximately 50 meters from the monitoring point, this area is characterized by metalworking activities, including the consistent hitting and hammering of metals. The noise from these activities significantly contributes to the overall acoustic profile, especially during peak working hours. • Truck Movements: Trucks frequently enter the area to offload sewage at a nearby water treatment plant. These vehicles generate significant noise, both from engine operation and during the unloading process. The combination of high human activity, frequent motorcycle movements, industrial noise from the Jua Kali sector, and truck operations results in consistently elevated noise levels. This location represents a challenging acoustic environment due to the convergence of various noise sources. Noise levels are anticipated to be higher on market days, particularly Mondays, Wednesdays, and Fridays, due to increased human activity and vehicular movements associated with market operations.

5.2.4.1 Monitoring Results

The noise monitoring data obtained for each location compared against the respective EMCA regulatory maximum limits for construction sites for diurnal and nocturnal noise levels are as presented in Table 5-13 and Table 5-14 respectively.

Table 5-13: Diurnal Noise Levels- Monitoring Results (06:01-20:00)

Site ID	Date of measurement	L _{Amin} dB(A)	L _{Amax} dB(A)	Leq dB(A)	EMC limits dB(A)
NML1	27-28 Apr 2025	42	64	53	55
NML2	24-25 Apr 2025	43	80	56	40
NML3	25-26 Apr 2025	37	57	48	50
NML4	26-27 Apr 2025	49	78	63	60

Table 5-14: Nocturnal Noise Levels- Monitoring Results (20:01-06:00)

Site ID	Date of measurement	L _{min} dB(A)	L _A F _{max} dB(A)	Leq dB(A)	EMC limits dB(A)
NML1	27-28 Apr 2025	24	44	39	35
NML2	24-25 Apr 2025	34	75	40	35
NML3	25-26 Apr 2025	31	46	35	35
NML4	26-27 Apr 2025	33	60	43	35

From Table 5-13 and Table 5-14 above, the following conclusions are made:

1. The results indicate that NML2 (Muslim School) and NML4 (Market area) exhibited significantly higher nighttime noise levels compared to the EMCA limits during daytime.
2. Night-time noise monitoring revealed that only NML3 (Residential Estate) reported noise levels within the EMC limit for residential zones. The compliance at this location reflects the relatively calm environment typical of residential areas during nighttime hours, with minimal vehicle and human activity. However, NML1, NML2, and NML4 exceeded the EMC limits for night-time noise. Generally, the highest noise levels were reported at NML4 (Market) and lowest averages at NML3 (Residential Estate). Noise levels at NML4 are anticipated to be higher on market days, particularly Mondays, Wednesdays, and Fridays, due to increased human activity and vehicular movements associated with market operations.

The baseline data obtained is representative of the noise levels at all the measurement locations and can be used to compare subsequent levels when the project is under construction and operational phases.

5.2.5 Waste Management

The main waste streams in the project area can be broadly categorized as follows:

- **Household Waste:** Organic waste (e.g., food scraps, garden waste), recyclables (e.g., plastics, glass, paper), and non-recyclables (e.g., textiles, broken items).
- **Commercial Waste:** Packaging materials, food waste from restaurants, e-waste from businesses, and general office waste.
- **Industrial Waste:** Waste generated by industries, including manufacturing by-products, scrap metal, packaging materials, and hazardous waste.
- **Public Space Waste:** Waste generated from public areas, including streets, parks, and other communal spaces.

5.2.5.1 Solid Waste

The main dumpsite serving Meru Town is Nkunga Dumpsite along the Meru – Nanyuki highway. There exist several waste streams ranging from household waste, waste from commercial centers and waste from few industrial parks such as Njeru tea industries. Waste collection in Meru town is carried out by the county government which operate eight (8) waste collection trucks. Along Gakoromone market and public areas, County government has installed waste skips that are used for waste collection before final transportation to Nkunga dumpsite. The biomedical waste generated within the town's health care facilities are incinerated at the Meru County Referral hospital.

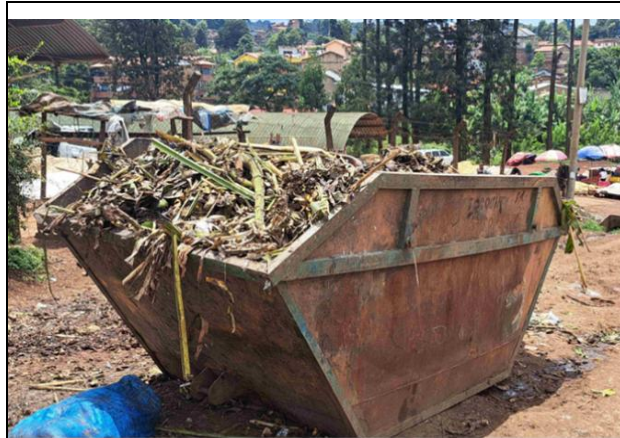


Plate 5-9: Waste skip at Gakoromone market

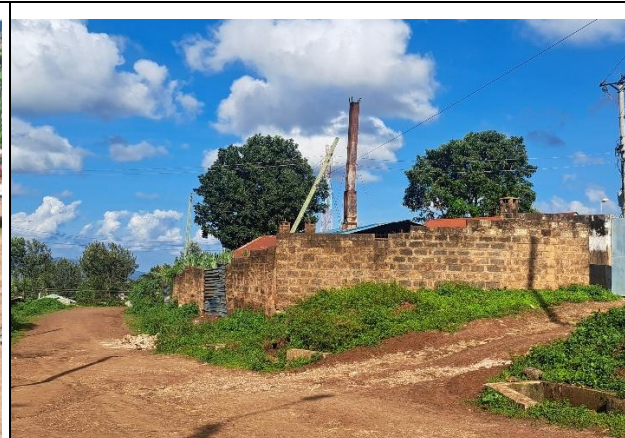


Plate 5-10: Meru TRH incinerator used for burning of biomedical waste

5.2.5.2 Liquid waste management

Management of liquid waste within Meru town is mainly through use of open sewage treatment ponds found next to Gakoromone market. The sewage facility developed run and managed by MeWASSCO serves a small proportion of the population leaving a larger majority to depend on septic tanks, soak away pits, pit latrines and biodigesters for liquid waste treatment.

5.3 Socio-Economic and Cultural Baseline

5.3.1 Demography

According to the 2019 Kenya Population and Housing Census (Volume II), Meru County had a total 1,545,714 people, comprising 767,698 male and 777,975 females and 41 intersex persons. Table 5-15 shows population distribution by sex, land area, population density and sub-counties found in Meru County.

Table 5-15: Population distribution for the various Sub-counties in Meru County

Sub- county	Male	Female	Total	Land Area (Sq. Km)	Population Density (Persons per Sq. Km)
Buuri East	38,101	38,497	76,598	333	230
Buuri West	40,496	40,264	80,762	639	126
Igembe Central	111,208	110,200	221,412	603	367
Igembe North	83,364	85,949	169,317	1,113	152
Igembe South	80,192	81,446	161,646	255	633
Imenti North	88,506	89,056	177,567	232	767
Imenti South	103,338	103,162	206,506	418	494
Meru Central	66,920	66,894	133,818	377	355
Tigania Central	51,814	52,916	104,730	237	441
Tigania East	35,352	37,194	72,549	511	142
Tigania West	67,715	72,241	139,961	399	351

The population density in each sub-county is dependent on urbanization, land use practices and the prevailing climatic conditions. Population density within the county ranges from as low as 126 persons per square kilometer in Buuri West Sub- County to as high as 767 persons per square kilometer in Imenti North.

The population data for sub-locations within Municipality Location in Imenti North Sub-County is as shown in Table 5-16 below.

Table 5-16: Population distribution in each Sub-location

Sub-location within Municipality location	Male	Female	Total	Land area	Population Density (Persons per Sq Km)
Gakoromone	4,034	4,345	8,379	2	4,304
Kaaga	2,655	2,763	5,418	3	2,131
Kaaga 1	6,187	6,599	12,788	4	3,159
Mwiteria	3,858	3,853	7,711	2	3,331
Township	3,043	1,786	4,830	1	5,295

5.3.1.1 Persons Living with Disabilities

Out of the total population of Meru County, 49,815 are persons living with disability comprising of 21,819 males and 27,994 females.

AGE	5-14			15-24			25-34			35-54			55+		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Visual	1,536	807	729	1,533	622	911	1,213	463	750	3,960	1,433	2,527	11,265	4,163	7,102
Hearing	1,217	639	578	939	521	418	745	409	336	1,558	767	791	4,814	1,772	3,042
Mobility	1,039	565	474	798	429	369	938	522	416	3,328	1,469	1,859	13,186	4,582	8,604
Self-care	1,196	723	473	799	483	316	769	546	223	1,389	946	443	3,424	1,306	2,118
Cognition	1,180	724	456	1,363	822	541	1,490	917	573	3,295	1,733	1,562	6,806	2,260	4,546
Communicating	1,197	708	489	957	564	393	671	419	252	944	619	325	1,074	456	618
Total	7,365	4,166	3,199	6,389	3,441	2,948	5,826	3,276	2,550	14,474	6,967	7,507	40,569	14,539	26,030

Figure 5-11: Population of persons living with disability by type, age and sex

Source: KNBS, 2019

5.3.2 Settlement Patterns

The project area has a mixed-use development and high-density housing typical of urban and semi-urban settlement patterns. The area around hospital roads closely borders the Central Business District (CBD) of Meru town with a blend of residential, commercial and light industries. The Three Steers Kambakia Road branches off from the heavily built Makutano centre with multi-storey buildings and apartments. In the peri-urban areas, settlement is scattered with farmlands in between as seen in Western Bypass and Kambakia Kagotone Roads.

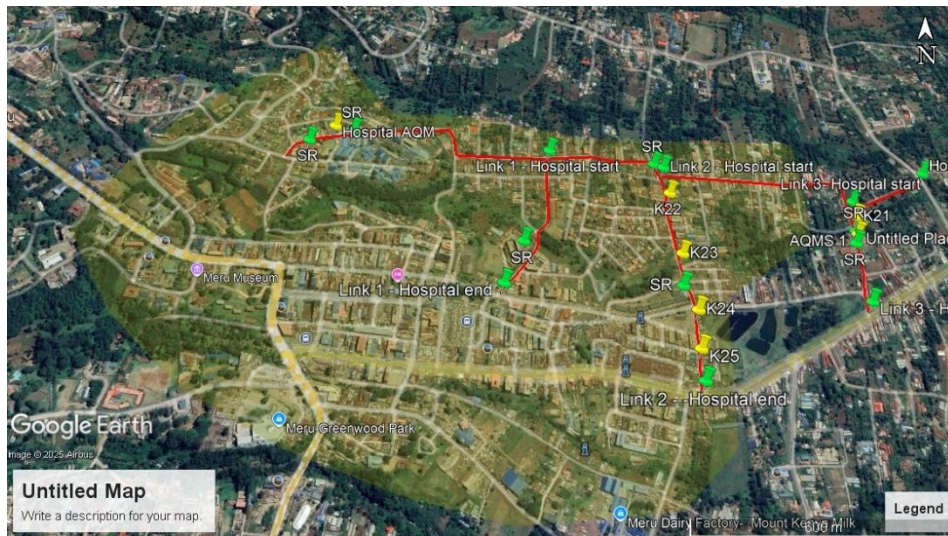


Figure 5-12: Built up Meru CBD (Highlighted) within which the Hospital Roads
Source: Google Earth

5.3.3 Healthcare

According to the Meru Vision 2040 plan, the county has a total of 601 health facilities distributed across its 10 sub-counties. Of these, 56% are privately owned, 32% are managed by the Ministry of Health (MOH), 11% are operated by faith-based organizations, and 1% are run by non-governmental organizations (NGOs). The doctor-to-population ratio is 1:14,285, the nurse-to-population ratio is 1:1,652, and the clinical officer-to-population ratio stands at 1:7,142.

Common illnesses include malaria, respiratory infections, diarrheal diseases, and hypertension/diabetes. The five most common diseases in order of prevalence in Meru County are Upper Respiratory Tract Infections, Arthritis, Joint pains, Intestinal worms and Disease of the skin. HIV and AIDS estimated prevalence stands at 2.9% for Meru County. Maternal-child health is strong, with 91% of births attended by skilled personnel. Health challenges include infrastructure gaps and adequate staffing (Government 2018).

Table 5-17: Number of Health Facilities in Meru

Sub County	Faith Based Organization	Ministry of Health	Non-Governmental Organization	Private Practice	Totals	%
Buuri East	5	10	0	23	38	6%
Buuri West	2	10	0	23	35	6%
Igembe Central	7	17	0	16	40	7%
Igembe North	2	15	0	13	30	5%
Igembe South	5	16	1	36	58	10%
Imenti Central	11	21	1	16	49	8%
Imenti North	9	21	5	135	170	28%
Imenti South	14	35	0	37	86	14%
Tigania Central	1	15	0	9	25	4%

Sub County	Faith Based Organization	Ministry of Health	Non-Governmental Organization	Private Practice	Totals	%
Tigania East	2	10	0	12	24	4%
Tigania West	3	29	0	14	26	8%
Total	61	199	7	334	601	100%

Imenti North, where the project roads are located, has a total of 170 health facilities. The project area is dotted with various health facilities including Meru Teaching and Referral Hospital along Hospital -Kiramburine JCT Road and Consolata Hospital Gitoro along 3 Steers Kambakia Road. There are also numerous health facilities including private clinics, public dispensaries and Chemists seeking to meet the health needs of the population. Additionally, in a bid to reduce incidences of non-communicable diseases, the Preventive and Promotive Directorate constructed and operationalized Public Health Aflatoxin Testing Laboratory at Kinoru Health Center to serve the region which is also close to some sections of the project (Three Steers Kambakia and Meru National Polytechnic Footbridge).



Plate 5-11: Gakoromone Dispensary along Link 3 MeWASSCO Junction Road

5.3.4 Livelihood

Meru County is a member of the Central Region and Economic Bloc (CEREB), a trade and investment for all the counties found in Mount Kenya area. The county contributes an average of 3.2 % of the National value of goods and services produced. The average value of goods and services produced per capita of Meru County is Ksh 148,366 with an average population growth of 1.3 % and overall poverty levels of 26.3 %.¹¹ . The agriculture sector is the most dominant economic activity and source of livelihood with employment opportunities in cash crop farming, animal husbandry and food production. The sector contributes about of 51.72 % of the county's economy. The service sector is the second, contributing an average of 39.23 % while the industry sector contributes about 9.45 %. Figure 5-13 below shows the comparison for the various economic sectors of the county.

¹¹ Assessing Labour productivity for Meru county, Kenya Institute for public Policy Research and analysis, Cecilia Naeka and Esther Irungu, No. 76/2023-2024.

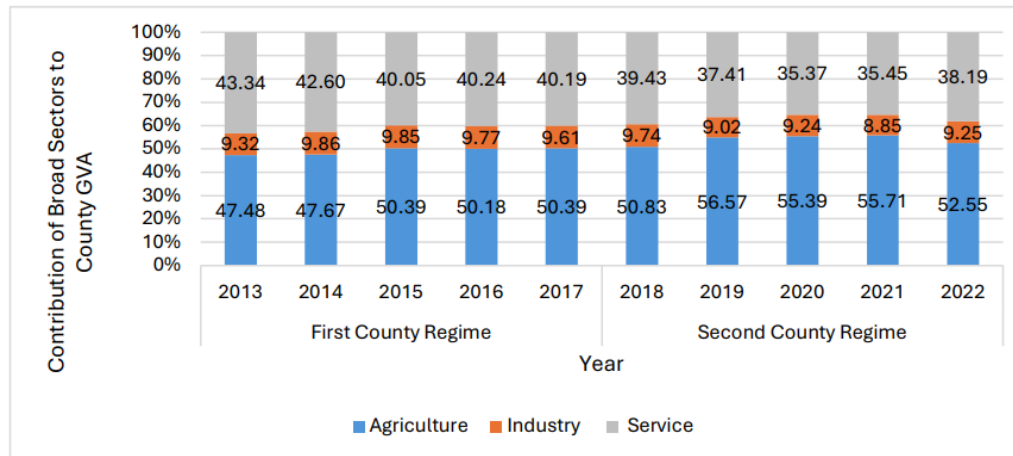


Figure 5-13: Performance of Agriculture, Industry and Service Sectors in Meru

Agriculture sector: The growth in the agricultural sector in Meru County can be partly attributed to changes in climate, government policy and growth in population. Nationally total area of land under agriculture is 10,032,857 hectares with subsistence farming taking the lion share of 8,432,132 hectares while commercial farming accounts for 961,501 hectares of land. Land under agriculture in Meru County is 361,272 hectares of the total land in Meru County. In terms of the number of households practicing agriculture 250,493 household practice crop production while 201,036 households practice livestock production, 1,089 practice apiculture, 1,666 practice aquaculture and 51,587 households practice irrigated agriculture¹². These data qualify agriculture as the dominant livelihood source in Meru County employing a large number of the people. Table 5-18 below shows a summary of households growing crops by type in Meru County.

Table 5-18: Households growing crops by type in Meru County

Type of crop	Tea	Coffee	Avocado	Citrus	Mango	Macadamia	Khat (Miraa)
No. of households	30,404	28,195	41,746	6,255	27,457	29,545	85,023

Data from Table 5-18 shows that under the agricultural sector khat (Miraa) is grown by a large number of households. This is mainly due to Khat acting as the main cash crop that is preferred in the county due to its low cost of farm inputs and the favorable climate in Meru County. Animal husbandry is done on a smaller scale compared to crop production. This is partly attributed to the cost, risks, availability of fodder and land. Poultry production as a form of livelihood activity, is also high in the county with the most common types of poultry reared being indigenous chicken.

¹² 2019 Kenya Population & Housing census; Volume iv; Distribution of population by socio-economic characteristics.



Plate 5-12: Napier grass grown along the Kongoacheke -Kwa Mukuru Road



Plate 5-13: Mixed farming along the Western Bypass Mate Road

Trade sector: Trading activities in the project area comprises of small to medium sized business premises within demarcated market areas, built commercial areas and roadside business sheds. Gakoromone Market is a major trading centre where most farm produce all over the country are sold. Other goods traded in the market include clothing, timber materials, footwear and juakali products. Roadside businesses mainly comprise of kiosks and eateries.



Plate 5-14: Business sheds at the end of Kambakia - Kagotone/KEMU Road



Plate 5-15: Traders at Gakoromone Market along Link 2 Road

Service sector: The dominant sub-sectors are transport with most people employed in the public passenger transport vehicles, long distance transport vehicles and motorized two- and three-wheel vehicles. Public administration and security is the second highest contributor under services at 19.96 %. The wholesale and retail trade sector is third with an average of 12.50 % contribution to livelihood of residents of Meru County. The County has a total working-age population of 918,702 which is about 59.44 % of the total county population. The majority of the working-age population is youthful (18-34 years) at 46.03 %. Imenti North has the highest percentage of working-age people at 65.78 %.

Tourism sector: Meru County is one of the few regions in the country that has the big five – the lion, elephant, rhino, leopard and buffalo. The big five are mainly found in gazetted game parks and forests such as the Meru National Park, Mt. Kenya National Park and Imenti forest. Meru national park and Lewa Conservancy are the wildlife conservation areas characterized by favorable ecosystems that are rich in flora and fauna. Within the tourism sector, hospitality sub-sector is the predominant employer of most people. Some of the hospitality establishments in the project area include Three Steers, Paradise Hills Garden Resort, Elsa Hotel, Gatimene Gardens Hotel, Kongo Gardens and Consular Resort.



Plate 5-16: Notable hotels and resorts within the project area

Mining sector: Mining activities in the county include building stones mining in Imenti Central, Imenti south and some parts of Buuri sub county. Sand mining is carried out in lower parts of Tigania West and East and much potential in Kiagu area at the confluence of River Mariara and River Kathita. Along the Kambakia -Kagotone road, there are roadside heaps of ballast symbolic of small scale mining activities.



Plate 5-17: Ballast sold along the Kambakia -Kagotone Road

Range sector: The rangelands in Meru is used as wildlife conservation areas while a few sections are used for beef farming by the large game ranches. The sector employs people in security, animal herdsmen and in the few meat processing facilities.

5.3.5 Education

The County has 773 Early Childhood Development and Education (ECDE) centres with 96,558 children enrolled; 753 primary schools with 325,152 pupils enrolled; and, 379 secondary schools with a total enrolment of 109,429 students. Figure 5-14 and Figure 5-15 below shows the percent primary school enrolment in each sub-county and the number of public and private learning institutions in Meru County respectively.

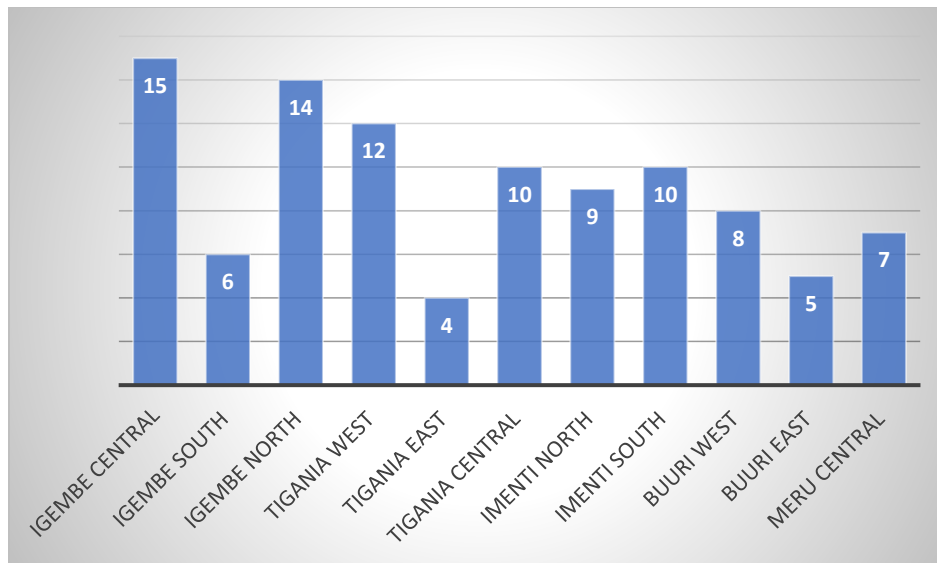


Figure 5-14: Percentage of primary school enrolment per Sub-County

	ECDE	Primary	Secondary	VTCs	TTIs	National Polytechnic
Public	770	753	379	30	6	1
Private	423	355	21	2	0	0

Figure 5-15: Number of public and private learning institutions in Meru County

The teacher: student ratio for ECDE centres is 1:50 against the recommended ratio of 1:25; teacher: student ratio for primary schools is 1:48 against the recommended ratio of 1:40. Teacher: student ratio for secondary schools is 1:60 against the recommended ratio of 1:40, while instructor: trainee ratio stands at 1:24 against the recommended ratio of 1:10.

Secondary Education: There are 192 public secondary schools in the county which absorb students from both public and private primary schools. These schools have a total enrolment of 54,682 students against 1,825 teachers. The proportion of those enrolled in secondary school is however low compared to the population aged 14-17 years as only 45 per cent are in school. The number of males in secondary school stand at 25,625 which is lower than that of girls whose number is 29,057. The low number of boys could be attributed to a combination of factors in the county. Notable secondary schools within the project area include Kaaga Boys and Girls' Secondary Schools, Nchaure Secondary School, Kirige Day Secondary School, Gikumene Girls' Secondary School and Meru School.

Tertiary Education: Some of the tertiary institutions within the project area include: The Meru National Polytechnic, Kenya Methodist University, Kenya Medical Training College, Meru Teachers College, Meru Institute of Business Studies and the Meru School of Theology.

Literacy: The County rate of literacy stood at 53 per cent in 2012, with the sex ratio being male 40 per cent and 60 per cent female. This implies that girl child campaign resulted in imbalances in enrolment and completion rates for boys and girls. To improve the literacy rate, 74 adult learning centres have been established with 910 learners and 312 teachers. There are however more female learners than male as the enrolment is 345 males and 565 females.



Plate 5-18: Meru School of Theology at Km 0+600 RHS of the Kambakia-Kagotone Road (Apprx 150 meters)



Plate 5-19: Meru National Polytechnic along the Meru Nanyuki Highway



Plate 5-20: Kenya Methodist university (KEMU) bordering the Kagotone -KEMU link Road

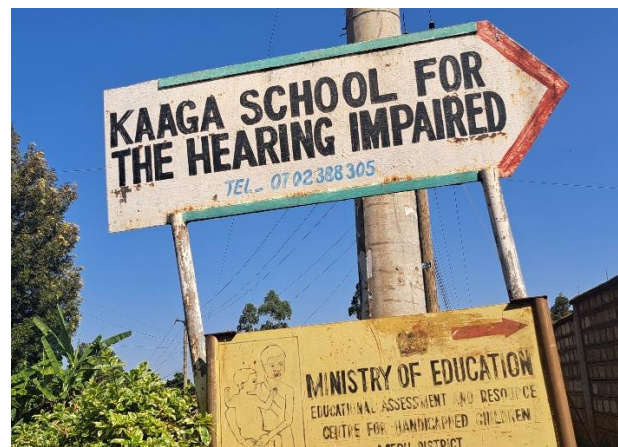


Plate 5-21: Kaaga School for the Hearing Impaired next to Kaaga Boys' School

5.3.6 Land use

Land use can be influenced by land tenure, biophysical and social-economic factors. The principle biophysical factors that influence land use are climate, landforms/topography, geology, soils, hydrology, and land cover. The social-economic factors include population, income, technology, administrative institutions and location.

Meru town located in between Mount Kenya and Nyambene hills serves as the County government headquarters. Its location and administrative role played determine the land use. According to the municipality plan, the area is zoned for different land use such as agriculture, commercial, education, residential, industrial and public purpose uses as shown in Figure 5-16.

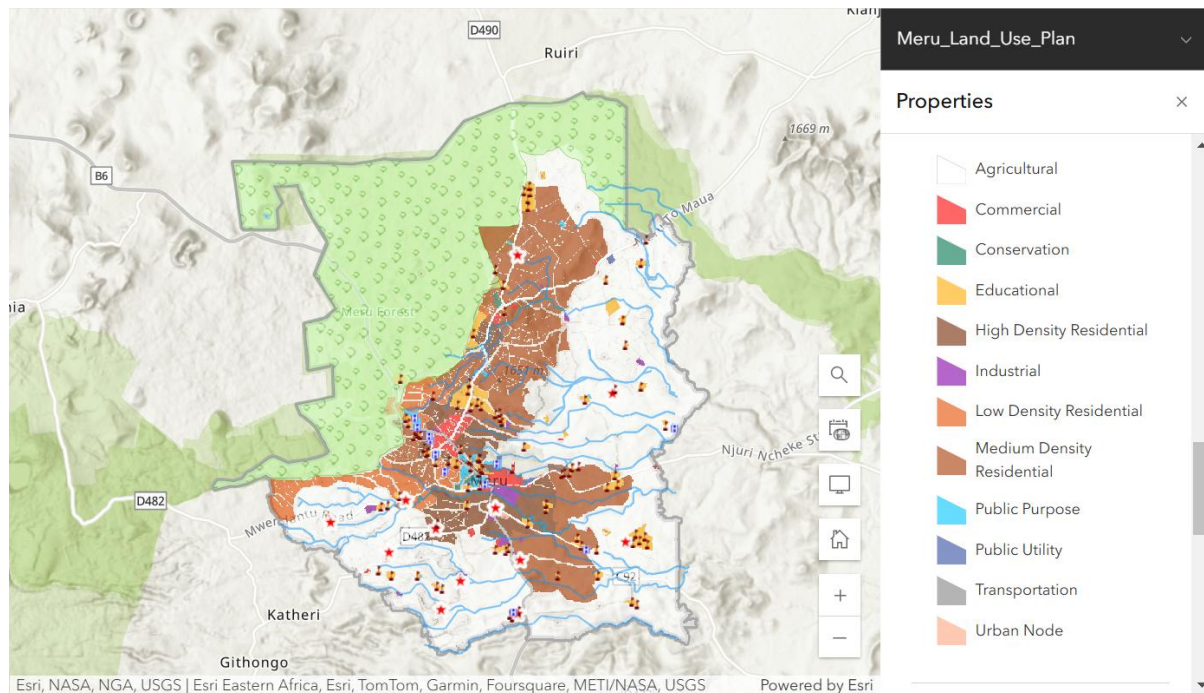


Figure 5-16: Land use Plan for Meru Town¹³

Within the Meru municipality boundary, approximately 35-40 % of the land is for agricultural use while both high- and low-density residential areas account for 30-35 %. Other land uses such as commercial, education, public purpose and industrial use account for 20-25 % of the total land within the municipality. Over the years, studies have shown that substantial changes in land use have been towards urbanization. This can partly be due to population increase, Land fragmentation and climate change. It is important to note that Upper Imenti forest, a protected area, is within the project area but outside the municipal boundary as shown in Figure 5-17 .Being in close proximity to the municipality the forest is properly fenced and electrified, however, the short elephant fence is incomplete.

¹³<https://www.arcgis.com/apps/mapviewer/index.html?layers>

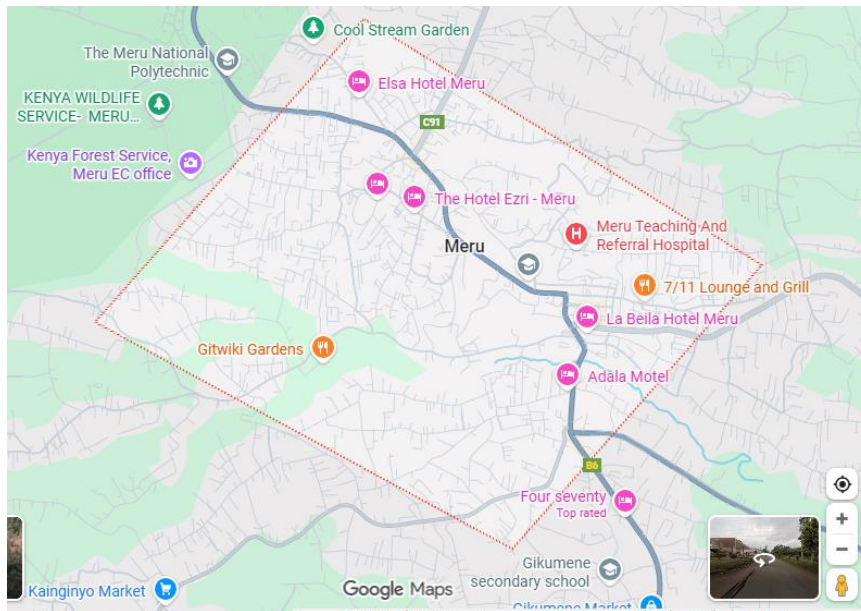


Figure 5-17: Boundary of Meru municipality in relation to the Upper Imenti Forest

Meru County is located on the eastern slopes of Mount Kenya with a cool and wet type of climate and well drained red volcanic soils creating suitable conditions for agriculture. This can be justified by data from Figure 5-13 and Table 5-18 showing the contribution of agriculture to the economy of the County and the number of households practicing agriculture respectively. The data can be extrapolated to represent land use within Meru town making agriculture the dominant land use in the town and its environs.

5.3.7 Security

According to the National Crime Research Centre data for the year 2020, the most prevalent crimes in Meru County were burglary, stealing, theft of stock, assault and possession of illicit brews. Other crimes in the county included Gender Based Violence, defilement and child labour. Further, the National Police Service Annual report for the year 2023 placed Meru County top as having the highest number of reported crimes (NPS, 2023). Figure 5-18 below presents the type and level of various crimes in Meru County.

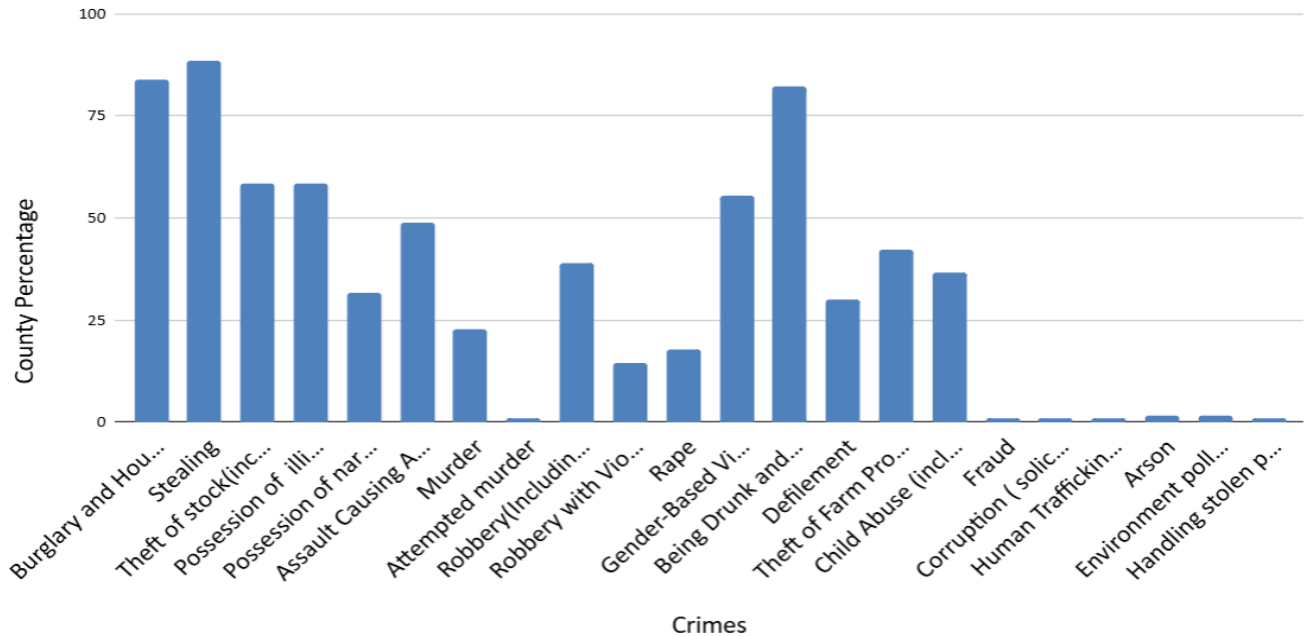


Figure 5-18: Meru County Crime Outlook 2020

Source: <https://www.crimeresearch.go.ke/meru/>

5.3.8 Infrastructure

5.3.8.1 Road Network

Meru County has an approximately 1,259.9 km of road network comprising of 225.7 km paved roads, 266.7 km gravel roads and 767.5 km earth roads. Buuri Sub-County has the largest portion of paved roads (114km) with Imenti North and South having 103.92km and 95.8km respectively. The roads network is maintained by various government agencies including KeRRA, KenHA, KURA and the county government. The County government oversees over 80 % of earth roads¹⁴.



Plate 5-22: Kambakia -Kagotone Road in gravel condition



Plate 5-23: Tarmacked Western Bypass Road at the Meru National Polytechnic T-Junction

¹⁴ Meru CIDP 2023 - 2027



Plate 5-24: Section of the Hospital -Kiramburine Road paved with cabro

5.3.8.2 Information Communication and Technology (ICT)

According to the KPHC-2019 (Vol. IV) report, 723,172 persons above the age of 3 years own mobile phones in Meru County. About 277,160 have access and use internet while about 102,691 use computers to go about their business. Only about 21,363 use online service to order for goods and services.

ICT has been embraced and widely used by the county government, learning institutions and the general population in Meru County. The areas around Meru municipality are adequately covered (about 95%) by mobile phone network with the main service providers being Safaricom, Airtel and Telkom. Safaricom network command the largest share of the project area.

5.3.8.3 Airstrips

Meru County is served by the Isiolo International Airport and a number of airstrips, namely: Gaitu, Mitunguu and private airstrips which include; Lewa wildlife conservancy, Meru national park, Kisima farm, Oldonyo farm, Embori farm and Maarania farm airstrips.

5.3.9 Poverty

Poverty can be defined generally as a measure of deprivation of the basic needs that a person, household or community requires to have a basic standard of living. Deprivation can be measured either in terms of a lack of resources (income, assets), capabilities (skills, knowledge, and technology) or both¹⁵. In Kenya, the national poverty rate was 33.6% of the population as of 2021 poverty report, while the poverty rate of Meru County was 26.3% of the population¹⁶.

Statistical data for food poverty in Meru County stood at 15.3% of the total head count, a figure lower than the national average of 30.5%. The poverty rates for absolute/overall poverty in the county was 17.2% against a national average of 33.4% while hardcore poverty was 3.2% of the population¹⁷. All poverty rates within the County are below the national average, this can be attributed to favorable climate for agriculture and fertile soils ensuring adequate supply of food and cash crops. To illustrate the poverty rates within the County, the percentage distribution of the conventional households by the wall material and type of cooking fuel used has been used to illustrate poverty rates in county as shown in the Figure 5-19 and Figure 5-20 below.

¹⁵ Definitions and measures of poverty; <https://devinit.org/wp-content/uploads/2016/07/Definitions-and-measures-of-poverty.pdf>

¹⁶ Kenya Poverty Report 2021

¹⁷ The Kenya poverty Report 2019

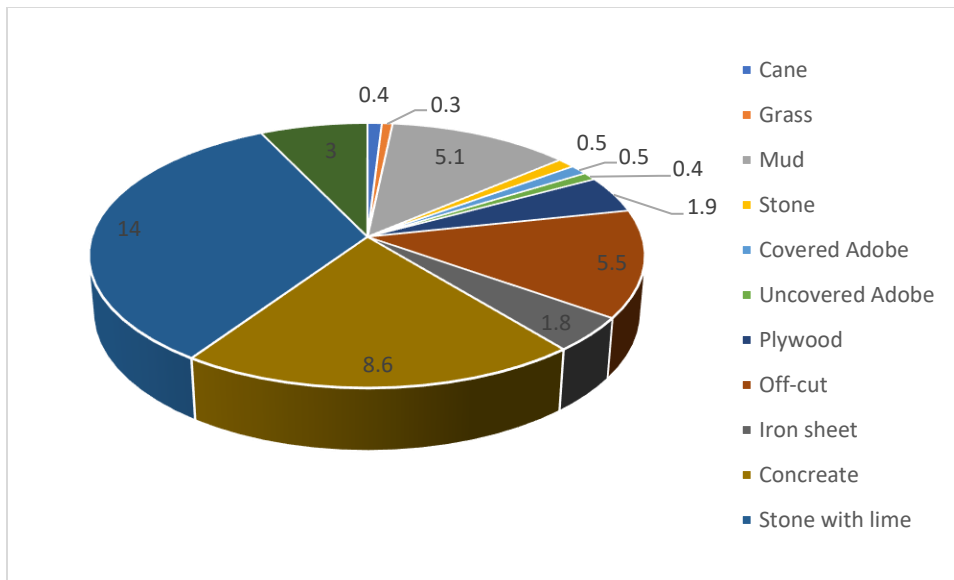


Figure 5-19: Percentage Distribution of Conventional Household By Wall Material

Data for the conventional household wall material shows that a total of 14% of the households surveyed used plywood as the main walling material as opposed to stone with lime or concrete. This can be attributed to the cost of acquiring the plywood which may be cheaper and accessible to a large number of people as opposed to concrete and stones.

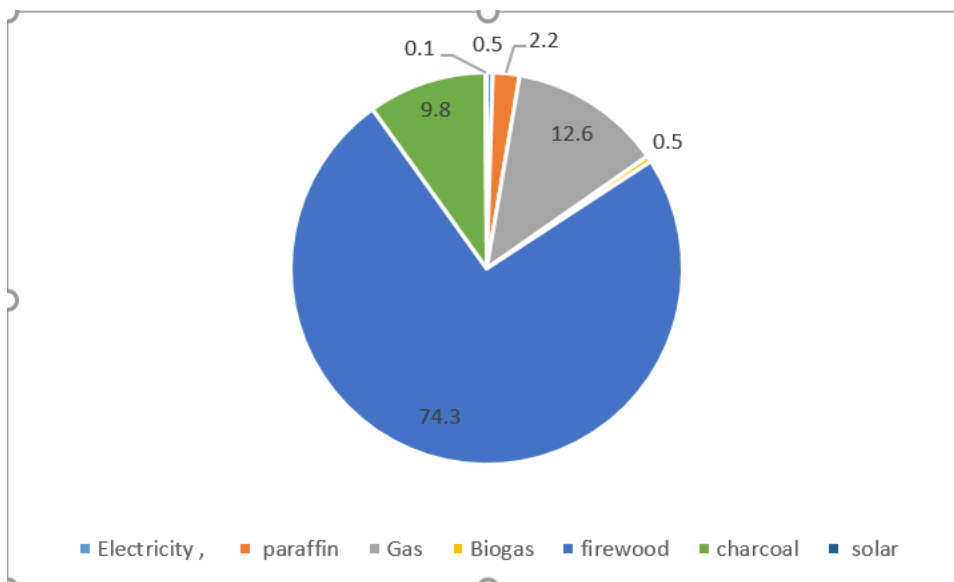


Figure 5-20: Percentage Distribution of Households by Cooking Fuel Type

The data shows that a total of 74.3% use firewood for cooking while 0.5 and 0.1% use electricity and solar power respectively. These attributes can be used as a measure poverty in the community. The cost of electricity installation and ongoing billing is a significant barrier to its widespread use for cooking, particularly among low-income households. Similarly, the high initial capital investment required for solar energy systems limits their accessibility. As a result, both electricity and solar energy remain largely affordable to wealthier segments of the population, while more vulnerable groups continue to rely on less efficient and potentially harmful energy sources.

5.3.10 Archeology, Religion and Cultural Heritage

Culture as per the 1982 Mexico Declaration by the United Nations Educational, Scientific and Cultural Organization (UNESCO), can be defined as the distinct spiritual, material, intellectual, and emotional features characterizing a society. It encompasses arts, lifestyle, human rights, value systems, traditions, and beliefs¹⁸. Meru county is home to the Ameru community a Bantu ethnic group, the community has nine sub-tribes; Imenti, Tigania, Igoji, Mitine, Mwimbi, Muthambi, Chuka, Tharaka and Igembe subtribes.

The Ameru community have been governed by elected and hierarchical elders with the supreme council of the *Nchuri Ncheke* council of elders. The *Njuri Ncheke* is also the apex of the traditional Meru judicial system and their edicts apply to the entire community. The functions of the *Njuri Ncheke* are to make and execute community laws, to hear and settle disputes, and to pass on community knowledge and norms across generations in their role as the custodians of traditional culture. Local disputes will invariably first be dealt with by lower ranks of the elders (Kiama), then the middle rank (*Njuri*) and finally the *Njuri Ncheke*. However, the *Njuri Ncheke* does not handle matters involving non-Meru people, or those that are expressly designated as being under Kenya's common law. Circumcision is a mandatory rite of passage for boys, during which time cultural education including community norms and expectations, such as respect for elders and protection of children are taught in a seclusion period that may last up to a month.

Typical Meru cuisine includes *nyani* (traditional vegetables), *mukimo* (mashed banana with traditional vegetables or potatoes), *kithere* or *muthere* (unfettered corn seeds cooked with beans or peas and traditional vegetables), *nyama cia gwaakia* (roasted meat), *ukie* or *ucuru* (fermented porridge made from flour of corn, millet or sorghum), and *rugicu* (a mixture of honey meat and vegetables). The Ameru believe in offering sacrifice to their gods and this was mainly done by the divine leader called *Mugwe*.

The historical and cultural artifacts of the Meru are preserved at the Meru Museum. The *Njuri Ncheke* Shrine at Nchiru is also gazetted as a heritage site and placed under the care of the National Museums of Kenya. The Shrine is accessible and open to the public most time of the year unless there are *Njuri Ncheke* activities at the site. Culturally the Ameru believe in a god called *Murngu* or *Arega Kuthera*. Mainstream religious groups are Christians, Muslims and Buddhist. Majority of the people practice Christianity spread across the following denominations, Catholic, Anglican church, Methodist, Presbyterian church and SDA. Notable religious facilities in the project area include: the African Inland Church Meru Town (Makutano), Majeeny Mosque, Kooje Catholic Church, Methodist Church of Kenya St. Andrews and Kooje SDA Church among others. Figure 5-21 shows distribution of population in Meru County by religious affiliation.



Plate 5-25: African Inland Church Meru Town (Makutano) along the Three Steers Kambakia Road



Plate 5-26: Majeeny Mosque along the Hospital - Kiramburine Road

¹⁸ <https://www.unesco.org/en/culture/about>

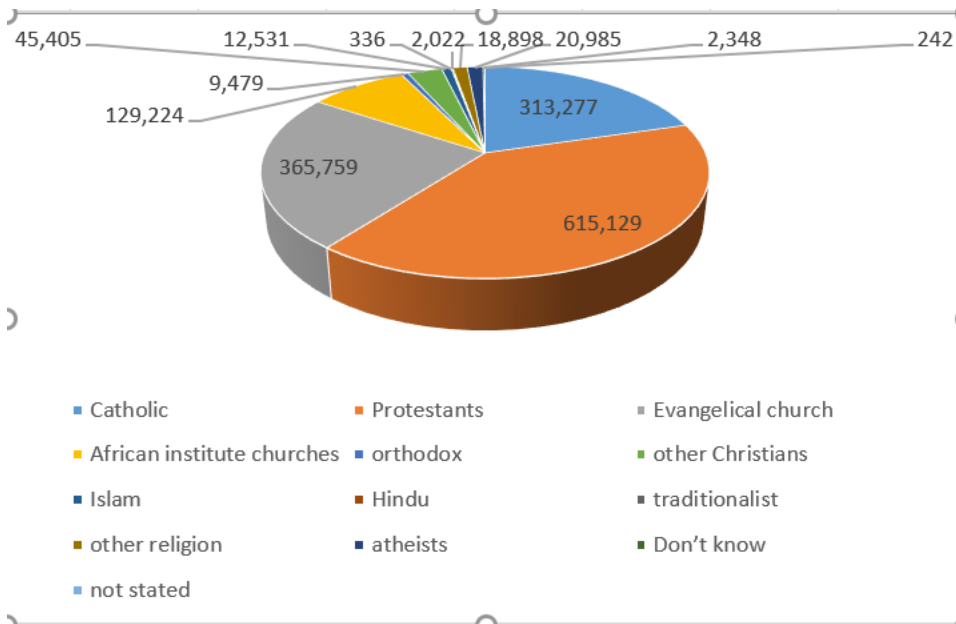


Figure 5-21: Distribution of Population by Religious Affiliation

5.3.10.1 Chance find procedure

The were no cultural heritage material or sites identified in the project area during the study whereas it is highly unlikely, road construction activities such as clearance of vegetation and excavations may unearth artifacts of cultural heritage value that could have been missed during baseline survey, a Chance Find Procedure has, therefore, been developed and attached to this report as Appendix 11 for use during construction.

6 PUBLIC CONSULTATION AND STAKEHOLDER ENGAGEMENT

6.1 Overview

Public consultation and stakeholder engagement are fundamental requirements under the Constitution of Kenya (2010). Article 35 guarantees the right of access to information, while Article 69(1)(d) obligates the State to encourage public participation in environmental governance. In line with these provisions, all development projects must involve affected communities and stakeholders at the earliest stages of planning. In addition, EMCA (Cap 387), and the Environmental (Impact Assessment and Audit) Regulations, 2003, require project proponents to demonstrate that consultations have been undertaken with Project Affected Persons (PAPs) and other relevant stakeholders.

This process was also guided by the World Bank's OP/BP 4.01 on Environmental Assessment, which emphasizes meaningful engagement with affected groups, including civil society organizations and NGOs. Feedback gathered through these consultations has been considered in project design and in the identification of appropriate mitigation measures.

6.2 Objectives of Public Consultation and Stakeholder Engagement

The main objectives of the public consultation and stakeholder engagement process were to:

- Provide the local community and relevant stakeholders with a clear overview of the proposed Extension of Meru Bypass Project.
- Understand community expectations regarding the potential direct and indirect benefits of the project, including employment opportunities, business prospects, and improved accessibility.
- Discuss the anticipated positive and negative environmental and social impacts associated with the project.
- Solicit views, concerns, and perceptions from affected persons and other interested parties regarding the project.
- Facilitate the formation of a representative steering committee comprising local leaders, elders, youth, and women to address project-related matters and promote inclusive participation; and
- Build consensus and foster broad-based support for the project among the immediate community and other key stakeholders.

6.3 Public Consultation

Public consultation meetings were organized at various venues identified jointly by the Consultant and local administration, particularly the area Chiefs. Community members were informed of these meetings through multiple channels, including posters, religious gatherings, and Chief's Barazas. In addition to the public forums, the Consultant administered structured questionnaires to a random sample of community members to supplement information gathered during the meetings and ensure broad representation of views.

A total of five public consultation meetings were held along the proposed road corridor between April 14 and 17, 2025. These forums provided an essential platform for local communities to voice their concerns, share suggestions, and contribute to the refinement of the road design. Details of the consultation meetings are presented in *Table 6-1* below. Comprehensive minutes of each meeting are also annexed (Appendix 5) to this report for reference.

Table 6-1: Public Consultations Meetings Held

Date	Location	Venue	Number of Participants		
			Male	Female	Total
14.4.2025	Kaaga	MCK St. Andrews Church	94	26	120
14.4.2025	Municipality	Kaaga Asst. Chief's Office	58	40	98
15.4.2025	Municipality	Kooje Catholic Church	80	59	139
15.4.2025	Runogone	EAPC Runogone	28	37	65
16.4.2025	Ntakira and Igoki	Nchaure Primary School	106	91	197
Total			366	253	619

6.3.1 Public Consultation Outcomes

Key issues and or concerns emanating from the public consultation meetings included:

- Disruption of water supply to the residents as a result of damages to community water pipes within the road corridor.
- Security concerns with regards to immigrant workers.
- Compensation for acquired properties and assets along the roads.
- Project Design concerns including storm water management (Drainage structures), access culverts.
- Child Labour.
- Gender Based Violence/Sexual Exploitation and Abuse/Sexual Harassment (GBV/SEA/SH).
- Pollution Management.
- Corporate Social Responsibility (CSR).

A Summary of public consultation outcomes are presented in Table 6-2 below.

Table 6-2: Summary of Public Consultation Outcomes

No.	Issue Raised	Outcomes
1.	Project Design and Scope	<u>Drainage</u> Community members expressed concerns about stormwater flooding and poor drainage along several road sections. For Three Steers - Kambakia Road, at Km 0+400, residents, including the local Member of County Assembly (MCA), reported frequent flooding during heavy rains. They requested the installation of a proper drainage system to protect affected households. On the Kambakia - Kagotone Road, residents identified two points - Km 0+600 and Km 1+000, where stormwater runoff damages nearby farms and homes. They recommended that the project include suitable outfall drainage structures at these locations. For Hospital - Kiramburine Road, at Km 1+100 (left-hand side), the community proposed directing stormwater to an existing natural drainage channel located about 200m away. These views reflect a strong need for effective drainage systems to prevent water-related damage and ensure the roads do not negatively impact surrounding properties. <u>Road Width</u> In meetings held Runogone, Nchaure and Kongoacheke Assistant Chief's camp, members of the public sought to know the width of the proposed roads. With regards to the Three Steers - Kambakia Road, the area MCA and one of the youth leaders requested that the road be expanded as it was narrow. The Consultant responded that the road had been designed with a width of 6 meters with sidewalks of 1.5m on both sides. Similar responses were given to the public with regards to the proposed Gikumene - Nchaure and Runogone - Kaithe Roads. <u>Access Culverts</u> In all the public meetings held, members of the public were concerned whether access culverts will be provided at each of the homesteads and properties along the roads. They equally requested that the surrounding of the access culverts should be compacted and adequately stabilized to minimize soil erosion and hence ease of access in all seasons. The Consultant informed the meetings that access culverts will be provided to all deserving residents. <u>Road Safety (Speed Bumps)</u> The community pointed out that considering that most of the roads are within the urban setup, there was need to have adequate speed bumps on the roads to minimize accidents. In most cases, they borrowed from the completed roads within Meru town which they said did not have adequate speed bumps. They further requested that roads under construction should have proper temporary speed bumps.
2.	Road Repairs and Maintenance	<u>Existing Cabro Sections</u> In the meeting held at the Kongoacheke Chief's camp members of the public sought to know who will be responsible for the maintenance of the cabro section of the Three Steers - Kambakia Road after completion of construction activities. They also sought to know whether KURA will repair damaged sections of the cabro as a result the movement

No.	Issue Raised	Outcomes
		of construction trucks during construction. The Consultant clarified that the entire road will be maintained by KURA upon completion of construction activities. It was also pointed out to the public that the project Contractor will be instructed accordingly should the existing cabro pavement be damaged by construction trucks and equipment.
3.	Employment and Labour Concerns	Concerns raised about employment revolved around hiring of the locals for skilled and unskilled job opportunities. Members of the community requested that 70 percent of casual jobs be reserved for the locals. The public also requested the project to have a transparent hiring process and that all jobs should be advertised in public spaces accessible to the general population. In the meeting held at Runogone Church, it was agreed that a Community Liaison Committee (CLC) be formed during the construction to oversee the hiring of locals in the project. The idea was echoed in the other public meetings held for the project. The Consultant further clarified that all the employment opportunities in the project will be advertised by the project contractor and not through any agents or proxies.
4.	Land Acquisition and Compensation	In all the public meetings held, members of the public were concerned about the specific parcels affected by the proposed roads and the compensation procedure. The Consultant, however, informed the meeting that land acquisition concerns will be comprehensively addressed during the Resettlement Action Plan (RAP) process which was yet to begin. Some of the specific concerns raised by the public included: • Who is liable for compensation where land or property is co-owned by a group or family. • Whether structures damaged as a result of road construction activities will be liable for compensation. • How compensation will be done to properties without title deeds and whether property owners are required in person during property census. • At what point will notices be issued for the affected properties along the road. • Whether small scale traders along the project roads will be eligible for compensation. • Whether damaged community water pipes and those owned by Meru Water and Sewerage Services Company Ltd (MEWASSCO) within the road corridor will be compensated for by the project. The Consultant responded to all the queries raised and confirmed to the community that all land acquisition matters will be handled as provided for in law and as provided for by the World Bank Operational Policies.
5.	Road Safety	<u>Street Lighting</u> Members of the public requested that proper street lighting be done along the roads to improve the safety and security of road users and especially along the Kambakia – Kagotone Road which is frequented by students from the Meru National Polytechnic. <u>Road signs</u> In meetings held at Kooje Catholic Church and Kongoacheke Chief's Camp, members of the public raised a concern that most of the completed roads within Meru town did

No.	Issue Raised	Outcomes
		not have adequate traffic signage. They requested that the project ensures that sufficient and appropriate safety signs are installed along the roads after construction activities.
6.	CSR	In a meeting held at Kongoacheke Chief's Camp, members of the public requested if feeder roads not considered in the project could be done under CSR. Assistant chief for Kooje Sub-location requested if the project can construct an office at the sub-location as part of CSR
7.	Environmental and Social Issues	Generally, the public expressed concerns over dust pollution, noise disturbance and GBV/SEA/SH during construction activities.



Plate 6-1: Sample Public Meeting Notices Displayed in Public Spaces within the Project Area

6.4 Stakeholder Engagement

6.4.1 Framework for Stakeholder Engagement

A comprehensive Stakeholder Engagement Plan (SEP) was developed to guide the stakeholder engagement process. Prior to the development of the SEP, the Consultant surveyed the project area and mapped out key stakeholders, including their roles, area of influence, and their relevance to the proposed project. The SEP defined the techniques, modes of engagement, and the expected outcomes from each of the identified stakeholders.

Stakeholders identified and consulted during the study included state and non-state organizations as presented in the Table 6-3 below.

Table 6-3: Identified Stakeholders and mode of consultations

No	Key Informant	Area of interest	Engagement Strategy
1.	Ministry of Interior and National Administration. Meru County Commissioner, Deputy	- Grievance Redress Committee (GRC) formations - Mobilizations - Security	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.

No	Key Informant	Area of interest	Engagement Strategy
	County Commissioner and Area Chiefs.		
2.	KWS	- Human-Wildlife Conflicts within Upper Imenti Forest - Wildlife Movements/migrations patterns - Currents threats to wildlife - Wildlife species of conservation concern	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.
3.	WRA - Meru Sub-basin Office	- River diversions - Possibilities of impact on ground and surface waters - Licensing and permits for water abstraction from different water resources in the project area	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.
4.	KFS - Upper Imenti Forest Station.	- Tree species of conservation concern(s). - Climate change mitigation programs - Threats to forest conservation - Invasive species found within the forest block	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.
5.	NEMA	- General environmental issues for consideration - Environmental issues specific to the project area	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.
6.	MeWASSCO	- Number of households under sewerage coverage - Challenges and plans - Partnerships	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.
Meru County Government Departments			
7.	Department of Health services: Meru Teaching and Referral Hospital	- Morbidity data - Statistics - Traffic management	- Formal Meetings. - One-on-one interview. - Other forms of engagement; phone call and email.
8.	Department of Roads, Transport and Energy,	- Information on ongoing and planned projects within Meru Town - Traffic Management plans	- Formal Meetings. - One-on-one interview. - Other forms of engagement; phone call and email.

No	Key Informant	Area of interest	Engagement Strategy
9.	Department of Water, Irrigation, Environment and Climate Change	- Key environmental conservation concerns such as waste management, pollution controls, etc. - Environmental bylaws - Climate change adaptation initiatives - Past experiences with sources of materials sourcing - Permits and licences, e.g. (Solid and liquid wastes)	- Formal Meetings. - One-on-one interview. - Other forms of engagement: phone call and email.
10.	Department of Land, Physical Planning, Urban Development and Public Works	- Town planning and Land use plans - Approvals of plans - Encroachment issues - Planning challenges and opportunities due to the condition of roads - Masterplans - Land tenure	- Formal Meetings. - One-on-one interview. - Other forms of engagement: phone call and email.
11.	Department of Education, Technology, Gender & Social Development	- Data on ECDE enrolment - Gaps in ECDE infrastructure with main focus to the project roads - Other factors affecting school enrolment/ transition - Female/male enrolment - Persons Living with disability (students)	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.
12.	Department of Trade, Tourism and Cooperatives,	Livelihoods and general comments	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.
13.	Department of Education, Technology, Gender & Social Development (Gender and Social services)	- Vulnerable, marginalized population - Active and planned programs - Empowerment programs - Gender dynamics - Special interest groups i.e. commercial sex workers, Lesbian, Gay, Bisexual, Transgender, Queer Plus (LGBTQ+) community	- Formal Meetings. - One-on-one interview. - Other forms of engagement; phone call and email.
14.	Kaaga Boys School	- Current security/safety Concerns - Alcoholism, Drug and substance abuse related concerns - Student(s) Living with disabilities - Any other challenges experienced	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.

No	Key Informant	Area of interest	Engagement Strategy
15.	National Police Service; Meru Central Police (Divisional HQ)	- General security - Accidents data - Black spots - Crime map - GBV/SEA	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.
16.	Bodaboda Riders Association	- Challenges facing with the condition of the roads - Traffic management during construction - Security - Pricing (current and after)	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.
17.	Registered Association of Public Service Vehicles (PSV).	- Challenges facing with the condition of the road - Traffic management during construction - Security - Pricing (current and after)	- Formal Meetings - One-on one interview - Other forms of engagement; phone call and email
18.	Association of Transporters	- Challenges facing with the condition of the road - Issues of Sand sourcing and transportation - Business opportunities - Traffic management	- Formal Meetings - One-on one interview - Other forms of engagement; phone call and email
19.	The National Syndemic Diseases Control Council (NSDCC)	HIV/AIDS and STIs, prevalence rates and contributing factors specific to the project area	- Formal Meetings. - One-on one interview - Other forms of engagement; phone call and email
20.	NGOs based within the study area , CSO, CBOs	- Biodiversity conservation - Child abuse - Climate change and adaptation - Sanitation - Community health and safety - Alcoholism drug and substance abuse - Disease prevalence	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.
21.	Vulnerable and Marginalized Population: Women and Youth Groups within the study area	- Employment and opportunities - GBV and SEA - Utilization of resources - Conservation	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.
22.	National Government; Ministry of Education, County Director of Education,	- Literacy levels - Enrolment/transition of students - Learning infrastructure within the county	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.

No	Key Informant	Area of interest	Engagement Strategy
		Challenges faced in the sector	
23.	DOSHS	- Common incidents reported. - Unique behavioural characteristics e.g. temperament. - Excessive use of stimulants and sedatives in relation to safety at workplace. - Training, capacity building and partnerships.	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.
24.	National Government Department of Labor	- Unemployment. - Challenges and lessons in relation to the implementation of the Gender rule. - Perceptions of different types of work. - Training and capacity building partnerships. - Experience with labour unions especially. infrastructure projects.	- Formal Meetings. - One-on one interview. - Other forms of engagement; phone call and email.

6.4.2 Key Informant Interviews

A total of 17 key informant interviews (KIIs) were conducted with various national and county governments as presented in Table 6-4 below.

Table 6-4: Details of Key Informant Interviews Conducted

No	Date Interviewed	Stakeholder	Responsible Personnel	Gender
National Government				
1.	9-04-2025	Ministry of Interior and National Administration; County Commissioner	Bernard K. Njenga	M
2.	10-04-2025	KFS Meru - County Forest Conservator (CFC)	Wellington Ndaka	M
3.	10-04-2025	KWS Warden - Meru County	John Ngalia Mwakima	M
4.	14-04-2025	DOSHS Officer - Meru County	Jimner Mwangi Muiruri	M
5.	14-04-2025	NSDCC Regional Coordinator	Julius Koome	M
6.	23-04-2025	WRA Meru Sub-Basin	Agatha Warutere	F
7.	29-04-2025	Kenya Police Service; Meru Police Station	Bonface Mugambi	M
Meru County Government				
8.	9-04-2025	Office of Meru County Secretary	Dr. Kiambi Atheru	M
9.	19-04-2025	MeWASSCO	Patrick Mugendi	M
10.	23-04-2025	Department of Agriculture	Mwiti Njue	M

No	Date Interviewed	Stakeholder	Responsible Personnel	Gender
11.	23-04-2025	County Lands and Physical Planning	Jefferson Musyoka	M
12.	24-04-2025	Department of Lands	Richard Kirina	M
13.	29-04-2025	County Department of Health Services	Dr. Joseph Mukundi	M
14.	29-04-2025	County Labor Office	Catherine Muthoni	F
15.	29-04-2025	County Department of Trade	Kapwine Murupe	M
16.	29-04-2025	County Department of Social Development	Francis Muguro	M
17.	29-04-2025	Department of Roads, Transport and Energy	Lilian Makena	F

6.4.2.1 Summary of Key Informant Interviews and Institutional Feedback

The KIIs conducted with national and county government stakeholders highlighted several critical issues relevant to the project's planning and implementation. Key concerns raised included:

- The need for strong partnerships between the project and relevant government institutions to ensure effective mitigation of social and environmental risks.
- Protection of surface water resources from pollution, particularly during construction and operational phases.
- Safeguarding of wildlife and their habitats along or near the project corridor throughout implementation.
- Compensation for the loss of vegetation, including trees and other natural resources affected by project activities.
- Integration of climate change mitigation measures into the design and execution of the project.
- Timely and coordinated relocation of utilities such as water pipelines, electricity, and telecommunications infrastructure to avoid disruption of essential services.

These institutional perspectives will inform the design of appropriate mitigation measures, reinforce alignment with relevant policy and regulatory frameworks, and strengthen collaboration with key stakeholders throughout the project lifecycle.

Table 6-5: Details of Stakeholder Engagement Meetings Held

No	Stakeholder	Concern/Issue
1.	KFS Meru County Forest Conservator	Threats to the Upper Imenti Forest Highlighted prevailing threats to the forest as including: • Climate Change • Urbanization • Forest Fires; and • Spread of Invasive species Change of alignment along the Kambakia – Kagotone Road The Consultant informed the meeting that the project had proposed a shift in the road alignment into the forest by approximately 10 meters from Km 1+800 to Km 2+000 LHS. The CFC noted the proposal and advised that the necessary approvals be sought before clearing of trees in the affected section.

No	Stakeholder	Concern/Issue
		Compensation of the affected trees The CFC informed the meeting that the project should compensate for all the affected trees in the section where the alignment shifts into the forest. The Consultant informed the meeting that due process will be followed before clearing any trees from the forest. Partnerships The CFC informed the meeting that the KFS was undertaking a reforestation program as part of climate change mitigation in the area. He requested that the project partner with the service in tree planting at identified sites during the construction phase.
2.	KWS	Human – Wildlife Conflict The County Warden informed the meeting that the area along the proposed Kambakia – Kagotone Road was prone to human–wildlife conflicts with recorded fatalities. He further stated that the area serves as a breeding ground for elephants during the wet season. There are wildlife watering points in the forest that are bordered by the proposed Kambakia – Kagotone/KEMU C91 Road. Incidents of poaching The Warden pointed out that there have been cases of poaching in the Upper Imenti Forest in areas bordering the proposed Kambakia-Kagotone Road. Specifically, most of the cases involved Bush-backs, antelopes, hares and in rare cases elephants. Fencing The Warden asked the project to seek relevant approvals from KWS before relocating the electric fence in areas around Km 1+800 LHS. He further stated that the fence should be reinstated promptly to minimize Human – wildlife conflicts in the area.
3.	WRA	Approvals and Permits The Sub-Basin Coordinator advised the project to acquire all the necessary approvals and permits for the stream diversions and all the water abstraction points. Protection of streams and rivers from pollution The Authority stressed on the need to protect riparian areas from pollution and disturbances by having proper mitigation measures during the construction of the roads. The project was advised to install adequate soil erosion control, effluent discharge, and waste management measures to protect the surface and underground water sources. Compliance with legal and regulatory framework

No	Stakeholder	Concern/Issue																															
		The authority advised the project to observe strict adherence to the provisions of the Water Act of 2016 and the Water (Resources) Regulations 2025 during the implementation of the project.																															
4.	DOSHS	Approvals and permits The Directorate stressed on the need for the project to acquire all the necessary permits and approvals for all the project sites before and during the implementation of the project. Training and Awareness Creation The directorate advised the project to ensure that all workers are taken through health and safety trainings and that the community and workers are adequately sensitized on the health and safety procedures. Staffing The directorate pointed out that qualified staff should be employed in the project to oversee the management of health and safety in the project.																															
5.	NSDCC	Factors contributing to HIV/AIDS and STIs in Meru town • Urbanization • Poverty and population pressure • Poor school enrolment especially in slums Areas of partnership The council pointed out that it partners with the community, state, non-state and projects in sensitization and awareness creation, provision of Information Education Communication (IEC) materials, supply of male and female condoms, linkage with health facilities and HIV/AIDS messaging.																															
6.	National Council for Persons Living with Disabilities (NCPLWD)	Consultations with the Meru NCPLWD office revealed that Imenti North Sub-County had about 510 people living with various forms of disabilities as presented below. <table><tr><th rowspan="2">Nature of PLWDs</th><th colspan="3">Number</th></tr><tr><th>Male</th><th>Female</th><th>Total</th></tr><tr><td>Mobility impairments</td><td>100</td><td>80</td><td>180</td></tr><tr><td>Visual impairments</td><td>40</td><td>50</td><td>90</td></tr><tr><td>Hearing impairments</td><td>20</td><td>30</td><td>50</td></tr><tr><td>Mental</td><td>37</td><td>22</td><td>59</td></tr><tr><td>intellectual</td><td>78</td><td>53</td><td>131</td></tr><tr><td>Total</td><td>275</td><td>235</td><td>510</td></tr></table>	Nature of PLWDs	Number			Male	Female	Total	Mobility impairments	100	80	180	Visual impairments	40	50	90	Hearing impairments	20	30	50	Mental	37	22	59	intellectual	78	53	131	Total	275	235	510
Nature of PLWDs	Number																																
	Male	Female	Total																														
Mobility impairments	100	80	180																														
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Hearing impairments	20	30	50																														
Mental	37	22	59																														
intellectual	78	53	131																														
Total	275	235	510																														

No	Stakeholder	Concern/Issue
		Road design The Council raised concerns that most of the roads in Meru were poorly designed in that they lacked sidewalks, had access barriers and were often impassable during rainy season, hence unfriendly to PLWDs. The project was urged to adequately consider the interests of PLWDs in the project design. The Council further pointed out the need to have ramps and audible signals for use by the PLWDs. Discrimination in employment The Council observed that their members were not adequately considered for employment opportunities in past road construction activities. The project was urged to ringfence some of the employment opportunities for PLWDs.
7.	National Government; Ministry of Education, County Director of Education	Safety and security The chief officer reiterated safety risks faced by teachers and students at the Meru National Polytechnic and Kaaga Boys School. She pointed out that lack of proper road crossing infrastructure had led to increased cases of drug abuse among students and general insecurity. Noise and air pollution Focus on safeguarding education institutions and minimizing disruptions to learning during construction. She stressed that appropriate noise and dust barriers should be installed around schools. Sexual exploitation The chief officer pointed out that there have been cases of sexual exploitation and abuse from previous road construction projects. She requested the project to put in place adequate measures to curb such cases including cooperation with the relevant national government agencies. Further, she stressed the need for extensive training and awareness creation during the project implementation.
8.	MeWASSCO	Sewerage coverage Meru town has insufficient sewerage coverage at only 8%. There is an ongoing construction of a new sewer line that is expected to raise the coverage to upto 20% upon completion. Most households in Meru depend on septic tanks to manage their effluent. MeWASSCO has bousers trucks to assist households empty their septic tanks at a standard fee. Water Supply Currently, about 15,000 households are supplied with clean water by MeWASSCO. Ongoing Challenges River Kathita constitutes the principal source of water for the majority of users. Climate change has led to seasonal reductions in river flow, especially during dry periods, thereby constraining the capacity of intake facilities to secure adequate supply.

No	Stakeholder	Concern/Issue
		There is the issue of rampant illegal connections that result in Non-Revenue Water (NRW) thereby contributing to loss of revenue. Destruction of water pipes during road construction could hamper water supply to the residents.
9.	Meru County Government	The Consultant held consultations with various offices under the Meru County Government including the office of the county secretary, the departments of lands and physical planning, health services, roads, transport and energy, social services and crops among others. In addition to welcoming the proposed project, the following feedback was received: • The existing culverts on the Three Steers – Kambakia Road are of 450mm diameter hence cannot accommodate the large volume of runoff water. • That workers in the project should be issued with contracts before commencing their roles. In addition, the project should comply with the provisions of the Employment Act 2007 on hiring, handling workers' concerns and termination of employment. • The project should have a responsive Grievance Redress Mechanism (GRM) for dealing with the expected land acquisition disputes. • The department of Lands and physical planning stressed the need to implement the project in line with the existing Meru Town Integrated Urban Development Plan. • Ensure that all the Project Affected Persons (PAPs) are fully compensated including damaged crops. • Provide for the needs of people living with disabilities in the implementation of the project.
10.	Kaaga Boys School	Kaaga Boys School has 1,203No. students among whom are 3No. PLWDs. The school principal explained that the staff and students face several challenges in accessing the school due to speeding Matatus and motorbikes. He explained that the proposed project is anticipated to enhance access to the school, increase security and enhance students' enrollment. He, however, requested the project to mitigate dust and noise pollution as well as install streetlights at the footbridges to enhance security.
11.	Centre for Rights Education and Awarenesses (CREW)	The Consultant interviewed the Centre for Rights Education and Awarenesses Meru who raised the following concerns: Safety That the project should carry out adequate road safety awareness during construction to minimize accidents. Further, temporary road signs should be installed in all the active construction sites. Child abuse There are fears that road construction will increase case of child abuse by workers. The CREW implored on the project to have their workers sign Code of conduct and be sensitized before before taking up employment opportunities. The organization further pointed out that social risks arising from road construction

No	Stakeholder	Concern/Issue
		could be minimized by observing local cultural values and implementation of detailed grievance strategy.
12.	Meru-Nanyuki-Nyambene SACCO (MENANY)	Challenges faced with the condition of the road The SACCO pointed out that roads in Meru town are congested with traffic jams which result in delays and loss of time. The project was therefore timely as it will improve traffic flow in the town and enhance connectivity. Traffic management during construction. The sacco suggested that roads within Meru town should include PSV lanes and loading bays. Further, proper and prompt road maintenance should be carried out by KURA to ensure uninterrupted traffic flow, especially during the rainy season. It was also recommended that there is need to design and implement better traffic controls and maintain diversions to avoid traffic jams during road construction and that the necessary road furniture be installed on completion of construction activities. Safety and Security The sacco urged the project to install street lightings for safe driving, especially during night hours. Pricing (current and after) The PSV supervisor explained that the fare charges are Kshs. 50 per kilometer on tarmac but rises to over Kshs. 120 per kilometer on rough roads.

6.4.3 Focus Group Discussion

A total of 5 FGDs were held with women, youth, and management representatives of Meru National Polytechnic, KeMU and Gakoromone Market, as presented in Table 6-6 below.

Table 6-6: Summary of FGDs Held During the study

No.	Date	Venue	Group	Attendance	
				Male	Female
1.	16/04/2025	Gakoromone	Market Management	9	2
2.	17/04/2025	KeMU	College Admin and student leaders	10	3
3.	24/04/2025	Meru National Polytechnic	College Admin and student leaders	6	2
4.	24/04/2025	Municipality Location Office	Youth	8	8
5.	26/04/2025	Igoki Location Office	Women	0	8

6.4.3.1 Focus Group Discussion Outcomes

Key issues that came out of the FGDs included community health and safety, youth employment, road safety and Sexual Harassment, Exploitation and Abuse among others. Details of the discussions are as presented in Table 6-7 below.

Table 6-7: Details of FGDs Held During the study

No.	FGD	Area of Concern	Response
1.	Meru National Polytechnic	- Representative of the persons living with disability proposed that safety signs and marking be done during and after construction. She also proposed that the footbridge design should ensure usability to minimize sliding and offer support for people with disability. - Registrar Academics suggested that the peak open sides of the footbridge be well covered for safety concerns. He also proposed that barriers be installed to deter boda-boda operators from accessing the footbridge to prevent accidents. He further requested that students be considered for attachment in the proposed project. - The representative of the Dean of Students raised concerns about security, drug and substance abuse within and out of the institution. - The student's president proposed that adequate speed bumps be installed for safety of the students and the locals. He also raised issues on sexual exploitation, He further requested that one of the access roads in Kambakia be considered for construction. - Mr. Kenneth Kaimenyi suggested that the footbridge remains at the proposed location since the current school gate will not be closed permanently after the construction of the expected new gate for the institution. He also suggested the need for a bus bay for the Nanyuki-Meru Road users that alights passengers at the school gate, posing a risk to the students.	- Assistant Director Social Safeguards (KURA) informed the meeting that the design of the proposed footbridge has provisions for persons living with disability and that the ongoing consultations will assist in improving the design of the footbridge. - The student leader was informed that the proposed project had a fixed budget and that the projects considered had been arrived at following a consultative process. He was however, requested to formally reach out to KURA though the school administration concerning the request. - The meeting was informed that there was an independent consultant on GBV and Sexual Harassment and that gender concerns will be addressed.
2.	Youth	- Kaaga area youth representative Mr. Tonny Karani raised a concern on employment opportunities and urged that the youth be considered. He also had concern on road demarcation and safety markings during and after road construction. - Lucas was concerned about substandard roads and the failure to maintain roads after construction. He also raised a concern	The Consultant informed members that during project implementation, a representative is appointed by the Client to be resident at the project to supervise the project construction. The work of the Resident Engineer on behalf of the Client is to ensure the quality of the work, hence the construction of good roads.

No.	FGD	Area of Concern	Response
		on affected people, especially on pipes destroyed during road works and requested that full compensation be done to the PAPs, utilities, and livelihoods. • Emily Nkirote emphasized the installation of proper drainage structures on the roads. • Godfrey Kimathi and Valentine raised a concern about black spots and suggested that proper markings and road signs be done on the roads. • The boda-boda representatives expressed their dissatisfaction with poor roads that are rarely maintained, and proposed the introduction of checkpoints once the road is constructed to deal with overloading on the roads. • Najma Maua, youth representative for the Township area, having been engaged in previous road construction projects, raised a concern on safety within construction sites, citing that nails and sharp objects are often carelessly exposed, endangering the safety of workers and suggested that the proposed project ensure that waste is managed accordingly.	• An inventory for all the items that will be affected will be done and relocation plan developed to assist in ensuring no parties will be left aggrieved as the relocation will be done under mutual agreement • The proposed project will ensure that the drainage is properly done • The Consultant pointed out that most accident result from human error hence once the road is completed, they should obey traffic rules and speeds to prevent accidents from occurring. • Assistant Director Social Safeguards (KURA) urged the youth to take up responsibility once offered the job opportunities and ensure safety on site to avoid accidents. He informed them that it is within their rights as employees on site to be provided with Personal Protective Equipment and to be compensated in-case of any injuries caused at the workplace.
3.	Women	• Elizabeth Kinya from Kabuurine raised a concern on failure to compensate affected persons by the previously constructed roads. She also advocated for women to be considered in job opportunities. • Sesylene women representative Kathare area insisted on gender equality in job opportunities for skilled and unskilled labour. She also raised a concern on increased theft and insecurity during the past road construction projects. • Lucy Kamba women representative for lower Igoki area stated that they have always experienced water supply disruption during the previous road constructions. She raised that the previous road projects have not considered the welfare of persons living with disability fully in their implementation. Sexual exploitation/abuse to children during	• The Consultant informed members that once the project commences the community will be notified through the area local administration for job interviews and opportunities and that employment will be on merit. • Sensitization of children on sexual issues to minimize child sexual abuse and reporting any inappropriate behavior by employees to the resident engineer through the local administration or the relevant authorities. • The Consultant confirmed that proper road furniture and road marking will be done • The consultant indicated that notices will be given to the

No.	FGD	Area of Concern	Response
		construction. Lydia Karimi from Muringombugi requested that proper road marking and any other safety guard measure be done on the roads upon completion.	community about intended water supply disruption. The community and contractor can get into agreement on water supply to the community during the disruption period.
4.	Gakoromone Market	The market management requested the project to consider constructing additional shades to take care of the additional demand in the market.	The Consultant informed the meeting that the project was constrained financially and as such was not able to give any commitments. The concern was however noted for consideration by the Client.
5.	KeMU	The University administration sought to know whether any of the student hostels and facilities were affected by the proposed development. The University also requested the project to ensure that negative environmental and social impacts such as loss of vegetation, dust pollution and noise disturbance were adequately mitigated upon during the project implementation.	The Consultant informed the meeting that a detailed study of affected properties would be carried out under the RAP process. In response to the concern, the Consultant informed the meeting that a comprehensive environmental and social management plan will be prepared to mitigate negative environmental and social risks.

7 ANALYSIS OF PROJECT ALTERNATIVES

7.1 Introduction

This chapter presents an evaluation of the alternatives considered for the proposed Extension of Meru Bypass Project. The purpose of this analysis is to assess various project options from environmental, technical, and socio-economic perspectives, to inform decision-making and optimize project sustainability. The alternatives analyzed include:

- “No Project” scenario
- Route alignment options
- Construction materials and alternative technology
- Waste management approaches
- Transportation mode alternatives
- Design and engineering options
- Air quality and dust control
- Vehicle operating efficiency

The alternatives have been evaluated based on their potential environmental and social impacts, technical feasibility, cost implications, and alignment with national development objectives and stakeholder interests.

7.2 Alternatives Considered

7.2.1 “No project” scenario

In the absence of the proposed project, the project roads comprising gravel, earth surfaces, and some segments built using Do-Nou Technology (e.g., Runogone–Kaithe Road), would remain unimproved. While routine and periodic maintenance is occasionally conducted, this approach fails to support the strategic objective of enhancing connectivity and traffic flow within Meru Municipality, as envisioned by the Government of Kenya.

Under the “No project” scenario, road conditions would continue to deteriorate, leading to increased travel times, high vehicle operating costs, limited access to services, and safety risks. The following maintenance practices would apply:

- Heavy routine maintenance (e.g., clearing blocked drains, repairing surfaces)
- Periodic maintenance (e.g., patching failed sections, restoring drainage)
- Timely routine maintenance (e.g., vegetation control, maintaining culverts)

This scenario would also require continued extraction of construction materials from borrow pits, leading to negative environmental and social impacts such as:

- Landscape scarring and visual degradation
- Increased malaria incidence from poorly drained pits
- Open water bodies posing drowning risks
- Accelerated surface runoff due to loss of vegetation

Moreover, this option does not align with national infrastructure development goals and offers limited long-term value.

7.2.2 Alignment and Route Alternative

Stakeholder consultations and field assessments revealed no viable alternative route to the proposed alignments. However, minor realignments may be considered to:

- Straighten sharp bends with poor visibility

- Avoid displacing residential structures (e.g., apartment blocks)
- Minimize land acquisition and compensation costs by routing through public land such as KFS land, where feasible

Such adjustments will be subject to detailed design and further stakeholder engagement.

7.2.3 Technology and Construction Material Alternatives

The project will utilize locally and internationally approved construction materials and technologies that meet safety, environmental, and structural standards. Key considerations include:

- Locally sourced materials that meet Kenya Bureau of Standards (KEBS) specifications.
- Use of energy- and water-efficient construction equipment and machines.
- Minimization of timber use, prioritizing fast-growing exotic tree species when timber is necessary.
- Rainwater harvesting for construction and non-potable uses at worker camps.
- Water abstraction from River Kathita and possible borehole drilling for industrial activities (e.g., concrete batching).
- Pollution control technologies on Asphalt mixers, crushers and other construction equipment and machines including - dust arrestors, emission control systems, noise suppression devices and use of clean fuels, where possible.

These choices promote cost-efficiency and reduce environmental and health risks during construction.

7.2.4 Solid Waste Management Options

The project will generate substantial solid waste. An integrated waste management strategy will be implemented in line with best practices and the waste hierarchy:

- Waste Minimization at Source - Training and awareness for workers, with signage in camps and work areas.
- Reuse and Recycling - Separation of recyclables (especially from kitchen and construction waste) for sale or reuse.
- Composting - Organic waste (e.g., food and vegetation) managed through composting.
- Combustion - For non-recyclable dry waste, subject to air quality standards.
- Sanitary Landfilling - Final disposal option for residual waste.

7.2.5 Air Quality Management Alternatives

The existing roads are mostly earth roads and there is dust generated as motor vehicles move on the roads. The roads undergo routine maintenance which also generates dust and is expensive.

The dust pollution is a leading cause of many long-term health hazards to road users who are continually exposed to this condition. It also interferes with visibility causing accidents and delays.

The proposed rehabilitation alternative will likely increase dust generation during construction. This will however be mitigated using measures suggested in the ESMMP and will be short-term. During operation of the rehabilitation alternative, however, such dust will be a thing of the past.

7.2.6 Alternative Mode of Transportation

There are no viable alternatives to this road that fulfil the functions of providing relatively fast, cheap land transportation. Air, rail, and water transport are unlikely to either complement or to substitute for roads or highways in this region. There is no railway transport system close to the project area and no water body that can be used as a

mode of transportation in the project area. The only possible means of transport is air transport but, this is a rather expensive alternative and cannot be used as an alternative to the road.

7.2.7 Transport Efficiency and Cost Alternatives

The condition of the road is to gravel standards with Do-Nuo Technology some road sections and with eroded sections of the roads especially along the steep sections. The erosion along drains and road surface makes the road very narrow in some areas, making it difficult to conduct two-way traffic. These conditions lead to long journey times and high costs of fuel consumption and hence high costs of transport and fares, wear and tear on vehicles is also experienced. The proposed road rehabilitation alternative is designed to improve the operating speed upward of 80 kph. This will drastically reduce delays and Vehicle Operating Costs (VOCs) and overall bring down the cost of doing business and access to basic services.

7.2.8 Road Design and Engineering Options

The existing roads are mostly to gravel standards and narrow in some sections. As such improving the roads to asphalt road is a design alternative that is foreseen to be cost effective option in the longer term and environmentally sustainable. If well maintained, it may not require the use of excessive additional material in its design life. Adequate and cost-effective engineering measures were taken to arrive at the road alignment, both vertical and horizontal, material selection, pavement design and material sites, siting of the hydraulic structures, flood routing, construction methods, landscaping, and so forth.

8 GRIEVANCE REDRESS MECHANISM

8.1 Overview

The Project Grievance Redress Mechanism (GRM) for the extension of Meru Bypass Roads project is designed to address complaints related to the project. Developed alongside the Environmental and Social Impact Assessment (ESIA) and Monitoring and Management Plan (ESMMP), it provides a structured grievance redress process commensurate with the project's potential risks. The GRM leverages the existing formal grievance and dispute resolution channels, supplemented by the proposed project-specific protocols. It is intended to serve communities, stakeholders, workers, and others who may be affected by the project. The GRM will be managed by the Environmental and Social Specialists with support from sub-county and community-based structures. The project is expected to use this framework to develop a more detailed and project specific GRM plan.

8.2 GRM Jurisdiction

The proposed GRM is project specific and scaled to the risks and impacts of the Project. It is meant to solve the project's concerns by the stakeholders or any complainant. The proposed GRM is, however, not intended to bypass any Governments' own existing redress process; rather it is intended to address affected people's concerns and complaints promptly, making it readily accessible to all segments of the affected people. Any established Government Redress mechanisms takes priority over the proposed GRM. The GRC's term shall have a Terms of Reference (ToR), tenure and timeless when the GRC will be closed.

8.3 GRM Handling Structure

8.3.1 GRM Structure

The GRM structure is the framework upon which project grievances are received, documented, assessed, resolved and feedback issued to complainants. Considering that the project will be implemented within Five (5) locations within Imenti North Sub-County, we propose a Three-tier GRM structure as follows.

Tier -1: Resident Engineer

The Resident Engineer (RE) serves as the official representative of KURA within the project. In this capacity, he acts on their behalf and is authorized to seek support from KURA management—including their respective boards—whenever necessary. The RE is the first level of grievance handling comprising of the resident project management with the Resident Engineer being the chairperson. At this level, grievances from the project community will be received, logged and addressed by the RE and his staff in consultation with the project Contractor. The RE will work with the project's safeguard team, the surveyor and other relevant experts on site to interrogate these grievances and initiate resolution or appropriate mitigation measures.

Tier – 2: Locational Level

This is the second level of grievance handling in the project within the location and shall be chaired by the area chief. The RE or his appointed staff will be the secretary to the committee and shall be the custodian of the grievance log. The RE will notify the area chief of unresolved grievances who will in turn convene a locational GRC meeting to discuss and resolve. Besides the primary grievance log at the RE's office, grievances may also be received at the chief's office or other public offices within the location but later logged at the primary grievance log.

Tier – 3: Sub-County Level

For the purposes of this project and considering that it falls squarely within Imenti North Sub-County, tier-3 shall be the apex grievance handling level on site. The level will be chaired by the Deputy County Commissioner and will receive unresolved grievances from the locational level GRC. Depending on the nature of the grievance, the DCC will convene relevant national and county government agencies within the sub-county to interrogate the grievance(s) and find amicable solution.

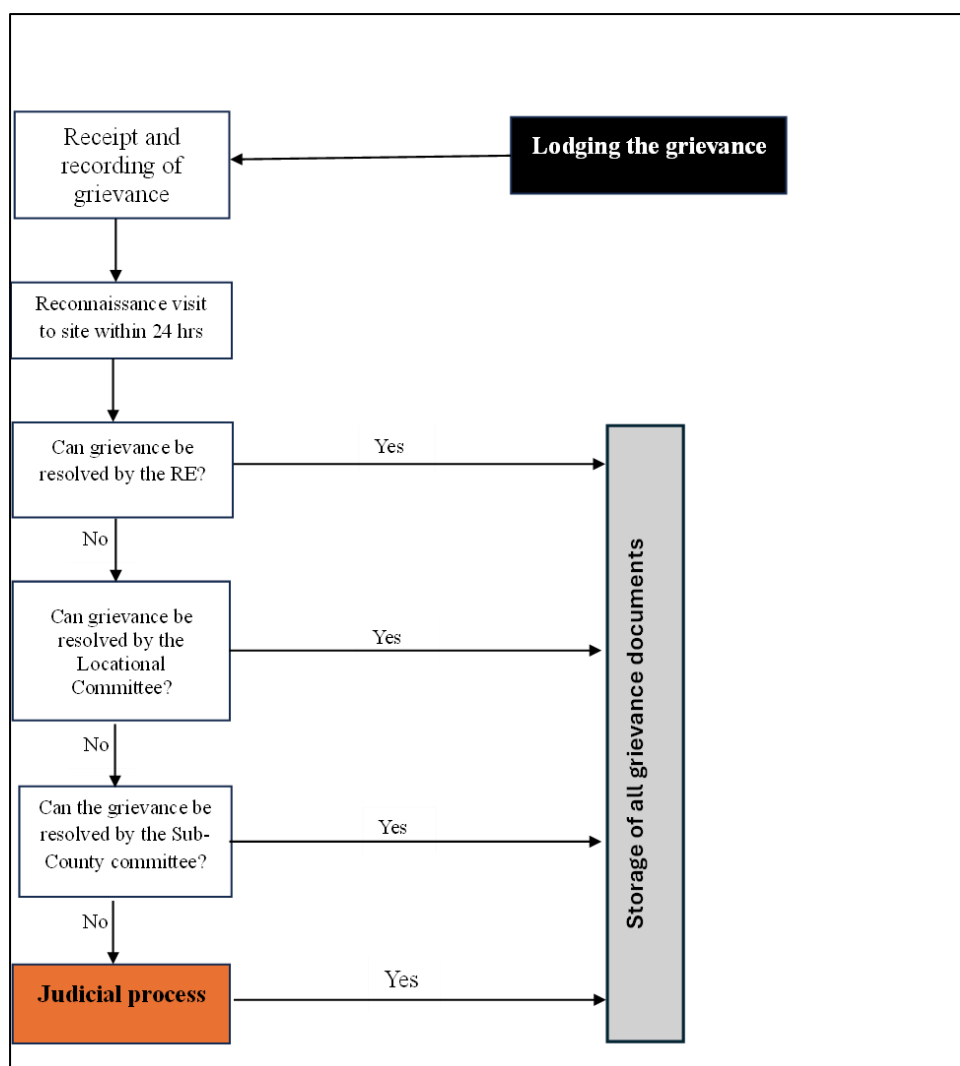


Figure 8-1: Schematic Representation of the GRM

Tier 4: Judicial Process

If all avenues for resolution have been exhausted and the matter remains unresolved, the final recourse is judicial intervention. The aggrieved party may seek redress through the courts should they deem the grievance inadequately addressed.

8.3.2 Other Grievance Handling Alternatives

Should grievances remain unresolved after the third tier, such grievances will be escalated to the relevant external bodies with consent from the Client. In the event that the complainant will not be satisfied with the resolution made at the project level, he or she will be at liberty to escalate the grievance to a tribunal or a court of law for redress.

Based on the above GRM structure, the following are expected to be members of the project GRM Committees.

Table 8-1: Outline of the project GRM Committee

Name/Organization	Representative	Position
Ministry of Interior and Coordination of National Government	Deputy County Commissioner	Tier -3 GRC Chairperson
Ministry of Interior and Coordination of National Government	Chief	Tier -2 GRC Chairperson
KURA	Resident Engineer	Tier-1 Chairperson and project GRM Secretary

Name/Organization	Representative	Position
Project Contractor	Sociologist	Member
General Public	Village Elder/Administrator	Member
Other Stakeholders (NGOs, CBOs, KFS, KWS, NEMA, WRA, Meru County Government)	As may be determined during project implementation and on need basis	Member

Membership to the GRC should be gender balanced and include persons living with disabilities, area administrators, relevant village administrators, youth and other special groups within the area to ensure fair representation.

The GRC shall be issued with Terms of References (ToR) by the implementing government agency (KURA) on their roles and responsibilities, with a clear period of tenure. In addition, facilitation of the Grievance Redress Committee (GRC) should be done accordingly based on the applicable government rates.

8.3.3 Key Staff Coordinating GRM

The Resident Engineer or his delegate will be designated as the person in charge of Grievance Redress with the following responsibilities;

- Coordinate formation of Grievance Redress Committees (GRCs) before the commencement of construction to resolve issues.
- Act as the Focal Point for the client on Grievance Redress issues and facilitate the grievance mechanisms.
- Create awareness of the Grievance Redress Mechanism (GRM) amongst all the stakeholders through appropriate channels.
- Assist in Redress of all Grievances by coordinating with the concerned parties.
- Maintain information of grievances and Redress.
- Monitor the activities on Redress of Grievances.
- Prepare monthly and quarterly progress reports; and
- Provision of resources to cover the operational costs of the GRM (facilitation costs etc.).

8.3.4 Receiving of Complaints

Official complaints will be received and entered into the project Grievance log maintained on site. After registering the complaint in the Grievance Redress Registration and Monitoring Sheet, the safeguard specialist will examine the complaint made in detail and forward the complaint to the concerned officer with specific dates for replying and redressing the same. He/she would hold meetings with the affected persons / complainant and then attempt to find a solution to the complaint received. The deliberations of any meetings held with the complainant and decisions taken are recorded and minutes filed.

8.3.5 Registry and Monitoring

All complaints received will be entered into a publicly accessible system that will allow complaints to be tracked and monitored. The system will also present a database showing:

- Number of complaints received.
- Number and percentage of complaints that have been resolved.
- Number and percentage of complaints that have gone to mediation.
- Number and percentage of complaints that have not reached agreement.

The information provided by the database is expected to help improve the Grievance Redress Mechanism and better understand and address the environmental and social impacts of the project

9 POTENTIAL POSITIVE IMPACTS

9.1 Knowledge and Skills Transfer

Construction of the Meru Bypass roads and footbridges at Meru Polytechnic and Kaaga High School will utilize modern engineering technology and expertise that may be unfamiliar to local contractors and artisans. The interaction between local contractors and artisans with skilled engineers will help in updating their skills and knowledge in road construction. Through the recruitment of local labour, workers will have the opportunity to learn an array of skills that relate to road construction and footbridges.

9.2 Provision of Market for Supply of Construction Materials

The project will require supply of large quantities of construction materials, most of which will be sourced locally from within Meru County or even the neighboring counties. Some of the materials that will be required include cement, steel, electrical wires and cables, sand, hardstones, ballast, bitumen, fuel, gravel, and machinery/equipment spare parts, among others. Business premises and land owners from which these materials will be sourced will benefit immeasurably, thereby leading to the expansion of businesses. This will promote the economy of the project area and the entire Meru County.

9.3 Increased Land Value and Housing Rates

In the long term, land values along the upgraded roads will gradually increase as a result of the successful operation of the road project. Construction of these roads will improve accessibility, attracting development, investment, and businesses to the project area. Enhanced infrastructure will also stimulate economic activity by facilitating trade, transportation, and the movement of people and goods, leading to higher land prices. Areas previously used for agriculture along Western Bypass-Link Mate and Runogone-Kaithe roads might be redeveloped for residential or commercial purposes, which can significantly impact land values. It will also lead to an increase in rental income.

9.4 Improved Welfare Standards

Providing a more efficient transportation system that integrates the entire region is a significant improvement over the current situation, where traveling across the region is time-consuming, lengthy, and uncomfortable. Improved living standards for people working and living around the project area are attributed to livable environments for workers and their families, as well as thriving business opportunities that generate income. Upon completion of the project, prices of consumer goods are expected to decrease, as transportation costs and the monopoly held by a few traders have kept prices of goods and services in the project area comparatively high. Access to better educational facilities and healthcare services within and around the municipality will boost literacy levels and reduce disease prevalence and suffering.

9.5 Growth of Social and Economic Investments

The upgraded roads will provide faster movement of people, goods and services in the project area, which will likely stimulate more public and private investments such as facilities which include but are not limited to schools, health centres, water, or energy. This growth means the social and economic conditions of the people will improve, uplifting the standards of living along the proposed road project. The reduced vehicle operating/transportation costs due to improved roads will enable accessibility to basic facilities, for the local communities and enabling businesses to access wider markets and trade more effectively.

9.6 Traffic Impact

The new roads are expected to attract traffic from surrounding routes, potentially easing congestion elsewhere. This redistribution may have positive effects, particularly if public transport vehicles are diverted to the new corridors. Such a shift would benefit road users—especially those who rely on public transport—by improving travel efficiency, reducing delays, and enhancing overall accessibility.

9.7 Improved Drainage and Its Environmental Benefits

Overall, the drainage of the roads will be improved due to the upgrading of the road structures, such as bridges, culverts and other cross-drainage facilities like roadside drainage. Areas like at Km 0+130 of the Western Bypass Road and

km 0+400 of Three Steers - Kambakia Road where water from higher areas cross the road at this point, appropriate drainage structures are to be installed to avoid flooding in downstream areas and water menace on the existing road. The existing roads are currently gravel surfaced, and the passing of vehicles, coupled with strong winds, often generate high levels of dust which can affect the health of travelers and those either residing or doing business along the roads. The tarmacking of these roads will reduce offset dust emission from existing roads especially during the dry season.

9.8 Improved Access to Social Services

Upgrading of the roads will improve access to social services such as schools, health facilities, business centers and places of worship. The upgrading of hospital link roads will improve accessibility of people to health services such as to Meru Teaching and Referral hospital, KMTC to Gakoromone market which is one of the biggest markets within the project area and to other social places. The paving of the road will also improve accessibility and make it easier for people to travel to Meru town hence facilitating social connections between urban core and peri-urban communities for services.

9.9 Improved Security and Safety

The project will enhance security and safety in the area. Security measures, like frequent road patrols during both construction and operational phases, will be implemented. Installing streetlights along roads will help reduce crimes such as theft.

Improved road infrastructure with the addition of sidewalks, clear markings, and proper signage will make roads safer for both pedestrians and vehicles, reducing the risk of accidents and injuries. Building sidewalks will generally enhance safety in the project area, especially for students of KeMU, and Meru National Polytechnic, who walk long distances to reach schools and hostels. Adding footbridges will also boost safety for students crossing busy roads or highways to reach dormitories and hostels at Kaaga Boys High School and Meru National Polytechnic.

9.10 Reduction in Travel Time and Costs

The construction of the proposed roads will significantly reduce travel time and costs for the public. Improved road conditions will enhance accessibility and connectivity within Meru town and to other key locations in the project area. This will facilitate easier and faster movement of people as well as agricultural products to local and regional markets. Shorter travel times will also lower vehicle operating costs, thereby encouraging increased economic activity within the municipality. Ultimately, this improved accessibility will contribute to higher living standards by expanding income opportunities and improving access to essential social services.

9.11 Increased Business Opportunities

The project is expected to attract a significant workforce during the construction phase, thereby creating a ready market for goods and services within the local area. This will spur numerous business opportunities for small-scale traders, including food vendors, retail shop owners, and service providers operating near construction sites. The increased demand for daily necessities will boost local commerce, promote entrepreneurship, and contribute to improved livelihoods for households engaged in informal and small-scale enterprises.

9.12 Creation of Employment Opportunities

The project is expected to generate substantial employment opportunities, particularly during the construction phase, which is typically labour-intensive. Both skilled and unskilled individuals from Meru Municipality and surrounding areas will benefit from short- to medium-term employment opportunities in areas such as masonry, carpentry, machine operations, traffic control, and general site work. Given the high levels of unemployment in the region, this presents a significant socio-economic benefit.

In the long term, additional employment will be created during the operation and maintenance phases of the road. Routine maintenance activities will require continued labour, while improved access and connectivity are expected to stimulate the growth of roadside businesses, such as kiosks, retail shops, and transport-related services. These opportunities will contribute to local income generation, reduce poverty levels, and enhance the overall economic well-being of the host communities.

9.13 Increased Revenue to the County Government

The construction and subsequent operation of the Meru Bypass roads is expected to contribute positively to the County Government of Meru through increased revenue generation. During the construction phase, the County will collect income from permits, licenses, and other statutory fees charged to contractors, suppliers, and service providers engaged in the project.

In the longer term, the improved road infrastructure is anticipated to attract new investments and business ventures to the region. This will lead to the growth of commercial enterprises, expansion of service sectors, and creation of new employment opportunities. As a result, the County Government will benefit from enhanced revenue streams through business taxes, land rates, trade licenses, and other applicable levies. These revenues will strengthen the county's fiscal capacity to invest in public services and infrastructure, thereby supporting sustainable economic development.

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10 POTENTIAL CONSTRUCTION PHASE NEGATIVE IMPACTS

10.1 Noise Pollution and Excessive Vibration

The proposed extension of the Meru Bypass traverses a mix of urban and peri-urban environments, where land use is characterized by high human activity and a concentration of noise-sensitive receptors. These receptors include health facilities, educational institutions, places of worship, residential areas, and commercial establishments, most of which are situated within close proximity to the road corridor Table 10-1.

Table 10-1: Sensitive Receptors and their Approximate Distance from the Road

<i>Sensitive Noise Receptors</i>	<i>Approximate Distance from the Project Roads (m)</i>
<i>Gitoro Inter Denominational Church</i>	<i>18</i>
<i>MNP Student Hostels</i>	<i>18</i>
<i>MCK St. Andrews Church</i>	<i>30</i>
<i>KEMU Private Student Hostel</i>	<i>6</i>
<i>Kongoacheke</i>	<i>12</i>
<i>Kongo Gardens</i>	<i>17</i>
<i>Three Steers Hotel</i>	<i>67</i>
<i>Meru AIC Nursery School</i>	<i>13</i>
<i>Consolata Hospital Gitoro</i>	<i>91</i>
<i>Mosque</i>	<i>10</i>
<i>Meru Teaching and Referral Hospital (Metrh)</i>	<i>33</i>
<i>CCM Good Shepherd Primary School</i>	<i>11</i>
<i>Kooje Catholic Church</i>	<i>18</i>
<i>Gakoromone Dispensary</i>	<i>07</i>
<i>MCK Gakoromone Church</i>	<i>21</i>

Construction activities, particularly site clearance, excavation, compaction, and the use of hydraulic breakers and heavy machinery (such as excavators, bulldozers, graders, rollers, and shovels), as well as operations involving metal cutting and grinding, are anticipated to generate elevated levels of noise and ground-borne vibration. These emissions may exceed baseline ambient levels and, if unmitigated, could result in adverse effects on human health, institutional functionality, and community well-being.

Based on the spatial distribution of sensitive land uses, the following road segments are identified as high-risk zones for noise and vibration impacts:

- Hospital Road: Characterized by high population density and the presence of multiple sensitive institutions, including a hospital, the Kenya Medical Training College (KMTTC), and a mosque. The concentration of vulnerable groups and essential services heightens the significance of potential disturbances.
- Kambakia - Kagotone Road: This segment runs adjacent to densely settled residential areas, where structures are located in immediate proximity to the right-of-way. The limited setback distances increase the potential for structural vibration impacts and prolonged community disturbance.
- Western Bypass - Mate Road (Km 0+000 to Km 0+500): This section features compact residential settlements along the alignment, increasing the likelihood of cumulative noise exposure during intensive construction activities.

To assess the magnitude of potential impacts, the consultant undertook measurement of baseline ambient noise levels were measured at 4 representative receptor locations, as documented in *Table 10-2* below. These data serve as reference thresholds for impact prediction and the formulation of mitigation strategies.

Table 10-2: Diurnal Noise Levels- Monitoring Results (0601-2000 Hrs)

Sensitive receptors	EMCA Classification of zones	Leq dB(A)	EMCA limits dB(A)
Hospital Roads Link3 - MeWASSCO JCT - NML1	Other areas	53	55
Hospital roads - Kiramburine JCT Muslim School - NML2	Educational Institution	56	40
Kambakia - Kagotone - Residential estate NML3	Residential	48	50
Hospital Road Link 2 - Market area NML4	Commercial	63	60

Baseline noise monitoring results showed that most locations recorded noise levels within the allowable limits set under the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 (Figure 11-1). However, 2 monitoring points, Hospital Roads Link 1 and Link 2, exceeded the prescribed limits.

SECOND SCHEDULE [rr. 13(1), 14(1)(b)]

MAXIMUM PERMISSIBLE NOISE LEVELS FOR CONSTRUCTION SITES

(Measurement taken within the facility)

Facility	Maximum Noise Level Permitted (Leq) in dB(A)	
	Day	Night
(i) Health facilities, educational institutions, homes for disabled etc.	60	35
(ii) Residential	60	35
(iii) Areas other than those prescribed in (i) and (ii)	75	65

Time Frame:

Day: 6.01 a.m. – 6.00 p.m. (Leq, 14 h)

Night: 6.01 p.m. – 6.00 a.m. (Leq, 14 h)

Figure 10-1: Permissible Noise Levels Under EMCA Noise and Excessive Vibration Regulations

To estimate the anticipated noise levels during construction the Consultant adopted findings of a study by Blackwater Gold Project (2015) on sound pressure levels for selected construction equipment. In the study the preselected construction equipment sound pressure levels are indicated in the table below.

Table 10-3: Sample Typical Construction Equipment Used in the Pressure Level Study.

Construction Equipment	Measured /permitted (Leq) in dB(A) @ 15 meters
Grader	83
Dumper Trucks	85
Pneumatic Roller	86

To estimate noise exposure to sensitive receptors during construction, typical sound pressure levels (Table 10-3) were referenced and input into an online sound level damping calculator developed by Eberhard Sengpiel (<http://www.sengpielaudio.com/calculator-distance.htm>)¹⁹ were used to estimate the expected noise at the identified sensitive receptors. The modelled outcomes were analyzed against the provisions of the Second Schedule EMCA (Cap 387), which outlines the maximum permissible noise levels for construction sites.

The anticipated noise pressure levels were calculated based on the following assumptions.

- The machines are operating as per the manufacturer's recommendation, and no modification is made for sound deafening.
- The machines are operating within the recommended daytime (6:00 am - 6:00 pm).

Table 10-4: Projected Noise Levels at the Sensitive Receptors

Receptor	Construction Equipment	Approx. distance from the road (m)	EMCA Limits (dB A) Schedule 2	Projected Noise pressure level (dB A)
Gitoro Inter Denominational Church	Grader	18	75	81.42
	Dumper Truck	18	75	85.42
	Pneumatic roller	18	75	84.42
Student Hostels	Grader	18	60	81.42
	Dumper Truck	18	60	85.42
	Pneumatic roller	18	60	84.42
MCK St. Andrews Church	Grader	30	75	76.98
	Dumper Truck	30	75	80.98
	Pneumatic roller	30	75	79.98
Residential apartments (KeMU Student Hostel).	Grader	06	75	90.96
	Dumper Truck	06	75	94.96
	Pneumatic roller	06	75	93.96
Kongoacheke	Grader	12	75	84.94
	Dumper Truck	12	75	88.94
	Pneumatic roller	12	75	87.94
Kongo Gardens	Grader	17	75	81.91
	Dumper Truck	17	75	85.91

¹⁹ (<http://www.sengpielaudio.com/calculator-distance.htm>)

Receptor	Construction Equipment	Approx. distance from the road (m)	EMCA Limits (dB A) Schedule 2	Projected Noise pressure level (dB A)
Three Steers Hotel	Pneumatic roller	17	75	84.91
	Grader	67	75	70
	Dumper Truck	67	75	85.91
	Pneumatic roller	67	75	73
Meru AIC Nursery School	Grader	13	60	84.24
	Dumper Truck	13	60	81.24
	Pneumatic roller	13	60	87.24
Consolata Hospital Gitoro	Grader	91	60	67.34
	Dumper Truck	91	60	71.34
	Pneumatic roller	91	60	70.34
Mosque	Grader	10	75	86.52
	Dumper Truck	10	75	90.52
	Pneumatic roller	10	75	89.52
MeTRH	Grader	33	60	76.15
	Dumper Truck	33	60	80.15
	Pneumatic roller	33	60	79.15
CCM Good Shepherd Primary School	Grader	11	60	85.69
	Dumper Truck	11	60	89.69
	Pneumatic roller	11	60	88.69
Kooje Catholic Church	Grader	18	75	81.42
	Dumper Truck	18	75	85.42
	Pneumatic roller	18	75	84.42
Gakoromone Dispensary	Grader	07	60	89.62
	Dumper Truck	07	60	93.62
	Pneumatic roller	07	60	92.62
MCK Gakoromone Church	Grader	21	75	80.08
	Dumper Truck	21	75	84.08
	Pneumatic roller	21	75	83.08

The noise level calculations indicate that the sound pressure generated by Grader will exceed EMCA limits in 14 out of 15 receptor points.

Worst exceedances are expected at:

- KeMU Private Hostel: Projected 90.96 dBA against limit of 75.
- Gakoromone Dispensary 89.62 dBA against limit of 60.
- CCM Primary School 85.69 dBA against limit of 60.

The Dumper Truck will exceed limits in 13 out of 15 receptor points.

Worst exceedances at:

- KeMU Hostel: 94.96 dBA against a limit of 75 dBA.
- Gakoromone Dispensary: 93.62 dBA against a limit of 60 dBA.
- CCM Primary School 89.69 dBA against a limit of 60 dBA.

Sound pressure level generated by the Pneumatic roller is expected to exceed limits in all receptors except Three Steers Hotel that is within the allowable noise limits.

- Worst exceedances are expected at KeMU Hostel (6 m): 93.96 dBA against a limit of 75.
- Gakoromone Dispensary 92.62 dBA against a limit of 60 dBA.
- CCM Primary School 88.69 dBA against a limit of 60 dBA.
- Meru AIC Nurse School 87.24 dBA against a limit of 60 dBA.

The identified sensitive receptors operate on varying schedules, and their exposure to noise and vibration impacts will depend on the timing of construction activities. For instance, learning institutions and dispensaries typically operate during regular weekday hours and may experience minimal disturbance if construction coincides with weekends or school holidays. Places of worship, such as churches, generally hold services on weekends or during special events, meaning noise impacts will be occasional and time bound.

In contrast, receptors such as hospitals, hotels, and residential areas are continuously occupied and therefore more susceptible to construction-related disturbances throughout the project duration. However, since most construction activities are expected to occur during daytime hours, the impacts will generally be intermittent and confined to working hours, reducing the potential for night-time disruption.

Other factors that may affect the impact are weather conditions. The area exhibits a bimodal rainfall pattern characterized by 2 distinct long and short rainy seasons. The area receives an average annual rainfall of about 1,500 mm with the long rains occurring from March to May, while the short rains fall between October and December and dry spell in January and February. The weather conditions will impact noise generation as most activities like earthworks that utilizes dumper trucks, rollers and graders are suspended or slowed, this is because most construction activities are done during the dry season while in the wet season activities are limited to concrete works and other minimal construction activities like clearing of drains and bush clearing.

The distance from the source is also another factor affecting the vibrations and excessive noise effects. The further the receptor is from the source the minimal the impacts and the nearer the receptor the high the impacts for example noise levels are noted to be considerably high at CCM Primary School, Meru AIC Nursery school will be affected and also at Gakoromone Dispensary and KeMU Students' hostel because of their proximity to the source. Three Steers hotel and Consolata Hospital Gitoro will experience minimal effects as they're located at a distance from the source of noise and vibration.

Mitigation Measures

- Obtain a Noise Permit and ensure full compliance with the conditions outlined in the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.
- The Contractor will be expected to take appropriate steps to minimize the impact of noise on the workers by providing appropriate PPE to construction workers (use of earmuffs).
- The Contractor should minimize the frequency of transport of construction materials and ensure that all construction machinery is well maintained and switched off when not in use especially the dumper trucks.
- Limit construction activities to daytime hours (6:00 a.m. to 6:00 p.m.) to minimize noise and vibration impacts on residents along the project corridor. This measure is particularly critical in densely settled sections such as: Kambakia - Kagotone Road (Km 2+200 to Km 2+400), Western Bypass - Mate Road (Km 0+000 to Km 0+500), the entire stretch of Three Steers - Kambakia Road, and Hospital Road - Kiramburine Junction.
- Develop a comprehensive community sensitization plan to inform local residents and stakeholders about upcoming project activities. This will enable the community to prepare adequately and minimize potential conflicts or disruptions related to the project's implementation.

- Provide advance notifications to PAPs and nearby establishments regarding major construction activities that may generate significant noise or vibrations, such as the operation of breakers, drilling equipment, or compressors. Timely communication will help mitigate disturbances and foster cooperation.

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10.2 Air Quality

The proposed project is located in a mixed urban and peri-urban setting. The prevailing wind direction, southeast to northwest (Figure 4.4, Chapter 4), influences local pollutant dispersion. Air quality in the area is affected by both natural and human activities, notably vehicle emissions, poor waste management, agricultural practices, and construction-related dust. In Meru Town, these sources contribute to elevated levels of airborne pollutants.

Monitoring was conducted at selected points using calibrated equipment, with results assessed against the Environmental Management and Coordination (Air Quality) Regulations, 2014. Key pollutants considered included particulate matter (PM_{2.5} and PM₁₀), ozone (O₃), nitrogen dioxide (NO₂), and sulphur dioxide (SO₂), in line with WHO guidance.

Findings indicated compliance with most regulatory limits, except for PM_{2.5}, which exceeded allowable levels at nearly all sites. This highlights existing air quality concerns PM_{2.5} that may be aggravated by construction if not properly managed (see Appendix 6 for Air Quality Baseline details).



Plate 10-1: Illegal Dumping of Waste at the gate of Meru KMTC along Hospital Road - Kiramburine Junction

Project construction activities such as excavation, demolition, and the transport of construction materials will generate significant levels of dust and exhaust emissions, particularly along active work zones and adjacent road corridors. Sensitive receptors and the public along the following roads are likely to be impacted:

- Hospital Road - Due to the high population density, proximity to Meru Level 5 Hospital and KMTC, this corridor is especially sensitive to dust and fumes.
- KEMU - Kambakia Road - Characterized by dense residential development along its alignment, making it highly susceptible to air quality degradation during construction.
- Western Bypass Link - Mate Road (Km 0+000 to Km 0+500) - This section has a notable concentration of residential settlements and will similarly experience significant air quality impacts.

Other roads and footbridges along the project route will also be affected; however, impacts are expected to be less severe due to more dispersed settlement patterns.

Table 10-5 below outlines some of the sensitive receptors identified within the project corridor.

Table 10-5: Table Showing Position of Sensitive Receptors

<i>Receptor</i>	<i>Position Relative to the Road</i>	<i>Position of Receptor against the Direction of Wind</i>
<i>Gitoro Inter denominational Church</i>	LHS Kambakia Kagotone/KEMU Rd	Northwest
<i>Meru Polytechnic Student Hostels</i>	RHS Kambakia Kagotone/KEMU Rd	Southeast
<i>MCK St. Andrews Church</i>	LHS Kambakia Kagotone/KEMU Rd	Northwest
<i>KEMU Private Student Hostel</i>	LHS and RHS Kambakia Kagotone/KEMU Rd	Northwest
<i>Kongoacheke Residentilals</i>	RHS Kongoacheke Kwa Mukuru Rd	East
<i>Kongo Gardens</i>	RHS Kongoacheke Kwa Mukuru Rd	South-southeast
<i>Three Steers Hotel</i>	RHS Threes Steers Kambakia Rd	Southeast
<i>Meru AIC Nursery School</i>	RHS Threes Steers Kambakia Rd	East
<i>Consolata Hospital Gitoro</i>	LHS Threes Steers Kambakia Rd	Northwest
<i>Majeeny Mosque</i>	LHS Hospital Kiramburine Rd	North
<i>MeTRH</i>	RHS Hospital Kiramburine Rd	South
<i>Meru Cancer Treatment Center</i>	LHS Hospital Kiramburine Rd	Northwest
<i>KMTC Meru Campus</i>	RHS Hospital Kiramburine Rd	South
<i>Full Gospel and Shalom Academy</i>	RHS Link 1 Meru Bus Terminus Rd	West
<i>CCM Good Shepherd Primary School</i>	LHS Link 1 Meru Bus Terminus Rd	East
<i>Kooje Catholic Church</i>	RHS Hospital Kiramburine Rd	West
<i>Gakoromone Dispensary</i>	RHS Link 3 MeWASSCO Jct Rd	West
<i>Deliverance Church Runogone</i>	RHS Runogone Kaithe Rd	Southwest
<i>MCK Gakoromone Church</i>	RHS Link 3 MeWASSCO Jct Rd	West

The prevailing wind direction in Meru is from the southeast toward the northwest. As a result, sensitive receptors located to the west of project roads are more likely to be impacted by dust and other airborne emissions, while those situated to the east are expected to experience lower exposure.

Most receptors, particularly schools and health facilities, are located downwind (northwest) of the general wind direction. This increases their potential exposure to pollutants originating from construction activities, including dust from moving equipment and vehicles, exhaust emissions, and smoke or odors from construction activities.

A few receptors are located upwind and are therefore less likely to be directly affected by emissions. Receptors located to the east, west, or southwest, require site-specific assessments. Their exposure risk depends on local topography, proximity to construction zones, and the nature of nearby emission sources.

Mitigation Measures

- The Contractor should suppress dust by sprinkling water as required to effectively suppress fugitive dust at all active work areas, haul roads, excavated zones, and diversion routes. Priority should be given to densely populated areas such as Hospital Roads, Kiramburine Junction, and Kambakia - Kagotone Roads, as well as all other identified roads according to the construction schedule.
- Dust nets should be installed at batching plants and high-risk locations to minimize fugitive dust emissions.
- In the event that the Contractor opens his own borrow pits then dust suppression measures to be applied at borrow sites should include conducting material extraction during wet conditions and transporting materials in covered trucks.
- All site workers should be provided with appropriate and adequate PPE, including dust masks, overalls, and safety gear.
- A strict speed limit of 30 km/h should be enforced within all construction zones to reduce dust formation due to vehicle movement.
- Soil heaps, berms, and material stockpiles must be covered or appropriately contained to prevent wind dispersal of dust.

- All operations should comply with the Environmental Management and Coordination (Air Quality) Regulations, 2024.
- The Project should procure and use construction machinery, equipment, and vehicles that are fuel-efficient and environmentally friendly, with minimal emissions.
- All construction equipment and vehicles should be serviced and maintained regularly to optimize engine performance and reduce emissions.
- Unnecessary engine revving and idling by plant operators and drivers to minimize emissions and fuel consumption should be prohibited.
- Movement of construction traffic should be limited to essential operations only through effective planning and scheduling.
- Machine operators and drivers should be trained and encouraged to switch off engines when equipment is not in use, as part of energy conservation and emission reduction.
- Apart from siting the quarries away from sensitive air quality receptors, quarries should deploy wet crushing to minimize generation of fugitive dust.

10.3 Waste Management

10.3.1 Impacts on Solid Waste

The project activities are anticipated to generate considerable quantities of solid waste during various phases of development. During the construction phase, solid waste materials will be produced from the demolition of old existing structures, bush clearing, soil stripping, disposal of waste tyres, as well as from diverse packaging materials such as cement and spare parts wrappings, which will contribute to the waste streams, including wood cuttings, among others. The Contractor is obligated to ensure that all solid waste is systematically collected and disposed of properly to promote a clean and healthy environment along the road construction corridor and all associated facilities linked to the project.

Mitigation Measures

- Routinely collect road litter or illegally dumped waste and manage it according to the recommendations in the General EHS Guidelines and Waste Management Regulations, 2006.
- Adopt the three-bin system for waste segregation in all the facilities associated with the project.
- Provision of bottle and can trash disposal receptacles at parking lots to avoid littering along the road.
- Obsolete products should be managed as hazardous waste as described in the General EHS Guidelines.
- Composting of vegetation waste for reuse as a landscaping fertilizer.
- Managing sediment and sludge removed from storm drainage systems maintenance activities as a hazardous or non-hazardous waste based on an assessment of its characteristics.
- Develop and implement a Construction Waste Management Plan before project commencement.
- Sub-contract a licensed waste handling firm to collect solid wastes regularly and dispose of in approved dumping sites.
- Drainage outfalls should be engineered appropriately to minimize erosion and sediment transport resulting from surface runoff and stormwater discharges.
- Comply with provisions of the Environmental Management and Co-ordination, Waste Management Regulations 2006.

10.3.2 Liquid Waste Management

Meru Municipality, where the project is being undertaken, does not have an elaborate sewer line. The town only has a sewerage coverage of 4% and about 9% of the household served by septic tanks in areas where sewer lines are unavailable, serviced by 3 exhausters. Currently, there is an ongoing construction of a new sewer line and sewerage treatment plant in Rwanyange which is expected to raise the sewerage coverage to about 22%.



Plate 10-2: MeWASSCO Exhauster Trucks used in effluent management

It is expected that construction activities especially operations at the campsite will generate significant amount of liquid waste from the washing areas and toilets. Additionally, improper handling of fuels, lubricants, and other petroleum-based products presents a significant risk to both surface and groundwater quality. Spills or leakages from service areas and fueling stations, if not properly contained, may lead to soil and water contamination.

Construction activities involving excavation and site clearance will also disturb large areas of topsoil. Without adequate erosion control, rainfall may wash sediment into nearby water bodies, leading to increased turbidity, degradation of aquatic habitats, and downstream water quality impacts.

These risks underscore the importance of implementing effective wastewater treatment systems, hazardous material management protocols, and erosion and sediment control measures to safeguard local water resources and ensure compliance with both national regulations and international environmental standards.

Mitigation Measures

- Treated wastewater and stormwater should be reused in dust suppression, landscaping, and equipment cleaning.
- Biodigester and oil-water separators should be installed at Contractor's camp, service bays, and fueling areas.
- Calibrated water meters should be installed in all the camps and construction facilities to monitor consumption.
- Routine maintenance of the biodigester, grease traps, and plumbing systems should be conducted to prevent leaks and overflows.
- All wastewater handling should comply with EMCA (Water Quality) Regulations 2024 and the Water (Resources) Regulations 2025.
- Licensed waste handlers should be engaged, and effluents disposed of at NEMA-approved facilities.

10.4 Water Resources

The Project Roads traverse a catchment area drained by several rivers, including the Mpuone and Gasioma streams, which flow west to east into River Kathita, the primary water source for MeWASSCO. The proposed road works intersect both seasonal and permanent rivers, necessitating the construction of cross-drainage structures such as box and pipe culverts. During construction, temporary diversions of these streams may be required to facilitate culvert installation and other in-stream works. Such interventions are expected to affect downstream water quality.

Key impacts on water resources are:

- Degradation of water quality due to accidental spillage of fuels and oil as well as potential runoff from concrete batching plants and worker camps.
- Increased sediment loads from soil erosion during excavation and in-stream works; and
- Reduced flow volumes from abstraction for construction use, which may impact downstream water availability.

Whereas these impacts are largely temporary and localized, they can be significant if not well managed, particularly during the rainy season or along river Mpuone and Gasioma.

Mitigation Measures

- Construction camps, asphalt plants, and concrete batching facilities should be located at a safe distance from rivers, streams, and other water sources.
- In-stream activities that could release pollutants into water bodies should be controlled to avoid release of pollutants into the water.
- The contractor should obtain liquid waste disposal permits from relevant authorities before discharging any wastewater into natural channels.
- Appropriate siltation control measures should be implemented during in-stream works, particularly in River Mpuone and Gasioma.
- Alteration of riverbanks or streambeds should be avoided unless essential for the works; in such cases, protective measures should be implemented to safeguard water quality and flow integrity.
- Obtain water abstraction permits before embarking on water abstraction activities

10.5 Soil Resources

10.5.1 Soil Erosion

Within the wider road project area, the dominant soil types are acrisols and ferralsols which tend to be deep, red, strongly weathered, acidic soils with low fertility. These types of soil have high erosion potential, hence the rugged terrain, high rainfall and soil properties result into significant soil erosion. Furthermore, the largely urban land use is characterized by built up areas largely devoid of vegetation cover also exacerbate runoff and soil erosion. Areas with the potential for erosion are presented in Table 10-6 below.

Table 10-6: Areas with Potential for Erosion

No.	Name of the Road	Location of the area using chainage	Slope Gradient in percentage
1.	Three Steers – Kambakia	1+200 – 1+700	2.9 – 3.6
2.	Kambakia – Kagotone C91	0+450 – 0+700	4.4 – 8.3
		2+600 – 2+700	1.9 – 12
		3+050 – 3+250	0.3 – 9.9
3.	Kogotone KEMU C91	0+150-0+300	4.3-4.7
4.	Kongoacheke JCT – Kwa Mukuru JCT	0+600 – 0+800	1.1 – 1.4
		0+200 – 0+300	0.1 – 6.9

No.	Name of the Road	Location of the area using chainage	Slope Gradient in percentage
		2+000 – 2+200	0.0 – 8.6
5.	Kongo Gardens – Kambakia	0+200	0.8 – 8.9
6.	Runogone – Kaithe	1+400 – 1+750	1.3 – 9.4
7.	Hospital Road – Kiramburine JCT	1+700 – 1+958	0.0 – 6.6
8.	Link 1 – Meru Bus terminus	0+200 – 0+350	4.7 – 5.4
9.	Link 2 – Gakoromone Market	0+200 – 0+400	3.2 -5.5
10.	Link 3 – MeWASSCO	0+000 – 0+100	0.4 – 2.2
11.	Western Bypass link road	0+000 – 0+600	2.6 – 6.6
12.	Western Bypass link (Gikumene) – Mate Road	0+400 – 0+600	1.7- 5.8

During the construction, several sections of the proposed roads will be vulnerable to soil erosion due to vegetation clearance, topsoil stripping, and extensive earthworks. These risks are heightened by the area's slope gradients and the occurrence of sporadic, intense rainfall. Erosion is particularly likely in cut-and-fill zones, borrow pits, material storage sites, and newly opened marram or aggregate extraction areas.

Freshly exposed surfaces will be susceptible to both runoff and wind erosion if not promptly stabilized. Without adequate control measures, these processes may lead to sedimentation of nearby watercourses, land degradation, and disruption of downstream drainage systems. Therefore, erosion prevention and control strategies will be essential during all phases of construction, due to their topography and land use.

Mitigation measures

- Practice sound road engineering by maintaining good drainage and natural water flows. However, the drainage ditches should only be constructed where necessary.
- To minimize potential soil erosion along embankments, back slope, other cleared areas, road verges, etc., immediate landscaping will be required.
- Develop an erosion control and revegetation plan to delineate measures to minimize soil loss and reduce sedimentation to protect water quality, especially for sections that will interact with water resources.
- Design runoff control features, especially on the roadside drainage channels to minimize soil erosion.
- Limit cleared areas to project footprint to avoid unnecessary exposure of soil to agents of erosion.
- Line side-drains with concrete or by stone pitching in erosion prone soils to avoid gully formation.
- In sloped areas (e.g., along Kambakia–Kagotone C91 road), earthworks should be designed with gentler gradients where feasible to reduce erosion risk. On sections such as Three Steers -Kambakia Road (Km 1+600 - 1+700), runoff control features, such as well-graded side drains and energy dissipators, sha to manage stormwater and prevent channel erosion.
- In erosion-prone areas (e.g., Km 3+100 - 3+250 along Kambakia - Kagotone), roadside drains should be lined with concrete or stone pitching to prevent gully formation.
- Upon completion of works, contractor campsites should be fully restored to pre-construction conditions, as agreed with landowner.
- Material stockpile locations should be screened and approved prior to use to avoid siting on vegetated or erosion-sensitive areas.

10.5.2 Soil Pollution

During the implementation of this project, large volumes of oil and other petroleum products will be required in the operation of machines, vehicles and other construction equipment. Soil pollution is therefore likely to occur in the event of accidental oil spills, or release of petroleum products and bitumen (among other liquids and solvents). This impact is anticipated to be localized in nature and will occur in and around machinery and plant yards, base camps, and areas of concentrated activities. These may infiltrate into the soil and cause soil pollution.

Mitigation measures

- Proper maintenance of machinery and equipment to avoid or minimize leakages from such machines
- Spill prevention practices and response actions should be applied in refuelling and vehicle-use areas to minimize accidental contamination of soil.
- Spills should be immediately addressed per the appropriate spill management plan, and initiate soil cleanup and soil removal if needed.
- Construction of a retaining wall around the garage, fuel storage and stations so that these potentially polluting substances can be properly handled so that any unintended escape of material from that area can be contained until such time as remedial action can be taken.
- Proper handling of the materials through use of drip trays, directing spills to an oil sump which should be emptied into a designated disposal site.
- Refuel in a designated fueling area that includes a temporary berm to limit the spread of any spill.
- Material stockpile locations should be screened and approved prior to use to avoid siting on vegetated or erosion-sensitive areas.
- In the event of accidental oil or fuel spillage, immediate containment and cleanup should be conducted to prevent soil contamination and further degradation.

10.6 Floral Resources

The most significant floral resource in the project area is the Upper Imenti Forest, a protected indigenous evergreen forest that extends from Mt. Kenya Forest ecosystem to the east of the project area, with an estimated area of 10,375.8 ha. The forest borders three project roads; Kambakia – Kagotone/KEMU C91 Road, Three Steers-Kambakia Road and Kongo Gardens - Kambakia JCT Road. In addition, Upper Imenti Forest is facing threats resulting from increased urbanization, agriculture, settlements and advancement of the invasive species. The general area of Upper Imenti Forest is facing threats *Lantana camara* and *Cuscuta campestris*.

During project construction, an estimated area of 2.47 ha of Upper Imenti forest land comprising of indigenous vegetation will be excised along Kambakia-Kagotone/KEMU C91 Road for road realignment. Vegetation clearance will be 10 m into the forest from km1+ 200 to km 2+ 600 of the road to avoid impacting private properties. A total of 36 identified mature trees will be cleared within the realigned section. Among the trees that will be cut are *Prunus africana* and *Vitex keniensis* which are listed in the IUCN Redlist as vulnerable and endangered respectively as shown in Table 10-7 below.

Table 10-7: Tree to be lost in Upper Imenti Forest due Kambakia -Kagotone/KEMU C91 Road realignment

Common Name	Scientific Name	No of trees in the section
Blue Gum	<i>Eucalyptus Spp</i>	4
Sudan Teak	<i>Cordia abyssinica</i>	8
Red stinkwood	<i>Prunus africana</i>	2
East African Croton	<i>Croton megalocarpus</i>	10
Meru Oak	<i>Vitex keniensis</i>	1
Peacock flower	<i>Albizia gummifera</i>	3
White stinkwood	<i>Celtis africana</i>	8
Total		36

Source: Joint inventory by the study team and the KFS

Although, the impact on flora will majorly be felt along Upper Imenti forest, vegetation loss will nonetheless occur along other project roads though minimal. Some of the species that will be affected along these roads include *Grevillea robusta* and *Eucalyptus* species which are not of conservation concern and other shrubby vegetation.

It is expected that the project will require materials such as ballast, murram, stones, sand, gravel, and soil, among others for construction activities. Establishment of quarry site(s), material borrow pits can lead to loss of vegetation at the respective sites. Additionally, vegetation clearance at campsites, road widening, and re-alignment will also contribute to overall vegetation loss. Based on preliminary design, road widening and re-alignment is likely to occur

in the following areas of the project roads; at Km 1+600 to km1+760 LHS Runogone-Kaithe Road, at Km1+300 to1+km400 Three steers- Kambakia road and at Km 3+000 RHS Kambakia-Kagotone road.

Some of the mature trees that are likely to be cleared along the project roads are highlighted below.

Photo	Description
	Mature Eucalyptus tree currently used as a natural boundary for the Upper Imenti Forest that is likely to be cleared during the construction of the Kambakia -Kagotone Road.
	<i>Prunus african</i> tree that will be cleared along the Kambakia -Kagotone Road. The bark of the tree is extracted for medicinal purposes by the community.
	Grevillea trees along the Western Bypass Mate Road used as natural boundaries by the locals. Some of the trees will be cleared to pave way for road construction.
	A Section of Upper Imenti Forest from Km1+200 to Km 2+600 to be excised for road realignment.

Mitigation Measures

- Vegetation clearance should be limited to the approved project footprint.
- In coordination with KFS, a degraded site within Upper Imenti Forest should be identified for compensatory tree planting, at a minimum replacement ratio of 3:1 which equates to 7.41 Hacters with indigenous species.
- Upon project completion, tree planting should be undertaken along road reserve edges, particularly along the Western Bypass - Mate Link Road and Kambakia – Kagotone/KEMU C91 Road.
- Borrow pits should be sited in sparsely vegetated areas and fully rehabilitated after use; surrounding disturbed areas must also be restored.
- Only pre-approved, existing access routes should be used to transport construction materials, minimizing disturbance to surrounding vegetation.
- Designated material dumping sites must be approved by the Resident Engineer (RE) and licensed by NEMA.
- Compacted soils on temporary access roads and diversions should be ripped post-construction to promote water infiltration and re-vegetation.

- Invasive species encountered within the construction corridor (e.g., *Lantana camara*) should be uprooted and safely incinerated under controlled conditions.
- To protect the integrity of the Upper Imenti Forest Ecosystem, use of the existing Nchoro Iboro Borrow Pit, which is infested with invasive *Lantana camara*, should be reconsidered in favour of an alternative site.

10.7 Fauna

Whereas the forest adjacent to the Kambakia - Kagotone Road - hosts a variety of wildlife including monkeys and a wide range of birds, most of these animals can easily adapt or move away from disturbances caused by construction activities.

Given the ecological sensitivity of the area, particularly during the wet season, construction-related disturbances such as noise, vibration, human activity must be carefully managed to minimize disruption to the local wildlife. Since elephants move around the forest, studies have shown that changes in behavioral patterns of elephants can be impacted by intermittent anthropogenic noise. This can include changes in movement patterns, avoidance of certain areas, trunk related behaviors (curling, and placement in the mouth), foot lifting, and standing in an alert posture (Richard Jakob-Hoff and Micah Kingan et al <https://pmc.ncbi.nlm.nih.gov/articles/PMC6721009/#animals-09-00504-f004>²⁰). A study by Beth Mortimer et al (<https://doi.org/10.5061/dryad.3tx95X6gb>²¹) concluded that treatments containing human-generated noise led to elephants significantly increasing the distance that they moved away from the trial location.

Construction equipment typically emits noise levels exceeding 80 dBA, which may cause temporary disturbance to elephants in the vicinity. Elephants are known to be sensitive to loud, persistent noise, particularly during calving and early nurturing periods. However, evidence of elephants occasionally crossing and adapting to traffic along the Meru - Nanyuki Road, which also traverses the forest, suggests some level of habituation to human activity in this landscape. Nonetheless, precautionary measures should be implemented to mitigate potential behavioral disruptions during construction.

Construction activities along the Kambakia - Kagotone Road, particularly between Km 1+200 and Km 2+586, will be accompanied by substantial intermittent noise above the ambient. As stated above, such elevated noise levels may lead to elephants moving away from part of the seasonal elephant maternity area close to the project road.

Mitigation Measures

- Noise levels should be regularly monitored along the Kambakia - Kagotone Road (Km 1+200 to Km 2+586), particularly in sections bordering the Upper Imenti Forest, to assess potential disturbance to wildlife.
- The contractor should implement noise-reducing measures, including the use of low-noise equipment, regular maintenance of machinery, and restricting high-noise activities to daylight hours.
- Construction schedules should take into account sensitive periods for wildlife, particularly elephant calving seasons, and intrusive works near the Upper Imenti Forest should be limited during such times.
- All project workers should be sensitized on the ecological significance of adjacent wildlife habitats and trained to report any wildlife sightings, especially elephants.
- A wildlife encounter protocol should be developed in consultation with KWS, and works should be temporarily suspended in the event of elephant presence near construction zones.
- Night time construction activities near forested sections should be avoided to reduce potential disturbances to wildlife, particularly nocturnal species.

10.8 Socio-economic Impacts

10.8.1 Land Acquisition, Livelihoods and Resettlement

The project traverses both urban and peri-urban areas, characterized by narrow road corridors measuring less than the standard 9-meter width required for the designed roads. Additional land acquisition shall be necessary to accommodate the proposed carriageways and associated infrastructure. This will result in the displacement of existing developments situated within or along the road reserve. Key components of the Project including Three Steers - Kambakia Road,

Western Bypass Link - Mate Road, Meru National Polytechnic Footbridge, Link 1 - Meru Bus Terminus, and Link 2 - Gakoromone Market are expected to be significantly affected due to their dense urban character. Local communities and residents, business owners and property owners within these sections shall be required to vacate the road reserve to allow for construction activities.

A detailed RAP has been prepared to assess the magnitude of displacement, outline entitlements, and provide mitigation measures, including compensation and livelihood restoration, in line with national legal requirements and applicable international standards. During the RAP study, a total of 896 PAPs were identified with 16 of the number having both their livelihoods and assets affected as shown in the table below

Table 10-8: Summary of project PAPs

No.	Land and Assets PAPs			Livelihood PAPs		Both Livelihood and Land and asset PAPs
	Male	female	Institutional	Male	female	
1	460	167	35	79	155	16



Plate 10-3: Some of the Business at Km 0+150 Western Bypass Link - Mate Road

Mitigation Measures

- The project should facilitate relocation of informal settlers and assist in identifying alternative sites for small-scale businesses.
- Transitional support and subsistence allowances should be provided to squatters and other vulnerable PAPs.
- Public awareness campaigns should be conducted to educate PAPs on the importance of maintaining a clear road reserve.
- Targeted health, safety, and livelihood sensitization programs should be delivered to affected households.
- Alternative income-generating opportunities should be promoted among the local community through capacity-building initiatives.
- Affected persons should be given priority for job opportunities during the construction phase, where possible.

- A formal GRM should be established and operationalized to address concerns from PAPs in a timely and transparent manner.
- Ensure that PAPs are compensated prior to demolition of structures and acquisition of parcels for road construction.
- Issue adequate notice to the PAPs along the road reserve for a period not less than 30 days after compensation before commencing on demolitions.
- Where possible consider PAPs for employment opportunities

10.8.2 Existing Utilities

During the field survey, it was noted that the project would affect existing utility infrastructure including power lines, MeWASSCO water pipes and underground fiber optic cables. Such utilities will need to be relocated during the construction of the road. During relocation, there will be disruption of services, some of which can affect sensitive institutions such as hospitals.



Plate 10-4: A Section on Hospital road Link 3 MeWASSCO JCT with KPLC and MeWASSCO water storage tank that may be affected by road realignment

Mitigation Measures

- A detailed utility mapping exercise should be undertaken using existing utility company records and site verification prior to commencement of works.
- All underground and overhead utilities should be clearly marked on-site to avoid accidental damage during construction.

10.8.3 Occupational Safety and Health

Occupational Safety and Health issues associated with the construction of the road will include physical hazards, chemical hazards and noise physical hazards. Chemical hazards in road construction activities will principally be associated with exposure to road construction materials, dust during construction; exhaust emissions from heavy equipment and motor vehicles.

Road construction personnel can be exposed to a variety of physical hazards from operating machinery and moving vehicles but also working at elevation on pedestrian bridges. Other physical hazards include exposure to weather elements, noise, work in confined spaces, trenching, contact with overhead power lines, falls from machinery or structures, and risk of falling objects. There is also the possibility of accidents when transporting workers to and from the construction sites. Also, construction workers may be attacked by wild animals during the construction period or before replacing the electric fence along Kambakia - Kagotone Road.

Mitigation Measures

- Work at night or in low-visibility conditions should follow strict safety protocols, including the use of high-visibility apparel and appropriate site lighting without causing glare to workers or motorists.
- A fleet and traffic management plan should be developed and implemented to enhance road work zone safety for both workers and road users.
- Elevated work platforms should be maintained in good condition and operated in compliance with fall protection measures, including the installation of guardrails and use of safety harnesses where applicable.
- Access to clean and adequate drinking water should be provided at all active construction sites.
- Functional and accessible first aid kits should be available at all construction locations.
- All OSH procedures should be aligned with the Occupational Safety and Health Act, 2007 (Kenya), and relevant International Labour Organization (ILO) conventions. The OSH should adopt safety risk mitigation hierarchy (Elimination, Substitution, Engineering Controls, Administrative Controls, and Personal Protective Equipment (PPE)).
- Workers should receive regular training on occupational health and safety, including emergency response procedures, equipment handling, and hazard awareness.
- Hotlines or information boards should be put in place for real-time updates on elephant movement.
- A wildlife encounter protocol should be developed in consultation with KWS, and works should be temporarily suspended in the event of elephant presence near construction zones.

10.8.4 Community Health and Safety

Given that the project traverses urban and peri-urban areas, construction activities can have significant community health and safety risks. Key risks include increased dust, noise, and vibration from machinery and vehicle movement, as well as heightened risk of communicable diseases associated with the influx of temporary construction labor.

Community safety risks will include pedestrian and traffic hazards, especially in high-density urban areas. Vulnerable groups, particularly children and motorcyclists, are at heightened risk due to limited physical protection, behavioral factors, and reduced visibility to motorists. Construction zones may also increase the likelihood of road traffic accidents involving vehicles, pedestrians, cyclists, and livestock.

Additional risks include emergency situations such as fuel spills, vehicle collisions, and poor response readiness. The glare from construction and vehicle lights may cause nighttime disturbance to nearby residents, potentially affecting sleep and general well-being. With anticipated increases in traffic volume post-construction, the scale of community health and safety impacts is considered significant if not mitigated. To understand the risk levels that the community will be exposed to, a summary of community health and safety concerns and their respective risk levels are represented in the Table 10-9 below.

Table 10-9: Summary of community health and safety concerns

No.	Project Road	Risk level (High, Medium and Low)	Reason for public safety concerns

1.	Three Steers-Kambakia	High	• Presence of hospitality establishment such as Three steers hotel, Elsa hotel and Cool breeze gardens which have frequent pedestrian and vehicular traffic. • Consolata Hospital Gitoru on the LHS of the road, which is visited by the sick, elderly and in some cases disabled. Construction activities will pose risk such as accessibility, noise and vibration and dust generated. • Meru AIC church and Nursery located on the RHS of the road will have accessibility challenges for the young children going to school, dust generation during dry period of road construction and noise and vibration impacts. • On both sides of the road at Km 0+400 to 0+500, there are roadside traders. The traders will have accessibility challenges both for their customers and owners, dust and noise vibration impacts. • Along the entire stretch of the road, there are high density residential areas. The residents will face accessibility challenges to their houses, there will be potential of accidents from construction vehicles, concerns of dust, noise and vibration pollution.
2.	Link 2- Gakoromone Market	High	• The road starts at Kooje Catholic church on the RHS and traverses a densely populated residential areas towards Gakoromone Market and MeWASSCO Sewage treatment facility. There is no alternative road for the residents of Kooje to access the market hence construction will significantly interfere with accessibility. There is also the potential of increased cases of accidents for those insistent on using the road.
3.	Kambakia-Kagotone/KEMU C91	Medium	• KEMU university and Meru polytechnic students use the road to access their private residential units. Construction will expose the students to increased chances of accidents when the school is in session. • At Km 1+200 to 2+600, the locals cross the road to access grazing fields for their livestock in Upper Imenti Forest, Construction activities will expose both livestock and herders to risks of accidents. • Along the Meru National Polytechnic gate, students crossing the Meru- Nanyuki highway are prone to accidents. Data from Traffic Demand and Economic Analysis report for the preliminary design identified four accidents of students being knocked by vehicles in 2024.
4.	Hospital-Kiramburine JCT	Medium	• This is one of the three alternative access roads to the Meru Teaching and Referral Hospital and KMTC. The road is the least used of the three hence lower pedestrian and motorized traffic. However, there are incidents where the public may use the road to either access the hospital, hospital morgue or their residents. Construction activities may pose increased risks of accidents, air, noise and excessive vibration will impact patients and the public using the road. The impact will be low since there are alternative access roads.
5.	Link 1- Meru Bus terminus	Medium	• The road borders Good Shepard Primary school on the RHS, Full Gospel church and Shalom Academy to the LHS terminating at the busy Meru bus Terminus. Due to the busy character, Construction activities will pose increased risk of

			accidents involving non-motorized and motorized transport as well as, pedestrians.
6.	Link 3- MeWASSCO JCT	Medium	On the RHS of the road, there is Gakomone Dispensary and MCK Gakoromone church. Gakomone dispensary experiences a high traffic of vulnerable walk-in patients. During construction noise, dust and excessive vibration will pose a health risk to the public including the vulnerable.
7.	Gikumene- Western Bypass Link- Mate	Medium	The road is in a rural setting connecting the Meru- Nairobi highway and Meru- Mitunguu Road. On both sides of the road are single residential homes, farms and few roadside traders. During construction, the people most likely to be affected will be the pedestrians, cyclists, motorcycle operators, material transport lorries, local farms and private vehicle owners using the road.
8.	Kagotone- KEMU C91	Low	The road is a short loop with narrow walkways providing a shorter alternative route for the KEMU students to the Meru- Maua Road. It offers an alternative with little risk of accidents to KEMU university students as they move from their private residential hostels to school.
9.	Kongoacheke JCT- Kwa Mukuru JCT	Low	At Km 0+020 to 0+120 there are residential houses used by both locals and students from Meru Polytechnic. Construction activities may exacerbate risk of accidents involving pedestrians and motorized transport.
10.	Kongo garden- Kamabakia JCT	Low	This is a short road with few residential units but more farmland on both sides of the road. Construction activities will impact on access to farms and how farmers will be transporting their produce to the markets hence, safety risks are considered low.
11.	Runogone- Kaithe	low	The road is in a peri urban setting with most residential areas being single dwelling units. Construction may impede access to residences due to the nature of terrain,

Mitigation Measures

- Safe pedestrian access and crossing points should be provided throughout construction zones, including temporary footpaths, overpasses, or underpasses, where feasible.
- Clear and visible safety signage should be installed at all active construction sites and along diversion routes.
- Temporary road signs and speed calming measures (e.g., rumble strips, barriers) should be erected near schools, markets, and residential areas.
- Trained traffic marshals should be deployed to manage vehicle and pedestrian movement at construction hotspots.
- Community sensitization programs should be conducted to raise awareness on road safety, construction hazards, and emergency protocols.
- Construction activities should be confined to daytime as per the EIA license conditions, to minimize disturbance from light and noise at night.
- All construction vehicles and equipment should be regularly maintained to minimize emissions, leaks, and noise pollution.
- Emergency response plans, including spill response kits and first aid stations, should be established and made accessible at all major construction zones.

- The contractors should prepare and implement traffic and road safety management plans for the construction phase.
- During construction the proposed pedestrian walkways should be clearly separated from active construction areas as far as feasible

10.8.5 Sexually Transmitted Infections

Implementation of the project will result in the influx of construction workers and support staff, potentially leading to increased social interaction with local communities, which may elevate the risk of spread of STIs, including HIV and AIDS. Effective prevention and control of STI and HIV transmission will require coordinated efforts between the project proponent, the contractor, and relevant county and national health agencies. With proactive interventions, this impact is preventable.

Mitigation Measures

- The Project should implement an STI, HIV, and AIDS prevention and awareness programme in collaboration with local health authorities.
- The Contractor should provide voluntary HIV Testing and Counselling (HTC) services to workers and community members, administered by qualified health personnel.
- The Contractor should distribute free condoms at camps and work sites to promote safer sexual practices.
- All workers should be required to sign a Code of Conduct prohibiting sexual exploitation and abuse, including inappropriate relations with community members.
- Sensitization and peer education campaigns should be conducted regularly for both workers and surrounding communities to raise awareness of STI/HIV and AIDS risks and prevention strategies.

10.8.6 Traffic Management

The current road network within the project area is earth roads that don't allow for fast moving traffic. The design speeds for the project vary between 30km/h or 50 Km/h which is a substantial increase in reference to the current roads.

Traffic is expected to increase during construction, mainly by vehicles transporting materials from community areas using unclassified roads, posing road safety concerns to the wider public. The narrow nature of the project roads will also pose a challenge to construction traffic, when turning. Road safety within the urban setups of the project roads will be a major concern and should be handled with care to avert or avoid accidents from happening.

Mitigation Measures

- The project should formulate and implement a general Traffic Management Plan (TMP) and site-specific management plans should be put in place.
- Appropriate safety signage and warnings should be installed at designated points e.g. truck and equipment turning signage should be placed at any access road facing the all the entrances from the Eastern and Western Bypasses and the Meru - Nanyuki Highway.
- Separate entry and exit gateways should be provided for vehicles and construction equipment.
- The contractors should hire qualified and experienced drivers and operators for construction vehicles and equipment.
- Truck speeds within the project roads should be restricted to 40km/h and below.
- Temporary road signs and speed calming measures (e.g., rumble strips, barriers) should be erected near schools, markets, and residential areas.
- Well trained traffic marshals should be assigned to control traffic at the site entry and exit points.
- Concrete barriers should be installed in all sections with high fills.

- Access to active construction site should be limited to authorized personnel.

10.8.7 Security

Insecurity within the project area is likely to increase due to an influx of construction workers and presence of construction machinery at the project sites. There might be increased risk of poaching and human wildlife conflict with wild animals especially elephants as a section of the fence will be moved to pave way for a section of Kambakia-Kagotone Road. Also, construction workers may be attacked by wild animals during the construction period when or before replacing of the electric fence.

Mitigation Measures

- The Project should liaise with KWS to plan and implement relocation of the electric fence during the period when the elephants move away from the Kambakia area, mostly during the dry season.
- All project workers should be sensitized on the ecological significance of adjacent wildlife habitats and trained to report any wildlife sightings, especially elephants.
- Hotlines or information boards should be put in place for real-time updates on elephant movement.
- A wildlife encounter protocol should be developed in consultation with the KWS, and works should be temporarily suspended in the event of elephant presence near construction zones.

10.8.8 Existing Structures

Road construction activities will involve use of heavy construction equipment including drum and sheep foot rollers which generate substantial amounts of vibration. Studies have shown that higher continuous vibrations (20-50 Hz) can impact negatively on the integrity of structures within a radius of 50 meters from the vibration source²⁰. The magnitude of the vibration propagation is higher in coarse-grained soils but relatively lower in rock fill and asphalt.

Considering that most of the project roads are in a built up urban and semi-urban areas, excessive vibrations have the potential to affect the structural integrity of residential and commercial structures in proximity. It is therefore imperative that appropriate measures be taken in areas around quarries, borrow pits and within the roadways with high concentration of residential and commercial structures. Areas that are likely to be affected by construction vibration are as tabulated in Table 10-10 below.

Table 10-10: Identified Vibration Hotspots

No	Project road	Section likely to be impacted
1.	Three Steers- Kambakia	0+000- 1+000: The area is aligned with commercial and residential structures within 50 meters of the road on both sides.
2.	Kambakia- Kagotone/KEMU C91	3+050 to 3+200: The section has residential flats on both sides of the road in proximity.
3.	Kongoacheke JCT- Kwa Mukuru JCT	1+200 to 1+700: The section has residential and commercial structures on both sides of the road.
4.	Kagotone- KEMU C91 Link	0+050 to 0+150: LHS are student residential flats.
5.	Link 1- Meru Bus Terminus	0+300 to 0+400: The section has residential, commercial and religious buildings.

^{20 1} Nanayakkara, H. S. C. (2017). Analysis of vibration levels at nearby structures due to road construction activities (Master's thesis, University of Moratuwa, Sri Lanka).

6.	Hospital- Kiramburine JCT	0+000 to 0+400: the section has structures belonging to KMTC, Meru cancer hospital, Meru Teaching and Referral Hospital, morgue and Majeeny mosque both sides of the road.
7.	Western Bypass Link (Gikumene)- Mate Road	0+000 to 0+100: The section has both commercial and residential buildings on both sides of the road.

Mitigation measures

- Carry out a pre-construction structural integrity assessment of structures within the areas outlined in the Table above.
- Continuous structural monitoring of nearby buildings and infrastructure should be conducted during construction to detect and address potential damage early.

11 POTENTIAL OPERATION PHASE NEGATIVE IMPACTS

11.1 Noise Pollution and Excessive Vibration

Upon completion of the project, ambient noise and vibration levels in the vicinity are expected to rise significantly. This increase will primarily result from higher vehicular and pedestrian traffic volumes, compounded by poor vehicle maintenance, high-speed driving facilitated by improved road conditions, and vehicle overloading, factors that collectively stress engines and intensify noise emissions.

These elevated noise levels may adversely affect sensitive receptors along the corridor, including the Meru Teaching and Referral Hospital, KMTC, Gakoromone Dispensary, Gitoru Health Centre, and nearby residential settlements. In residential zones, increased noise pollution could reduce the quality of life and make the areas less habitable. In Health Facilities, elevated noise may disrupt both service provision and recovery environments for patients.

Mitigation measures

- Public awareness campaigns should be conducted targeting drivers and public transport operators to educate them on the health and environmental impacts of excessive noise, and promote responsible driving behavior.
- Implement and enforce speed limit, particularly near sensitive areas such as hospitals, schools, and residential neighborhoods. Designated “silent zones” should be clearly marked, to warn road users against hooting and loud vehicle operation.
- Physical noise barriers (e.g., acoustic walls or vegetative berms) should be installed along sections of the road adjacent to sensitive receptors.
- Trees and shrubs should be planted along the road to act as natural sound absorbers, improving both aesthetics and noise reduction.
- Axle load limits should be enforced at weighbridges to prevent overloading of heavy trucks, which contributes to increased vibration and noise, especially during acceleration and braking.
- A routine noise monitoring program should be developed and implemented at critical locations (e.g., health facilities, learning institutions, places of worship and residential areas) to ensure that noise levels remain within prescribed limits.
- Regular environmental audits should be undertaken during the operation phase to assess the effectiveness of implemented mitigation measures and ensure continued compliance with environmental standards.

11.2 Air quality

Air quality measurements undertaken during the environmental and social baseline survey for the Project revealed that ambient air quality in areas surrounding Gakoromone Market and the entrance to Hospital Roads exhibited elevated levels of particulate matter (dust) and gaseous pollutants, exceeding the permissible limits outlined in the Environmental Management and Coordination (Air Quality) Regulations, 2024. These elevated pollution levels are primarily attributed to activities such as: open burning of solid waste within market areas, incineration of medical waste at nearby healthcare facilities and emissions from sewage treatment infrastructure.

Upon completion and commissioning of the Extension of Meru Bypass Project, it is anticipated that air quality within the project area will deteriorate further due to an increase in motorized traffic and associated emissions. Specific contributors include:

- Higher traffic volumes leading to increased vehicle exhaust emissions (e.g., nitrogen oxides, carbon monoxide, sulphur dioxide, and particulate matter).
- Poor maintenance of vehicles resulting in incomplete fuel combustion and excessive exhaust output.
- Continued use of fuels with high sulphur content, particularly by older diesel-powered vehicles.
- Persistence of open-air waste burning practices in market areas and increased incineration of hospital waste.

If unmitigated, these air pollutants could adversely affect the health of nearby residents and workers, with an increased incidence of respiratory infections, eye and skin irritation, and long-term chronic conditions such as asthma and bronchitis. Additionally, accumulation of acidic gases in the atmosphere may, over time, contribute to acid rain, potentially damaging vegetation, soils, and built infrastructure.

Mitigation Measures

- Open burning of waste in markets and other public spaces should be strictly prohibited. The County Government will enhance waste management systems to ensure timely collection and transportation of solid waste to designated disposal sites.
- Health Facilities and public institutions within the project area will be encouraged to upgrade waste handling and treatment systems. Modern, emission-controlled incinerators should be adopted where incineration is necessary, while non-burn alternatives should be explored where feasible.
- All vehicles operating along the Meru Bypass should be required to undergo regular maintenance to ensure mechanical efficiency and compliance with emission standards. Installation and maintenance of effective emission control devices, such as catalytic converters and particulate filters, will be encouraged.
- Collaborations with fuel suppliers and regulatory authorities will be pursued to encourage the use of low-Sulphur fuels and discourage the use of adulterated or substandard petroleum products.
- Tree and shrub planting should be promoted along the Meru Bypass and near sensitive institutions will serve as a natural air quality improvement measure by trapping dust and absorbing gaseous pollutants.
- Regular sensitization campaigns targeting market vendors, transport operators, and the general public will be carried out to raise awareness of the health impacts of poor air quality and promote behavioral change.
- A routine air quality monitoring program will be established at identified pollution hotspots. Parameters to be monitored will include PM_{2.5}, PM₁₀, NO_x, SO₂, and CO, with results used to inform continuous improvement. Monitoring results will be compared against national air quality standards, and corrective action will be taken as needed.

11.3 Road safety

Road safety involves measures to prevent road traffic-related accidents and injuries. Baseline survey data from Traffic Demand and Economic Analysis report for the preliminary design identified roads within Meru town that recorded high number of accidents. Amongst the hot spots for accidents was the Meru National Polytechnic gate, which in 2024 alone recorded three accidents of students being knocked down by vehicles. It was also noted that amongst all the accidents recorded, approximately half of the number led to fatalities and serious injuries. These numbers however, may have the potential of increasing if proper and adequate mitigation measures are not put in place at the time of operation. As part of the strategies to ensure reduced accidents and other road safety related concerns, the designs speeds were graded at 50 km/h a slight improvement from the previous 20 km/h.

During operations, there is a potential of increased accidents along the new roads. These can be due to poor vehicle conditions, lack of awareness regarding the use of the designated crossing points and negligence on the part of road users. The other factors that may lead to accidents are lack of knowledge of proper use of the new infrastructure by the locals, speeding by motorists and in extreme cases weather-related slippages during rains. It is anticipated that the accidents will be common in areas with high human population mainly areas where students reside (Meru National Polytechnic, KEMU and KMTC), market areas such as Gakoromone, services areas such as the hospital roads and Meru bus park terminus and densely populated areas.

Mitigation measures

- The proponent should organize regular public awareness and sensitization campaigns targeting local residents and road users. These campaigns should aim to promote responsible use of the new infrastructure and reduce accidents resulting from negligence or lack of awareness.

- The proponent should ensure that the road and all associated infrastructure, including drainage systems, signage, and safety features, are regularly maintained throughout the operation phase to preserve functionality and safety.
- Clearly marked pedestrian crossing points should be provided at appropriate intervals, especially near schools, hospitals, markets, and residential areas, to enhance pedestrian safety and accessibility.
- Road signs should be erected at strategic locations along the bypass to provide adequate information and warnings to all categories of road users, including motorists, cyclists, and pedestrians.
- Vehicle owners and operators should ensure that vehicles using the bypass are well-maintained and roadworthy, in compliance with national transport regulations. Regular servicing should be undertaken to reduce the risk of mechanical failure, accidents, and environmental pollution.

11.4 Risk of Increased Poaching

Meru County is host to one of Kenya's largest protected forest ecosystems, the Upper Imenti Forest, which supports a variety of wildlife species, including elephants, ungulates (e.g., antelopes), and primates. This Forest plays a critical ecological and conservation role, serving as a habitat for both resident and migratory fauna. During baseline consultations, KWS raised concern over a significant rise in illegal poaching activities within the Forest. These activities appear to be driven in part by local demand for bushmeat and other wildlife products. Of particular concern is the proximity of the Kambakia - Kagotone Road, which runs adjacent to the Forest and serves as a boundary between the protected area and neighboring human settlements.

Upon completion of the road, improved access, reduced travel time, and increased openness of the area may motivate illegal entry into the forest by poachers. The upgraded road infrastructure may inadvertently provide easier escape routes for offenders, especially during nighttime or low - patrol periods. This may lead to a rise in poaching incidents, threatening biodiversity, disrupting ecological balance, and undermining conservation efforts within the Upper Imenti Forest.

Mitigation Measures

- KWS should conduct regular and well-coordinated patrols along the Upper Imenti Forest and the road corridor to deter poaching activities and facilitate timely arrests and prosecutions of offenders.
- In collaboration with local leaders, conservation groups, and community-based organizations, the project proponent should support continuous public education campaigns. These should aim to sensitize communities on the ecological and economic benefits of wildlife conservation and the legal implications of poaching.
- Community involvement in forest stewardship should be promoted by supporting local conservation initiatives and promoting alternative livelihood programs to reduce dependence on wildlife exploitation.
- The use of surveillance technologies such as motion sensors, community hotlines, and forest watch groups should be promoted to enhance real-time reporting and response to illegal activities.
- Measures should be taken to reinforce the buffer zone between the road and the forest boundary through physical barriers (e.g., fencing or vegetation buffers), improved lighting in high-risk zones, and increased signage indicating protected area boundaries.

11.5 Disruption of Natural Habitat and Ecosystems

Scientific studies have shown that linear infrastructure projects such as roads exert significant pressure on wildlife and natural ecosystems. Common impacts include habitat fragmentation, increased wildlife mortality from vehicle collisions, disruption of movement and migration patterns, spread of invasive species, and escalated human-wildlife conflict.

During the operation phase of the Kambakia - Kagotone (C91) Road, wildlife within the adjacent Upper Imenti Forest is expected to face heightened ecological stress due to increased noise and vibration from vehicular traffic. These disturbances may particularly affect species that rely on acoustic communication, such as elephants. Elevated noise

levels may interfere with breeding, feeding, and migratory behavior, thereby reducing the animals' chances of survival in the area.

In addition, the project will result in the conversion of approximately 2.47 hectares Upper Imenti Forest land that previously served as wildlife habitat. This habitat loss, coupled with the proximity of the road to the forest is likely to increase the frequency and severity of human-wildlife conflicts, as animals venture into adjacent settlements in response to displacement and disturbance. Similar patterns have been observed in other protected areas, where infrastructure-induced behavioral changes in wildlife have triggered conflicts with nearby communities.

Mitigation Measures

- The proponent, in collaboration with KWS and local community-based organizations, should conduct regular sensitization campaigns to educate communities about potential increases in human-wildlife conflict and the importance of wildlife conservation.
- All road signs, signals, markings, and other traffic control devices, particularly those related to wildlife crossings and livestock movement, should be properly installed and maintained to reduce vehicle-wildlife interactions and improve safety.

11.6 Aesthetics and Landscape

The proposed Extension of Meru Bypass Project covers areas with notable visual and ecological value, particularly the Kambakia - Kagotone Road corridor adjacent to the Upper Imenti Forest. One of the most aesthetically sensitive segments lies within a 400-meter stretch of mature indigenous forest cover, where tree canopies form a continuous green tunnel along the existing road alignment. Implementation of the project will necessitate the clearing of this forested section to facilitate road expansion and associated infrastructure works. This will result in the permanent loss of mature trees and associated vegetation, significantly altering the visual character of the area. In particular, the removal of indigenous canopy cover will degrade the scenic quality that currently defines the landscape, especially for both road users and adjacent communities. Without appropriate intervention, the project could have lasting negative effects on the area's aesthetic integrity and natural heritage.

Mitigation Measures

- Upon completion of construction, all disturbed areas, particularly road embankments, cut-and-fill slopes, and cleared sections, should be rehabilitated through landscaping and re-vegetation using indigenous plant species suited to the local ecology.
- A tree replacement program should be developed in collaboration with the KFS, Meru County Government, and local community groups, targeting the planting of native tree species along the affected section to restore the natural visual buffer and compensate for the loss of canopy cover.
- Landscaping activities should be incorporated into the final road design to ensure a visually cohesive interface between the new infrastructure and the natural environment. This includes the use of green buffers, planting strips, and the preservation of any remaining vegetation outside the construction corridor.
- Long-term monitoring and maintenance of replanted areas should be conducted to ensure survival and growth of vegetation, with periodic reviews integrated into the post-construction ESMMP.

11.7 Storm Water Management

During the baseline assessment, climate variables such as precipitation, runoff potential, and humidity were modelled to understand hydrological dynamics in the project area and inform the road design process. Climate change projections for Meru County indicate an anticipated increase in precipitation, estimated at 2% in the medium term and 4% in the long term. These changes, coupled with increased impervious surfaces from the completed road, are expected to contribute to significantly higher surface runoff volumes during storm events.

Additionally, baseline observations revealed existing stormwater management challenges in several locations. Notably, sections along the Kambakia - Kagotone Road (UTM 37N: 347626.51mE, 7827.27mN) and the Three Steers

- Kambakia Road (GPS: 348565.98mE, 6708.22mN) have experienced flooding and property damage due to uncontrolled surface water flows.

Upon completion of road construction, the increase in impervious cover, such as asphalt and concrete surfaces, will reduce the ground's natural infiltration capacity. This will lead to increased stormwater runoff being discharged into the constructed drainage systems. If not properly managed, this additional runoff may exceed the capacity of the drainage infrastructure, leading to erosion, flooding, and damage to downstream properties and ecosystems.

Mitigation Measures

- KURA should collaborate with Meru County Government and relevant water authorities to develop a localized stormwater management plan that considers future urban development, climate change trends, and cumulative hydrological impacts.
- Regular inspection and maintenance of stormwater drainage infrastructure (culverts, side drains, catch basins, and outfalls) should be conducted to prevent blockages, overflow, and degradation of drainage efficiency over time.
- Where feasible, check dams or vegetative filters should be installed at strategic points along open channels to slow runoff velocity and enhance sediment capture.
- Designated outfalls should be equipped with energy dissipation structures (e.g., riprap, stilling basins) to reduce the erosive force of discharged water on receiving environments.

11.8 Traffic impacts

New urban road networks can unintentionally worsen traffic conditions through induced demand, modal shifts, and spatial redistribution effects. Key Adverse Traffic Impacts are as follows:

- Induced Demand: The improved roads may attract more vehicles than anticipated, as improved access encourages additional trips and car ownership. This can lead to congestion along the roads with time.
- The roads once improved will enhance connectivity which can accelerate urban sprawl, pushing development to peripheral areas. This increases travel distances and dependency on road-based transport, further straining the network.
- Local residents were accustomed to low traffic volumes along these roads, allowing them to walk or cycle with minimal safety concerns. However, the increasing marginalization of non-motorized road users now threatens both their safety and accessibility, particularly for vulnerable groups such as pedestrians and cyclists.

Mitigation Strategies

- Integrated Transport Planning: Align road development with public transport, land use, and non-motorized transport strategies to avoid car-centric outcomes.
- Provide pedestrian walkways to improve road safety for the vulnerable road users.
- Community Engagement: Involve local stakeholders to identify mobility needs and ensure equitable access across transport modes.

12 POTENTIAL DECOMMISSIONING PHASE NEGATIVE IMPACTS

According to the preliminary design report, a design life of 120 years has been assumed for the two footbridges and box culverts while pavements have a design life of 15-20 years as provided for in the Kenyan Design Manual, Part III (1987). Although full decommissioning of the road is not anticipated, rehabilitation works will likely commence at the end of the design life to maintain its functionality and safety. In contrast, temporary construction facilities such as campsites, access roads and diversions, and material storage areas will be decommissioned immediately after the construction phase as per their respective decommissioning plans. This process may pose short-term environmental, social, health and safety risks, including pollution, generation of construction waste, and potential safety hazards to workers and the public.

12.1 Occupational health and safety impacts

Decommissioning works such as breaking paved areas, dismantling plants and equipment, material stockpile areas, housing quarters and associated infrastructure including sanitary facilities will require use of heavy construction equipment and hand-held tools which can cause injuries to workers. It is therefore imperative that appropriate measures be taken to protect workers from potential occupational risks and hazards associated with such works.

Mitigation measures

- Conduct safety training and awareness to all workers before commencement of decommissioning activities.
- Issue all workers with the appropriate PPEs in-line with the activity.
- Erect appropriate warning signs strategically in all the active decommissioning sites.
- Hoisting and lifting equipment should be rated and properly maintained.
- Provide all workers with clean drinking water.
- Provide temporary gender sensitive sanitation facilities for use during the decommissioning works.
- Provide a standby emergency vehicle on site.
- Have a fully equipped first aid kit handled by trained first aiders on site.

12.2 Soil and water contamination

Decommissioning of on-site fuel storage and pumping facilities, workshops, effluent management systems, used oil storage tanks and other stationary construction plants may result in accidental spillages which may in turn contaminate the receiving soil and surface and underground water resources.

Mitigation measures

- Scoop contaminated soil for proper disposal.
- Account for all the hydrocarbon fluids within the campsite at the time of decommissioning.
- Exhaust all the septic tanks before decommissioning.
- For biodigesters, treat the remaining slurry or digestate to reduce biological activity and odor.
- Further the extracted digestate should be disposed appropriately as per the decommissioning plan; and
- Depending on the level of spillage, adequately remediate the affected area(s) and may be necessary.

12.3 Community health and Safety

Decommissioning quarries, material borrow pits, campsites and other facilities may result in dust pollution, excessive vibration and noise, contamination of water bodies and accidents to the public. The aforementioned may result in respiratory and waterborne diseases, hearing problems, injuries and or loss of both animal and human life and potential damage to properties.

Mitigation measures

- Limit demolition works to daytime hours.
- Hoard all sites during demolition activities. For the other sites, ensure adequate protection with reflective warning tapes and any other appropriate protection measure.
- Install appropriate safety warning signages in active demolition sites.
- Ensure that all the material sites are rehabilitated and reinstated to their original condition as much as possible.
- Control access into active decommissioning sites.
- Control dust in potentially high dust generation sites.

12.4 Loss of Income

Construction workers will lose income sources as their services will be terminated. Consequentially local businesses that depended on the workforce will lose their customer base, hence, loss of livelihood. This may impact negatively on the mental health of the affected business owners or workers.

Mitigation measures

- Notify the employees in advance on the project closure date and ensure that all the pending claims are paid

12.5 Waste

Decommissioning works typically generate wide range of solid waste including used timber, steel cuttings, concrete debris, waste tyres and junks. It is important to note that the expected wastes can be normally amenable to Reuse, Recycle, Repurposing and Energy Recovery (4Rs), hence, the volumes expected to go to the disposal site can be significantly reduced if these measures of circular economy are applied.

Mitigation measures

- Contract a licensed waste handler to help in collection and disposal of decommissioning waste.
- Establish a segregation and grading waste management system to help in achieving the 4R's of circular economy.
- The contractor should prioritize deconstruction instead of demolition to increase benefits of cyclic economy.
- Initiate site clean-up by restoring the site to the initial condition as much as possible.

12.6 Decommissioning of construction auxiliary components

Decommissioning of construction auxiliary facilities such as site camp, worker accommodation, storage areas, concrete/asphalt batching plants and temporary utilities will be guided by the ESMMP prepared for the respective facilities as part of the ESIA document. However, we note that the decommissioning of such components have the potential of generating waste, soil disturbance, noise/air pollution and potential of polluting nearby water resources. During decommissioning waste will be generated albeit temporarily. These wastes include materials from demolished temporary structures such as portable buildings, leftover construction materials, and old piping. Major infrastructure might be removed, though sub-surface elements like foundations or utility ducts might be left in place to minimize further environmental disturbance. However, the removal of temporary access roads can cause localized soil compaction. Additionally, there may be the potential of contamination from fuel spills or decommissioning of chemical storage facilities, if necessary, precaution is not put in place.

Mitigation measures

- To minimize waste generation, the contractor should follow the waste hierarchy, minimizing, reusing, recycling, and properly disposing of materials is essential to manage the large amounts of waste generated.

- The contractor should develop a site-specific EMP to guide during decommissioning process to reduce negative impacts, including the management of contaminated soil.
- The contractor should ensure specialized handling and disposal of hazardous and chemical waste (contaminated soil, asbestos, fuel) by licensed waste handler.
- The contractor should limit high-noise decommissioning activities to daytime hours and select quiet machinery.

13 CLIMATE CHANGE

13.1 Introduction

Climate change refers to long term shifts in temperatures and weather patterns. These shifts may be natural through variations in the solar system or through human activities such as burning fuel and coal. Meru town has a warm and wet climatic condition that is influenced by its location at the slope of Mount Kenya and proximity to the equator. Due to climate change, extreme weather events like storms and heavy rainfall will increase, and the road transport infrastructure must be adapted to them. Extreme weather is an important factor that impacts on the reliability and safety of the road network. Although there are considerable uncertainties in the projections of future climate change and related socio-economic developments, there is a constant need for decisions and development of the road transport system that is resilient to climate change.

13.2 Extension of Meru Bypass Sources of Green House Gases

Greenhouse gas (GHG) emissions in road construction come from two main sources: the production of materials like cement, steel, and aggregates, and the construction process itself, which includes fuel combustion from heavy machinery and transportation. The emissions from material production, known as "embodied carbon," are the most significant contributor, making up roughly 65% of a project's total emissions.

Raw materials production

- **Cement and concrete:** The production of cement is a major source of GHG, as it is an essential material in both cement and asphalt pavements.
- **Steel:** The manufacturing of steel used in projects releases significant emissions.
- **Aggregates:** Processing raw materials like sand and gravel to create aggregates also contributes to emissions.

Construction process

- **Fuel combustion:** The use of diesel-powered equipment, such as excavators, pavers, and rollers, for tasks like excavation, mixing, and compacting releases GHGs.
- **Transportation:** Transporting raw materials to the site and finished products from the site consumes fuel and creates emissions.
- **Electricity use:** The electricity used for site operations, including any pre-fabrication or mixing, can be a source of emissions depending on the energy source.

13.2.1 Estimating GHG emissions from the project

General estimates from research suggest a wide range of emissions per kilometre of road constructed:

- Studies have found per-kilometre emissions for highway construction can range significantly. One case study for a central China expressway reported about **10,605 tonnes of CO₂ equivalent per kilometre per lane**²¹.
- Another source noted that the per square kilometre (implying a certain width/type) GHG emissions in China ranged from 10.6 tonnes of CO₂ equivalent in some regions to over 823 tonnes in others, highlighting the vast differences based on local practices and materials.

²¹

https://www.researchgate.net/publication/382194544_Quantitative_Analysis_of_Carbon_Emissions_from_Highway_Construction_Based_on_Life_Cycle_Assessment

Based on these studies and the design of the project, we estimate that the project will generate in the lower range since of about 850 tonnes of CO₂ equivalent per Km translating to about 14,875 tonnes of CO₂ equivalent.

13.2.2 Mitigating GHG emissions in the project:

Mitigation measures will entail the types and sources of materials, tweaking construction process to reduce vehicular emissions and establishing carbon sinks. Specific measures are as follows:

Material selection:

- Use recycled aggregates, fly ash, and other industrial by-products to reduce embodied carbon.
- Favor locally sourced materials to minimize transport emissions.
- Deploy modern energy efficient construction equipment and optimize fuel use.
- Require contractors to meet sustainability benchmarks in tenders and contracts.

One of the complementary projects that the Contractor can support is a tree planting exercise within the Upper Imenti Forest. KURA together with KFS can identify a degraded portion of the forest and partner with the Contractor to plant trees. To achieve this, it is recommended that they collaborate with KFS to provide seedlings.

This initiative will require planting of about 100,000 trees to help sequester some 2,500 tonnes of CO₂ equivalent assuming one tree absorbs 0.025 tonnes of carbon in its lifetime.

13.3 Assessing Climate Change Projections and Scenarios

To understand how road infrastructure may be affected by future climatic changes, it is important to develop an understanding of the climate change projections relevant to the project area using geographical location to determine key climate change types and existing climate change scenarios and projections.

13.4 Climate Change Projections

The road traverses Meru Municipality which receives adequate rainfall throughout the year. From the environmental baseline survey and public consultations carried out within the area, the roads are in most cases impassable during the heavy rains. The roads are also prone to excessive erosion particularly along steep sections. Climate change projections were undertaken to predict future climatic conditions and help in the planning to address the impacts of climate change on the road and associated structures. Key indicators analyzed are temperature, precipitation and water runoff.

13.4.1 Methodology

The projections were derived from the Climate Information Platform developed by the Swedish Meteorological and Hydrological Institute (SMHI) on behalf of the World Meteorological Organization, to predict future climate change scenarios.

The scale of future anthropogenic emissions is heavily dependent on global political decisions as well as on population growth and technological advances. These uncertainties are depicted through various emission scenarios. For this study, two Green House Gas emission scenarios were used to project future climatic changes i.e. Representative Concentration Pathway (RCP) 8.5 scenario representing business as usual and RCP 4.5 scenario representing medium level climate change mitigation measures. The projections were for long term (year 2011-2040) and medium term (year 2041 – 2070).

Severity of climate change elements are categorized on the basis of potential magnitude of change as follows:

- **Large** when the change is more than 75% of the baseline
- **Medium** when the change is 25-75% of the baseline
- **Small** when Change is less than 25% of the baseline

13.4.1.1 RCP 8.5 Emission Scenario

The RCP 8.5 emission scenario means that the anthropogenic activities that result in GHGs emission scenario remain the same without any interventions to mitigate emissions. Table 13-1 below presents the projections of the two climatic key indicators i.e. precipitation and water runoff for the project area for both short term and medium-term scenarios.

Table 13-1: Scenario 8.5 projected climatic changes

Element	Short term (2011-2040) Annual mean	Medium term (2041-2070) Annual mean
Precipitation	+2%	+4%
Water run-off	+8%	+13%
Temperature	+1 ⁰ C	+2 ⁰ C
Aridity	+2%	+7%
Soils moisture	0%	-2%
Water discharge	+9%	+14%

From *Table 13-1* above, in business as usual scenario, precipitation is projected to increase by about 2% in the short term and 4% in the medium term and water runoff by +8% and +13% respectively. A change of less than 25 % in both precipitation and run-off is considered small. Nonetheless projected increase in runoff and water discharge over the short and medium term will still have significant impacts on the road and existing drainage structures.

13.4.1.2 RCP 4.5 Scenario (with interventions)

The RCP 4.5 is a medium emission scenario where interventions are applied to limit anthropogenic activities that result in GHGs emission hence mitigating on emissions. Table 13-2 below presents the projections for the short- and medium-term scenarios for the project area.

Table 13-2: Scenario 4.5 Projected Climatic Changes

Element	Short term (2011-2040) Annual mean	Medium term (2041-2070) Annual mean
Precipitation	+5%	+1%
Water run-off	+7%	+4%
Temperature	+1 ⁰ C	+1 ⁰ C
Aridity	0%	0%
Soil moisture	+3%	-2%
Water discharge	6%	+5%

Source: <https://ssr.climateinformation.org/>

From *Table 13-2* above, with interventions to mitigate greenhouse gases emissions, precipitation may increase by about +5% in the short term and 1% in the medium term respectively and water runoff by +7% and +4% respectively. The change in these parameters are all below 25%, hence considered small but potentially significant to road infrastructure.

A change of less than 25 % in both precipitation and run-off is considered small (Table 13-1 and Table 13-2). Nonetheless projected increase in precipitation and runoff over the two periods will still have significant impacts on the road and existing drainage structures.

13.4.2 Hazard Analysis

A model, *Think Hazard!* was used to project an array of hazards that can potentially occur in the region. *Think Hazard!* provides a general view of the hazard's risks, for a given location, that should be considered in project design and implementation to promote disaster and climate resilience. The tool highlights the likelihood of different natural hazards affecting project areas (very low, low, medium and high), provides guidance on how to reduce the impact of these hazards.

The model was run for Meru Municipality, in Meru County and the following were the outcomes.

Table 13-3: Climate Risk Screening

Environmental Factors (Hazard)	Risk To Project
Wildfire	High
Landslide	Medium
Water scarcity	Medium
Urban flood	Low
River Flooding	Low
Extreme heat	Low

Source: <https://thinkhazard.org/en/report/51354-kenya-eastern-meru-central>

Landslide: The predicted modelled climatic data shows the natural hazard to be medium in intensity. This was attributed to precipitation patterns, terrain slope, geology, soil and land cover within the area. Based on these, road construction should be planned and designed in a way that takes into account the contributing factors to landslides. It is anticipated that the changes in climate will likely alter the slope and bedrock stability through changes in precipitation and/or temperature. The predication of avalanches will be determined and dependent on local geological conditions and other non-climatic factors.

River flood: hazard is classified as low. This means that there is a chance of more than 1% that potentially damaging and life-threatening river floods occur in the coming 10 years.

Water scarcity: hazard is classified as medium. This means that there is a 20% chance that drought will occur in the project area in the coming 10 years. Based on this information, it is recommended that the impact of drought should be considered in all phases of the project, in particular its effect on project workforce and project community and during design of the project.

Urban flood: Hazard is classified as low. This means that there is a chance of less than 1% that potentially damaging and life-threatening river floods occur in the project area in the coming 10 years. Therefore, based on this information, flood hazard does not need to be explicitly considered for the project.

13.5 Proposed Climate Change Adaptation Measures for the Road

Adaptation Measures During Design and Construction Phase

1. Design drainage structures with a capacity to accommodate an increase of a minimum of 10% of the current levels of precipitation and run-off so as not to cause damage to the road during floods.
2. The alignment needs to consider likely future change to the environment considering increases in rainfall, groundwater, storm surge, and the impacts on flooding.
3. Raising pavements and reducing the gradient of slopes.
4. Re-vegetating the upper catchment of the road with drought tolerant species.

Adaptation measures is intended to ensure the road is climate-proof over its lifespan, which includes, factoring a maintenance component into the project's development and design that can withstand the projected climatic conditions, e.g., drainage structures capacity that can accommodate higher rainfall as well as high water runoff.

14 POTENTIAL CUMULATIVE IMPACTS

Assessment of cumulative impacts of the project considered its combined effects alongside other ongoing, planned, or reasonably foreseeable projects and activities within the urban and semi-urban environment of Meru town. Unlike project-specific impacts, cumulative impacts may arise from spatial and temporal interactions among multiple developments, potentially leading to significant environmental and social consequences that exceed the sum of individual impacts. During the study, it was noted that the project area had ongoing road construction activities, real estate developments and installation of utility infrastructure especially the upgrading of the 13km Meru headquarters Road, community road empowerment project in Kooje and Gikumene and the construction of the new sewer line in Meru town.

14.1 Increased Pressure on Material and Water Sources

Road construction typically requires large volumes of raw materials including aggregates (gravel, sand, ballast), hardstones, and water. Based on the preliminary design report, the project is expected to source sand from local commercial sources and Ewaso Ngiro River. Considering that these are the main sand sources in the area from which other ongoing road construction also obtain their sand, there will be cumulative impacts on these resources with significant environmental and social risks. Sand harvesting from Ewaso Ngiro riverbed will potentially destabilize its banks leading to increased risk of erosion and flash floods during rainy season. If unchecked, sand harvesting may also disturb existing breeding grounds for aquatic lifeforms and loss of habitat.

River Kathita is identified in the engineering design report as the water abstraction point for the project. Currently, the river is also the main source of water for the ongoing construction activities around Meru town. In view of the fact that the river is the main source of water supply for domestic and small-scale agricultural activities in Meru town and its environs, additional abstraction of water for road construction may therefore result in reduced flow volumes especially during dry seasons leading to water use conflicts.

Currently, ongoing road construction activities in Meru town depend on Nchoro Iboru and Rugusu borrow pits as the main source of gravel. The engineering design report has also identified the two borrow pits as the primary sources of gravel for the construction of the project roads. continuous exploitation of Nchoro Iboru and borrow pits for gravel without adequate rehabilitation may result in undesirable landscape transformation leaving behind unstable slopes that are prone to soil erosion and landslides.

Isiko Quarry is currently the main source of hardstones that are used for major ongoing construction projects in Meru town. The same quarry has been identified by the design engineer as the source of aggregates for the construction of the project roads. Sustained extraction of hardstones from the quarry without adequate restoration measures will scar the landscape and expose it to erosion and or landslides.

Mitigation measures

- Find alternative sources of water to River Kathita for construction requirement especially by drilling boreholes as recommended by WRA Meru Sub-Basin office.
- Whereas the material sources are commercial, the agreement between the supply and Contractor should satisfy sustainability compliance with EMCA Cap 387 and World Bank safeguards requirements including progressive rehabilitation and community safety.
- Ensure that all material sources are compliant with the law and that the necessary permits and licenses have been obtained from NEMA, WRA and the relevant national and county agencies

14.2 Community Health and Safety

Concurrent road construction activities within Meru town will lead to more traffic being diverted to other roads within the area. The diverted traffic may pass through residential areas, school zones, and informal settlements that were not originally designed to handle high traffic volumes. This can lead to increased road safety risks to the public including simple to life threatening pedestrian injuries and vehicle collisions. School-going children, elderly residents, and persons with disabilities are particularly vulnerable to safety risks where pedestrian infrastructure and signage are not provided.

Mitigation measures

- Establish community-sensitive traffic management plans, including signage, speed controls, and safe pedestrian crossings.
- Engage communities in diversion routes prior to traffic diversion on safety measures. Ensure that safety awareness and sensitization campaigns include new traffic diversion routes.
- Coordinate with local health centres for rapid response to construction-related injuries.

14.3 Land Use Change

Construction of the extension of Meru Bypass roads concurrently with the ongoing upgrading of feeder roads and urban link improvements will impact land use practices in the area. Improved connectivity and accessibility as a result of better road infrastructure will attract commercial developments along the new corridors. Agricultural lands along the upgraded roads may be subdivided further and be converted into residential and commercial zones due to rising land values.

Mitigation measures

- Work with the Meru County Government and the KFS to protect existing Upper Imenti Forest buffer zones.

14.4 Economic Displacement

Improved road infrastructure in Meru town after completion of the ongoing upgrading of the Meru Headquarter Road and the project roads will lead to a rise in land and property values, attracting developers and formal enterprises. While this can stimulate economic growth, it also risks speculative displacement, where low-income residents and informal businesses are priced out of newly developed areas. Rental inflation becomes a silent force of exclusion, pushing vulnerable groups to the periphery with diminished opportunities for jobs and services.

Mitigation measures

- Where feasible, KURA should enter a formal Memorandum of Understanding (MoU) with the Meru County Government to track and facilitate the socio-economic integration of affected informal traders.
- Work with the Meru County Government department of transport and trade to designate serviced zones and lay-bys for informal traders and transport operators, especially along the Hospital -Kiramburine Road, Link 2-Gakoromone Market Road and the Kambakia-Kagotone Road.
- Provide pedestrian-friendly access to markets, schools, and health centers to maintain foot traffic and economic activities in the areas.

15 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

The Consultant has prepared a provisional Environmental and Social Management and Monitoring Plan (ESMMP) which outlines anticipated environmental and social impacts during construction and presents management plans in line with World Bank Operational Policy 4.01 – Environmental Assessment. A more detailed Contractor's ESMMP (CESMMP) will be prepared prior to works commencement, once site-specific construction details, equipment, labour force and scheduling are determined.

The ESMMP should be used as a compliance tool by the Contractor, Client, NEMA, and project stakeholders. For comprehensive background and impact analysis, the ESMMP should be read alongside the Environmental and Social Impact Assessment (ESIA) Study Report prepared for the project. The ESMMP is a living document and may be revised as project conditions evolve or new information emerges.

15.1 Resources, Roles, Responsibilities and Authority

This section outlines the human resources required for road construction, along with clearly defined roles, responsibilities, and authority levels for effective project delivery.

15.1.1 Construction/Project Manager

The environmental responsibilities of the Construction Manager include:

- Plan and execute works to minimize environmental and social impacts.
- Ensure ESMMP requirements and statutory conditions are fully implemented.
- Confirm all site personnel receive ESMMP and Occupational Health and Safety (OHS) induction prior to work.
- Provide resources and oversight for environmental compliance.
- Immediately, halt works that pose imminent risk to the environment or community safety and notify the RE.
- Support audits, inspections and timely corrective actions.

15.1.2 Contractor Environmental Officer

The Contractor's Environmental Officer shall be responsible for management of environmental aspects of the project, including-

- Development, implementation, monitoring and updating of the CESMMP and related sub-plans.
- Conduct environmental risk assessments and propose mitigation measures.
- Secure and maintain environmental licenses and permits from NEMA and other relevant authorities.
- Monitor ESMMP compliance, conduct site inspections and maintain environmental records.
- Prepare monthly environmental performance reports for submission to Project Manager and the RE.
- Lead environmental inductions, toolbox talks, and training for all project staff and subcontractors.
- Enforce corrective actions and stop work where significant non-compliance or risk exists. Coordinate with regulators and manage environmental incident reporting and close-out.
- Support the grievance redress process and ensure environmental issues raised by stakeholders are resolved promptly.

15.1.3 Community Liaison Officer

Key responsibilities of the Community Liaison Officer include to:

- Coordinate and document all stakeholder consultations in line with the Stakeholder Engagement Plan (SEP).

- Maintain the grievance regress mechanism, including a 24-hour hotline and grievance register, and ensure timely resolution of complaints.
- Provide feedback to complaints and escalate unresolved cases to the Environmental Officer and Resident Engineer.
- Share project updates and information on ESMMP implementation with communities in an accessible format and language.
- Promptly flag potential risks such as unrest, resistance, or misinformation.
- Identify and report emerging social risks such as misinformation, unrest, or conflicts related to land, access, or employment.
- Ensure inclusive engagement by actively involving women, youth and vulnerable groups.

15.1.4 Site Inspectors/Engineer

The E&S responsibilities of the Inspectors/Site engineers include:

- Verify that all works comply with ESMMP, C-ESMMP and approved environmental controls.
- Provide guidance to staff on managing environmental risks and implementing mitigation measures.
- Monitor site activities to identify potential environmental risks and take immediate corrective actions.
- Respond promptly to environmental incidents by mobilizing resources and minimizing impacts.
- Report all environmental incidents and non-compliance issues to the Site Agent (Manager) and Environmental Officer without delay.
- Contribute to preparation and review of environmental plans and site documentation when required.

15.1.5 Foreman

The E&S responsibilities of the foreman include (but are not limited to) the following:

- Undertake environmental duties as defined by the superintendent or Project/Site engineers.
- Supervise site activities to ensure site activities comply with ESMMP, C-ESMMP, and the Environmental Work Method Statement (EWMS).
- Implement environmental controls such as erosion prevention, dust suppression and waste management.
- Conduct site-level environmental risk assessments prior to commencement of activities.
- Verify that all workers receive site induction and understand environmental requirements.
- Respond immediately to environmental and social incidents, including implementing spills containment measures.
- Report any environmental incidents or non-compliance to the Site Agent (Manager) and environmental officer without delay.
- Stop any work that poses actual or potential environmental harm and escalate to relevant managers for corrective action.

15.1.6 The Resident Engineer (RE) or Project Manager

The E&S responsibilities of the Project Manager include:

- Ensure all project activities comply with ESMMP, C-ESMMP, NEMA license conditions and World Bank Safeguards requirements.

- Review and approve the C-ESMMP and support environmental and social management sub-plans prior to commencement of works.
- Ensure environmental and social requirements are integrated into project planning and not compromised by construction priorities.
- Provide adequate resources (staff, finances and equipment) to ensure effective ESMMP implementation and monitoring.
- Liaise with relevant Government agencies and authorities as required for permits and compliance monitoring.
- Facilitate regular reviews of the ESMMP and C-ESMMP incorporating lessons learnt and updating controls as necessary.
- Ensure that all personnel receive environmental and social induction training, including grievance and community engagement protocols.
- Investigate and resolve complaints in accordance with the project's grievance redress mechanism (GRM).
- Exercise authority to stop work immediately where there is a significant environmental or social risk.
- Submit progress reports on ESMMP implementation to the Client and relevant Authorities.

15.1.7 Supervision Environment Health and Safety Officer

The Supervision Environment Health and Safety (EHS) Officer will be part of the RE staff. The EHS officer will be suitably qualified and experienced and independent of the Client and the Contractor.

Key responsibilities of the Supervision EHS Officer include:

- Serve as the primary advisor on environmental, health and safety performance to the RE and Client.
- Monitor implementation of ESMMP, C_ESMMP, and all environmental and social safeguards required under NEMA approval and World Bank standards.
- Review and approve the Contractor's environmental sub-plans, including minor amendments, to ensure compliance with project conditions.
- Conduct regular site inspections and audits in line with NEMA regulations and the project's environmental management system.
- Respond to and resolve community concerns relating to the environmental and safety performance of the project, in coordination with the Community Liaison Officer.
- Advise the Client on compliance with all NEMA license conditions, occupational health standards, and EHS requirements.
- Direct the contractor to take corrective measures where environmental or safety risks arise and stop works, if necessary to prevent harm.
- Evaluate environmental performance reports and recommend improvements to achieve project objectives.
- Ensure social aspects with respect to staff welfare and community safety are integrated into EHS compliance monitoring.

15.1.8 Compliance Management

The implementation team (Supervision, Contractor and Sub-Contractors staff) should ;

- Comply with the relevant requirements of the ESMMP and other environmental documentation.

- Participating in the Project/site induction program.
- Report any environmental incidents to the foreman immediately or as soon as practicable if reasonable steps can be adopted to control the incident.
- Undertake remedial action as required to ensure environmental controls are maintained in good working order, and
- Stop activities where there is an actual or potential risk of harm to the environment and advise the Project Manager, Construction Manager, or Environmental Manager.

15.1.9 Subcontractor Management

Environmental and social requirements and responsibilities shall be clearly defined in sub-contract agreements, including compliance with C-ESMMP and this ESMMP. Subcontractor selection should consider past environmental and safety performance; the Supervision EHS Officer may participate in the tender evaluation where high environmental risk is anticipated. All subcontractors must:

All subcontractors should be required to:

- Complete a prequalification questionnaire addressing environmental and safety compliance;
- Attend site induction sessions to understand ESMMP and C-ESMMP obligations; and
- Maintain compliance with all environmental controls during works.

A Project Induction and Training Register should be maintained for all subcontractors.

Regular audits of subcontractors will be conducted using a standard monitoring form to assess:

- Work practices and implementation of environmental controls.
- Effectiveness of mitigation measures.
- Compliance with ESMMP requirements and maintenance of protective measures.

15.2 Recommended Routine Construction Practices to Minimize or Avoid Impacts

In this section construction practices and methodology aimed at reducing environmental and social impacts are presented. Typically, these are Best Engineering Practices that the Contractor should routinely follow.

15.2.1 Hoarding Construction Sites

- Hoarding of the campsite and construction area (if applicable) should be suitably secured to prohibit access by livestock, local fauna and wildlife.
- No unauthorized pedestrian or vehicular access should be allowed into fenced, off-limit areas (Warning signs installed and security personnel).
- Hoarding should be kept neat. The Contractor should be responsible for the maintenance of all fences at all project sites.
- If hoarding is removed temporarily for the execution of work, the Contractor should reinstate it as soon as practicable. Until re-instatement, the Contractor should demarcate the working area by surrounding it with warning-tape marking and appropriate signage.
- Breaches in the fencing must be repaired immediately.
- The purpose of the fenced areas is to control construction and personnel activity within the designated areas, and limit unauthorized access to improve safety.

15.2.2 Clearing and Grubbing

- The Contractor should always carefully consider what machinery is appropriate to the task while minimizing the extent of environmental damage.

- Topsoil should be cleared of woody vegetation before ripping and removing.
- The topsoil is regarded as the top 13-25cm of the soil profile.
- Topsoil should be handled twice (once during clearing and stockpiling & once during rehabilitation). This will reduce soil erosion.
- The topsoil, including the existing grass cover, is to be shallowly ripped (only the depth of the topsoil) before removal. This is to ensure that organic plant material, and the natural seed base is included in the stripping process.
- The Contractor should apply soil conservation measures to the stockpiles to prevent erosion. This can include the use of erosion control fabric or grass seeding.
- If at any stage of the clearing operations archaeological artefacts are unearthed or identified, the National Museums of Kenya (NMK) must be contacted immediately to conduct a thorough scientific investigation of the finds.
- All invasive species identified along the route alignments will be cleared by the Contractor. An effort must be made to remove the entire root system, and the plant left to dry out on a hard surface to prevent germination of seed.

15.2.3 Site Buildings/ Coordination Campsite

- The Contractor should carry out ESIA for all the ancillary facilities and acquire-NEMA license prior to construction
- The planning and design for the Construction Camp must ensure that there is minimal impact on the environment.
- No construction camps will be allowed in sensitive areas such as wetlands, sensitive vegetation types or sensitive landscape units. The Construction Camp will be situated within an already disturbed area as far as possible.
- The Construction Camp site will be identified by the Contractor in consultation with the RE and the EHS officer to determine suitability of the site, and negotiations done by the Site Manager with the relevant landowners.
- All buildings will be soundly built and will not pose a danger to the project personnel.
- No fires will not be allowed outside the Construction Camp. Adequate and well-maintained firefighting equipment - according to the fire hazard strategies - will be maintained on site during the construction period.
- Welding, gas cutting or cutting of metal will only be permitted in a protected area inside the Construction Camp.
- The Contractor should be liable for any costs related to extinguishing fires started by the Contractor's representatives / employees.

15.2.4 Initial Earthworks and Platforms

- The construction platform for the Contractor's camp, as well as the platform for the materials storage area must be appropriately planned.
- The Contractor should take appropriate and active measures to prevent erosion resulting from his own works, operations and activities as well as storm water control measures to the satisfaction of the RE and the Supervision Environment Representative. Restoration costs will be for the Contractor's account, should these measures not be reasonably implemented. Aspects normally covered in construction

contracts in terms of protection of works are standard and are not to be billed or confused with any details covered under environmental requirements.

- During construction the Contractor should protect areas susceptible to erosion by installing all the necessary temporary and permanent drainage works as soon as possible. All such measures must be included within the design and layout phase, and any additional measures which may be required on site will require approval from the RE.

15.2.5 Vehicle Parking Area

- All vehicles and plants should be allocated a designated parking area within the camp site.
- Parking outside of the allocated area is strictly prohibited to ensure order, safety, and site efficiency. Service Area / Wash Bay.
- All vehicles and construction plants should be regularly serviced to ensure that there are no oil or fuel leakages.
- The Contractor should install concrete floor slab in maintenance areas to prevent infiltration of hydrocarbon products in case of spill.
- Drip trays should be employed during servicing of vehicles to contain any leaks or drips.
- Drainage from the service area will be channelled into a sump or oil-skimming tank, where it should be treated to remove old hydrocarbons.
- Soil contaminated by oil, fuel or chemicals should be removed and disposed of at a registered Hazardous Waste Disposal Site if any will be available in the project area at the time of construction or rehabilitated in-situ which will be the most likely scenario.
- The Contractor should educate workers on the appropriate methods for workshop maintenance and fuel points to prevent fuel and oil being washed out of containment areas.
- Toxins and oil must be recovered from the system at least once a week, and if necessitated more regularly should the Environment Representative require it.
- Toxins and oil recovered must be stored in sealed drums on a covered, bunded area and removed from site either for recycling or disposal at a registered waste Disposal Site.
- The servicing of plant and vehicles will only be allowed in the Construction Camp within the demarcated areas.

15.2.6 Separation Tanks

- The Contractor should provide grease and oil separation tanks (if required) at all areas where oil spillage or collection will occur, i.e. workshops, oil storage, vehicle wash areas and fuel points.
- The Contractor should provide a method for oil recovery. Recovered oil should be collected in weather-proof drums for recycling or disposed of at a registered Waste Disposal site. These drums will be stored on site only in a covered, bunded area.
- The Contractor should test effluent discharged from the oil skimming tanks for conformance with relevant effluent standards if requested to do so by the Environment Representative when pollution is suspected.

15.2.7 Aggregate Storage

- Materials should be securely stored at the campsite, covered and adequately safeguarded from erosion.
- Fine aggregate should be stored on a compacted sub-base platform and covering provided.
- The Contractor should ensure (and implement steps if required, e.g. bund walls) that no fine aggregate is washed from the storage area onto the rest of the site during high rainfall periods.

- Coarse aggregate should be stored, at minimum, on a surface composed of compacted inert sub-base material to ensure stability and containment.
- All borrow pits used as a source of construction materials must be approved by the EHS and RE and the Contractor must provide acceptable borrow pit rehabilitation plans which must be approved by NEMA.
- Aggregate used should be stored as compactly as possible to minimize the possibility of it spreading across a greater area than necessary and to prevent it from being washed away by storm water.

15.2.8 Fuel Storage Areas

- The Contractor should construct and maintain bund walls around his fuel storage areas within the site with a sump. Each bund wall must be equipped with a sump and be of sufficient height to accommodate at least 110% of the total volume of the stored fuel, ensuring containment in the event of spillage.
- These provisions apply exclusively to above-ground storage. Underground fuel storage will require approval of the Energy and Petroleum Regulatory Authority (EPRA) and must be licensed by NEMA.
- All runoff from fuel storage areas should be treated to effectively eliminate oil and fuel residues, in order to mitigate environmental contamination.
- The Contractor should ensure that adequate shading is provided over the fuel pumping station to protect equipment and reduce the risk of heat-related hazards.

15.2.9 Dust Control

- The Contractor should implement effective measures to minimize the generation of dust as a result of construction works. Such measures include frequent sprinkling of water during low rainfall / dry periods or by other means approved by the RE. Dust control by means of water-spraying would be sufficient on these sites, but water used for this purpose must be used in quantities that will not result in the generation of run-off.
- Speed limits should strictly be enforced in all areas, including public roads and private property to limit the levels of dust pollution.
- Spoil dumps should strategically be positioned such that they are not vulnerable to erosion.
- Spoil and other dust-generating dumps which are left unused for long should be sprayed with water to control dust and treated with mulch and seeded.
- Newly opened roads where no roads currently exist and that are not trafficked should be sprayed with water to limit dust generation by construction vehicles.
- Trucks hauling spoil, sand, murram and other loose material should be covered when loaded.

15.2.10 Access Roads and Accommodation of Traffic

- Wherever feasible, existing roads should be utilized to minimize disruption and land degradation. Temporary access roads should not be constructed unless explicitly approved by the Resident Engineer (RE) and following negotiation with affected landowners. Any related expenses should be the responsibility of the Contractor.
- Any temporary roads required should be decommissioned by the Contractor and rehabilitated using stockpiled topsoil.
- Topsoil should be removed as described under 'Clearing and Grubbing' prior to the construction of the road.
- During construction the Contractor should protect all areas susceptible to erosion by installing all necessary temporary and permanent drainage works as soon as possible.

- The accommodation of traffic is an important aspect on the existing roads that have been identified for upgrade as part of the project. Where required, temporary works to facilitate the accommodation of traffic during bridge construction, should be completed first as road closures will be avoided as far as possible.

15.2.11 Sanitation

- The Contractor should ensure the provision of adequate chemical latrines or on-site toilet facilities at all operational locations. These units must be supported by an appropriate waste management system and serviced regularly to prevent overflow or unsanitary conditions.
- All provided latrines must meet efficiency standards, be hygienic, and not cause offense through odors or visual impact.
- Mobile toilets should be provided to crews working away from camps.
- A minimum of one toilet should be provided per 20 persons, with proper handwashing facilities, at each working area such as the construction camp.

15.2.12 Construction Waste Storage Area

- Temporary storage of construction waste will be limited to within the site, and within areas designated by the RE.
- The Contractor will be responsible to remove and transport all waste material off site to a registered Waste Disposal Site.

15.2.13 Domestic Waste Storage Area

- The Contractor should dispose of all refuse generated by his staff and Subcontractors on a weekly basis at a registered Domestic Waste Disposal Site or in situ.
- The Contractor should on a daily basis do site clean-ups of litter other than construction spoil and dispose of it in designated refuse bins provided on site.

15.2.14 Spoil Material

- All suitable materials excavated should be used in the construction of the works.
- All unsuitable and surplus spoil rock should be removed from the site to a dumping site or sites, to be negotiated by the Contractor and accepted by the RE where it should be dumped, spread and levelled, all to the satisfaction of the RE and NEMA standards.
- No dumpsite should be used without the prior written approval of the Project/Site Manager and the owner of the property.
- No spoil material should be stockpiled in violation of any legal requirement or to obstruct any watercourse or drainage channel.

Shaping

- The soil surface should be contoured, and the edges of all cut and fill areas rounded to fit into the natural landscape.
- Topsoil should be spread in keeping with the natural topographical form of the site and immediate surroundings.

Topsoil Placement

- Topsoil should be placed to a minimum depth of 150 mm over all areas that have been disturbed by the construction activity.
- Topsoil placement should follow as soon as construction in an area has closed.

- All compacted areas should be ripped parallel to the contours to a minimum depth of 300 mm.
- All areas onto which topsoil is to be spread should be graded to the approximate original landform and should be ripped prior to placement.
- Topsoil should be placed in the same area from which it had been stripped. If there is insufficient topsoil available for a particular soil zone, additional topsoil may be brought from other soil zones at the approval of the RE or the EHS officer.
- Where topsoil that has been stripped by the Contractor is insufficient to provide the minimum depth, the Contractor should obtain suitable substitute material from other accepted sources.
- No vehicles should be permitted access onto the topsoil after it has been placed.

15.2.15 Revegetation

- Revegetation of disturbed and work areas should be done with an indigenous grass mix; similar to what is found in the vicinity of the site and approved by the EHS officer.

15.2.16 Storm Water Management

- Prior to the start of construction activities, the Contractor should install appropriate erosion control structures—whether temporary or permanent—to safeguard vulnerable areas from degradation
- Any erosion channels developing during the construction period or during the operational and maintenance period should be backfilled and consolidated immediately and the area restored to the proper condition.
- Restoration efforts should include the replacement of displaced topsoil using suitable material sourced from approved borrow pits to ensure stability and compatibility with the surrounding environment.

15.2.17 Traffic Management

- The Contractor should ensure the placement of clear and appropriate traffic warning signage along all routes used by construction vehicles, including those connecting the camp, borrow pits, or quarry to the main site.
- Transport operators handling fine materials must take all necessary precautions to prevent nuisances caused by material spillage or airborne.
- The Contractor should remedy, at his own expense, dust generation and spillage where it occurs to an acceptable level along the transport routes. It is recommended that the load haul of all transport vehicles be covered with tarpaulins.
- Deliveries should be scheduled for off-peak hour traffic time schedules near major towns
- All trucks and vehicles removing spoil from the site should have the load areas covered by a tarpaulin to prevent rocks and spoil from falling onto the road surfaces or causing a nuisance to persons in the vicinity.

15.2.18 Personnel/Workers

- Working hours should ideally occur only between 07:00 and 18:00 during weekdays. Should the Contractor wish to work outside of these timeframes, negotiations must be conducted with the RE, the client and Site Manager in consultation with the local community.
- Warning signs must be placed on and around the site as per the occupational health and safety requirements.
- Where necessary cooking facilities should be provided for the construction staff within the confines of the construction camp. No trees may be removed for the making of fires but collection of dead wood is allowed.

- All fires are to be confined strictly within designated zones inside the construction camp. No open flames are permitted outside these boundaries to reduce the risk of wildfires..
- Where there exists a potential for a particular fire hazard at any point in the construction works, the Contractor should ensure that his employees are properly trained in the use of the appropriate firefighting equipment and that such equipment is on hand at all times.
- The Contractor should take all measures necessary to prevent his staff from hunting, capturing or killing animals and birds during the construction phase.
- The Contractor should take all necessary precautions against trespassing on adjoining properties and will ensure that all livestock, game or crops are not interfered with.
- The Contractor should comply with all safety regulations regarding electricity supply and should take every precaution to ensure the safety of all the people on site.
- The Contractor should ensure that as far as practical, suitable arrangements are made on the site for the maintenance of health, the prevention and overcoming of outbreaks of disease. Adequate first aid services will be provided by the Contractor at the Construction Camp.
- The Contractor should be responsible for his own security arrangements and should comply with any security instructions, which the RE or the client may issue from time to time.
- The Contractor should ensure that suitable safety regulations and precautions are established and brought to the attention of the personnel. Approved safety helmets and other protective clothing should be worn where deemed necessary by the Supervisor. Such protective equipment should be provided by the Contractor to the employees.
- The Contractor should, at his own cost provide for a constant supply of potable water for human consumption to the Construction Camp and other domestic use on site. The Contractor should allow for chemical testing of water samples monthly, or more frequently if pollution is suspected by the RE.
- The Contractor is responsible for the behavior and discipline of all personnel while they are present on the site and should always exercise strict supervision over them.
- All the project staff should sign workers' code of conduct, then trained in its use and its implementation monitored in accordance with the contract provisions.
- All the project managers should sign code of conduct, then trained in its use and its implementation monitored in accordance with the contract provisions.
- The Contractor should put in place an ethical and safe process for receiving, investigating and addressing allegations of SEA and/or SH from the Contractor's or any other person including third parties
- Make it a contractual requirement that all subcontractors comply with the SEA/SH prevention and response obligations that are pertinent to the Subcontractor's work.

15.2.19 Personnel ESHS Induction

- The Contractor should ensure that his personnel are inducted on the requirements of the ESMMP. This will be in the form of presentations and demonstrations to be conducted by the Contractor's representative on EHS issues.
- The Contractor should ensure that his personnel have a clear understanding of the Health and Occupational Safety aspects of the contract works.
- The Contractor should ensure that his staff complies with the ESMMP requirements for best practice as described by this document.

- Training should cover hazard identification, use of Personal Protective Equipment (PPE), emergency procedures, safe work practices and Issues around GBV, SEA and SH.
- Regular refresher sessions should be conducted to reinforce compliance and address emerging risks or changes in site conditions.
- Conduct mandatory training for all workers on GBV/SEA and SH prevention, reporting, and respectful conduct.
- Display awareness materials in English, Swahili and local languages, if possible, at camps and work sites.

15.2.20 Fauna and Flora

- Natural vegetation should be kept in an undisturbed state as much as possible. Special attention should be paid to preserve trees and plant communities along the road corridor.
- Vegetation removals as part of the development requirements – such as along new alignments or along non-existing roads are excluded.
- Indigenous plants or wild animals (including reptiles, amphibians or birds etc.) may not be damaged or harmed
- All incidents of harm to any animal or natural vegetation (apart from the agreed vegetation areas) must be reported to the EHS.

15.2.21 River/Stream Embankments

- No activity should be allowed which should, in any way, create unnecessary disturbance of any river embankment due to the extreme sensitivity of these zones.
- Care must be taken to ensure that machinery used does not erode the stream embankments further. Where embankments along the alignment are severely eroded, the RE may request the Contractor to install erosion control measures at the Contractor's expense.

15.2.22 Site Clean Up and Rehabilitation

- The Contractor must ensure that all structures, equipment, materials and facilities used or created on site for or during construction activities are removed once the project has been completed.
- The construction site should be cleared, cleaned and rehabilitated to the satisfaction of the ER, prior to revegetation.

15.2.23 Quality of Discharged Water

- The Contractor is to ensure that the quality of the water discharged is compliant with the NEMA water quality standards, with respect to the receiving environment.

15.2.24 Fuels, Oils, Hazardous Substances and Other Liquid Pollutants

- The Contractor should construct machinery and vehicle maintenance areas as well as sealed areas for the storage of pollutants so as to avoid any accidental discharge that would pollute water resources.
- Hazardous materials should be stored above flood level and at least 20 metres from any watercourse.
- Chemicals and fuel should be stored in storage tanks within a secure compound. All chemicals and fuels should be stored in accordance with the manufacturer's instructions.
- Storage areas or secondary containment should be constructed of waterproof reinforced concrete or approved equivalent, which is not adversely affected by contact with chemicals captured within them.
- Pipe-work carrying product from the tank to facilities outside the containment should be provided with secondary containment.

- Tank equipment such as dispensing hoses, valves, meters, pumps, and gauges should be located within the containment or provided with own containment.
- Fence of the tank compound with locks or other adequate security controls at the site.
- Locks on unattended dispensing hoses.
- Appropriate training for the handling and use of fuels and hazardous material is to be provided by the Contractor as necessary. This includes providing spill response and contingency plans.
- Extreme care will be taken when transferring chemicals and fuels from storage vessels to equipment and machinery on an impervious sealed area which is kerbed and graded to prevent run-off. Chemical and fuel transfer areas should drain away from the perimeter bund to a containment pit. The design should provide for the safe and efficient movement of vehicles.
- All chemicals stored within the banded areas should be clearly labelled detailing the nature and quantity of chemicals within individual containers.
- Any chemical or fuel spills should be cleaned up immediately. The spilt liquid and clean-up material should be removed, treated and transported to an appropriate site licensed for its disposal.
- Stormwater must be redirected away from fuel handling zones, and an oil-water interceptor must be installed to treat any runoff from storage and refuelling areas.
- Measures should be taken to ensure proper storage of fuel, oil and bitumen. Oil-water interceptors or sumps should be constructed to capture discharge of oils, fats and other polluting liquids from maintenance workshops, vehicle and equipment washing bays and kitchen drains.
- At the work sites the Contractor will be expected to maintain strict surveillance particularly when working within the vicinity of water supply points and the rivers within the project area.
- A safety and emergency response plan will need to be developed for all operations with emphasis on the protection of the environment prior to start up.

15.2.25 Community Health and Safety

- The Contractor should install warning signs along transport routes and near work zones to alert the public on road safety.
- Schedule deliveries during off-peak hours to minimize disruption near populated areas.
- Cover trucks transporting spoil to prevent falling debris and reduce nuisance.
- Conduct regular awareness/outreach activities to inform nearby residents of potential risks (e.g. noise, dust, vibration, and restricted access).
- Provide contact details for complaints or emergencies related to construction activities.

15.2.26 Security

- The Contractor should establish a secure perimeter/hoarding around the construction site using fencing, barriers, or controlled access points to prevent unauthorized entry.
- Security personnel should be deployed at key access locations and work zones, especially during non-operational hours, to safeguard workers, materials, and equipment.
- All site accesses should be clearly marked and monitored to maintain a safe working environment and protect sensitive installations.
- Identification badges or site passes should be issued to all authorized personnel and visitors to enhance accountability and reduce the risk of trespassing.

- Security lights should be installed to illuminate access points and storage areas during evening hours, enhancing visibility and deterring intrusion.
- Emergency response protocols, including fire safety and medical aid plans, should be clearly displayed on-site and communicated to all staff.
- The Contractor should coordinate with local law enforcement or community representatives when operating near residential zones to promote transparency and minimize disruption.
- Secure storage areas should be designated for high-value materials and hazardous substances, with access restricted to trained personnel only.

15.2.27 Occupational Health and Safety

- Appoint a qualified Health and Safety Officer responsible for monitoring compliance and conducting regular inspections.
- The Contractor should provide appropriate PPE (e.g. helmets, gloves, safety boots, high-visibility vests, ear protection) to all workers based on task-specific risks.
- Always enforce mandatory use of PPE within designated work zones.
- Conduct regular safety induction sessions for all workers and subcontractors.
- Provide task-specific safety training, including handling of hazardous materials, working at heights, and operating machinery.
- Establish a clear protocol for reporting accidents, near misses, and unsafe conditions.
- Equip the site with first aid kits, fire extinguishers, and emergency contact information.
- Conduct periodic emergency drills, including fire and evacuation procedures.
- Regulate working hours to prevent fatigue-related incidents and ensure adequate rest periods.
- Avoid excessive overtime and ensure compliance with labor standards.
- Subcontractors must adhere to the same OHS standards and be monitored for compliance.
- Display OSHA abstract, EHS statement and GBV/SEA statement on notice boards in all the campsites.
- The Contractor should have a whistle blower policy in place which should provide a formal mechanism for employees, contractors, and stakeholders to report unethical, illegal, or unsafe conduct within the site—without fear of retaliation.

15.2.28 Existing infrastructure

- The Contractor should conduct a thorough site survey to identify and have an inventory of all existing infrastructure (Electric cables, communication cables water pipes and any other utilities).
- The contractor should liaise with the local authorities and service providers before relocation works commence.
- The Contractor should install physical barriers, signage, and protective coverings to safeguard infrastructure from accidental damage.
- Restrict heavy machinery movement near sensitive installations unless approved mitigation measures are in place.
- The Contractor should promptly repair or restore any damaged infrastructure to its original or improved condition.
- The Contractor should bear all costs associated with damage caused by construction activities, including compensation where applicable.

15.2.29 Sexually Transmitted Infections

- The Contactor should appoint qualified personnel to conduct regular sensitization sessions for workers and nearby communities on the risks, prevention, and treatment of STIs.
- Disseminate educational materials in appropriate languages and formats, including posters, brochures, and verbal briefings.
- Facilitate access to voluntary counseling and testing (VCT) services for workers, either on-site or through referral to local health facilities.
- Ensure confidentiality and non-discrimination in the provision of STI-related health services.
- Provide free and accessible condoms at the construction camp and other work areas.
- Encourage safe sexual practices through peer education and health promotion campaigns.

15.2.30 Wildlife

- Avoid unnecessary clearing of vegetation, especially in areas known to support wildlife populations.
- Schedule noisy or high-impact activities during periods least likely to affect wildlife movement or breeding cycles.
- Conduct awareness sessions for workers on the importance of wildlife conservation and appropriate behaviour when operating in or near natural habitats.
- Collaborate with local wildlife and conservation agencies to monitor impacts and implement mitigation measures where necessary.
- The Contractor should acquire necessary permits if construction activities are expected to affect protected species or habitats.

15.3 Environmental and Social Management and Monitoring Plan Matrix

This ESMMP matrix summarizes the key impact elements identified in the ESIA study report and the remedial measures.

15.3.1 Construction Phase (Contractor)

Table 15-1: ESMMP Matrix for Construction Phase

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
Noise and Excessive Vibrations	Increased noise and vibration levels affecting sensitive receptors (schools, hospitals, residences, places of worship).	- Obtain a Noise Permit and ensure full compliance with the conditions outlined in the Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009. - The Contractor will be expected to take appropriate steps to minimize the impact of noise on the workers by providing appropriate PPE to construction workers (use of earmuffs). - The Contractor should minimize the frequency of transport of construction materials and ensure that all construction machinery is well maintained and switched off when not in use especially the dumper trucks. - Limit construction activities to daytime hours (6:00 a.m. to 6:00 p.m.) to minimize noise and vibration impacts on residents along the project corridor. This measure is particularly critical in densely settled sections such as: Kambakia - Kagotone Road (Km 2+200 to Km 2+400), Western Bypass - Mate Road (Km 0+000 to Km 0+500), the entire stretch of Three Steers - Kambakia Road, and Hospital Road - Kiramburine Junction. - Develop a comprehensive community sensitization plan to inform local residents and stakeholders about	Contractor	- Continuous / Noise and vibration monitoring every 3 months or as directed by NEMA. - Annually (Noise and excessive vibrations monitoring).	Noise levels above 75dBA at site boundary Number of complaints logged and resolved.	390,000.00

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
		upcoming project activities. This will enable the community to prepare adequately and minimize potential conflicts or disruptions related to the project's implementation. • Provide advance notifications to PAPs and nearby establishments regarding major construction activities that may generate significant noise or vibrations, such as the operation of breakers, drilling equipment, or compressors. Timely communication will help mitigate disturbances and foster cooperation.				
Air Quality Dust from site clearance and construction works	Increased dust emissions and exhaust fumes during construction, causing health risks and nuisance to nearby communities.	Dust control: • Sprinkle water on exposed surfaces daily as will be needed on roads frequented by haulage trucks, unpaved diversions, material access roads and unpaved road sections. • Cover stockpiles and haulage trucks. • Enforce onsite speed limit of 30 Km/h in all the Construction zones. • Hoard areas around the concrete batching plant and stone crusher with appropriate dust trapping nets and iron sheets to reduce construction dust being blown into nearby homes and properties. • Enforce wet crushing of hardstones at the crusher to minimize dust generated. • Issue workers with the appropriate dust protecting PPE such as dust coats, coveralls, face masks and respirators. Emission control: • Procure modern fuel-efficient machines and equipment fitted with emission controls.	Contractor	Continuous; Dust suppression daily. Air Quality monitoring quarterly or as directed by NEMA.	• PM 10 and PM2.5 levels within EMCA standards. • Number of public complaints resolved. • Dust suppression records.	1,440,000.00

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
		• Ensure all machines, equipment and vehicles are properly and regularly maintained/serviced to promote proper combustion. • Sensitize construction truck drivers and machine operators to switch off engines when not in use. • All mobile and immobile plants should be inspected at least twice a year and obtained the necessary certificate. PPE & Monitoring: • Provide masks and other PPE to workers • Monitor PM10 and PM2.5 levels against EMCA standards. • Keep records of water sprinkling and inspection logs..				
Solid and liquid Waste management.	Environmental pollution from poor handling and disposal of solid, liquid and hazardous waste from the construction sites and the campsites.	General Waste • Routinely collect road litter or illegally dumped waste and manage it according to the recommendations in the General EHS Guidelines and Waste Management Regulations, 2006. • Adopt the three-bin system for waste segregation in all the facilities associated with the project. • Provision of bottle and can trash disposal receptacles at parking lots to avoid littering along the road. • Obsolete products should be managed as hazardous waste as described in the General EHS Guidelines. • Composting of vegetation waste for reuse as a landscaping fertilizer. • Managing sediment and sludge removed from storm drainage systems maintenance activities as a	Contractor.	Continuous; Monthly waste audits.	• Approved WMP in place. • Waste disposal records. • Inspection logs for oil interceptors. • Availability of contracts with NEMA-approved waste handlers.	As per contract

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
		hazardous or non-hazardous waste based on an assessment of its characteristics. • Develop and implement a Construction Waste Management Plan before project commencement. • Sub-contract a licensed waste handling firm to collect solid waste regularly and dispose of in approved dumping sites. • Drainage outfalls should be engineered appropriately to minimize erosion and sediment transport resulting from surface runoff and stormwater discharges. • Comply with provisions of the Environmental Management and Co-ordination Waste Management Regulations 2006. • Provide sanitary bins in all the female toilets in the project. • Treated wastewater and stormwater should be reused in dust suppression, landscaping, and equipment cleaning. • Biodigester and oil-water separators should be installed at Contractor's camp, service bays, and fueling areas. • Calibrated water meters should be installed in all the camps and construction facilities to monitor consumption. • Routine maintenance of the biodigester, grease traps, and plumbing systems should be conducted to prevent leaks and overflows • All wastewater handling should comply with EMCA (Water Quality) Regulations 2024 and the Water (Resources) Regulations 2025.				

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
		- Licensed waste handlers should be engaged, and effluents disposed of at NEMA-approved facilities. Hazardous Waste - Seek the services of a NEMA approved hazardous waste handler to collect and dispose of all the hazardous waste generated in the project. - Used oil should be collected in labelled tanks and stored in bunded areas. - Bund and ensure that all the car washing areas are paved to reduce seepage of oil containing water into the ground. - Install oil traps at the fuelling, garage and generator sections to prevent infiltration of hydrocarbon fluids into the soil in case of accidental spillage.				
Water Resources	Bush clearing and earthworks may result in siltation and contamination of nearby water resources. Additional construction Water demand will Increase pressure on the existing water resources.	- Obtain all necessary permits from WRA for abstraction or diversion, before commencing instream works. - Site all the material stockpiles at a distance not less than 50m away from the natural water courses. - Locate the Contractor's camp, asphalt and concrete mixing facilities at least 100m away from the natural surface water courses. - Install silt traps around all material stockpiles that are next to natural water bodies or on steep sloping areas. - Clear debris and restore water channels post-construction. - In the event that the Contractor intends to sink a borehole, due diligence should be done to ensure that	Contractor.	Continuous during works near water bodies. Water quality monitoring quarterly.	- Water Quality downstream of culvert works. - WRA permit in place. - Water quality monitoring records for downstream water sources. - Records of water use and disposal.	1,450,000.00

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
		the boreholes are at least 800m away from the existing boreholes and natural springs. - Prohibit direct discharge of wastewater into rivers/streams. - Install oil interceptors at workshops and fueling points to prevent hydrocarbon pollution. - Implement water-saving practices by reusing non-contaminated site water (e.g., settled wash-down water or harvested rainwater) for dust suppression, where feasible, to reduce demand on freshwater sources. - Monitor water quality (turbidity, pH, oil/grease) as per EMCA Water Quality Regulations, 2006.				
Soil Erosion	Soil erosion, siltation of water bodies, land degradation.	- Develop a Soil Erosion Sediment Control Plan that will focus on seeding, mulching or mating of disturbed areas. - Practice sound road engineering by maintaining good drainage and natural water flows. However, the drainage ditches should only be constructed where necessary - To minimize potential soil erosion along embankments, back slope, other cleared areas, road verges, etc., immediate landscaping will be required. - Develop an erosion control and revegetation plan to delineate measures to minimize soil loss and reduce sedimentation to protect water quality, especially for sections that will interact with water resources. - Design runoff control features, especially on the roadside drainage channels to minimize soil erosion.	Contractor	Continuous; Monthly inspections during rainy seasons	- Erosion control measures in place - Evidence of stabilized slopes - No hydrocarbon-contaminated soil reported	0.00

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
		- Limit cleared areas to project footprint to avoid unnecessary exposure of soil to agents of erosion. - Line side-drains with concrete or by stone pitching in erosion prone soils to avoid gully formation. - In sloped areas (e.g., along Kambakia–Kagotone C91 road), earthworks should be designed with gentler gradients where feasible to reduce erosion risk. On sections such as Three Steers -Kambakia Road (Km 1+600 - 1+700), runoff control features, such as well-graded side drains and energy dissipators, to manage stormwater and prevent channel erosion. - In erosion-prone areas (e.g., Km 3+100 - 3+250 along Kambakia - Kagotone), roadside drains should be lined with concrete or stone pitching to prevent gully formation. - Upon completion of works contractor campsites should be fully restored to pre-construction conditions, as agreed with landowner. - Material stockpile locations should be screened and approved prior to use to avoid sitting on vegetated or erosion-sensitive areas.				
Soil Pollution	Potential contamination of soil from hydrocarbons	- Proper maintenance of machinery and equipment to avoid or minimize leakages from such machines. - Spill prevention practices and response actions should be applied in refueling and vehicle-use areas to minimize accidental contamination of soil. - Spills should be immediately addressed per the appropriate spill management plan, and initiate soil cleanup and soil removal if needed.	Contractor	Continuous; Monthly inspections during rainy seasons	No hydrocarbon-contaminated soil reported	-

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
		- Construction of a retaining wall around the garage, fuel storage and stations so that these potentially polluting substances can be properly handled so that any unintended escape of material from that area can be contained until such time as remedial action can be taken. - Proper handling of the materials through use of drip trays, directing spills to an oil sump which should be emptied into a designated disposal site. - Refuel in a designated fueling area that includes a temporary berm to limit the spread of any spill. - Material stockpile locations should be screened and approved prior to use to avoid sitting on vegetated or erosion-sensitive areas. - In the event of accidental oil or fuel spillage, immediate containment and cleanup should be conducted to prevent soil contamination and further degradation.				
Flora	- Loss of 1.2Ha of Upper Imenti Forest Land - Loss of other Vegetation resources - Reduction of ecosystem services	- Limit vegetation clearance to the project footprint - Obtain approvals from KFS and comply with the Forest management and Conservation Act, 2016. - Plant indigenous trees along the edge of the road reserve after completion of the road works in consultation with KFS and the Client. - In consultation with KFS, identify at least 3.6Ha in a degraded area within Upper Imenti Forest for compensatory tree planting using indigenous trees. - Monitor survival rate of planted trees for at least 12 months post-construction.	Contractor.	Continuous during vegetation clearance. Tree survival audits every 6 months.	- Extent of ground cover and presence of woody plants within the road corridor. - Number of trees planted vs cut trees. - Percentage survival rate of planted trees. - Approved rehabilitation reports from KFS	1,200,000.00

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
		- Rehabilitate borrow pits and temporary access routes with native vegetation upon completion of material sourcing. - Use existing access routes during material supply to minimize disturbance to vegetation. - Designate material dumping sites and obtain necessary approvals from both the RE and NEMA. - In areas where soils are compacted during road construction (such as along diversion and temporary access roads) the soil should be ripped after completion of the works, to enable infiltration of water and natural establishment of vegetation. - Remove invasive species in compliance with NEMA guidelines.				
Socio Economic Impacts	Land acquisition and Displacement.	- Prepare a comprehensive RAP in line with Land Act of 2012 and World Bank OP 4.12. - Ensure prompt, fair and documented compensation of PAPs before displacement. - Operationalize the GRM and maintain a grievance register. - Ensure timely resolution of complaints.	Contractor with Supervision Team.	RAP before construction; GRM active.	- Percentage of PAPs compensated before displacement (target: 100%). - Number of grievances resolved within 30 days.	2,500,000.00
	Loss of livelihoods for PAPs;	- Develop a Livelihood Restoration Plan for PAPs who may be affected by the project. - Conduct regular stakeholder consultations in line with SEP, ensuring inclusion of vulnerable groups. - Monitor PAP's livelihood recovery post-compensation.	Contractor with Supervision Team.	throughout project cycle; Livelihood.	Percentage of households reporting restored/improved livelihoods.	

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
	- Potential vulnerability of women, youth, and marginalized groups. - Increased risk of exclusion or exploitation.	- Implement GBV/SEA/SH prevention measures including signed Codes of Conduct, awareness sessions, and confidential reporting channels. - Ensure inclusive participation in consultations and decision-making.	Contractor with Supervision Team.	Monitoring every 6 months.	- Percentage of GBV/SEA/SH awareness sessions conducted. - Percentage of workers signing Code of Conduct. - Number of reported cases addressed through GRM.	
Existing Utilities	Damage to utilities during relocation.	- Develop and implement a Utilities Relocation Plan for the project. - Provide temporary drainage solutions where existing systems are rerouted or disconnected - Develop detailed utility maps and refer to utility company records. - Mark all underground and overhead utilities on-site to avoid accidental damage. - Notify all relevant utility agencies prior to construction commencement. - Conduct continuous stakeholder consultations.	Contractor.	Continuous/ Throughout the project Cycle.	- Relocation of existing utilities records. - Minutes or documentation of stakeholder consultations.	
Existing Structures	Damage to structures and properties along the project roads	- Carry out a pre-construction structural integrity assessment of structures. - Continuous structural monitoring of nearby buildings and infrastructure should be conducted during construction to detect and address potential damage early.	Contractor.	One-off.	Baseline survey for structures bordering the roads.	600,000.00

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
Occupational Safety and Health	Occupational Accidents, Fatalities and incidents at the construction site.	• Develop and implement site - specific Occupational Health and Safety Management Plan. • Develop and post strategically a Health and Safety Policy Statement duly approved by the RE. • Develop and enforce a health and safety managers' and workers' Code of Conduct in all the project sites. • Institute and train a Health and Safety Committee and provide the necessary resources for its functions. • Ensure that all workers are trained and sensitized routinely on Health and Safety by a DOSHS certified trainer. • Ensure that the project has adequate number of trained first aiders who have been vaccinated against Hepatitis B. • In event of work at night, use high-visibility safety apparel and proper illumination for the workspace (while controlling glare so as not to blind workers and passing motorists). • Develop and enforce a fleet management plan for road construction that includes measures to ensure work zone safety for construction workers and the travelling public. • Develop and train construction workers on Standard Operation Procedures for work at height. • Ensure that the workers are provided with adequate safe drinking water at their work stations. • Ensure all sections and sites are equipped with stocked first aid kits.	Contractor.	Continuous/ Throughout the project. cycle	• Installation of site safety signage. • Provision of PPEs and regular replacement • Existence of worker's code of conduct. • Health and safety committee established. • No. of health and safety trainings conducted. • Accident and incident register. • Standard operating procedures (SOPs). • Health and safety training reports. • Fleet management Plan. • Well-equipped first aid kits provided.	5,150,000.00

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
		Ensure that all workers are issued with appropriate and adequate PPEs; worn-out PPE to be replaced promptly.				
Community Health and Safety	Injuries and Illnesses resulting from construction activities to the community	- Provide safe pedestrian crossings and walkways around active construction sites. - Install safety signage on site. - Erect temporary road signs and implement speed calming measures on all the project roads. - Deploy traffic marshals to control traffic at active construction sites. - Secure and restrict access to material borrow pits under the Contractor's jurisdiction. - Prevent children and onlookers from idling or entering active construction sites. - Community sensitization programs should be conducted to raise awareness on road safety, construction hazards, and emergency protocols. - Construction activities should be confined to daytime as per the EIA license conditions, to minimize disturbance from light and noise at night. - All construction vehicles and equipment should be regularly maintained to minimize emissions, leaks, and noise pollution. - Emergency response plans, including spill response kits and first aid stations, should be established and made accessible at all major construction zones.	Contractor	Continuous/ Throughout the project cycle	- Installation of temporary road signs. - Number of recorded accidents	200,000.00

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
Sexually Transmitted Infections (STIs, HIV and AIDS)	Rise in new HIV/AIDS infections	- The Project should implement an STI, HIV, and AIDS prevention and awareness programme in collaboration with local health authorities. - The Contractor should provide voluntary HIV Testing and Counselling (HTC) services to workers and community members, administered by qualified health personnel. - The Contractor should distribute free condoms at camps and work sites to promote safer sexual practices. - All workers should be required to sign a Code of Conduct prohibiting sexual exploitation and abuse, including inappropriate relations with community members. - Sensitization and peer education campaigns should be conducted regularly for both workers and surrounding communities to raise awareness of STI/HIV and AIDS risks and prevention strategies.	Contractor	Continuous/ Throughout the project cycle	- New infections recorded. - No. of sensitization and awareness campaigns.	3,510,000.00
Traffic Management	Accidents at the construction sites.	- Ensure a general Traffic Management Plan (TMP) and Site-Specific Management Plans (SSTMPs) are in place. - Appropriate safety signage and warnings should be installed at designated points e.g. truck and equipment turning signage should be placed at any access road facing the all the entrances from the Eastern and Western Bypasses and the Meru - Nanyuki Highway. - Separate entry and exit gateways should be provided for vehicles and construction equipment .	Contractor and Supervision Team.	Continuous/ Throughout the project cycle.	- Traffic management Plan and SSTMPs approved - No. of sites / locations with SSTMPs. - No. and location of installed signs. - Number of recorded accidents.	400,000.00

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
		- The contractors should hire qualified and experienced drivers and operators for construction vehicles and equipment. - Truck speeds within the project roads should be restricted to 40km/h and below. - Temporary road signs and speed calming measures (e.g., rumble strips, barriers) should be erected near schools, markets, and residential areas. - Well trained traffic marshals should be assigned to control traffic at the site entry and exit points. - Concrete barriers should be installed in all sections with high fills. - Access to active construction site should be limited to authorized personnel.			- Grievances recorded. - No. of marshals trained and deployed.	
Fauna	Potential Human-Wildlife conflict	- Noise levels should be regularly monitored along the Kambakia - Kagotone Road (Km 1+200 to Km 2+586), particularly in sections bordering the Upper Imenti Forest, to assess potential disturbance to wildlife. - The contractor should implement noise-reducing measures, including the use of low-noise equipment, regular maintenance of machinery, and restricting high-noise activities to daylight hours. - A wildlife encounter protocol should be developed in consultation with KWS, and works should be temporarily suspended in the event of elephant presence near construction zones. - Nighttime construction activities near forested sections should be avoided to reduce potential	Contractor and Supervision Team	Continuous/ Throughout the project cycle	- Emergency Response Plan developed and approved - Reinstatement of the fence - No. of sensitization meetings / meeting records - No. of grievances / conflicts recorded - No. of signages installed	900,000.00

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
		disturbances to wildlife, particularly nocturnal species. Replacing the electric fence.				
Livelihoods	Disruption of livelihoods	- Prepare a detailed RAP report and implement its livelihood restoration plan. - Ensure that PAPs are compensated prior to demolition of structures and acquisition of parcels for road construction. - Issue adequate notice to the PAPs along the road reserve for a period not less than 30 days after compensation before commencing on demolitions. - Where possible consider PAPs for employment opportunities.	Contractor and Supervision Team	Continuous	- PAPs compensated - Registered grievances	RAP implementation cost
Security	Theft of construction equipment, material, fuel, physical assault, rape and other criminal activities	- Develop and monitor the implementation of project's Security Management Plan. - Collaborate with the national and local security agencies in investigating and arresting criminal elements in the project . - Restrict entry and access into all sites under the jurisdiction of the Contractor for authorized persons only and ensure that the entry and exit points have permanent trained security guards and standby armed personnel. - Sensitize and create awareness on sexual offences; this should be reinforced by having all workers sign a Gender Based violence (GBV), Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH) Code of Conduct.	Contractor and Supervision Team.	Continuous.	- Safety of workers and machinery. - Number of security incidents and grievances. - Security management plan developed and approved. - No. of GBV/SEA/SH cases reported.	Contractual

Element	Potential Impact	Mitigation Measures	Responsible Parties	Frequency/Timing	Monitoring Indicator	Monitoring Means & Mitigation Costs
		• Include security emergency protocols in the project's ERPP.				

15.3.2 Operation Phase (Client-KURA)

Table 15-2: ESMMP Matrix for Operation Phase

ELEMENT	POTENTIAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	FREQUENCY/TIMING	MONITORING INDICATOR	MONITORING MEANS & MITIGATION COSTS
Road safety	Road traffic accidents	- Ensure that the roads have adequate and appropriately installed traffic signs. - Provide clearly marked pedestrian crossing points. - Carry out regular road safety campaigns - Commission road safety monitoring survey to identify accident black spots and inform on additional safety measures. - Work closely with the National Police Service and National Transport and Safety Authority (NTSA) to enforce posted speed limits, apprehend traffic offenders and suppress vandalism of road furniture. - Work closely with the County Government of Meru to install streetlights along the project roads and footbridges. - Constant monitoring of the road reserve to proactively deter encroachment. - Constant monitoring of walkways to deter encroachment by small - scale traders.	KURA regional offices. Kenya Police NTSA. Meru County Government.	Continuously.	- Records of public sensitization meetings. - Location and No. of installed signs. - No. of road safety sensitization meetings conducted / records of meetings.	100,000.00
Wildlife	Risks of road kills and poaching	Work with KWS to maintain the wildlife deterrent electric fence along the Kambakia-Kagotone Road.	KWS Upper Imenti Forest KURA	Continuously.	Records of training and sensitization campaigns.	0.00

ELEMENT	POTENTIAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	FREQUENCY/TIMING	MONITORING INDICATOR	MONITORING MEANS & MITIGATION COSTS
Storm water management	Potential of flooding incidents and soil erosion	Carry out routine maintenance of drainage structures and outfalls.	Maintanace Contractor and KURA.	Continuously.	Installed soil erosion techniques.	0.00

15.3.3 Decommissioning Phase (Contractor)

Table 15-3: ESMMP matrix for Decommissioning phase

ELEMENT	POTENTIAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	FREQUENCY /TIMING	MONITORING INDICATOR	MONITORING MEANS & MITIGATION COSTS
Socio-economic	Loss of employment and income	Notify workers in advance of the project closure date and ensure that all their dues are paid.	Contractor	Before end of contracts	Contract status and notice of project completion	0.00

ELEMENT	POTENTIAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	FREQUENCY /TIMING	MONITORING INDICATOR	MONITORING MEANS & MITIGATION COSTS
Community and occupational health and safety	Aesthetics Residual pollutants	- Limit demolition works to daytime hours. - Hoard all sites during demolition activities. For other sites, ensure adequate protection with reflective warning tapes and any other appropriate protection measure. - Install appropriate safety warning signages in active demolition sites. - Ensure that all the material sites are rehabilitated and reinstated to their original condition as much as possible - Control access into active decommissioning sites. - Control dust in potentially high dust generation sites.	Contractor	Pre-decommissioning and Continuously during decommissioning.	- Approved decommissioning plan prepared by the Contractor - Issuance of clearance certificates from NEMA - Discharge agreements for all the sites under the Contractors jurisdiction.	0.00
Waste(Construction debris)	Aesthetics Traffic safety.	- Contract a licensed waste handler to help with collection and disposal of decommissioning waste. - Establish a segregation and grading waste management system to help in achieving the 4R's of circular economy manage recyclables, debris and other forms of waste generated. - The contractor should prioritize deconstruction instead of	Contractor	After completion of road works.	Clearance certificate from the Client.	0.00

ELEMENT	POTENTIAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	FREQUENCY /TIMING	MONITORING INDICATOR	MONITORING MEANS & MITIGATION COSTS
		demolition to increase benefits of cyclic economy.				
Soil and water contamination	Contamination of water and Soil resources.	• Scoop contaminated soil for proper disposal. • Account for all the hydrocarbon fluids within the campsite at the time of decommissioning. • Exhaust all the septic tanks before decommissioning. • For biodigesters, treat the remaining slurry or digestate to reduce biological activity and odor. • Further the extracted digestate should be disposed appropriately as per the decommissioning plan; and • Depending on the level of spillage, adequately remediate the affected area(s) and may be necessary.	Contractor	Continuous monitoring during decommissioning.	• Issuance of clearance certificates from NEMA.	0.00

Table 15-1 contains actions that will be expanded with documented procedures and guidelines for work practices to be as responsive to the situations that various Contract Parties will encounter. This will be achieved through the preparation of detailed Construction ESMMP with individual sub-plans to address specific environmental concerns. The Parties, on the other hand, will formulate procedures and practices and maintain records as required by the Act (EMCA, Cap 387). The implementation of the ESMMP will be done within the provisions of the law and for the ultimate benefit of the stakeholders in the Project area. The effectiveness of the ESMMP should be monitored and assessed during spot checks, formal inspections and at the end of the Project when an overall audit of the works should be carried out.

15.4 Competence Training and Awareness

To ensure that this ESMMP is effectively implemented, each level of management is responsible for ensuring that all personnel reporting to them are aware of the requirements of this ESMMP. The E&S will coordinate environmental and social trainings in conjunction with other training agencies.

15.4.1 Induction

It is expected that all personnel, including Sub-Contractors, will be required to attend compulsory site induction that includes an all-safety procedure before deployment to site. The induction will include an overview of:

- Relevant details of the ESMMP including purpose and objectives
- Company safety policy..
- Personal Protective Equipment (PPE).
- Hazard identification and control.
- Site emergency procedures.
- Specific road construction hazards.
- Incident response and reporting requirements.
- Welfare facilities.
- Drug and substance abuse.

A record of all inductions will be maintained and kept on-site.

The Supervision EHS will review and endorse the induction program and monitor its implementation.

15.4.2 Toolbox Talks, Training, and Awareness

Toolbox talks will be used to raise awareness and educate personnel on construction related safety and environmental issues. The toolbox talks will be used to ensure safety awareness continues during construction period.

Toolbox talks will be tailored to specific environmental issues, including:

- Erosion and sedimentation control.
- Hours of work.
- Proper use of PPEs.
- Emergency and spill response.
- Housekeeping and waste management.
- Working at heights.
- Construction safety.
- Works in Waterways.
- Dust control measures.
- First aid and fire safety.
- Simple defensive driving.

- Equipment safety.

Attendance at the Toolbox talks is mandatory. The participants are required to sign an attendance sheet which will be maintained on site. Targeted awareness on relevant topics will be provided to individuals or groups of workers based on their specific work responsibilities and environment.

Information, Education and Information (IEC) materials such as posters, booklets or banners may be developed and distributed to engineers, leading hands, foreman and others with a responsibility for managing specific work locations or activities. Awareness notes may also be distributed to the broader workforce at daily pre-start meetings.

15.4.3 Daily Pre-Start Meetings

The pre-start meeting serves as a vital communication forum for informing the workforce about the day's operational activities. It encompasses the dissemination of safe work protocols, environmental protection measures, work area restrictions, activities that may impact the work, coordination considerations with other trades, hazard identification, and other pertinent information essential for executing the day's tasks.

The Site Foreman, or appropriately designated personnel, should facilitate a daily pre-start meeting with the entire site workforce before the commencement of work each day or shift, including instances of subsequent changes that occur within a shift. These pre-operational briefings may be conducted on a project-wide basis or tailored to specific work zones. Documentation of briefing topics, date(s) of delivery, and a comprehensive register of attendees should be maintained and retained for record-keeping purposes.

15.5 Communication

15.5.1 Internal Communication

Clear lines of communication across all levels and functions (e.g. management, staff and sub-contracted service providers), are essential to minimizing environmental impacts and achieving continual improvements in environmental performance. Project correspondences between the engineer and the contractor will be in form of signed site instructions while ESHS progress reports will be shared with the Client and the financier.

The E&S team will convene regularly to discuss on-site environmental management, amendments to plans, changes to construction activities, etc. Additionally, regular meetings may be scheduled with the Environmental, Health, and Safety Committee to communicate ongoing environmental performance and address emerging issues. The E&S team will also participate routinely in toolbox talks to communicate environmental performance to the broader project team, advise on sensitive safety matters for future work areas, and receive feedback from on-site personnel. Information regarding toolbox talks and daily pre-start meetings is provided in Sections 9.2 and 9.3 above.

15.5.2 External and Government Authority Consultation

Several Government agencies are regarded as development partners in the construction ecosystem. They play a key role in ensuring effective partnerships and successful project delivery, as their input is key during the pre-project and project implementation phase

The relevant authorities and stakeholders to be consulted are:

- NEMA.
- The Ministry of Health via the local Public Health Unit.
- County Environment Committee.
- Directorate of Occupational, Safety and Health Services (DOSHS).
- Water Resources Authority (WRA).
- KWS.
- KFS.

- Ministry of Interior and National Administration (Services).

15.6 Stakeholder and Community Communication

15.6.1 Community Engagement Strategy

A Grievance Redress Committee (GRC) will be established to fairly and efficiently resolve conflicts and complaints, ensuring a transparent and accountable process for all parties involved. They will receive, investigate, and make decisions on grievances, striving for timely and satisfactory resolutions.

GRC acts as a crucial bridge between those with complaints and the organization or institution they are addressing, ensuring that concerns are heard, investigated, and resolved in a fair and transparent manner

15.6.2 Complaints and Inquiries Protocol

A suggestion/feedback box, a phone number and an email address should be provided for receipt of complaints and enquiries. The box will be located outside the main offices and accessible to the public while telephone numbers and email addresses should be posted at all work sites.

A complaints register/log for all complaints received, including how they were addressed and whether a resolution was reached and whether mediation was required or used will be included in the register. The information contained in the register will be made available to the Client/Project implementation team upon request.

15.6.3 Incidents and Emergencies and Reporting

All incidents and emergencies resulting from the work will be managed in accordance with the Emergency Response and Preparedness Plan (ERPP) that the Contractor must prepare as part of the preliminaries. Typically, the ERPP should provide the following:

- Types of incidents.
- Criteria for classification of environmental incidents.
- Processes for systematically responding to and managing emergency situations, and
- Processes and legal requirements (e.g., DOSHS, NEMA Regulations) for the reporting and notification of an environmental incident.

In the event of an incident, NEMA and DOSHS require that the person reporting the incident must

- i. Give accurate reporting of the exact occurrence of incident(s),
- ii. Provide necessary details to assist in locating and addressing the incident, and finally.
- iii. Provide feedback on the effectiveness of incident response.

NEMA's Incident Management Policy outlines a collaborative framework with designated lead agencies to address environmental hazards that may lead to disasters. The system employs a risk-based classification approach, emphasizing the importance of raising awareness among staff and partner organizations. This system will be implemented in the event of an incident occurring at the project site.

NEMA maintains a dedicated incident reporting telephone line that is separate from the normal telephone lines used. The telephone line is on an Incident Desk that is covered during a typical working day between 8:00 am and 5:00 pm. Outside of those hours, an automatic telephone answering service is provided on that dedicated line. Officers from the Compliance and Enforcement Team man the Incident Desk between 8:00 am and 5:00 pm on regular working days. The duties of the officer include:

- i. Receive incidents reported to the Authority.
- ii. Record reported incidents in the Incidents Register.
- iii. Classify the incident according to the National Incident Classification Scheme.

- iv. Allocate resources to respond appropriately to the incident.
- v. Maintain and update the Incident Register.
- vi. Close incidents when investigations are complete or where a prosecution file is commenced.
- vii. Feedback the results of the investigations to the person reporting the incident, unless they have requested no further contact.

The dedicated contacts for incident reporting to NEMA are as stated below:

Report Environmental Incidents on:

Line: 0786 101 100, or 0741 101 100

Email: incidence@nema.go.ke

In case of an occupational injury, DOSHS has procedures for reporting as follows:

- When an accident occurs and an employee is injured, the employer must report to the DOSHS County offices within 24 hours if the accident is fatal, and within 7 days for non-fatal accidents using the DOSHS1 form.
- This triggers an accident investigation. A county DOSHS officer visits the workplace where the accident happened. They write a report on the nature, cause, and impact of the accident.
- The form is used as the basis to seek compensation through the Work Injury Benefit Act (WIBA). The employer is held responsible if they have not taken up WIBA. Insurance cover.
- A payment certificate (WIBA 7) is issued once a claim is paid the investigation file or case is closed

The incident reporting to DOSHS varies and can be via phone call, text or email depending on convenience.

15.7 Oversighting

15.7.1 Inspections Schedule

The Contractor and Supervision Engineer's E&S Safeguards Team, Client E&S team will undertake regular inspections of work sites during construction. Inspections by Supervision EHS in the company of the Contractor staff would typically occur on a weekly or fortnightly basis depending on the complexity of the work and anticipated environmental and social risks associated with the stage of construction. Inspections by the Client and site E&S team should occur monthly.

Deficiencies and required actions will be analyzed and prioritized at the completion of the inspection and timeframes for implementation of corrective actions will be agreed upon.

If any maintenance and/or deficiencies in environmental controls or environmental performance standards are observed, they will be recorded. Records will also include details of any maintenance required, the nature of the deficiency, any necessary actions, and the priority for implementation. The completion of the actions will be monitored to ensure they are implemented within the agreed timeframes.

15.7.2 Documentation

The Contractor's Environmentalist and Sociologist are responsible for maintaining all safety and environmental documents as current at the point of use. Types of records include:

- Monitoring, inspection and compliance reports/records.
- Correspondence with Government authorities such as NEMA, DOSHS, WRA, KFS, KWS and relevant County Departments.
- Induction and training records.
- Reports on environmental and social incidents, other environmental non-conformances, complaints and follow-up actions.
- Community engagement records, and

- Minutes of Construction Environmental and Social Management Plans (CESMP) and construction environmental management system review meetings and evidence of any action taken.

All documents are subject to review and continual improvement. This includes times of change to scheduled activities or to legislative or licensing requirements. Only the E&S team have the authority to change or improve any of the documents.

15.8 Environmental and Social Performance Monitoring

Environmental and Social (E&S) monitoring should be an integral part in overall project management during the construction phase. A series of programmes should be developed by the Contractor, in consultation with key lead agencies, particularly NEMA, KWS, KFS, DOSHS, WRA and Relevant County Departments, to address construction activities which have adverse E&S effects and ensure compliance with relevant conditions attached to any ESIA License, financier's policies and the ESMMP.

Monitoring programmes aim to:

- Detect the type and extent of environmental change and, specifically, identify those changes directly resulting from road construction projects.
- Verify 'actual' versus 'predicted' levels of environmental change arising from construction activities.
- Supplement the assessment of the effectiveness of environmental management being implemented during a project's construction.
- Provide an evidence base from which the Contractor can demonstrate compliance with requisite environmental legislation, ESIA License conditions and other environmental license/permit conditions, and adherence to the implementation of the CESMP.

Environmental and social monitoring to be undertaken during construction should be structured and systematic and conducted by suitably qualified and experienced personnel. The monitoring should be periodically reviewed and modified to provide the necessary assurance and confidence of its continued appropriateness. Such reviews should consider the required frequency and duration of monitoring, conformance with requisite permit/licensing conditions and evaluate the ongoing need for individual programmes.

Copies of the records of all monitoring activities should be maintained by the E&S team and the Contractor to facilitate the audits.

15.8.1 Auditing and Compliance Checks

The Contractor should implement a robust programme of compliance, auditing and reporting throughout the project construction phase to demonstrate the effectiveness of its site-based environmental and social management programme(s). A structured and systematic audit programme should be implemented to:

- Periodically assess environmental and social management practices being implemented with a particular focus on their effectiveness and legal compliance.
- Check the currency of all environmental and social management practices, documentation, reports/registers etc.
- Evaluate the performance of environmental and social management practices against objectives and targets.
- Identify continual improvement and better practices.
- Review the frequency and content of training, together with the qualifications of the nominated trainers.

- Review the causes of environmental and social incidents such as occupational accidents, hazardous spills and compliance failures and assess the effectiveness of response plans and gauge whether any lessons-learned are being disseminated and applied.
- Identify and communicate any major environmental and social priorities to senior management.

A proposed audit and reporting program is presented in Table 15-4 below:

Table 15-4: Suggested ESMMP Audit and Reporting Programme

Type	Content	Submission To	Responsibility
Daily Environmental and Social Report	Daily log of activities, visual observations, records using checklists, identification of specific issues/incidents, forward planning/scheduling.	Contractor Site Manager/ Foreman, /Supervisor	Contractor
Weekly Environmental and Social Report	This is similar to the daily E&S reports but provides a comprehensive summary of priority actions, concerns, and a review of completed and scheduled environmental management measures and controls.	Contractor Site Manager/Foreman, /Supervisor	Contractor
Environmental Incident Report (as required)	Catalogue issues, practices and incidents which have posed or caused environmental harm. Record the procedures and corrective actions implemented to address the incident or occurrence. This is inclusive of corrective action reporting and follow-up.	Clients Safeguards Team/Construction Manager/Supervisor /NEMA Officer/ DOSHS Officer	Contractor
Monthly Environmental and Social Monitoring Report	Formal summary of monitoring data and level of ESMMP implementation and legal compliance. Record of any significant milestones, incidents and follow-up.	Clients Safeguards Team/Supervision Engineer/Contractor Site Manager	Contractor
Quarterly Environmental and Social Monitoring Report	As above with the inclusion of environmental and social management programme performance.	Clients Safeguards Team/Supervision Engineer/Construction Manager	Contractor Site Manager/Foreman and Construction Manager/Supervisor
Independent Environmental Audit (Annual)	Formal third-party audit procedure and independent report prepared by the NEMA Registered Officer to monitor legal compliance against relevant EIA License conditions and other legislation, the incidence of non-compliance and their correction, the handling and response to complaints and occurrence of environmental incidents in terms of types and again the effectiveness and responsiveness of corrective actions procedures and reporting.	Contractor or NEMA	Contractor NEMA Inspection Officer

15.8.2 Environmental Monitoring Plan

This is a key component of an Environmental and Social Management Plan (ESMMP). It outlines how environmental impacts identified during project planning will be tracked, managed, and reported throughout the project lifecycle.

Error! Reference source not found. below presents a summary of Environmental and Social monitoring points for the Road Project.

Table 15-5: Environmental Monitoring Plan

Environmental and Social aspects	Performance monitoring Points	Responsibility	Frequency
Air quality	Link 3 – MeWASSCO Junction (351501.85 m E, 5389.81 m N) Hospital -Kiramburine JCT Road (350175.15 m E, 5691.73 m N) Kambakia- Kagotone (349757.22 m E, 8931.79 m N) Link 2-Gakoromone Market (351059.40 m E, 5168.70 m N) Three Steers – Kambakia (348615.96 m E, 6642.90 m N)	Contractor	Air Quality monitoring quarterly or as directed by the RE or NEMA
Noise and Excessive Vibration	Link3- MeWASSCO Junction. (351534.00 m E, 5386.74 m N) Hospital -Kiramburine JCT Road (350160.93 m E, 5715.07 m N) Kambakia- Kagotone (349757.22 m E, 8931.79 m N) Link 2- Gakoromone market (351059.40 m E, 5168.70 m N)	Contractor	Noise and vibration monitoring every 3 months or as directed by NEMA
Water Resources	Along Gasioma and Mpuone	Contractor	Continuous during works near water bodies Water quality monitoring quarterly.
Waste management	Contractor's camp site Asphalt and concrete mixing plants.	Contractor	Continuous. Monthly waste audits
Flora	The annexed section of the Upper Imenti forest	Contractor	Continuous during vegetation clearance. Tree survival audits every 6 months
Socio economic impacts	The entire project	Contractor with Supervision Team	RAP before construction; GRM active throughout project cycle; Livelihood monitoring every 6 months

Occupational health and safety	Within active construction sites	Contractor	Continuous/ Throughout the project cycle
Community health and safety	Along road sections where the locals may directly interact with construction works	Contractor	Continuous/ Throughout the project cycle
Sexually transmitted infection (HIV&AIDS and STDs)	Within active construction sites. Next to Meru polytechnic and KEMU student residential areas.	Contractor NSDCC Meru county	Continuous/ Throughout the project cycle
Traffic Management	Within active construction sites. Next to Meru polytechnic and KEMU student residential areas.	Contractor and Supervision Team	Continuous/ Throughout the project cycle
Wildlife	Along the annexed sections of Upper Imenti Forest block	Contractor and Supervision Team KWS Upper Imenti Forest KURA	Continuously
Road safety	The entire project area.	KURA regional offices Kenya Police NTSA Meru County Government	Continuously

15.8.3 Non-Compliance and Corrective Action

Where environmental and social monitoring audits, ad-hoc observations and/or any activity and incident indicates deficient performance that do not conform with environmental and social management requirements set out in the ESMMP or related documents such as ESIA Reports and accompanying ESIA Licenses (which should be read in conjunction with this document) or that further performance improvement is necessary, corrective action should be implemented. Appropriate corrective action procedures should therefore be established to:

- Determine the cause of any recorded non-compliance.
- Define and assign the appropriate level of responsibility and authority for investigation and implementation.
- Establish requirements for recording non-compliance.
- Identify and implement appropriate corrective action(s).
- Initiate preventative actions.
- Apply controls to ensure that preventative actions developed for ‘futureproofing’ and
- Update written procedure resulting from the corrective action and amend this CESMP, as required.

Non-conformance classifications applicable to this ESMMP implementation are shown in the Table 15-6 below.

Table 15-6: Non-Compliance Classifications

Classification	Descriptors	Responsibility
Major Non-Conformance (Any one of the points listed)	• Significant adverse effect on health and safety of personnel, suppliers and Contractors. • Contravenes conditions attached to an ESIA License or environmental licenses/permits with risk of penalties, fines or enforcement actions being issued.	Construction Manager/Supervision

Classification	Descriptors	Responsibility
	- Breaches and/or environmental effects which could be irreversible and costly to fix. - Significant level of legitimate and valid complaints raised by stakeholders and the public. - Public image of the Client is adversely affected.	
Minor Non-Conformance	- Breaches and/or environmental effects are easily reversible. - Minor irritation or nuisance to the local community or sensitive environmental receptors. - Health and safety of personnel, suppliers and Contractors not placed at significant risk. - Public image of the Client remains unaffected.	Construction Manager/Supervision

15.8.4 Emergency Response and Preparedness

The Contractor should establish and maintain procedures which will clearly document the protocols for identifying and responding to environmental and social incidents and emergency situations resulting from the construction work. The prevention and mitigation measures suggested should be agreed upon and reviewed by the Supervision EHS officer and approved by the RE prior to the commencement of construction works. Part of the environmental induction and training should be dedicated to ensuring that all the Contractor's site personnel are well versed in environmental emergency response and understand their individual responsibilities.

Such procedures should include:

- Lists of key personnel and their responsibilities.
- Availability of emergency services or specialist Contractors registered for site containment and clean-up.
- Procedures for communicating both internally within the Contracting entity and the Client, and externally with the regulator, NEMA, DOSHS, and other stakeholders
- Potential environmental incidents which could give rise to wider reaching effects beyond development site
- Hazard information such as safety data sheets.
- Training, monitoring and drills.
- Procedures for controlling incidents and undertaking remediation work
- Internal and external responsibilities for the follow-up investigation and remediation.

Potential environmental and social incidents and emergency situations likely to arise because of construction activities include:

- Traffic related incidents. These incidents may result from vehicular collisions, pedestrian accidents and struck-by incidents from construction equipment.
- Occupational accidents. May be caused by hazards resulting from work at height, work in confined spaces, poor electrical connections and machinery/plant operation.
- Environmental hazards. Potential environmental hazards that are likely to be experienced in the project area include landslides/earth movements and spillage of hazardous chemicals, hot bitumen
- Health emergencies. include respiratory complications as a result of dust and fumes, allergic reactions or sudden medical conditions.

- Security and public safety risks: Include theft and vandalism of construction machines, unauthorised access into construction areas leading fatalities and accidents and traffic related accidents and/or incidences.

All site personnel should immediately report an incident(s) to the Site E&S team who will further escalate the issue to the RE and Clients Safeguard's Team then relevant authorities. The E&S Team should assess the situation and implement the following steps:

- Immediately take all reasonable steps to contain further damage or danger to personnel and the environment.
- Contact relevant emergency service and regulatory authorities.
- Inform the relevant emergency and regulatory authorities as required by legislation and/or an EIA License and other environmental permit/license conditions.
- Complete a detailed report of the incident using a registered Environmental Incident Form (to be developed by the Contractor and approved by the RE) or similar.
- Initiate appropriate and approved corrective action(s) and response measures.
- Where relevant plan and implement site clean-up and restoration.

15.8.5 Environmental and Social Incident Review and Management

The Contractor should implement a robust incident management and investigation process, which focuses on:

- Management roles and responsibilities in incident investigation.
- 'Root-cause' analysis for significant incidents and near misses.
- Periodic evaluation of incident cause trends to determine where improvements in systems, processes, practices or procedures are warranted.
- Procedures for disseminating knowledge and experience from relevant lessons learned
- Procedures for follow-up and closure of actions.

Copies of incident reports should be maintained in an incident register established by the Contractor.

15.8.6 Requirements For Sign-Off and Site Handover

A summary report, based on the Contractor's implementation of the CESMP (including monitoring data summary; complaints and non-conformance records) and a final inspection report should be supplied by the Contractor to the Client at the completion of construction works. The summary report is to be issued to the Clients Safeguards team for review and comment prior to site handover and closure.

16 CONCLUSION AND RECOMMENDATIONS

16.1 Conclusion

The Environmental and Social Impact Assessment (ESIA) study has assessed relevant environmental and social baseline conditions of the project area and evaluated potential impacts across all the phases of the project lifecycle. The assessment was guided by the national legislative framework under EMCA and World Bank Operational Policies which informed the project's risk category and the level of analysis. Both beneficial and adverse impacts have been identified with feasible mitigation measures proposed to minimize environmental, social, health, and safety risks.

The findings indicate that the proposed extension of the Meru Bypass will significantly enhance local connectivity, stimulate economic growth, and improve access to essential services, with minimal irreversible environmental and social impacts. Key concerns, particularly those related to land acquisition, livelihood restoration, and community displacement. We have made recommendations on how these should be addressed by the Client to uphold the project's sustainability and social license to operate.

Extensive stakeholder engagement and public consultations were conducted throughout the ESIA process, ensuring that community perspectives, concerns, and aspirations were meaningfully taken on board the ESIA process. These engagements revealed broad public support for the project contingent upon transparent grievance redress mechanisms and inclusive compensation strategies.

Based on the comprehensive assessment, inclusive stakeholder input, and the proposed mitigation framework, it is our finding that the project remains environmentally and socially viable subject to full compliance with the Environmental and Social Management and Monitoring Plan (ESMMP), relevant national regulations, and applicable international standards.

16.2 Recommendations

Further to the comprehensive mitigation measures provided in the ESMMP, we wish to recommend the following to enhance the project's viability:

- Considering that most of the flooding incidents along the Three Steers - Kambakia Road (Km 0+200 – 0+400) is exacerbated by stormwater from the Meru- Nanyuki highway, it is our recommendation that the stormwater channel be rerouted from the highway from draining towards the project road. Further, it is recommended that the Client carry out outfall improvement works at km 0+240 to enhance its capacity for projected stormwater.
- The Contractor should in consultation with KFS carryout a comprehensive tree inventory based on the final designs along the Kambakia – Kagotone/KEMU C91 Road bordering Upper Imenti Forest before vegetation clearance.
- Ensure that the ESMMP is implemented fully and the necessary resources allocated for compliance with the national and international regulations and policies.
- Due consideration should be given to the youth, women and PLWDs in employment opportunities arising from road construction activities. Further, the hiring process for workers should be fair, transparent and based on merit.
- The environmental and social safeguards team should be mobilized early enough to ensure that the necessary structures/frameworks are prepared and available for implementation. In addition, the team should be adequately facilitated with a dedicated vehicle for their use.

16.2.1 Potential Complementary Projects

Whereas the project will bring immense social and economic growth in Meru as conceptualized and designed, the Contractor and the Client may consider the following climate change adaptation and Corporate Social Responsibility projects:

16.2.1.1 Afforestation as a Climate Change Mitigation Measure

A potential complementary initiative for the Client and Contractor is tree planting within the Upper Imenti Forest. Under this proposal, KURA and the Contractor, in collaboration with KFS, could identify a degraded section of the forest and establish a partnership to implement tree planting as a carbon sink. To realize this, it is recommended that the parties work closely with KFS to select a suitable site and supply seedlings of appropriate species for reforestation. Figure 16-1 illustrates an example of a degraded area within the forest where such an intervention could be undertaken..

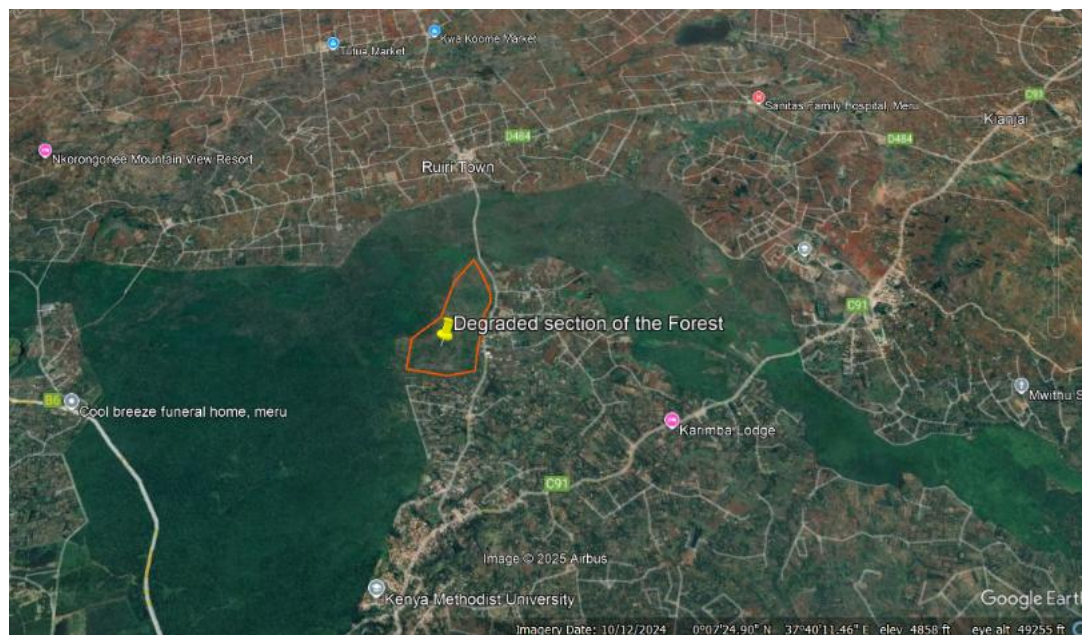


Figure 16-1: Degraded section of the Upper Imenti Forest recommended for afforestation

Source: Google Earth

Wildlife conservation initiative

The Electric fence in Upper Imenti Forest is an essential and impactful tool in managing human-wildlife conflict and advancing wildlife conservation efforts. Serving as a non-lethal barrier, it effectively deters animals from encroaching into human settlements and agricultural zones, significantly reducing crop destruction, livestock losses, and the need for retaliatory killings. Moreover, it plays a crucial role in preserving wildlife corridors, ensuring the safe and natural movement of animals within the parks. Partnering with the Kenya Wildlife Service (KWS) to complete the remaining sections of the fence, which has already proven successful in deterring elephants, would be a strategic and sustainable investment. This initiative not only enhances community safety but also demonstrates a strong commitment to conservation and responsible stewardship. Implementing this project as part of your CSR efforts will foster community trust, protect livelihoods, and promote coexistence between humans and wildlife.

16.2.1.2 Corporate Social Responsibility Project

Improvement of Gakoromone Market

Gakoromone Market plays a vital role in the local economy by fostering private sector activity, providing economic opportunities for small entrepreneurs, and enhancing access to goods and services. It serves as a hub for trade, various market participants and contributing to the overall economic well-being. A section of the market lacks stalls and the project can consider Corporate social Responsibility (CSR) the area by constructing stalls, additional toilets and a gate for the traders to shield them from extreme weather conditions and improve their welfare. Gakoromone Market plays a vital role in the local economy, driving private sector growth, creating crucial opportunities for small entrepreneurs, and significantly improving access to essential goods and services. As a key hub for trade, it connects diverse market participants and boosts the region's economic vitality. To further unlock its potential, the market needs essential upgrades.



Figure 16-2: Open-air Market Section

Source: Google Earth

A section currently lacks stalls, which hampers traders' ability to operate effectively. Implementing Corporate Social Responsibility (CSR) initiatives—such as constructing new stalls, adding toilets, and building a protective gate—would greatly enhance the market environment. These improvements would safeguard traders from harsh weather, support their welfare, and foster sustainable economic development for the entire community.

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APPENDICES

Appendix 1: ESIA/EA Lead Expert Licenses

Appendix 2: E-Cue Practicing Licenses

Appendix 3: Drawings

Appendix 4: BoQ

Appendix 5: Stakeholder Engagement and Public Consultation Details p

Appendix 6: Air Quality and Noise Monitoring Reports

Appendix 7: Water Quality Monitoring Reports

Appendix 8: Public Participation Notice

Appendix 9: Approved ToR

Appendix 10: KML Files

Appendix 11: Chance Find Procedure