REPUBLIC OF KENYA

MINISTRY OF TRANSPORT, INFRASTRUCTURE, HOUSING AND URBAN DEVELOPMENT

Kenya National Highways Authority

Quality Highways, Better Connections

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED DUALLING OF ISINYA-KONZA-MALILI ROAD

June 2021

DECLARATION

TITLE: ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED ISINYA-KONZA-MALILI ROAD PROJECT

This ESIA study report has been prepared in accordance with the provisions and requirements of the Environmental Management and Coordination Act (EMCA) Cap 387 and subsidiary regulation -Environmental (Impact Assessment and Audit) Regulations, 2003.

NAME	NEMA REG. NO	SIGN	DATE
Walter Nyatwang'a	Lead Expert-0822		

For and on behalf of:

Kenya National Highways Authority,
Barabara Plaza, Off Airport South Road, along Mazao Road, Opposite KCAA HQs.
P.O. Box 49712 - 00100
NAIROBI.

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ABBREVIATIONS

ESIA	Environmental and Social Impact Assessment
EMCA	Environmental Management and coordination Act
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GoK	Government of Kenya
CoK	Constitution of Kenya
HIV/AIDs	Human Immunodeficiency Virus/ Acquired immune deficiency syndrome
KeNHA	Kenya National Highways Authority
KeRRA	Kenya Rural Roads Authority
Km	Kilometers
KFS	Kenya Forest Service
NEC	National Environment Council
NEAP	National Environmental Action Plan
NEMA	National Environmental Management Authority
RAP	Resettlement Action Plan
ToR	Terms of Reference
WRA	Water Resource Authority

EXECUTIVE SUMMARY

Introduction

The Government of Kenya through Kenya National Highways Authority (KeNHA) has earmarked funds to undertake final design, environmental and social impact assessment study in preparation for full construction of Isinya-Konza-Malili road project.

The proposed Isinya-Konza-Malili road project was set out by three ranchers in 1980s to provide access to gypsum miners around Km 13 and later classified as a class E road under the jurisdiction of Kenya Rural Road Authority (KeRRA). In 2018, the road was re-classified and upgraded to class B and became one of the important trunk roads transversing four counties namely Makueni, Machakos, Kajiado and Narok. It goes on to form an important link between A8 at Malili and A2 at Isinya, proceeding through Kiserian-Ngong-Kimuka before terminating at Suswa as B50 (This latter section is under construction to bitumen standards). Essentially, the only section of B50 remaining for upgrading is the proposed Isinya-Konza-Malili whose funds have been set aside for feasibility studies, detailed design and environmental and social impact assessment in preparation for full construction.

The ESIA team employed both conventional and participatory approaches in the course of primary and secondary data collection, synthesis, analysis, reporting and documentation. This was geared towards identifying the potential environmental and social impacts as well as designing suitable mitigation measures for the proposed upgrading of Isinya-Konza-Malili Road.

Project Description

The proposed Isinya-Konza-Malili road is an important missing link that connects Athi River-Namanga (A2) road at Isinya and Mombasa-Nairobi (A8) road at Malili. This is the only murram section of the B50 as the rest of the sections are either completed or under construction. The section between Isinya-Kiserian-Ngong was recently rehabilitated and upgraded to class B standards of design and construction while the section between Ngong-Kimuka-Suswa is under construction and is estimated to be completed soon. The proposed sections for upgrading, Isinya-Konza-Malili, is entirely murram surfaced with some impassable section during the rainy season. The proposed road commences at Athi River-Namanga (A2) Road junction at Isinya Township (Km 0+000) and proceeds to move in north easterly direction to Ilpolasat Market Centre (Km 28+700) before crossing SGR railway (Km 32+500), the boundary of Kajiado and Machakos County (Km 35+400), passing through Konza market centre (Km 38+300) before terminating at Malili market Centre, Nairobi-Mombasa (A8) Road (Km 46+900). In lieu of the design parameters for a class B road and the need to avoid private property and huge land uptake at Isinya town, the design engineers have proposed three major re-alignments at Km 0-Km3+800, Km8+340-Km 14 and Km 24+340-Km 28+150.

Policy, Legal and Regulatory Framework

The key legal framework on environmental management in Kenya includes the Constitution of Kenya, 2010, the Environmental Management and Coordination Act (EMCA) Cap 387, Wildlife Conservation and Management Act, 2013, the Forest Conservation and Management Act, 2016, the Land Act 2012, among others. This report is prepared in accordance to the Environmental (Impact Assessment and Audit) Regulations, 2003 and Amendment Regulations, 2016 under EMCA, Cap 387, the principal environmental law. The Kenyan Constitution in Article 42 emphasizes that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. On social issues related to the project, relevant legislations to the project includes the Kenya National Aids Strategic Plan, Sexual offence Act on prevention and the protection of all persons from harm from unlawful sexual acts, especially youth and the vulnerable persons in close proximity to the project sites.. A number of Multi-Lateral Environmental Agreements (MEAs) have been considered key among them being the United Nations Convention on Biological Diversity (UNCBD), African Convention on the Conservation of Nature and Natural Resources, Convention on International Trade in Endangered Species, The Ramsar Convention for the conservation and sustainable utilization of wetlands, The 1992 United Nations Framework Convention on Climate Change (UNFCCC), The Paris Agreement , The Rio Declaration on Environment and Development, Earth Summit on Sustainable Development Agenda 21, The Convention on the Rights of the Child (CRC), The Convention on the Elimination of all forms of Discrimination against Women (CEDAW) and The International Labour Organization (ILO) among others.

Baseline Environmental and Socio-Economic Parameters

Administratively, the road project majorly traverses Kajiado and Makueni Counties with a small section touching Machakos County at Konza.

Topography: Kajiado County is characterized by plains, valleys and occasional volcanic hills. The lowest altitude is about 500 meters above sea level at Lake Magadi while the highest is 2500 metres above sea level in Ngong Hills. The landscape within the County is divided into Rift Valley, Athi Kapiti plains and Central Broken Ground. Machakos County has unique physical and topographical features. These include hills rising between 1800-2100m above sea level and Yatta plateau, which is elevated to about 1700m above sea level and slopes to the South East while Makueni County lies in the arid and semi-arid zones of the eastern region of the country. Major physical features in Makueni County include the volcanic Chyulu hills which lie along the southwest border of the county in Kibwezi West Constituency, Mbooni Hills in Mbooni constituency and Kilungu Hills in Kaiti constituency which rise to 1,900m above sea level. The county terrain is generally low-lying from 600m above sea level in Tsavo at the southern end of the county.

Geology and soils: Kajiado County has three geological regions namely Quaternary volcanic, Pleistocene and basement rock soils. Quaternary Volcanic soil is found in the Rift Valley.

Basement System Rocks which comprise various gneisses, cists, quartzite and crystalline limestone, are found mainly along the river valleys and some parts of the plains. Pleistocene soils are found in the inland drainage lake system around Lake Amboseli. Quarrying of building materials is also done within the county. The rocks in Machakos County consist of intensely folded Basement Rock system of gneisses and schists which include limestone, amphibolites and quartzites as well as the predominating biotite granitoid gneisses. The rocks have been metamorphosed and granitized to a considerable degree. Makueni County is generally covered by thin sandy soil overlying rocks of the metamorphic system, generally a combination of gneisses and schist's. The area comprises of erosional resistant hills composed of granitoid gneisses and which the rocks are also exposed at the valleys where seasonal streams meanders exposing the fractured gneisses and schist. The geology of the project area consists of depositional sandy soils, gneisses and schist's. However, the rocks are locally weathered and fractured which makes it possible for the enhancement of the water recharge mechanisms.

Climate: Kajiado County has a bi-modal rainfall pattern. The short rains fall between October and December while the long rains fall between March and May. There is a general rainfall gradient that increases with altitude. The bimodal rainfall pattern is not uniform across the County. The long rains (March to May) are more pronounced in the western part of the county while the short (October to December) rains are heavier in the eastern part. Makueni County experiences two rainy seasons, the long rains occurring in March /April while the short rains occur in November/December. The hilly parts of Mbooni and Kilungu receive 800-1200mm of rainfall per year. High temperatures of 35.8 ℃ are experienced in the low-lying areas causing high evaporation which worsens the dry conditions. Climate variations and extreme differences in temperatures can be explained by change in altitude. Machakos County receives bimodal rainfall with short rains in October and December while the long rains from March to May. The rainfall range is between 500mm and 1250mm, which is unevenly distributed and unreliable. The altitude mainly influences rainfall distribution in the county. The high areas such as Mua, Iveti and Kangundo receive an average rainfall of 1000mm while the lowland areas receive about 500mm. Temperatures vary between 18˚C and 29˚C throughout the year. The dry spells mainly occur in January to March and August to October.

Air quality: The proposed road project is largely crossing over mainly rural areas and a few urban settlement where there is vehicular movement both small and goods transporting trucks including lorries, saloon cars, pickups motorcycles which emit a lot of smoke (carbon dioxide and carbon monoxide among other toxic gases) from the combustion of hydrocarbons in fuel and burning of wood in tea factories. The low level emissions are further moderated by filtration by the heavy vegetation and high dispersal conditions. Pollutants including carbon dioxide, carbon monoxide, Sulphur oxides, nitrogen oxides and particulate matter (dust) may, therefore, be considered very low. However, during the dry seasons, the unpaved road are very dusty. It is expected that during construction the fine dust will increase and there is need for water suppression.

Surface and Ground Water Resources: Kajiado lies in the semi-arid and arid zones with mean annual precipitation being approximately 400 mm/year. Largely, the county does not have a reliable source of water with the main sources of water being seasonal rivers, shallow wells, springs, dams, water pans and boreholes. Kajiado County is an Arid and Semi-Arid Land (ASAL) characterized by an acute shortage of clean and safe water for drinking and other domestic uses. According to the County Statistical Abstract 2015, only 67.2 percent of the total population have access to safe water. The number of households (HH) with an access to piped and portable water is about 36.8 percent of the total population. Machakos County is a water scarce County with its water situation levels below the national natural endowment of 647m_3 per capita per year. Its arid and semi-arid areas are critically limited in water endowment. Water resources in the County are mainly seasonal rivers, dams and springs. Furthermore, the County has two perennial rivers. One of them traverses the County namely Athi River and the other namely Tana River forms the County boundary with Embu and Tharaka Nithi counties. Makueni County has two permanent rivers; Athi and Kibwezi. There are four protected springs and 117 boreholes. Households with piped water are 12671 while 27752 households have access to potable water. There are 289 water pans and 159 surface dams.

Flora and Fauna: Kajiado County boasts of a wide range diverse fauna and flora. The animals include Wild Beasts, Gazelles, Zebras, Warthogs, Hyenas, Giraffes, Elephants, and Lions, Leopards and Elands and diverse bird species. Areas designed for game reserves are; Amboseli National Park which covers a total of 392Km^2 and Chyulu conservation area which is 445Km^2. These areas fall within range. The vegetation types in Machakos County are influenced by altitude, rainfall, soils and rivers. The types include: forest types (hilltop), woodlands, bushland and shrub land, and dwarf shrub grassland. Species common in Machakos County include: indigenous forest types tree like *Croton macrostachyus, Albizia gumnifera, Ficus thornigii;* plantation forests inthe hilltops with trees such cypress, pines, and eucalyptus. Common in the wetter regions for woodlands Combretum species, Comnihora species in the drier areas and Enchea spp, *Croton macrostachus*, Ravetateifana, Vanguewa spp, Terminalia spp. In Makueni County the flora and fauna found in the area is the indigenous vegetation cover which has been tampered with to give way to subsistence cultivation and poles and timber for houses construction. However, the tree planting exercise of exotic trees that is being carried out by the local population is slowing promoting the environmental conservation especially in the institutions of learning, business buildings and residential houses. The project area is an urban centre where vegetation has become scarce due to developments.

Land Resources: The project road has essentially a rural disposition with the local population mainly engaged livestock farming with small sections practicing water fed agriculture.

Public participation

Consultations with local administration were done at DCC's Offices at Isinya and Mukaa whilst public barazas were carried out at Isinya multipurpose social hall, Emaparasuai Primary School, Chiefs office at Ilpolosat centre, Konza Chief's grounds and at Malili trading centre. During these meetings, the project's key features were discussed as part of the design and scope of works of the

aforementioned road project were discussed and comments, suggestions and concerns gathered from stakeholders. Standard questionnaires were administered to members of the public working, residing as well as those owning business properties along the proposed road project. Positive comments obtained during the public consultation meetings included: creation of employment opportunities, increased business opportunities, improved social infrastructure, faster means of transport, easy cheap and fast movement of people, easy and fast movement of goods and potential for increased economic activities. Negative concerns raised include*:* increased accidents, noise pollution, and dust generation during construction, waste disposal and spoils, loss of vegetation cover, displacement of local communities and loss of property, and increase in the spread of STD, HIV and AIDS.

Potential Impacts and Mitigation Measures

The project will have both positive and negative impacts during construction, operation, and decommissioning phases.

Positive Impacts: During the construction phase the impacts includes: Gains in the local and national economy through provision of employment to the locals, income from the salaries and wages will improve the economy of the town centres and the county at large; Transfer of skills local people employed during the construction phase will learn new skills from the civil engineers, welders, masons and other employees that come from outside, while during the operation phase there will be increased business opportunities and improvement of local socio-economy through increased access to markets, reduced wastage due to spoilage due to lack of access to the markets, access to value chain centre viz, buying centres, factories and subsequently reducing transport/marketing cost, and easy access by the extension officers to educate farmers on good production practices; improved road safety; improved aesthetics; urbanization.

Negative Impacts: In the construction phase, the excavations, demolitions, and transportation of building materials will result in the emissions of large amounts of dust within the project site and surrounding areas. Asphalt, concrete and batching plants and diversions are also possible sources of dust and air pollution within the project area. Solid waste materials will be generated during construction works and operations such as rock and soil materials, general solid waste from campsites; vegetation waste from the clearance of road reserves; and sediment and sludge from storm-water drainage system. The occupational health and safety issues associated with the construction and operation of the proposed road will include; physical hazards, chemical hazards and noise hazards. Potential impacts to biodiversity could arise due to the physical disturbance during the construction, contamination of the environment due to chemical/ oil spillage or leakage and inappropriate liquid and solid waste disposal mechanisms. There will be impact due to oil spillage, disposal practices of used oil, oil filters during the construction of the project. Possible impacts include: pollution of groundwater sources during construction phase (bridges construction work) interference with existing community water sources during construction phase, infiltration of contaminants from on-site activities into soils, pollution and degradation of water quality of

underlying aquifer during earthwork, excavations, oil wastes from the camp/garage and impact to human health through direct exposure to contaminated drinking contaminated.

The extraction and transportation of materials will also result in the distortion of the ground structure, vegetation loss, dust emission, oil spills, noise and increase potential for accidents.as well as creating public health hazard when ponded. Other impacts will include: loss of and productivity potential; Permanent loss of natural (material) resources; and increased susceptibility to soil erosion.

During the implementation of project activities, the local social service sector will be overwhelmed by the presence of project employees who may be in need of these services. If the project leads to in-migration, it will increase pressure on social service infrastructure like housing, health, water sources and sanitation facilities in the area when people move into the community in anticipation of employment opportunities. With an increase in the population of the area boosted by the project employees the social set up of the area will be affected. This change may be in the form of lost social norms and morality, an increase in school drop-out due to cheap labor, child labor, and increased incidences of HIV/AIDS and other communicable diseases

To mitigate against all the impacts identified an ESMP has been developed. The ESMP will ensure adherence and future compliance with legislation, good environmental performance, and integration of environmental and social issues into the project decision.

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Design and construction phase				
Topography and Geology	• Slope gradient maintenance and controlled borrow pits and quarry excavation to avoid vertical phases • Erosion control measures in excavated borrow pits areas and working sites along the road • Site reclamation or rehabilitation during decommissioning phase of the project	Contractor/KeNHA/Supervision Consultant	Continuous	-As appropriate
Noise Pollution and Vibrations	• Sensitize drivers of construction vehicles and machinery operators to switch off engines or machinery that are not being used. • Ensure that all vehicles and construction machinery are kept in good condition all the time to avoid excessive noise generation. • Ensure that all workers wear ear muffs and other personal protective gear/equipment when working in noisy sections. • Ensure machines are switched off when not in use. • Undertake loud noise and vibration level activities during off-peak hours during the day (i.e. between 8.00 am and 5.00 pm).	Contractor/KeNHA/Supervision Consultant	Monthly	- As appropriate - - - -
Air Pollution due to Dust Generation and Air Emissions	• Sprinkling of water on dry and dusty surfaces regularly including the access roads.	Contractor/KeNHA/Supervision Consultant	Monthly	As appropriate

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	• Use of waste water to sprinkle at the construction site to reduce excessive dust. • Adherence to personal protective clothing such as dust masks. • Enforce onsite speed limit regulations. • Ensure machines and vehicles are properly and regularly maintained. • Erection of speed calming measures near public institutions such as schools, hospitals and town centres			- - - -
Solid Waste Generation	• Maximizing the rate of recycling of road resurfacing waste either in the aggregate (e.g. reclaimed asphalt pavement or reclaimed concrete material) or as a base; • Incorporating recyclable materials to reduce the volume and cost of new asphalt and concrete mixes. • Contracting of an ordinary waste and hazardous waste handler to collect and appropriately dispose wastes from camp sites • Collecting road litter or illegally dumped waste and managing it according to the recommendations in the General EHS Guidelines. • Provision of bottle and can recycling and trash disposal receptacles at parking lots to avoid littering along the road.	Contractor/KeNHA/Supervision Consultant	Monthly	- - As appropriate - As appropriate

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Surface water quality	• Grinding of removed, old road surface material and re-use in paving, or stockpiling the reclaim for road bed or other uses (Thika –Magumu-Njabini). Old, removed asphalt may contain tar and polycyclic aromatic hydrocarbons and may require management as a hazardous waste. • Develop and implement a Construction Waste Management Plan before start of the project. • Construct communal septic tank linked to a constructed wetland system. • Promote recycling of wastewater in construction activities. • Ensure wastewater is channeled and treated in sewerage plants or disposed in septic tanks • Ensure regular maintenance of plumbing system to avoid spillage of wastewater. • Discharge of partially treated sewage into septic tanks • Ensure regular maintenance of plumbing system and septic tanks to avoid spillage of raw sewage.	Contractor/KeNHA/Supervision Consultant	Monthly	- As appropriate - - - - -
Water Abstraction and Consumption	• Install water conserving taps and toilets. • Drainage structures that will be constructed –cross culverts, at the river courses be at appropriate positions.	Contractor/KeNHA/Supervision Consultant	Continuous	- As appropriate

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	• Stone pitching and side drains to cover meaningful lengths along the prone protection areas. • Timing of the construction of proposed bridges to coincide with dry periods when water levels in the rivers are low to avoid possible water pollution. • Contractor to avoid dumping of waste materials within the riparian zones/ within the watercourses. • Bitumen trucks should be washed at designated areas only.			-
Soil Erosion	• Ensure surface runoff generated on impervious surface is not channeled directly to steep slopes. • Provide grassed water ways along the access roads. • Construct flow breaks on roadside drainage channels. • The contractor will source building materials such as gravel, sand, ballast and hard core at the project locality. • Consultation should be held with the community members and their representatives on the best sites to source materials and rehabilitation measures should be agreed • All exhausted quarries and borrow pits should be isolated, protected and rehabilitated to usable state before the contract closure.	Contractor/KeNHA/Supervision Consultant	continuous	- - - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Loss of Vegetation Cover and Biodiversity	• Siting roads and support facilities to avoid critical terrestrial habitat by utilizing existing transport corridors. • Minimize clearing and disruption of riparian vegetation. • Provide adequate protection against scour and erosion and consider the onset of the rainy season with respect to construction schedules. • Minimize removal of indigenous plant species and replant indigenous plant species in disturbed areas. • Explore opportunities for habitat enhancement	Contractor/KeNHA/Supervision Consultant/KFS/KWS	Monthly	- - - As appropriate -
Health Aspect	• Develop a comprehensive STDS, HIV and AIDs awareness and control Programmes such as provision of condoms to workers both male and female. • Creation of awareness of STDs, HIV/AIDS in workers camps through trainings and installation of posters. • Adhere to and implement the Sexual Offences Act, 2006 and its amendment 2012.	Contractor/KeNHA/Supervision Consultant/County Governments	Monthly	As appropriate -
Road Safety	• Avoid long traffic diversion roads. • Water diversions to ensure dust is minimized hence easier visibility for drivers. • Ensure Installation and maintenance of all construction signs, signals, markings, and other devices used to regulate traffic, including posted	Contractor/KeNHA/Supervision Consultant	Periodically	- As appropriate As appropriate

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Occupational Health and Safety	speed limits, warnings of sharp turns, or other special road conditions. • Advance information on communication systems will be an advantage to users. • Make Traffic circulation changes as per the Traffic Act Cap 403. • Development of a transportation management plan for road construction that includes measures to ensure work zone safety. • Establishment of work zones to separate workers on foot from traffic and equipment by routing of traffic to alternative roads. • Use protective barriers to shield workers from traffic vehicles, regulation of traffic flow by warning lights, design of the work space to eliminate or decrease blind spots, and ensure reduction of maximum vehicle speeds in work zones. • Training of workers in safety issues related to their activities. • Ensure safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety apparel and proper illumination for the work space. • Barricade the area around which elevated work is taking place to prevent unauthorized access. • Use of the correct asphalt product for each specific application and ensuring	Contractor/KeNHA/Supervision Consultant	Monthly	- - - - - - - As appropriate -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Disturbance to flora and fauna	application at the correct temperature to reduce the fuming of bitumen during normal handling. • Training on correct PPE use and provision of adequate PPEs • Siting roads and support facilities to avoid critical terrestrial and aquatic habitat by utilizing existing transport corridors. • Avoidance or modification of construction activities during the breeding season and other sensitive seasons or times of day to account for potentially negative effects. • Minimize clearance and disruption of riparian vegetation. • Minimize removal of indigenous plant species, and replant indigenous plant species in disturbed areas. • Explore opportunities for habitat enhancement through reduced clearance to conserve or restore native species.	Contractor/KeNHA/Supervision Consultant/ KWS/KFS	Monthly	- - - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Possible Displacement of People	• Relocate all facilities affected in consultations with various parties affected with respect to water, sewerage, pipelines, and electricity. • Involvement and continuous consultation of key stakeholders and community members with respect to water, pipelines, and electricity at all stages of the project cycle. • Use of an integrated approach in planning public utilities by sharing most transport corridors for roads, water, sewerage, electricity lines, etc. • Provision of employment in the project for the squatters where possible. • Put in place a grievance redress mechanism as discussed in chapter Seven (7) of this report.	Contractor/KeNHA/Supervision Consultant	Continuous	As appropriate
Material Sites and Material Haulage	• Environmental impact assessments (EIA) to be undertaken prior to extraction of materials from identified sites and approved by NEMA. • Operations of the materials sites to be guided by respective management plans established and approved under the ESIA, • Material extractions and delivery should only be done during the day.	Contractor/KeNHA/Supervision Consultant	Quarterly	As appropriate - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	• If borrow pits and quarries are operated, they be fenced off. • Proper handling and management of liquid effluent and used waste oil to forestall incidence of surface water bodies • Any abstraction of water from the existing river systems or from boreholes should be undertaken after acquisition of the prerequisite licenses, • Rehabilitation of materials sites to take place upon exhaustion (Contractors will provide appropriate rehabilitation plans for each material site). • If commercial material sources are adopted, the Contractor(s) should ensure due diligence process is followed by the suppliers at all times, • Material extraction and haulage should be done in dump conditions to keep dust low, especially if it is located within settled areas.			- - - - - -
Operational phase				
Noise Pollution and Excessive Vibrations	• Enforcement of Traffic Act regulations to ensure that all vehicles using the road are in good condition all the time to avoid excessive noise generation. • Install speed control measures in town areas and near public institutions	Contractor/KeNHA	Monthly	- As appropriate

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	• Install no hooting signs in sensitive areas such as near schools, etc.			PPC
Impacts on flora and Fauna biodiversity	• Liaise with KWS to ensure that important wildlife crossing corridors and dispersal areas are not affected • Maintenance of road signs at appropriate areas to warn drivers on wildlife crossing paths.	Contractor/ KeNHA/KFS/KWS	Continuous	- As appropriate -
Increased Generation of Storm Water	• Use of storm water management practices that slow peak runoff flow, reduce sediment load and increase infiltration. • Regular inspection and maintenance of permanent erosion and runoff control features. • Use of vegetated swales, filter strips, terracing, check dams, detention ponds or basins, infiltration trenches and infiltration basins. • Repair works to be carried out in dry weather to prevent runoff of asphalt or cement materials.	Contractor/KeNHA	Continuous	- - - -
Loss of human and animal life due to increased road accidents	• Install speed calming measures next to public institutions , towns and settlement • Provide road signages all along the road • Conduct road safety sensitization programmes. • Carry out Risk Assessment to identify risk areas and provide appropriate prevention measures.	Contractor/KeNHA	Continuous	- - As appropriate -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Road Safety	• Installation and maintenance of speed control and traffic calming devices at pedestrian crossing areas. • Installation and maintenance of all signs, signals, markings, and other devices used to regulate traffic, specifically those related to pedestrian facilities • Installation and maintenance of all signs, signals, markings, and other devices used to regulate traffic, including posted speed limits, warnings of sharp turns, or other special road conditions. • Installation of measures to reduce collisions between animals and vehicles (e.g. use of signs to alert drivers on road segments where animals frequently cross). • Prepare an emergency preparedness and response plan in coordination with the local community and local emergency responders. • Comply with OSHA 2007 requirements, they include; o Carrying out Safety Audits. o Implementing DOSHS improvement orders. o Carrying out EHS Risk Assessments. • Involve all the relevant stakeholders during the audit so as to incorporate suggested EHS measures into the report.	Contractor/KeNHA	Continuous	As appropriate - - - - - - - - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Increased Generation of Solid Waste	• Maximizing the rate of recycling of road resurfacing waste either in the aggregate (e.g. reclaimed asphalt pavement or reclaimed concrete material) or as a base. • Incorporating recyclable materials to reduce the volume and cost of new asphalt and concrete mixes. • Collecting road litter or illegally dumped waste and managing it according to the recommendations in the General EHS Guidelines. • Provision of bottle and can recycling and trash disposal receptacles at parking lots and bus stops to avoid littering along the road. • Collecting animal carcasses in a timely manner and disposing them through prompt burial or other environmentally safe methods. • 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. • Management of all removed paint materials suspected or confirmed of containing lead as hazardous waste. • Grinding of removed, old road surface material and re-use in paving, or stockpiling the reclaim for road bed or other uses.	Contractor/KeNHA	Continuous	- - - As appropriate - - - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	• Ensure implementation of the project's operation phase Waste Management Plan. • Comply with EMCA Cap 387 Waste Management Regulations, 2006.			
Occupational Health and Safety	• When undertaking road repairs, use protective barriers to shield workers from traffic vehicles, regulation of traffic flow by warning lights, design of the work space to eliminate or decrease blind spots, and ensure reduction of maximum vehicle speeds in work zones. • Training of workers in safety issues related to road maintenance activities. • When undertaking road repairs, ensure safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety apparel and proper illumination. • When repairing the road, use asphalt product of appropriate specification and ensure application at the correct temperature to reduce the fuming of bitumen during normal handling. • Maintenance of work vehicles and machinery to minimize air emissions. • Reduction of engine idling time in construction sites; Use of extenders	Contractor/KeNHA	Continuous	- - - - - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	or other means to direct diesel exhaust away from the operator. • Ventilation of indoor areas where vehicles or engines are operated or use of exhaust extractor hose attachments to divert exhaust outside. • Carry out Safety Audits. • Implement DOSHS improvement orders.			- - -
Soil Quality Degradation	• Rehabilitate borrow areas. • Revegetate cleared areas. • Ensure proper drainage infrastructure along the road. • Used oil and spills should be disposed in an environmental friendly manner.	Contractor/KeNHA/Public	Continuous	As appropriate As appropriate - -
Risk of spread of invasive species	• Reduce open gaps in road reserves by planting appropriate tree species suitable for highway or road side tree planting • Monitor composition of species regenerating along road reserves and take prompt actions in case of emergence of invasive species • Carry out routine road reserves maintenance mainly to clear bushes that may harbor invasive species.	Contractor/KeNHA/Public	Continuous	As appropriate
DECOMMISSIONING PHASE				
Demolition waste	• Use of an integrated solid waste management system i.e. through a hierarchy of options: o Source reduction o Recycling	Contractor/KeNHA	at the time of decommissioning	- - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	○ Composting and reuse ○ Combustion ○ Sanitary land filling. • All buildings, machinery, equipment, and others that will not be used for other purposes must be removed and recycled/reused as far as possible. • All foundations must be removed and recycled, reused or disposed of at a licensed disposal site. • Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site. • Donate reusable demolition waste to charitable organizations, individuals and institutions.			- - - - - - -
Noise and Vibration	• Sensitize workforce including drivers of construction vehicles. • Install sound barriers for pile driving activity. • Install portable barriers to shield compressors and other small stationary equipment where necessary. • Proper maintenance of all equipment. • Workers near high level noise to wear safety and protective gear.	Contractor/KeNHA	at the time of decommissioning	As appropriate As appropriate - - -
Dust Emission	• Spray demolished piles of earth with water.	Contractor/KeNHA	at the time of decommissioning	As appropriate

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	• Avoid pouring dust materials from elevated areas to ground. • Cover all trucks hauling soil, sand and other loose materials. • Provide dust screen where necessary. • Implement an appropriate re-vegetation programme to restore the site to its original status. • Consider use of indigenous plant species in revegetation.			As appropriate As appropriate As appropriate
Site degradation		Contractor/KeNHA	at the time of decommissioning	As appropriate -

Conclusion: The successful construction and operationalization of the only missing link for B50 road will no doubt contribute to reduction of travel times and overall enhancement of socio-economic benefits, such as improved access to health care centres, schools, and better communication between settlements and market centres.
The impacts identified are manageable through application of mitigation measures wherever they occur. The findings of the Environmental and Social Impact Assessment (ESIA) study establish that the road project will elicit positive impacts on the socio-economic environment of the area. The key positive impacts will be a wider and safer transport network, increase in operation of public service vehicles, local economic stimulus, and creation of employment and business opportunities.

Recommendations: The proposed project will have both positive and negative impacts. The report has strived to give comprehensive mitigation measures and environmental management and monitoring mechanisms which if put in place will minimize or completely eliminate the possible negative impacts. If the environmental management and monitoring mechanisms developed in this report is strictly adhered to throughout the life of the project, then the project will be deemed sustainable.

CHAPTER 1.0: INTRODUCTION

1.1 Project Background

The Government of Kenya through KeNHA has earmarked funds to undertake final design, environmental and social impact assessment study in preparation for full construction of the proposed Isinya-Konza-Malili road project.

In Kenya, road transport is the predominant mode of transport carrying approximately 93% of all cargo and passenger traffic in the Country. The road network in Kenya has been established to be approximately 160,886 Km long, comprising of approximately 11,189Km of paved roads and 149,689Km of unpaved roads. The bulk of the road network in Kenya lies within the highly populated parts of the country, providing access to the rest of the Country. The Authority intends to upgrade most of her classified roads bitumen standards to facilitate the economic transformation of the entire country as well as giving access to citizens wherever the roads traverses.

The proposed Isinya-Konza-Malili road project was set out by three ranchers in 1980s to provide access to gypsum miners around Km 13 and later classified as a class E road under the jurisdiction of Kenya Rural Road Authority (KRRA). In 2018, the road was re-classified and upgraded to class B and became one of the important trunk roads transversing four counties namely Makueni, Machakos, Kajiado and Narok. It goes on to form an important link between A8 at Malili and A2 at Isinya, proceeding through Kiserian-Ngong-Kimuka before terminating at Suswa as B50 (This latter section is under construction to bitumen standards). Essentially, the only section of B50 remaining for upgrading is the proposed Isinya-Konza-Malili whose funds have been set aside for feasibility studies, detailed design and environmental and social impact assessment in preparation for full construction.

The environmental and social impacts assessment for the proposed upgrading of Isinya-Konza-Malili Road was conducted through both conventional and participatory approaches in order to ensure identification of potential environmental and social impacts and proposition of practical mitigation measures. This is in line with the Environmental Management and Co-ordination Act Cap 387 and Environmental Impact Assessment and Audit Regulations of 2003 and the environmental international best practices.

1.2 Objectives of the ESIA

The main objective of the ESIA study was to predict, assess, and analyze the possible positive and negative environmental and social impacts that are expected during the construction, operation and decommissioning phases of the project. This was done with the aim of proposing the possible mitigation measures for the highlighted negative impacts. This is in line with ensuring that the development does not impact negatively on the environment in terms of social, health, economic and physical (soil, water, plant and animals) state of the project site. The exercise was carried out in accordance with the Environmental Management and Co-ordination Act Cap 387 of Kenya (EMCA 1999, Revised 2015) and Environmental Impact Assessment and Audit Regulations of 2003 and international best practices.

The specific objectives were to:

- Identify all potential significant adverse environmental and social impacts of the proposed project and recommend mitigation measures;
- Ensure compliance with the environmental regulations and industry's standards;
- Generate baseline data for monitoring and evaluation of the success of the mitigation measures implemented during the project life cycle;
- Recommend cost effective measures to be implemented to mitigate against the expected impacts;
- Provide guidelines to stakeholders participating in the mitigation of adverse social impacts of the project;
- Prepare an environmental Impact Assessment Study report compliant to the Environmental Management and Coordination Act, EMCA Cap 387 and detailing findings and recommendations.

1.3 Terms of Reference

The terms of reference developed for this study were submitted to NEMA on the 8/06/2021 and refrenced 289.

1.4 Project Background, Overview, Justification and Objectives

1.4.1 Project Background

The proposed Isinya-Konza-Malili road project was set out by three ranchers in 1980s to provide access to gypsum miners around Km 13(former ranches have since undergone sub-division as a result of being proximal to Nairobi Metropolitan City) and later classified as a class E road under the jurisdiction of Kenya Rural Road Authority (KeRRA). In 2018, the road was re-classified and upgraded to class B and became one of the important trunk roads transversing four counties namely Makueni, Machakos, Kajiado and Narok. It goes on to form an important link between A8 at Malili and A2 at Isinya, proceeding through Kiserian-Ngong-Kimuka before terminating at Suswa as B50 (This latter section is under construction to bitumen standards). Essentially, the only section of B50 remaining for upgrading is the proposed Isinya-Konza-Malili whose funds have been set aside for feasibility studies, detailed design and environmental and social impact assessment in preparation for full construction.

The proposed road project is a Government of Kenya project being spearheaded by the Kenya National Highways Authority as the implementing agency with funding from Road Maintenance Levy Fund (RMLF). The full construction of the project road will enhance accessibility and socio-economic developments along the areas traversed and proceed to link the four counties (Makueni, Machakos, Kajiado and Narok) served by B50 road. Isinya-Ngong section of B50 road is already paved, whilst the section between Ngong-Suswa is currently under construction. In sum, the section between Isinya and Malili remains unpaved. In lieu of the above, the Government of Kenya through KeNHA intends to pave the unpaved section in

order to complete the whole B50 link road and consequently enhance economic transformation of the region.

1.4.2 Project Overview

The scope of the project shall be implemented under 3 No. phases as follows: **Phase 1:**

Detailed Design

- Review of the existing data on the proposed road project and social and economic activities in the project study area;
- Collection of social, environmental, and physical data that is necessary to assist in the design of the project road;
- Geological studies to inform on the ground conditions on the existing alignment on possible existence of fault lines and other tectonic plate movements;
- Detailed Materials Investigations for Pavement Design using design standards including preliminary costs estimates and implementation schedule;
- Detailed Engineering survey and design work for the optimum alignment and design standards including preliminary costs estimates and implementation schedule;
- Carrying out an environmental and social impact assessment study of the project area in relation to the proposed project.

Phase II: Works Supervision

- Review of the Contractor's work programmes and monitoring, on a day-to-day basis, of the Contractor's adherence to these programmes.
- Approval of the Contractor's proposed materials sites.
- Review and approval of the Contractor's traffic management plan
- Issuance of Site Instructions.
- Verification of quality of executed works and materials used.
- Verification of measurements and issuance of interim payment certificates.
- Monitoring contractor's work progress, Preparation of Progress Reports and advising the Engineer accordingly.
- Advising the Engineer on problems arising during the execution of the works.
- Arranging for the relocation of services.
- Monitoring of sound use of resources and protection of the environment.
- Requesting for assistance in HIV/AIDS awareness campaigns from the Ministry of Health.
- Co-ordinating with third parties, e.g. public utilities, traffic police.
- Analysis of any claims submitted by the contractor.
- Services at Taking Over of the works.

Phase III: Services during Maintenance Period

- Inspection of defect rectification works and maintenance.
- Services at End of Defects Liability of the works.
- Preparation of Final Completion Report, Final Accounts and As-built drawings.

1.4.3 Project Purpose and Objectives

The upgrading of the proposed project road is being upgraded to meet the following objectives and service needs both during construction and operation phases of the project:

- Improve the region's road network,
- Reduce travel time along and across the roads,
- Enhance the operational efficiency of the road,
- Promote economic growth within the region,
- Improve safety and reliability for all road users,
- Attract diverted traffic that will foster regional growth,
- Provide employment opportunities to local inhabitants, among other benefits

1.5 Scope of the ESIA Study

In order to identify the potential environmental and social impacts, and to come up with the proper mitigation measures for the proposed upgrading of Isinya-Konza-Malili road, the team utilized both conventional and participatory approaches.

In conducting this exercise, the team undertook:

- The reviewing of preliminary designs and alignment for the proposed project to get acquainted with environmental issues in the project site vicinity.
- The planning and preparing of a time schedule for the activities to be undertaken for the ESIA.
- Visiting the project site, and widely consulting with the local communities at local leaders and other relevant key stakeholders within the three counties traversed by the road.
- Carrying out a comprehensive assessment ensuring all environmental concerns and views of all parties/persons likely to be affected by the project are taken into consideration.
- Developing an environmental and social management plan with mechanisms for monitoring and evaluating the compliance and environmental performance, which include the cost of mitigation measures and the timeframe of implementing the measures.
- Publicizing the project in the local dailies and public spaces such as churches and centres.
- Liaising with NEMA for compliance with all mandatory and regulatory requirements relating to the ESIA.

1.6 Data collection methods and procedures

The data collection was carried out in two phase: Phase one entailed scoping followed by detailed biophysical, socio-economic data collection and stakeholders mapping between

February and March 2020. Stakeholders consultations were done focused on extensive public and stakeholders consultative engagements held from 4th- 13th September 2020 along the entire stretch. In total five meetings were done at the town centres between Isinya-Malili.

The ESIA Study was carried out in compliance with the government of Kenya's Environment Management and Coordination Act (EMCA Cap 387) and the Environmental (Impact Assessment and Audit) Regulations 2003, among other best practices.

The general steps followed during the assessment were as follows:

- Environment screening, in which the project was identified as among those requiring environmental impact assessment under schedule 2 of EMCA, Cap 387 Environmental scoping that provided the key environmental issues;
- Desktop studies;
- Physical inspection of the area and surrounding areas;
- ESIA Public participation via the use of questionnaires/ interviews/ meetings / focused group discussion;
- Data analysis; and
- Report preparation.

a. Environmental screening

This step was conducted through legal review and desktop studies to assess whether there will be a need for an environmental and social impact assessment, and what level of assessment is necessary. This was done using a screening checklist in reference to requirements of the EMCA Cap 387 specifically the second schedule. In line with the second schedule of the Environment Management Act EMCA Cap 387, all new roads including trunk roads are categorized as high-risk projects and require a TOR to be prepared and full ESIA Study be undertaken for submission to the National Environment Management Authority (NEMA) for approval.

b. Environmental scoping

The scoping process, through an ESIA scoping checklist, was conducted to help narrow down onto the most critical issues requiring attention during the assessment. Environmental issues were categorized into physical, natural/ecological and social, economic and cultural aspects. It also included discussions with key stakeholders, managers and design engineers as well as interviews with local communities.

c. Desktop study

Desktop study included document review on the nature of the proposed activities, project documents, designs, policy and legislative framework as well as the environmental setting of the area among others. The key documents reviewed included the following: -

- Integrated Counties Plans.
- Proposed road alignment reconnaissance visit findings.

- Kenya National and County Laws.
- International Best Practices
- Applicable Multilateral Environmental Agreement (MEAs).

d. Site assessment

Reconnaissance surveys along the route of traverse were conducted by the study team to familiarize with the site conditions and identify transects for further detailed investigation. Selected sites were then subjected to further detailed investigations and screening to document baseline conditions as a basis for anticipating Project Impacts.

e. Public participation

This activity whose progress and outcomes are reported in Chapter Five of this report was undertaken in fulfillment of the requirements of the Kenyan Constitution, 2010 and EMCA Cap 387 which require all project development to be proceeded by mandatory public consultation and stakeholder engagement as a measure of improving environmental and social sustainability of projects, enhancing project acceptance and making a significant contribution to successful project design and implementation. Public participation meetings were conducted various centres along the road project.

To ensure adequate public participation in the ESIA process, questionnaires were administered to the local communities, leaders, and the information gathered was subsequently synthesized and incorporated into the ESIA Study Report. Team has incorporated the concerns and views of all stakeholders and the affected people.

f. Data analysis, reporting and documentation

Upon data analysis, potential environmental impacts (both positive and adverse) were predicted based mainly on concerns raised by the public, stakeholders and expert observations on the ground and available tools. The magnitude, significance, and acceptability of predicted impacts were evaluated with a view to determining whether observed adverse impacts are significant enough to warrant mitigation. Impacts were further screened for occurrence and significance of residual (those which cannot be mitigated satisfactorily) and cumulative impacts with a view to providing a basis of making recommendations on the way forward for the project.

1.7 ESIA organization and structure

Based on the existing information, the ESIA study was carried out to full completion and processing is estimated to take another 45 days from the date of undertaking.

The ESIA study as proposed above culminated with production of this Study Report designed to ensure that the proposed development complies with the Environmental Management and Coordination Act (EMCA, Cap 387). The report is organized in 10 chapters as outlined below:

Chapter 1: Gives Background Information to the Study Describing the Objectives and the Terms of Reference.

Chapter 2: Project Description.

Chapter 3: Gives the Policy, Legal and Regulatory Framework Policy, Legal, Institutional and Administrative Framework. Study Area.

Chapter 4: Outlines the Baseline Information of the

Chapter 5: Summarizes the outcome of the Stakeholder Engagement and Public Consultations process.

Chapter 6: Project Alternatives to the Project.

Chapter 7: Grievance Redress Mechanism Identification of Potential Impacts of the Project.

Chapter 8: Analysis of Environmental Impacts

Chapter 9: Environmental and Social Management Plan (ESMP).

Chapter 10: Climate Change

Chapter 11: Concludes the findings and recaps the main recommendations.

Chapter 12 References

Appendixes

The implementation of ESMP is a core part of the project implementation from design to completion stage and is expected to be adopted by the contractor and supervising consultant with close monitoring on its adherence by KeNHA.

CHAPTER 2.0: PROJECT DESCRIPTION

2.1 Introduction

The Government of the Republic of Kenya has earmarked funds through the Development Vote for use in undertaking final design, environmental and social impact assessment study in preparation for full construction of Isinya-Konza-Malili road project. The development of the road will provide an important missing link that connects roads A2 and A8 i.e. connection for Narok-Kajiado- Machakos and Makueni or Mombasa traffic. The link road is envisioned to promote social welfare, economic activities and provide a wider road network to the proposed Konza City and its environs within the project's zone of influence. Previously, the proposed road was a class E road under the jurisdiction of KeRRA but was later re-classified and upgraded to class B (coded B50) in 2018. The road project transverses three counties of Kajiado, Machakos and Makueni. It runs from Malili town through Konza, Isinya, Kiserian, Ngong, and Kimuka and terminates at Suswa town, Narok County.

2.2 Project Objective

The objective of the assignment is to provide the Government of Kenya through the Kenya National Highways Authority (KeNHA) which is the implementing road agency, with sufficient information from studies, investigations, enquiries and designs presented in form of drawings, bills of quantities and reports to enable upgrading of Isinya -Konza -Malili (B50) Road to bitumen standards and same time dualling.

The upgrading of the road to bitumen standards is envisioned to increase the traffic capacity thereby reducing travel time and vehicle operating cost as well as enhancing road safety.

2.3 Project Details

The project road commences at Isinya Town at the junction of Athi River-Namanga Road (A2) and B50 Roads and ends at Malili Town at the junction with Mombasa-Nairobi Road (A8). The project road is approximately 50Km long, mainly located in Kajiado County (38Km) and short sections in Machakos and Makueni Counties. The road traverses a rolling terrain and land with very high potential for livestock and horticulture farming.

The width of the existing Right of Way (ROW) ranges between 15m and 18m for Class E road, but the road has since been reclassified to Class B road. This will necessitate the widening of the road corridor to a minimum of 60m thereby translating to major land acquisition in order to achieve the requisite ROW for the project road.

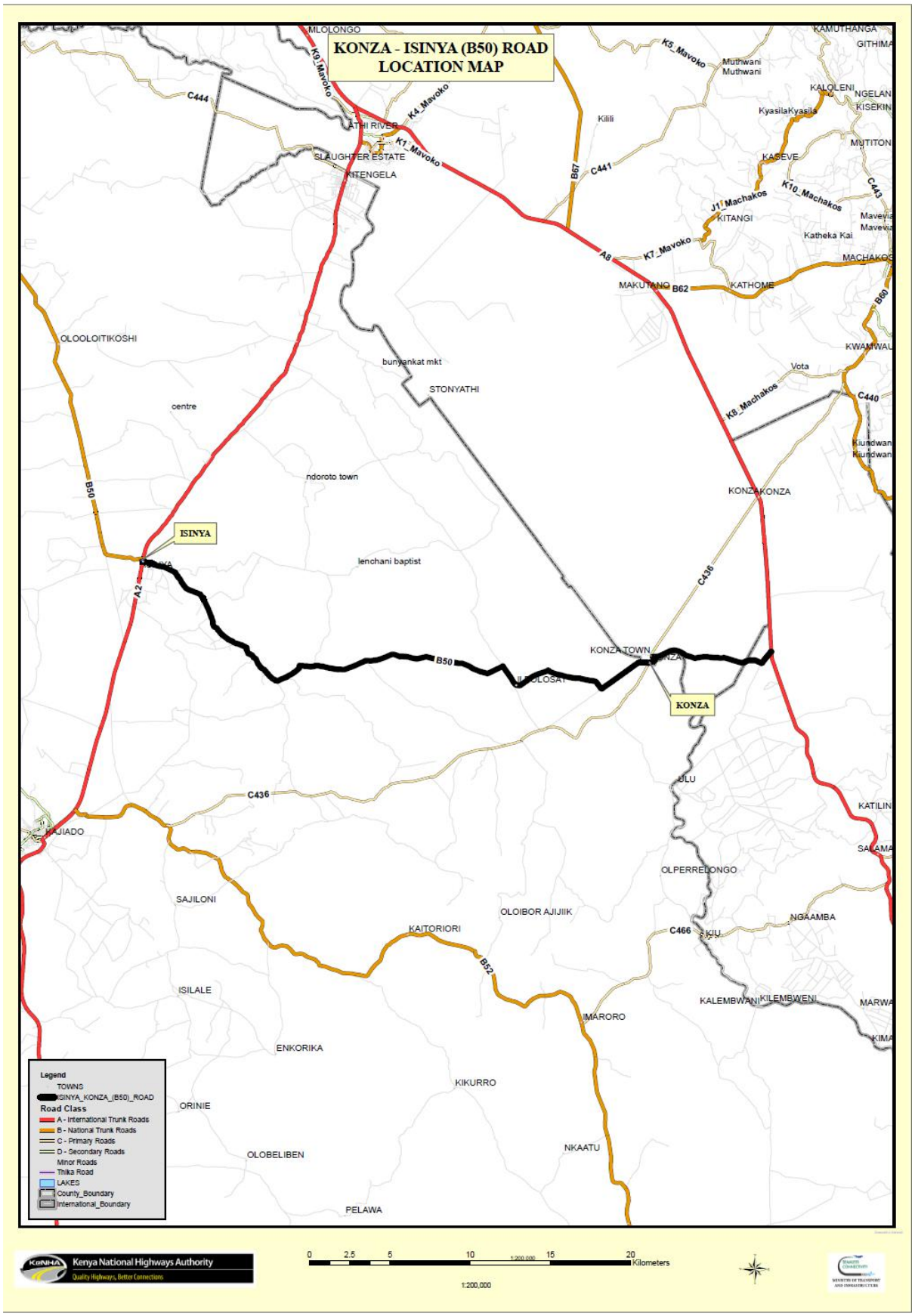


Figure 1: Map showing Isinya-Konza-Malili Road Section

2.4 Project activities and processes

The project has **4** major phases:

i. Pre-construction (planning and design) phase.
ii. Construction phase.
iii. Operational phase.
iv. Decommissioning phase.

A. Planning and design phase

This is the initial phase of the whole road construction project. It involves the following activities:

i. Preliminary design

The preliminary design entails the following:

a. Review of the existing data on the proposed road project and social and economic activities in the project area.
b. Collection of social, environmental and physical data that is necessary to assist in the design of the project road.
c. Preliminary engineering survey and design work for the optimum alignment and design standards. These includes;
    - Topographical surveys
    - Hydrological and hydraulic studies
    - Sub-surface soil exploration
    - Material surveys (borrow sites, quarries and water sources) and
    - Field and laboratory soils and materials investigations
d. To carry out an Environmental Impact Assessment of the project area in relation to the proposed project.

ii. Detailed design

The detailed design entails:

a. Comprehensive field surveys.
b. Soils and material investigation.
c. Drainage and bridge site investigation.
d. Geometric designs.

iii. Road Design

The road runs through three former group ranches which since have been subdivided into individual parcels. During demarcation exercise, some section of road was moved from the existing location to new corridor between Km 11+000 to 14+300 without factoring in corridor width which averages currently at 18m.

Design Philosophy

The following general design philosophy has been used as a guideline for the geometric design of the project road: -

Achievement of economic design which will result in optimum balance between the construction and overall road user costs.

Investigation of alternative alignments, pavement and structural design proposals with a view of obtaining optimum alignment that is commensurate with the requirements of Road Design Manuals.

Provision of road alignments that are safe and aesthetically pleasing and that maintain harmony between the road and the surrounding environment, while minimizing any negative impacts on the environment.

Design Route Lengths and Proposals

The following table shows the various Lengths of the Project Roads consisting of the main carriageway from Isinya -Konza-Malili and associated town roads.

Table 2.1: Project Road Lengths.

Type		**Proposed Route**	**Lengths**
a	Dual Carriageway	Isinya- Konza -Malili The road bypasses Isinya, Konza and Malili towns	43.5 Kms
b	Urban Road	Isinya town road	3.2 Kms
		Konza town road	5 Kms
		Malili town road	2 Kms
c	Rural Road	Konza Techno polis Access road	3 Kms

The following table shows the various project roads consisting of the main carriageway from Isinya-Konza-Malili, bypass routes and town roads whose design has been carried out.

Table 2.2: Proposed Routes

Type		**Proposed Route**	**General provisions**
a	Dual Carriageway	Isinya- Konza -Malili The road bypasses Isinya, Konza and Malili towns	Dual carriageway 2 lanes mixed traffic on either direction, 12- 15 m wide median, 2 lane service roads on either side
b	Urban Road	Isinya, Konza & Malili	Single Carriageway 2 lane 2-way Road
c	Rural Road	Konza Techno polis Access road	Single Carriageway 2 lane 2-way Road

Road Configuration Option

During Preliminary Stage, the road was generally designed as a rural single carriageway that mostly followed the existing corridor. The geometrics had been greatly improved and it was causing heavy demolitions especially in town sections. In Konza Town alone, the project road would have crossed the MGR lines twice, with one railway crossing too adjacent to the Konza Meter Gauge Railway Station with several crossings and government staff houses for Kenya Railways Corporation (KRC) and warehouses for National Cereals & Produce Board (NC&PB).

Consequently, future projections of traffic data prompted the decision to design the project road to dual carriageway standards but would be subjected to stage construction. After careful considerations of the above cost implications, it was therefore prudent to realign the road to bypass the towns of Konza, Isinya and Malili in order to achieve most economical, safe and adequate design. Grade-separated junctions will be provided at both Isinya and Malili towns at the newly acquired reserve for smooth flow of through traffic into and out of A2 & A8 roads

Design Output

The horizontal alignment of the project road has been realigned at some sections either to minimize built land acquisition or to avoid marshy grounds while attaining good geometry of the road.

a) Isinya and Malili Interchanges

Proposal for Trumpet junctions at Isinya and Malili towns has been done on a new corridor to be constructed as a future carriageway. The road was realigned at these particular sections to avoid expensive property compensation at both Isinya and Malili Shopping Centres by acquiring the vacant land adjacent to the towns.

b) Km 9 to Km 13

The delineated corridor is on marshy grounds established to be the old abandoned gypsum mining sites filled with storm water. Therefore, the proposed dual carriageway has been realigned almost 1 km away to avoid expensive earthworks required and anticipated drainage issues in future while improving the geometry of the road.

c) Konza Bypass

The existing alignment goes through SGR underpass and immediately crosses an old MGR line before crossing several other MGR lines near the old Konza Railway Station. This poses great challenge for a dual carriageway to be constructed without incurring expensive demolitions in Konza town and construction of at least two (2) road over rail long span bridges. Therefore, realignment was deemed necessary to bypass Konza town and acquire new corridor over expensive compensations and costly structures required.

Construction phase

Setting out

The construction works shall start with setting out the alignment of the road. Reference pegs shall be 50mm in section 600mm long driven into ground and painted white above the ground. The offset from the centerline shall be indicated by small nail 20mm to 25mm long with its head driven flush with the top of the peg. Chainage, off-set and reference elevation would be indicated to the sides of the peg to the satisfaction of the proponent. After cutting of benches and prior to commencement of earthworks or sub-grade works, Contractor shall take commencement cross-sections again and submit the copy of the same to proponent for agreement. These cross-sections shall then be used as basis of measurement for all subsequent layers, unless otherwise stated.

Clearance of the alignment and creation of diversions

This will involve clearance of the site on road reserve including removal of trees, hedges and other vegetation and any deleterious materials, grub up roots, backfilling and compaction to 100% MDD (AASHTOT99) with approved material. It would also involve removal of topsoil to a maximum depth of 200mm. When instructed by the Engineer, the Contractor shall demolish or remove structure and any other obstruction from the road reserve.

Earthworks

Earthworks will involve:

- Filling in soft material including benching of embankments and compaction to 95% MDD (AASHTO T99) in layers not exceeding 150mm.
- Filling in hard material (rock fill in selected sections).
- Cutting to spoil both hard and material.
- Landscaping and grassing.

Specifically, this stage would involve:

Preparation prior to forming embankment

Where benching is required for existing pavement to accommodate earthworks sub-grade or sub- base for widening the road, the rate for compaction of existing ground shall be deemed to cover this activity.

Excavation in the pavement of the existing road shall be kept dry. In the event of water penetrating the underlying layer, construction of the subsequent layers shall be postponed until the underlying layers are dry enough to accommodate the construction plant without deforming or otherwise showing distress.

Step construction shall be carried out per layer at the joint where excavating, both vertically and perpendicular to the direction of the travel. The step shall be 500mm perpendicular to the direction of the travel and 150mm vertical unless otherwise instructed by the Engineer.

Construction of embankments

Only material approved by the Engineer shall be used for fill in embankments.

Material with high swelling characteristics or high organic matter content and any other undesirable material shall not be used, unless specifically directed by the Engineer.

Unsuitable material shall include:

- All material containing more than 5% by weight or organic matter (such topsoil, material from swamps, mud, logs, stumps and other perishable material).
- All material with a swell of more than 3% (such as black cotton soil) All clay of plasticity index exceeding 50.
- All material having moisture content greater than 105% of optimum moisture content (Standard Compaction).

Embankment repair

Where directed by the Engineer, any localized filling in soft, hard or natural; selected material requirements shall be executed.

Compaction of earthworks

At pipe culverts, all fill above ground level around the culverts shall be compacted to density of 100% MDD (AASHTO T.99) up to the level of the top of the pipes or top of the surround(s), if any and for a width equal to the internal diameter of the pipe on either side of the pipe(s) or surround(s) as applicable.

At locations adjacent to structures, all fill above ground level up to the underside of the sub-grade shall be compacted to density of 105% MDD (AASHTO T.99). In case of fill around box culverts this should be carried out for the full width of the fill and for a length bounded by the vertical plane passing through the ends of the wing walls.

Compaction of sub-grade material (i.e. material immediately below formation) in cut areas shall not be carried out by the contractor in areas where the formation is formed in hard material, unless specific instructions to the contrary are issued by the Engineer.

Where improved sub-grade material shall be required, this shall be compacted and finished to the same standards and tolerances as those required for normal sub-grade and clauses in the specifications applying to normal sub-grade shall also apply.

Mass-haul diagram

The Contractor will prepare a mass haul diagram and will also be responsible for locating suitable materials for constructing earth-works along the alignment and elsewhere.

Borrow pits

Fill material which is required in addition to that provided by excavation shall be obtained from borrow pits to be located and provided by the Contractor but to the approval of the Resident Engineer.

Top soiling, grassing and tree planting

Top soiling and Grassing will be done as per specifications for Roads and Bridges 1986 and as guided by road engineer. Cleared trees will be compensated by planting suitably adapted and native tree species at the project site or its environs.

Sub-grade

Sub-grade shall mean upper 300mm of earthworks either in-situ or in fill and sub-grade shall be provided, as part of earthwork operation and payment shall be made as 'fill'. The material for sub- grade shall have a CBR of not less than 15% measured after a 4-day soak on a laboratory mix compacted to a dry density of 100% MDD (AASHTO T99) and swell less than 1%.

Excavations and filling for structures

The major activities would be:

- Excavations and backfilling for gabions in soft material.
- Excavation in soft materials for culverts and foundations for piers and abutments.
- Placement for gabions and mattresses as directed by the engineer.
- Rock-filing gabions.
- Placement of 200mm thick pitching including grouting to aprons upstream/downstream of bridges, culverts and drains.

Culverts and drainage works

The construction of culverts and drains would involve the following activities:

- Excavations in both soft and hard material for pipe culverts, headwalls, wing walls aprons, toe walls and drop inlets.
- Placement of class 20(20) concrete to headwalls, wing walls, aprons, inlets and outlets to pipe culverts including formwork.
- Excavations for side drains, mitre, drains cut-off drains and outfall drains.

The Contractor shall excavate and remove all existing blocked or collapsed culvert pipes of 450mm, 600mm and 900mm diameter including concrete surround, bedding, and inlet and outlet structure. The void left after removal of culvert pipes shall be widened as necessary to accommodate new concrete bedding, pipe and hunching.

Plate 1: Sample bridges that will be replaced during construction (a) drift at Km 10 b) 4-cell pipe culverts at Km 23

Storm water management plan

Storm water management plan will address storm water quantity and quality and how to protect ecological, social/cultural and economic values. The plan will be used to aid decision making to ensure that remedial measures (structural and non-structural) are undertaken in a cost-effective, integrated and coordinated manner and that the decisions made with regard to the project take into full account implications for storm water impacts.

Plate 2: a) Poor drainage at Isinya town b) storm water drainage at Isinya town to be replaced

Construction of deviations for traffic

The contractor would construct deviations roads, minimum width 6m thickness of gravel 150mm minimum CBR 20. The construction would also involve erection and maintenance of signage and barriers along the route.

Transportation and treatment of construction materials

Some of the major materials to be used in the construction of the road include:

- Natural gravel;
- Water;
- Ordinary Portland cement and lime;
- Bitumen;
- Kerosene;
- Wrought Shuttering Timber; and
- Mild Steel.

A materials data schedule will be maintained and updated as necessary highlighting source, quantities and date of receipt of materials and in the converse materials going out, where utilized and date utilized.

Concrete works

All concrete works would be done according to the specifications as provided in the engineering design.

Formwork for culvert walls and slabs

This work shall consist of all temporary moulds for forming the concrete for culvert walls and slabs together with all temporary construction for their support. Unless otherwise directed by the Engineer all formworks shall be removed as required on completion of the walls and slabs.

Materials

Forms shall be made of wood or metal and shall conform to the shape, lines and dimensions shown on the Drawings.

All timber shall be free from holes, loose material, knots, cracks, splits and warps or other defects affecting the strength or appearance of the finished structure.

Release Agents – Release agents shall be either neat oils containing a surface activating agent, cream emulsions, or chemical agents to be approved by the Engineer.

Construction method

A. Formworks

Formworks shall be designed to carry the maximum loads that may be imposed, and so be rigidly constructed as to prevent deformation due to load, drying and wetting, vibration and other causes. After forms have been set in correct location, they shall be inspected and approved by the Engineer before the concrete is placed.

If requested, the contractor shall submit to the Engineer working drawings of the forms and also, if requested, calculations to certify the rigidity of the forms.

Unless otherwise described in the Contract, all form joints for exposed surfaces of concrete shall form a regular pattern with horizontal and vertical lines continuous throughout each structure and all construction joints shall coincide with these horizontal and vertical lines. PVC pipes of 50mm diameter for weep holes shall be arranged as shown on the Drawings.

Unless otherwise specified, formwork shall be designed to form chamfers at all external corners whether or not such chamfers are shown on the Drawings to prevent cracks and other damage from arising.

The inside surface of forms shall be cleaned and coated with a releasing agent to prevent adhesion of the concrete. Release agents shall be applied strictly in accordance with the manufacturer's detailed instructions. The release agent shall be applied to the formwork prior to erection. Release agent must not come into contact with reinforcement. Immediately before concrete is placed, the forms shall be thoroughly cleaned and freed from sawdust, shavings, dust, mud or other debris by hosing with water. Temporary openings shall be provided in the forms to drain away the water and rubbish.

i) Scaffolding

All scaffolding required to support the forms shall be designed and constructed to provide necessary rigidity and support the loads without appreciable deflection or deformation.

Details, plans and structural and flexural calculations for scaffolding shall be submitted to the Engineer for approval, but in no case, shall the contractor be relieved of his responsibility for the results obtained by use of these plans, etc.

ii) Removal of formwork

The time at which the formwork is truck shall be the Contractor's responsibility and the forms shall not be removed until the concrete strength has reached 20 N/mm^2.

iii) Concrete works of culvert walls and slabs

This work shall consist of furnishing, mixing, delivering and placing of the concrete for the construction of culvert walls and slabs, in accordance with these Specifications and in conformity with the requirements shown on the Drawings.

iv) Concrete materials

a. Cement

Cement shall be of Ordinary Portland Cement type CEM 1, 42.5 and shall conform to the requirements of K.S. 02-21 or equivalent.

The contractor shall select only one type or brand of cement or others. Changing of type or brand of cement will not be permitted without a new mix design approved by the Engineer. All cement is subject to the Engineer's approval; however, approval of cement by the Engineer shall not relieve the Contractor of the responsibility to furnish concrete of the specified compressive strength.

Conveyance of cement by jute bags shall not be permitted. Storage in the Contractor's silo or storehouse shall not exceed more than two (2) months, and age of cement after manufacture at mill shall not exceed more than four (4) months. The Contractor shall submit to the Engineer for his approval the result of quality certificate done prepared by the manufacturer.

Whenever it is found out that cement have been stored too long, moist, or caked, the cement shall be rejected and removed from the project.

b. Aggregates

Fine and coarse aggregates must be clean, hard, strong and durable, and free from absorbed chemicals, clay coating, or materials in amounts that could affect hydration, bonding, strength and durability of concrete.

c. Water

All sources of water to be used with cement shall be approved by the Engineer. Water shall be free from injurious quantities of oil, alkali, and vegetable matter and salt as determined by the Engineer.

d. Admixture

Only admixture, which have been tested and approved in the site laboratory through trial mixing for design proportion shall be used.

Before selection of admixture, the Contractor shall submit to the Engineer the specific information or guarantees prepared by the admixture supplier.

The contractor shall not exclude the admixture from concrete proportions.

e. Proportioning concrete

The Contractor shall consult with the Engineer as to mix proportions at least thirty (30) days prior to beginning the concrete work. The actual mix proportions of cement, aggregates, water and admixture shall be determined by the Contractor under supervision of the Engineer in the site laboratory.

The Contractor shall prepare the design proportions which has 120% of the strength requirement specified for the designated class of concrete.

No class of concrete shall be prepared or placed until its job-mix proportions have been approved by the Engineer.

i. Concrete work

i) Batching

Batching shall be done by weight with accuracy of:

1) Cement: ½ percent
2) Aggregate: ½ percent
3) Water and Admixture: 1 percent.

Equipment should be capable of measuring quantities within these tolerances for the smartest batch regularly used, as well as for larger batches.

The accuracy of batching equipment should be checked every month in the presence of the Engineer and adjusted when necessary.

ii) Mixing and delivery

Slump of mixed concrete shall be checked and approved at an accuracy of +25mm against designated slump in these specifications.

iii) Concreting at night

No concrete shall be mixed, placed or finished when natural light is insufficient, unless an adequate approved artificial lighting system is operated; such night work is subject to approval by the engineer.

iv) Placing

In preparation of the placing of concrete, the interior space of forms shall be cleaned and approved by the engineer prior to placing concrete. All temporary members except tie bars to support forms shall be removed entirely from the forms and not buried in the concrete. The use of open and vertical chute shall not be permitted unless otherwise directed by the engineer. The contractor would provide a sufficient number of vibrators to properly compact each batch immediately after it is placed in the forms.

Road furniture

This would involve the erection of concrete posts and flex-beam guardrails complete with spacers at 3810mm intervals. The contractor will also be required to provide and erect permanent road signs where instructed by the resident engineer and in accordance to special specifications. They will include:

- Warning signs.
- Priority, prohibitory and mandatory signs.
- Standard informatory signs.

- Non-standard informatory signs.

Along with the physical signs the contractor would be required to provide and deliver air tight corrosion resistant 20 liters containers approved white paints and yellow (reflectorized) and mark the road as directed by the engineer. The works would also involve provisions of road studs both unidirectional and bidirectional of stimsonite nature or similar.

Edge marker posts

Edge marker posts shall be provided as directed by the Engineer and in compliance with standard Specification Clause 2003.

Permanent road signs

Permanent Road Signs shall be provided as directed by the Engineer and in compliance with the requirements of the "Manual for Traffic Signs in Kenya" Part II and Standard Specification clause 2004. Old signs to be reused should also be tested.

Existing road signs

Where directed by the Engineer, the Contractor shall take down road signs including all posts, nuts, bolts and fittings, and remove and dispose of the concrete foundation and backfill the post holes. The signs shall be stored at the Contractor's store and they shall become the property of the proponent who shall remove them prior to the expiry of the maintenance period. Measurement and payment for taking down road signs shall be made by the number of signs of any type and size taken down, cleaned and stored as directed.

Where a salvaged existing sign complies with the requirements of new road signs, the Engineer may instruct the Contractor to remove the sign for safe storage, and re-erect it.

Measurement and payment shall be made by the number of road signs re-erected as directed and the rate shall include for excavation, concrete foundations and backfilling around posts and removal of surplus material to spoil.

Road marking

Paint for road marking shall be internally reflectorized hot applied thermoplastic material (with Ballotini beads) in accordance with Clause 218 d (ii) of the Standard Specification. The Ministry of Public Works Materials Branch must approve this reflectorized paint inclusive of the Ballotini beads.

Guardrails

Guardrail posts shall be concrete 210mm x 210mm x 1710mm set vertically at least 1.2m into the shoulder as directed by the Engineer. Beams for guardrails shall be "Armco Flex beam" or similar obtained from a manufacturer approved by the Engineer and tested to ensure compliance with AASHTO M180.

Vertical joints

Vertical joints between adjacent Kerbs shall not be greater than 5 mm in width and shall be filled with a mortar consisting of 1:3cement: sand by volume.

Transition between flush and raised kerbs

The transition between flush and raised kerbs (e.g. at bus bays) shall be termed as ramped kerbs. The transition between flush and raised kerbs shall occur within a length of 2.0 m.

Kilometre marker posts

Kilometer marker posts shall be provided as directed by the Engineer and in compliance with Standard Specification clause 2008.

Rumble strips

Where directed by the Engineer, the Contractor shall provide, place, trim, shape and compact to line and level asphalt concrete rumble strips on the finished shoulders. This shall be done to the satisfaction of the Engineer

Construction plant

The plant would have the following machinery for construction purposes: graders, vibrating rollers, wheel loaders, tipper, water bowsers, concrete mixers, concrete vibrators among others

Quarries, borrow pits, stockpiles and spoil areas

a) Provision of land

The Contractor will make available any land for quarries, borrow pits, stockpiles and spoil areas, except for those areas in road reserves specifically approved by the resident engineer. The contractor will be entirely responsible for locating suitable sources of materials complying with the Standard and Special Specifications and for the procurement, mining, haulage to site of these materials and all costs involved therein. Similarly, the contractor will be responsible for the provision and costs involved in providing suitable areas for stockpiling materials and spoil dumps. Should there be suitable sites for spoil dumps or stockpiles within the road reserve forming the site of the works the Contractor may utilize these subject to the approval of the Engineer.

Safety and public health requirements

This is an integral part of the project especially during the construction phase. Warning and advisory notices, drugs and condoms would be provided for throughout the project duration. The contractor shall allow for qualified professionals to conduct lectures to the workers regarding the spread of HIV/Aids.

Summary project activities

The major Works to be executed under the Contract comprise mainly of but are not limited to the following: -

- Limited site clearance and top soil removal.
- Earthworks.
- Preparation of the sub-grade to receive the pavement layers as per the standard specifications.

- Provision of cement improved gravel for road sub-base of the specified thickness.
- Dense Bitumen Macadam (DBM) road base of the specified thickness.
- Provision of 50mm thick asphaltic concrete Type 1 binder course.
- Provision of a single surface dressing using 14/20 mm pre-coated class 4 chippings for the carriageway and using 6/10 mm pre-coated class 4 chippings for the shoulders. The shoulders shall be constructed with the same material and thickness as for sub-base, base and surfacing.
- Construction of culverts and other drainage works.
- Protection works using stone pitching and gabions as necessary.
- Relocation of services as necessary.
- Installation of kerb stones where instructed.
- Provision of road furniture, including road marking and traffic signs.
- Landscaping including top soiling and grassing.
- Maintenance of passage of traffic through and around the works.
- Any other activity not listed above in either category but deemed to be necessary by the Engineer, shall be subject to the Engineer's formal instructions and within the mode of payment stipulated either by day works or on a measured basis.

B. Operation phase activities

The Contractor will be required to remedy any defects during the Defects Liability Period. The major items of work during Defects Liability period included in the contract are as follows:

- Repair of any defects on the road and road furniture;
- Removal of construction camps, removal of un-used material stockpiled on the road, tidying and general cleanness of the road and construction sites.

C. Decommissioning phase

Decommissioning refers to the final disposal of the project and associated materials at the expiry of the project life span. In respect to the road, decommissioning is not anticipated. (Details of the Decommissioning Plan are highlighted on Chapter 9, subsection 9.3.10)

Table 1: The products, by products and waste generated during project cycle

Project activities	Material /equipment to be used	Waste/by products generated	Disposal method
1 Planning and Design Phase – No anticipated physical activities or processes			
2 Construction Phase			
Clearing the site	-Power Saws -Caterpillars	-Cut vegetation -Rock debris -Noise (by power saw)	-Soil to be used for backfilling -Wood would be used as fuel and in the construction of workers houses. -Good maintenance of machines being used.
Excavation/Earthworks including removal of topsoil	-Excavation equipment's including caterpillars, haulers etc.	- Soil -Roots -Noise	- Soil to be used for backfilling and landscaping
Transportation of materials & maintenance of equipment's	Trucks Fuel, spare parts and lubricants oil	-Fumes -Used oil, and other lubricants	-Used oil/grease to be reused for lubricating movable parts of equipment
Construction/Building Materials	-Machine cut stones -Steel -Cement - Soils -Paving slabs -Timber -Nails, galvanized iron sheets -Gravel, sand -Glass -Bitumen -Oil -Water	-Stone /Rock Debris - Timber Splits - Broken Glass - Nails and Iron Sheets Cuts - Piping Remains - Plastic Waste - Oil and Greases Spills - Waste Water - Used Containers	-Soil and rock debris would be used for landscaping & back filling the reserves -Timber splits would be used for firewood and burning of tar etc. -Plastic waste should be resold to waste collectors or dumped in appropriate designated sites. -Metallic containers can be reused in storage of other materials or be sold to dealers. -Metallic wastes can be recycled or be sold to dealers.

	-Packaging Materials - Pipes and PVC -Oil and Grease - Storage Containers E.g. Drums - Paints		-Waste water can be recycled by watering diversions to control dust. -Oils and grease should be reused, be sold to dealer or be disposed of in areas.
Human Consumables	-Stationeries - Computers - Photocopiers - Clothing Materials - Vehicles - Medicines - Reagents -Food and Water	-Used paper -Obsolete/ spoilt clothing, computers, photocopiers and vehicle parts -Human waste -Expired drugs and reagents	-Sell waste paper to dealers. -All obsolete materials should be carefully sorted, stored and sold to dealers. -Septic tanks should be provided in all the workmen's camps and disposed of appropriately in designated sites.

Post construction and operations phase activities

Table 2: Post constructions and operations phase activities

Post constructions and operations phase			
Project activities	**Material /equipment to be used**	**Waste/by products generated**	**Disposal method**
Workmen's Camps	All Associated Building Materials	Unusable materials e.g. broken timber, glass	Should be removed and disposed in accordance to waste categories
Construction Machinery	All Machines		Should be sold to dealers or be used in other projects

Road repairs due to accidents, old age breakdowns etc.	Bitumen Oil and Greases Sand and Gravel	Removed materials or road cover including the base materials	Should be transported to designated municipal sites.
Vehicles involved in accidents		Vehicle wreckages	Should be towed away to garages or other regulatory recommended areas

2.4 Project cost

The total estimated construction cost for Dualling of Isinya-Konza-Malili Road is 6 billion.

CHAPTER 3.0: POLICY, LEGAL AND REGULATORY FRAMEWORK

3.1 Introduction

The Government's policy on road transport is to provide efficient and reliable road network to spur Socio-economic development and improve security. Under the administrative framework, the National Environment Management Authority (NEMA) is responsible for ensuring that Environmental Impact Assessments (EIAs) are carried out for new projects and environmental audits on existing facilities as per the requirements of the Environmental Management and Coordination Act (EMCA, Cap 387). Projects subject to this requirement are specified in the Second Schedule of the EMCA, Cap 387.

In Kenya, it is a legal requirement that any proposed project of the scale described in this report should undergo an Integrated Environmental and Social Impact Assessment. These requirements are stipulated in the Environmental Management and Coordination Act (EMCA, Cap 387) and EIA/EA Regulations 2003. This section outlines the Policy, Legal and Institutional framework pertaining to the proposed road development project.

3.2 Policy and institutional framework

3.2.1 The Constitution of Kenya of 2010

The Constitution of Kenya has taken onboard various issues that are related to environmental management. Article 42 of the Bill of Rights contained in the Constitution provides that 'every Kenyan has the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative and other measures'.

Chapter 5 of the Constitution is dedicated to land and the environment. The Constitution requires that land be used and managed in a manner that is equitable, efficient, productive and sustainable. Part 2 of Chapter 5 of the constitution is dedicated to Environment and Natural Resources. Article 69 in Part 2 provides that the state shall provide encourages efforts towards sustainable of natural resources, increasing of the national forest cover public participation in the management, protection and conservation of the environment, protection of genetic resources and biodiversity, environmental impact assessment, environmental audit and monitoring of the environment, etc. The proposed project should ensure compliance with the constitutional requirements in as far as equitable sharing of the resources between various stakeholders is concerned on matters of sustainability of livelihoods and biological resources public participation Resettlement Action Plan among others.

The Kenyan constitution also gives prominence to public participation; as a general national value in environmental protection. Article 69(1) states that the State shall encourage public participation in the management, protection, and conservation of the environment.

3.2.2 National policy framework

The Republic of Kenya has a policy, legal and administrative framework for environmental management. The broad objectives of the national environmental policy in Kenya are: -

- To ensure optimal use of natural resources while improving environmental quality.
- To conserve natural resources such that the resources meet the needs of the present without jeopardizing future generations in enjoying the same.
- To develop awareness that inculcates environmental stewardship among the citizenship of the country.
- To integrate environmental conservation and socio-economic aspects in the development process.
- To ensure that national environmental goals contribute to international obligations on environmental management and social integrity.

To achieve the above policy objectives, it is a policy directive that appropriate reviews and evaluations of all forms of developmental project plans and operations are carried out to ensure compliance with the environmental policy and legal frameworks. The following section provides details on the relevant policies in the country.

a. Sessional Paper No. 10 of 2012 on Kenya Vision 2030

Kenya Vision 2030 is a comprehensive national development plan for period 2008 to 2030. The plan was developed following successful implementation of the Economic Recovery Strategy for Wealth and Employment Creation which ensured the country's economy was back on the path for realization of rapid economic growth since 2002. The county's GDP growth rose from 0.6% to 7% in 2007, but declined to 1.7% and 1.8% in 2008 and 2009, respectively. The objective of the Vision 2030 is to transform Kenya into a middle-income country with a consistent annual economic growth of 10 % by the year 2030. The 2030 goal for urban areas is to achieve "a well-housed population living in an environmentally-secure urban environment." This goal is expected to be achieved by developing basic infrastructure services such as roads, street lights, water and sanitation facilities, storm water drains, footpaths, and others while ensuring that the country has a clean, secure and sustainable environment by 2030 through reduction of pollution and improvement of waste management. The proposed road project will contribute to the realization of the goals of Vision 2030 through improvement of a reliable and efficient road infrastructure facility, provision of employment opportunities, and provision of faster and efficient mode of transport, among others.

b. Environment and Development (Sessional Paper No. 6 of 1999)

The Kenya's policy paper on the Environment and Development was formulated in 1999. The policy defined approaches that will be pursued by the Government in mainstreaming environment into development. The policy harmonized environmental and developmental objectives with the broad goal of achieving sustainable development. The policy paper also provided guidelines and strategies for government action regarding environment and development. In regard to wildlife, the policy reemphasized government's commitment towards involving local communities and other stakeholders in wildlife conservation and management, as well as developing mechanisms that allow them to benefit from the natural resources occurring in their areas. The policy also advocated for the establishment of zones that allow for the multiple use and management of wildlife. This policy is relevant to the

proposed development project in view of the potential impacts on the environment and involvement of the public in project planning.

c. Sessional Paper No. 10 of 2014 on the National Environment Policy

The policy seeks to provide the framework for an integrated approach to planning and sustainable management of natural resources in the country. It recognizes the various vulnerable ecosystems and proposes various policy measures not only to mainstream sound environmental management practices in all sectors of society throughout the country but also recommends strong institutional and governance measures to support achievement of desired objectives and goals.

d. National Environmental Action Plan (NEAP) of 2009-2013

The 1992 Earth Summit held in Rio de Janeiro came up with various recommendations, among them Agenda 21, a Global Environmental Action Plan. The theme of the Summit focused on how nations could attain sustainable development. The Government of Kenya embraced this idea by developing the first National Environment Action Plan (NEAP) in 1994. The NEAP report addresses environmental issues from various sectors in an integrated manner and their significance in development planning. It proposed a strategy for achieving sustainable development in line with Kenya's quest to meet the Millennium Development Goals (MDGs), Vision 2030 and Medium-Term Plan (MTP). The report brings out several proposed interventions, legal and institutional framework to be incorporated into sectoral development plans and Programmes. Its implementation is monitored through the Annual State of the Environment Reporting.

e. The National Poverty Eradication Plan (NPEP) of 1999

The National Poverty Eradication Plan (NPEP) was formulated with an objective of reducing the high levels of poverty in Kenya by 50 percent by the year 2015, as well as to strengthen the capabilities of the poor and vulnerable groups to earn income. The plan also aimed at reducing gender and geographical disparities in order to create a healthy, better-educated and more productive population. The formulation of the plan was guided by the goals and commitments agreed during the World Summit for Sustainable Development (WSSD) of 1995. The plan therefore focuses on the delivery of four WSSD themes of poverty eradication; reduction of unemployment; social integration of the disadvantaged people and creation of an enabling economic, political, and cultural environment through development of transport and communication sector. The plan is implemented by the Poverty Eradication Commission (PEC) that was established in collaboration with various Government Ministries, bilateral and multilateral donors, the private sector, Community Based Organizations (CBOs) and Non-Governmental Organizations (NGOs). The NPEP is relevant since the proposed road will create an enabling environment that will contribute immensely in the enhancement of economic growth in Kenya. The proposed project would also impact businesses, agricultural and tourism related activities that have great relevancy to poverty eradication in the country.

f. The Poverty Reduction Strategy Paper (PRSP) of 2000

The Poverty Reduction Strategy Paper (PRSP) for Kenya has the broad objective of reducing poverty and promoting economic growth. This policy articulates Kenya's commitment and approach to tackling endemic poverty through involvement of the poor communities in both rural and urban areas in various socio-economic development activities. The proposed project, during and after implementation will offer various employment opportunities to Kenyans and will therefore contribute directly towards the realization of the broad national goal of reducing poverty in the country. In addition, the project would stimulate economic development by creating an enabling environment for other key sectors of the economy to thrive.

g. The National Biodiversity Strategy of 2000

The National Biodiversity Strategy and Action Plan (NBSAP) was formulated to enable Kenya address national and international commitments defined in Article 6 of the Convention on Biological Diversity (CBD). The strategy is a national framework of action for ensuring that the present rate of biodiversity loss is reversed, and present levels of biological resources are maintained at sustainable levels for posterity. The general objectives of the strategy are to conserve Kenya's biodiversity; to sustainably use its components; to fairly and equitably share the benefits arising from the utilization of biological resources among the stakeholders; and to enhance technical and scientific cooperation nationally and internationally, including the exchange of information in support of biological conservation. The proposed road project will need to comply with the requirements of this strategy since the project may lead to loss of biodiversity in some sections along the proposed route e.g. The Aberdares Forest Complex

h. Sessional Paper No. 3 of 2009 on National Land Policy

The Land Policy in Kenya is guided by the environmental management principles which are aimed at restoring the environmental integrity through introduction of incentives and encouragement of use of technology and scientific methods for soil conservation, among others. The policy further requires fragile ecosystems to be managed and protected by developing a comprehensive land use policy bearing in mind the needs of the surrounding communities. The policy also requires zoning of catchment areas to protect them from degradation and establishment of participatory mechanisms for sustainable management of fragile ecosystems. The policy also called for development of procedures for co-management and rehabilitation of forest resources while recognizing traditional management systems and sharing of benefits with contiguous communities and individuals. Lastly, all national parks, game reserves, islands, front row beaches and all areas hosting fragile biodiversity are declared as fragile ecosystems under the policy.

The policy recognizes that sustainable management of land based natural resources depends largely on the governance system that defines the relationships between people, and between people and resources. To achieve an integrated approach to management of land-based natural resources, all policies, regulations and laws dealing with these resources need to be harmonized with the framework established by the Environmental Management and Coordination Act (EMCA Cap 387).

The policy also addresses land management particularly in Section 3.4.3.2 on ecosystem protection (including wetlands). Measures for protection are required for fragile ecosystems. The policy also calls for the protection of watersheds, lakes, drainage basins and wetlands. The policy prohibits settlement and agricultural activities in water catchment areas and calls for identification, delineation and gazettement of all water courses and wetlands.

i. Forestry Policy of 2014

This policy of the government is intended to ensure forests in the country are protected from wanton destruction. The goal of the policy is to increase the area under forest to 10% of the total land area in the country. The proposed road project will therefore be required to be consistent with the Kenya's forest policy. Where clearance of forests or sections of forests is envisaged, it would be important to put in place appropriate mitigation measures such as those specified in the preliminary environmental management plan of this ESIA report.

j. Wildlife Policy of 2011

The wildlife policy is aimed at promoting protection and conservation of wildlife in Kenya, both in protected and non-protected areas. The policy is implemented by the Kenya Wildlife Service (KWS). The proposed road project will need to be consistent with this policy. Where wild animals will be disturbed during the construction and operation of the road, appropriate mitigation measures must be implemented to minimize disturbance to wildlife.

k. Wetlands Policy of 2013

The wetlands policy is intended to promote protection of wetlands in Kenya. The policy sets out strategic measures for the protection of existing wetlands in Kenya. The proposed road has potential of impacting some local wetlands. It would be important to undertake appropriate mitigation measures to minimize or avoid degradation of wetlands.

l. Physical Planning Policy

The current policy governs the development and approval all building plans as provided for in the Physical Planning Act (Cap 286). The proposed project will be subjected to the provisions of this policy and legislation.

m. Public Health Policy of 2014

The public health policy calls upon the project proponents to ensure that buildings are adequately provided with utilities so that they are fit for human habitation. The workers camps must be provided with all amenities/utilities that are essential for safeguarding public health for all people using the facilities.

n. Occupational Health and Safety Policy of 2012

This policy is intended to protect safety and health of workers in work places. The proposed road project will provide employment opportunities to many workers at various categories. The contractor will be expected to comply with the requirements of this policy when engaging workers in various construction activities. The preliminary environmental management

provides mitigation measures that can be undertaken to ensure compliance with the requirements of this policy.

o. HIV/AIDS Policy of 2009

The policy identifies HIV/AIDS as a global crisis that constitutes one of the most formidable challenges to development and social progress. The Pandemic heavily affects the Kenyan economy through loss of skilled and experienced manpower due to deaths, loss of man hours due to prolonged illnesses, absenteeism, reduced performance, increased stress, stigma, discrimination and loss of institutional memories, among others. Due to the large of number of workers who will be involved in the project and the associated social issues with projects of such as scale, HIV/AIDS has been considered as one of the proposed impacts, but adequate mitigation measures have also been proposed to that effect.

p. Kenya National Policy on Gender and Development (NPGD), 2000

The purpose of the Gender Policy is to institutionalize The Kenya National Policy on Gender and Development (NPGD), within Gender, Children and Social Development. It articulates the policy approach of gender mainstreaming and empowerment of women at the ministry level. The policy seeks a society where women, men, children and persons with disabilities enjoy equal rights, opportunities and a high quality of life. This report has in depth addressed matters to do with gender and development and in the concession period the entire project period the project shall be governed under this principle.

q. The Kenya National Climate Change Response Strategy of 2010

This strategy provides measures that the Government of Kenya is taking to address issues related to the impact of climate change on various sectors of the economy. The proposed road will need to take onboard the effects of changing climate in the country and apply applied climate change mitigation measures. This is important because climate change will in future affect the operation of the road.

r. KeNHA's Environment and Social Safeguards Policy, 2018

The revised policy is set within KeNHA Vision of quality, safe and adequate National Trunk Roads network. It contains the actions KeNHA will take so as to ensure that the Authority activities don't negatively harm the environment and adversely affect the social fabric in communities where it works. Working in an environmentally and socially responsible and safe manner are conditions of employment of contractors for various projects. This policy is therefore targeting the contractors and other service providers.

3.2.3 Environmental Guidelines

In line with the Kenyan Constitution, NEMA has developed a number of guidelines which are part of a series of environmental management tools for environmental management in Kenya under the Environmental Management and Coordination Act, CAP 387 of the Laws of Kenya. Below is a highlight of the key project relevant guidelines;

a. **National Solid Waste Management Strategy, NEMA, 2014**.

NEMA developed the National Solid Waste Management Strategy in 2014 as a framework for implementing the Vision 2030 flagship project. The Strategy establishes a common platform for action between stakeholders to systematically improve waste management. It introduces a new approach for improved waste management in Kenya to create wealth, employment and reduce pollution of the environment.

The proposed road project is anticipated to produce waste; the proponent will be required to manage waste as guided by this strategy but in line with Waste Management regulations of 2006 and other relevant legislative frameworks. In general, the project proponent should ensure waste management activities are 7R oriented, by Reducing; Rethinking; Refusing; Recycling; Reusing; Repairing and Refilling waste.

b. Technical guidelines on the management of used oil and oil sludge in Kenya (NEMA, 2014)

The main objective of the guidelines is to ensure effective and efficient collection and transportation systems for used oil. These guidelines target government agencies (responsible for decision making, formulating policies and enforcing health and safety aspects of used oil and oil sludge management in the country), small generators, bulk generators of used oil and oil sludge, garages, used oil treatment plants, recycling and disposal facilities, and other interested stakeholders. The Proponent is envisioned to use heavy machinery which will require servicing hence producing used oil. These guidelines provide direction on safe management of used oil and oil sludge in Kenya and are a main regulatory reference material for management of used oil in Kenya and hence will be used as a key reference point to create awareness on hazards associated with handling used oil and to provide guidance on infrastructure for management of used oil.

c. National sand harvesting guidelines, 2007

These Guidelines apply to all sand harvesting activities in Kenya. This is deemed key to ensure sustainable utilization of the sand resource and proper management of the environment. Since the road project will require use of sand, it is expected that the contractor's sand harvesting activities will be conducted in line with respective legal requirements and guided by these sand harvesting guidelines.

3.3 National environmental legal framework

The Republic of Kenya has numerous statutes that guide environmental management and conservation in the country. Most of these statutes are sector specific and cover a wide range of issues including public health, soil conservation, protected areas conservation, endangered species, public participation, water rights, water quality, air quality, excessive noise control, vibration control, land use, among others. The relevant legislations are described in the following sections.

3.3.1 Environmental Management and Coordination Act (EMCA, Cap 387)

The Section Part VI of EMCA, Cap 387 Part II states that every person is entitled to a clean and healthy environment and has the duty to safeguard the same. To achieve this goal, the projects listed under the Schedule No. 2 of EMCA must be subjected to Environmental Impact Assessment (EIA). The aim of EIA is to reduce negative environmental outcomes of the listed projects by implementing mitigation measures. The proposed project falls within the Second schedule and must therefore comply with EMCA requirements in as far as EIA is required. There are also several regulations that have been formulated within the framework of EMCA, Cap 387 that are applicable to the proposed project.

Under EMCA, Cap 387 NEMA has gazetted legal tools that govern conduct of EIAs and general environmental protection. The Proposed Road project has been screened against these tools with results outlined in the table 4.1 below. Detailed analysis of the trigger mechanism and modalities for mitigation are provided in Chapter 7 of this report.

Table 3: Analysis of Key EMCA, 1999 Relevant Regulations

Legal Tool	Status	Trigger mechanism/ Relevance to the project
Environmental Management and Co-ordination (Environmental Impact Assessment and Audit) Regulations, 2003	Triggered	ESIA Study must conform to these rules. The proposed project must comply with the requirements of the regulations that also include conducting continuous monitoring and annual audits on the proposed project.
Environmental Management and Co-ordination (Waste Management Regulations, 2006)	Triggered	Construction of the project will generate solid waste hence proper disposal of wastes will need to be observed by the contractor in key areas such as workers camps and the road works.
Environmental Management and Co-ordination (Water Quality) Regulations, 2006	Triggered	Water for construction will be drawn from Rivers and boreholes and there will also be work over rivers when constructing bridges and box culverts
Environmental Management and Co-ordination (Fossil Fuel Emission Control) Regulations, 2006	Triggered	There will be use of vehicles, machinery and equipment that depend on fossil fuel as their source of energy hence contractor must comply with emission levels as highlighted by the regulations.
Environmental Management and Co-ordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006	Triggered	The proposed road traverses' areas with diverse ecosystems which will need to be protected as per the requirements of this regulation.
Environmental Management and Coordination (Air Quality) Regulations 2014	Triggered	Construction activities, construction crew and facilities such as asphalt and concrete batching plants and quarries are likely to cause air pollution. The Proponent shall implement the mitigation measures proposed to comply with the provisions of these Regulations.

Environmental Management and Co-ordination (Controlled Substances) Regulations, 2007	Triggered	The project contractors will need to ensure that the requirements of this regulation are observed to ensure that equipment, machinery, vehicles and chemicals containing controlled substances are not imported into the country for use in the proposed project
Environmental Management and Co-ordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009	Triggered	The road crosses the wetlands, and river banks which are valuable water resources along the route. The contractor will need to employ measures for the preservation and conservation of these wetlands and river systems.
Environmental Management and Co-ordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009	Triggered	The project will involve use of heavy earthmoving equipment and trucks which can generate excessive noise and vibrations. The contactor of the road will have to ensure that no excessive noise and vibrations are made during the construction of the road.

Specifications of these guidelines will be captured in the Contracts for Construction to ensure that contractors are legally bound to undertake mitigation alongside general construction work. The EMCA, Cap 387 regulations likely to be triggered and their relevance in the proposed construction of the road are further reviewed below.

a. Environmental Management and Co-ordination (Environmental Impact Assessment and Audit) Regulations, 2003

The Environmental (Impact Assessment and Audit) Regulations provides guidelines for conducting EIA studies. The regulations provide details on the parameters to be evaluated when undertaking an EIA study. It also provides guidelines on the conduct of environmental audits and development of project monitoring plans. The proposed project must comply with the requirements of the regulations that also include conducting continuous monitoring and annual audits on the proposed project. The project requires an EIA license from NEMA before commencement of any activity.

b. Environmental Management and Co-ordination (Water Quality) Regulations, 2006

The EMCA (Water Quality) Regulations, 2006 provide guidelines on the use and management of water sources to safeguard quality of water for domestic use and irrigation, among others. The proposed project will need to comply with the requirements of this regulation to ensure water sources along the route are protected from pollution and over abstraction. The project will also need to comply with the regulations that prohibit undertaking of development within a minimum of 6m from the highest ever recorded flood level of a river system. Section 4(2), 6 and Section 24 of the regulation prohibits pollution of water bodies and requires that all substances discharged into the water bodies should meet the standards set under the Third Schedule of the regulation.

Everyone is required to refrain from any actions, which directly or indirectly cause water pollution, whether the water resource was polluted before the enactment of the Environmental Management and Coordination Act (EMCA Cap 387). It is an offence to contravene the provisions of these regulations with a fine not exceeding five hundred thousand shillings. In response to the above, the project design team should be advised on the requirements of this regulation and appropriately incorporate the regulations in the project design document.

c. Environmental Management and Co-ordination (Fossil Fuel Emission Control) Regulations, 2006

The EMCA (Fossil Fuel Emission Control) Regulations, 2006 aims at eliminating or reducing emissions emitted from internal combustion engines to acceptable levels. The regulation provides guidelines on use of clean fuels, use of catalysts and inspection procedures for engines and generators. This regulation is applicable to the proposed project since there would be use of vehicles, machinery and equipment that depend on fossil fuel as their source of energy. The requirements of the regulation must be implemented to eliminate or reduce air quality degradation. Sections of the regulation citing the standards of recommended emission levels will be given to the contractor and or pinned at strategic points in the contractor's field offices.

d. Environmental Management and Co-ordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006

The EMCA (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006 provides that no person shall engage in any activity that may have an adverse impact on any ecosystem; may lead to the introduction of any exotic species or to unsustainable use of natural resources, without an Environmental Impact Assessment License issued by the Authority under the Act.

The regulation requires NEMA in consultation with the relevant lead agencies, to impose bans, restrictions or similar measures on the access and use of any threatened species to ensure its regeneration and maximum sustainable yield. The proposed road traverses' areas with diverse ecosystems which will need to be protected as per the requirements of this regulation.

e. Environmental Management and Co-ordination (Waste Management Regulations, 2006)

The Waste Management Regulations are basically aimed at streamlining the handling, transportation and disposal of various types of wastes. The broad goal of the regulations is to protect human health and the environment. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source. The regulations have also classified various types of waste and recommended appropriate disposal methods for each waste type. Under the regulations, NEMA is supposed to licenses transporters, incinerators, landfills, composers, recyclers and transfer stations. Facilities to be licensed include local authorities, transporters and handlers of various types of waste. The licensing employs a risk-based approach by concentrating on facilities considered to pose a high risk to the environment. The regulations also provide an opportunity for investment in various aspects of waste management. During the construction of the proposed road, proper disposal of wastes will need to be observed by the contractor at the workers camps and the road works. This will ensure good hygiene and healthy working environment for workers. All waste collectors/ handlers will be required to have relevant permits/ licenses from NEMA.

f. Environmental Management and Co-ordination (Controlled Substances) Regulations, 2007

The EMCA (Controlled Substances) Regulation is aimed at controlling the production, consumption and, exports and imports of controlled substances. Controlled substances are grouped into three lists as indicated below:

- Group 1 list consists of halogenated flouro-chemicals with ozone depleting substances.
- Group 2 list consist of Hydrobromoflourocarbons with ozone depleting substances.
- Group 3 list consist of Bromochloromethane with ozone depleting 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. The project contractors will need to ensure that the requirements of this regulation are observed to ensure that equipment, machinery, vehicles and

chemicals containing such components are not imported into the country for use in the proposed project.

g. Environmental Management and Co-ordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009

The Environmental Management and Co-ordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009 applies to all wetlands in Kenya whether occurring in private or public land. The objectives of the regulations are to provide for the conservation and sustainable use of wetlands and their resources in Kenya and promote the integration of sustainable use of resources in wetlands into the local and national management of natural resources for socio-economic development. The act also aims at ensuring the conservation of water catchments and the control of floods and the sustainable use of wetlands for ecological and aesthetic purposes for the common good of all citizens. The act also makes provision for the protection of wetlands as habitats for species of fauna and flora. It also provides a framework for public participation in the management of wetlands.

The Act requires wetland resources to be utilized in a sustainable manner compatible with the continued presence of wetlands and their hydrological, ecological, social and economic functions and services. The Act requires special measures to be undertaken to preserve and maintain knowledge innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity in wetlands.

The regulation also calls for sustainable use of wetlands through integration into the national and local land use plans to ensure sustainable use of wetlands in the country. The proposed roads pass through numerous rivers which are valuable water resources along the route. The contractors will need to employ measures for the preservation and conservation of these wetlands and river systems.

h. Environmental Management and Co-ordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009

The Noise and Excessive Vibration Pollution Control Regulations, 2009 prohibits excessive noise and vibration. It states that no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. The contactor of the road will have to ensure that no excessive noise and vibrations are made during the construction of the road. This is important since the construction of the new road will involve use of heavy earthmoving equipment and trucks which can generate excessive noise and vibrations. Motor vehicles used during the construction of the proposed road should also adhere to the regulations which prohibit excessive noise. The provision of the act on motor vehicle states that no person shall operate a motor vehicle which produces any loud and unusual sound exceeding 84 dB(A) when accelerating. The Act also states that no person shall at any time sound the horn or other warning device of a vehicle except when necessary to prevent an accident or an incident. Any person carrying out construction, demolition, mining or quarrying work should ensure that the vibration levels do not exceed 0.5 centimeters per second beyond any source property boundary or 30metres from any moving source. Noise permits may be required in blasting areas.

i. Environmental Management and Coordination (Air Quality) Regulations, 2014

The objective of this regulation is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. It provides for the establishment of emission standards for various sources, including as mobile sources (e.g. motor vehicles) as outlined in the Environmental Management and Coordination Act, Cap 387. It also covers any other air pollution source as may be determined by the Minister in consultation with the Authority.

Emission limits for various areas and facilities have been set. In specific, first schedule of the regulations sets the emission limits of particulate matter for persons operating construction equipment or handling construction material. The regulations provide the procedure for designating controlled areas, and the objectives of air quality management plans for these areas. The Proponent for the road project shall observe policy and regulatory requirements and implement the mitigation measures proposed in this document to comply with the provisions of these Regulations on abatement of air pollution.

3.3.2 The Wildlife Management and Conservation Act 2013

The Wildlife and Conservation Act deals with the conservation and management of wildlife in Kenya. The Act provides that wildlife should be conserved to yield optimum returns in terms of cultural, aesthetic, scientific and economic benefits. The Act requires that full account be taken of the inter-relationship between wildlife conservation and land use. The Act controls activities within the national parks, which may lead to the disturbance of wild animals. Unauthorized entry, residence, burning, damage to objects of scientific interest, introduction of plants and animals and damage to structure are prohibited under this law.

The proposed road traverses' next to an important wildlife area the Aberdares forest ranges. The road construction will need to make provisions for the free passage of wildlife. Passage provisions will need to be integrated into the design of the road. The contractor will also need to provide free wildlife passages such as culverts so that the road project does not affect wildlife negatively. KWS shall be consulted on the best road signage and infrastructure that may be required.

3.3.2 Forest Conservation and Management Act, 2016

The Forest Conservation and Management Act, 2016 gives effect to Article 69 of the Kenyan 2010 Constitution about forest resources; to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socio-economic development of the country and for connected purposes. The Act applies to all forests on public, community and private lands. The principles of the Act lay emphasis on (a) good governance in accordance with Article 10 of the Constitution; (b) public participation and community involvement in the management of forests; (c) consultation and co-operation between the national and county governments; (d) the values and principles of public service in accordance with Article 232 of the Constitution; (e) protection of indigenous knowledge and intellectual property rights of forests resources; and (f) international best practices in management and conservation of forests. 5. Public Forest Policy (1) The Cabinet Secretary shall, in consultation with the county government. Further, the act forms the baseline to develop a national forest policy and formulate a public forest strategy for the sustainable use of forests

and forest resources. In addition, the Act, establishes the Kenya Forest Service to conserve, protect and manage all public forests in accordance with the provisions of this Act.

The road project traverses' patches of urban and farm forestry, it is therefore important to ensure community participation as provided for under the Act. The most appropriate would be initiation of participatory forest management in these forest sections so that the local community can have a significant input with Kenya Forest Service (KFS) office playing a coordination role. No trees along the route will be cut before necessary permits are obtained from KFS or county governments.

3.3.3 The Water Act 2016

The Water Act No. 43 of 2016 was assented to on 20th September 2016. The new Act repealed the water Act 2002. The enactment of this law aimed at aligning national water management and water services provision with the requirements of the Constitution of Kenya 2010 particularly on the clauses devolving water and sanitation services to the county governments. Consequently, the new law retained some and established other new institutional arrangements including, Ministry of Water and Irrigation as the sector coordinator, Water Services Regulatory Board (WASREB) for regulation of water services' providers, Water Resources Regulatory Authority (WRA formerly WRMA) for water resource use regulation, National Water Harvesting and Storage Authority for major water infrastructural development, Water Tribunal for dispute resolution, Water Sector Trust Fund for water services development towards the un-served and poor segments of the society in peri-urban and rural areas, Water Works Development Agencies to replace the Water Service Boards, and Basin Water Resources Committees to replace Catchment Advisory Committees (CAACs)

The Act vests provision of water and sanitation services with the county governments through Water Services Providers (WSPs) whose operations must be in accordance with a Service Agreement entered between each WSP and WASREB.

The Act stipulates that a permit shall be required in all cases of proposed diversion, abstraction, obstruction, storage or use of water, with minor exceptions relating to use for domestic purposes (Section.36). Under the Water Act (General) Rules, it is stated that any rights acquired under the permit are subject to the Public Health Act and the Malaria Prevention Act, in addition to the Water Act itself. The Public Health Act has wide-ranging provisions on pollutant discharges, which are set out below.

The Water Act (General) Rules make provision for discharges in a number of respects, as follows:

Effluent shall not be returned to any body of water unless it has been purified. Further, it must not contain poisonous or injurious matter or excess silt, gravel or boulders.

Water used for pulping, mulling or washing of coffee shall be efficiently screened.

In line with earlier Acts, Section 36 provides that a permit is required for regulation of water rights and works. A permit is therefore required for any of the following purposes;

(a) Any use of water from a water resource, except as provided by section 37;

(b) The drainage of any swamp or other land;

(c) The discharge of a pollutant into any water resource; and

(d) Any other purpose, to be carried out in or in relation to a water resource,

It is however notable that there are instances when a permit is not required. These include the same as before: (a). abstraction or use of water, without the employment of works; from any water resource for domestic purposes by any person having lawful access to the water resource; (b). abstraction of water in a spring which is situated wholly within the boundaries of the land owned by any one landholder and does not naturally discharge into a watercourse; abutting on or extending beyond the boundaries of that land; or (c). storage of water in, or the abstraction of water from a reservoir constructed for the purpose of such storage and which does not constitute a watercourse for the purposes of the Act.

The regulating authority may determine the potential prejudicial effects of the pollutant discharges and order the removal already made. It is an offence to allow effluent discharges, either domestic or industrial, if this would harm fish, and a fish warden may order its removal. Plans for rendering such effluent innocuous shall be submitted to and approved by the enforcing authority.

Additionally, the applicant for a water permit is required to outline the methods to be used for treating effluent before discharge (Form WAB 13, question 18). The permit would only be issued subject to satisfactory provision being made for the treatment of effluent. The Water Act, apart from the Rules, makes only limited provision for controlling water pollution. The provision is limited to the pollution of drinking water.

Under section 145, the water undertaker may make regulations to control polluting activities, which may threaten its source of water. It may itself construct the necessary works for intercepting, treating or disposing of foul water (s.149). Section 158 makes it an offence to pollute such waters. Similarly, under section 169, it is an offence to throw or convey polluting matter into a body of water. All project boreholes and direct extraction from the rivers will require permits from WARMA.

3.3.4 The Agriculture, Fisheries and Food Authority Act of 2013

Agriculture, Fisheries and Food Authority Act, 2013 (No. 13 of 2013) provides for the establishment of the Agriculture, Fisheries and Food Authority, the administration of matters of agriculture and the preservation, utilization and development of agricultural land and related matters. "Agriculture" in this Act means cultivation of land and the use of land and water for any purpose of husbandry, aquaculture and food production and includes cultivation of crops and horticultural practice, breeding of aquatic animals and plants, the use of land, fish harvesting and (e) the use of land for agroforestry.

The Act requires the Authority in consultation with the county governments to among others promote best practices. The Cabinet Secretary is required under the Act with the advice of the Authority, and in consultation with the National Land Commission, to provide general guidelines applicable in respect of any category of agricultural land. These land development guidelines are to be implemented by the county governments. In a like manner, the Cabinet

Secretary is given powers to make general rules for the preservation, utilization and development of agricultural land and aquatic resources and prescribe national guidelines for soil conservation. Each county government is required to keep a register of land development orders and land preservation orders, which they may issue under this Act. The Act also provides for participation by farmers. This law is important because the project cuts through livestock keeping/ pastoral areas.

3.3.5 Energy Act, 2006

This is an Act of Parliament to amend and consolidate the law relating to energy, to provide for the establishment, powers and functions of the Energy Regulatory Commission and the Rural Electrification Authority, and for connected purposes. The provisions of this Act apply to every person or body of persons importing, exporting, generating, transmitting, distributing, supplying or using electrical energy; importing, exporting, transporting, refining, storing and selling petroleum or petroleum products; producing, transporting, distributing and supplying of any other form of energy, and to all works or apparatus for any of these purposes. This Act is relevant to the proposed road project due to the need to relocate some of the petrol stations situated along the route.

The Act establishes a Commission known as the Energy Regulatory Commission, that among other roles, is expected to regulate (i) importation, exportation, generation, transmission, distribution, supply and use of electrical energy, (ii) importation, exportation, transportation, refining, storage and sale of petroleum and petroleum products; (iii) production, distribution, supply and use of renewable and other forms of energy.

3.3.6 Land Act, 2012.

The Land Act was enacted by Parliament to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land-based resources, and for connected purposes. The Act applies to all land declared as (a) public land under Article 62 of the Constitution; (b) private land under Article 64 of the Constitution; and (c) community land under Article 63 of the Constitution and any other written law relating to community land.

The Land Act guarantees security of tenure for land under (a) freehold; (b) leasehold; (c) such forms of partial interest as may be defined under the Act and other law, including but not limited to easements; and (d) customary land rights, where consistent with the Constitution and guarantees equal recognition and enforcement of land rights arising under all tenure systems and non-discrimination in ownership of, and access to land under all tenure systems.

Under the Lands Act 2012, The Wayleaves Act, Cap 292 and The Land Acquisition Act, Cap. 295 have been revoked but Sections 8 and 9 allow for Compulsory Acquisition as an option in acquiring land for public utility.

3.3.7 The Land Registration Act, 2012

This is an Act of Parliament that revises, consolidates and rationalizes the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes. The Act requires that there is proper marking and maintenance of boundaries. An interested person who has made an application to the Registrar for his/her

boundaries to be ascertained, the Registrar shall give notice to the owners and occupiers of the land adjoining the boundaries in question of the intention to ascertain and fix the boundaries. With regard to the maintenance of boundaries, the Act requires every proprietor of land to maintain in good order the fences, hedges, stones, pillars, beacons, walls and other features that demarcate the boundaries, pursuant to the requirements of any written law.

3.3.8 The National Land Commission Act, 2012 (No. 5 of 2012)

The National Land Commission of Kenya is an independent government commission whose establishment was provided for by the Constitution of Kenya to, amongst other duties, manage public land on behalf of the national and county governments, initiate investigations into present or historical land injustices, recommend appropriate redress, monitor and have oversight responsibilities over land use planning throughout the country. It was officially established under The National Land Commission Act, 2012. The mandate of the National Land Commission is drawn from the National Land Policy of 2009, Constitution of Kenya 2010, National Land Commission Act, 2012, the Land Act 2012 and the Land Registration Act of 2012. Under the National Land Commission Act, the Commission shall among other duties monitor the registration of all rights and interests in land and ensure that public land and land under the management of designated state agencies are sustainably managed for their intended purpose and for future generations. Also, the commission is required to manage and administer all unregistered trust land and unregistered community land on behalf of the county government and develop and encourage alternative dispute resolution mechanisms in land dispute handling and management. The Commission is also required in consultation and cooperation with the national and county governments, to establish county land management boards for the purposes of managing public land.

3.3.9 Community Land Act 2016

The Community Land Act, No. 27 of 2016 (the Act) came into force on 21 September 2016. The Act aims at: 1. Giving effect to Article 63 of the Constitution of Kenya, 2010 (the Constitution) which provides for a classification of land known as community land. To this end, the Constitution provides that community land shall vest in and be held by communities. 2. Providing for;

- The recognition, protection and registration of community land rights.
- The management and administration of community land.
- The role of county governments in relation to unregistered community land and related matters.

The Act repeals the Land (Group Representatives) Act (Chapter 287 of the Laws of Kenya) and the Trust Lands Act (Chapter 288 of the Laws of Kenya). This project shall uphold the requirement of all the relevant land legislations, involving key administrative stakeholders and the affected parties (i.e. the community) facilitating in coexistence with the surrounding community. Most of the land within the project route is community land. Community consultations and consent will be critical during project construction period.

3.3.10 The Environment and Land Court Act, 2011

This is an Act of Parliament to give effect to Article 162(2) (b) of the Constitution to establish a superior court to hear and determine disputes relating to the environment and the use and occupation of land. The Environment and Land Court is one of the Courts contemplated by article 162(2). It is a Superior Court and has the same status as the High Court. The court is established under section 4 of the Environment and Land Court Act No. 19 of 2011. It has jurisdiction to hear any other dispute relating to environment and land. The jurisdiction of the court is provided under section 13 of the Act. The Court has original and appellate jurisdiction to hear and determine all disputes in accordance with Article 162(2) (*b*) of the Constitution and with the provisions of the Act or any other written law relating to environment and land. The court has powers to deal with disputes relating to land administration and management. The court is also empowered to hear cases relating to public, private and community land and contracts or other instruments granting any enforceable interests in land. The court also exercises appellate jurisdiction over the decisions of subordinate courts or local tribunals in respect of matters falling within the jurisdiction of the Court. The court further exercises supervisory jurisdiction over the subordinate courts, local tribunals, persons or authorities in accordance with Article 165(6) of the Constitution.

3.3.11 The County Governments Act 2012

This is an Act of parliament to give effect to Chapter Eleven of the Kenyan Constitution; to provide for County government's powers, functions and responsibilities to deliver services and for connected purposes. Section 113 of the Act makes public participation in County planning processes compulsory.

3.3.12 Occupational Safety and Health Act 2007

The Occupational Safety and Health Act 2007applies to all workplaces where any person is at work, whether temporarily or permanently. The purpose of the act is to secure the safety, health and welfare of persons at work and protect persons other than persons at work against risks to safety and health arising out of, or regarding, the activities of persons at work. Section 19 of the Act provides that an occupier of any premises likely to emit poisonous, harmful, injurious or offensive substances, into the atmosphere shall use the best practicable means to prevent such emissions into the atmosphere and render harmless and inoffensive the substances which may be emitted.

Section 16 provides that no person shall engage in any improper activity or behavior at the workplace, which might create or constitute a hazard to that person or any other person. It is thus recommended that all Sections of the Act related to this project, such as provision of protective clothing, clean water, and insurance cover are observed to protect all from work related to injuries or other health hazards. The project shall be registered as a work place for regular inspections from DOSH inspectors. A healthy and safety committee shall be established to undertake implementation of all the provisions of the law.

3.3.13 The Public Health Act (Chapter 242) of Revised Edition 2012

The Public Health Act (Chapter 242) is an Act of Parliament that provides for securing and maintaining good health of citizens. The Act contains directives that are focused on ensuring protection of human health. There are provisions within the Act that deal with water, air and

noise quality as they pertain to human health. An environmental nuisance includes the emission from premises of waste waters, gases and smoke which could be regarded as injurious to health. The owner and/or occupier of premises responsible for such nuisances are liable to prosecution under the Act. The construction of the proposed road has potential pollution risks related to water and air. The contractor will need to ensure that air and water pollution is controlled and does not affect people living along the road and even workers residing in various construction camps established all along the route

3.3.14 The Valuers Act (Cap 532), 1985

The revised edition 1985 of the Valuers Act Cap 532 makes provisions for the relevant charges and conducts of Valuers in relation to valuation of assets. The Act also provides the relevant regulations and guidelines in the undertaking of the valuation works. The Act requires that adequate valuation is carried out to help meet the actual compensation measures and the market rates and reduce any acts of malice in the exercise. A competent valuer will have to be deployed to site to carry out the professional valuation of assets for compensation.

3.3.15 Physical Planning Act (Cap. 286)

This Physical Planning Act, Cap. 286 provides for the preparation and implementation of physical development plans. Section 36 of the Act provides for environmental impact assessments and states that 'if in connection with a development application a local authority is of the opinion that proposals for industrial location, dumping sites, sewerage treatment, quarries or any other development activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an environmental impact assessment report'. The proponent and contractors of the proposed road will need to comply with the requirements of this Act

3.3.16 The Penal Code (Cap. 63)

The Penal Code (Cap. 63) chapter on "Offences against Health and Conveniences" strictly prohibits the release of foul air into the environment, which affects the health of other persons. Any person who voluntarily violates the atmosphere at any place, to make it noxious to health of persons in general dwelling or carrying out business in the neighborhood or passing along public ways is guilty of misdemeanor and shall be subjected to imprisonment not exceeding two years with no option of fine. Under this code, any person who for trade or otherwise makes loud noise or offensive awful smell in such places and circumstances as to annoy any considerable number of persons in the exercise of their rights, commits an offence, and is liable to be punished for a common nuisance, i.e. imprisonment not exceeding one year with no option of fine. The contractor of the proposed road will therefore need to ensure that all emissions are controlled during the construction phase of the project to avoid interference on health of the local communities and the workers.

3.3.17 The Employment Act, 2007

The Employment Act, 2007 defines the fundamental rights of employees including the basic conditions of employment of workers. It also regulates employment of children. The contractor on site will have to employ casual labourers probably from the communities where the road traverses during construction.

The basic conditions of employees should be observed to avoid unnecessary conflicts during the construction works. The Contractor shall pay the entire amount of the wages earned by or payable to the workers. Payment of such wages should be done at the end of a working day at or near the place of work. The Contractor shall also ensure that all statutory deductions are submitted without delay to appropriate government agencies e.g. Kenya Revenue Authority, NSSF, NHIF, among others.

3.3.18 Work Injury Compensation Benefit Act (WIBA) 2007

The Work Injury Compensation Benefit Act 2007 provides guideline for compensating employees on work-related injuries and diseases contacted during employment. The Act also requires provision of compulsory insurance for all employees. The Act defines an employee as any worker on contract of service with employer. It will be important for the Contractor of the proposed project to ensure that all workers contracted during the project implementation phase are provided with appropriate insurance covers so that they can be compensated in case they get injured while working.

3.3.19 Public Roads and Roads of Access Act Cap 399

The Public Roads and Roads of Access Act Cap.399 Act states that a public road is any road which the public has a right to use immediately before the commencement of this Act, or all proclaimed or reserved roads and thoroughfares being or existing on any land sold or leased or otherwise held under the East Africa Land Regulations, 1897, the Crown Lands Ordinance,1902, or the Government Lands Act at any time before the commencement of this Act and all roads and thoroughfares hereafter reserved for public use. The construction of the proposed road will need to take note of the provisions of this Act.

3.3.20 The Traffic Act Cap 403

The Traffic Act reserves the use of the road corridor for road facilities only. Any vegetation grown to protect the road edges should not cause problems during maintenance. Encroachment along the road corridor will have to be checked especially during the operational phase of the project. The Act also spells out conditions for use of roads by motorists, among others. The contractor's vehicles shall comply with all the traffic rules in Kenya.

3.3.21 Building Code 2009

This by-law recognizes the county governments as the leading planning agencies. It compels potential developers to submit development applications for the approval. The county governments are hence empowered to approve or disapprove any plans if they do or don't comply with the law, respectively. Any developer who intends to erect a building must give the respective local authority a notice of inspection before the erection of the structure. On completion of the structure, a notice of completion shall be issued by the local authority to facilitate final inspection and approval. No person therefore shall occupy a building whose certificate of completion has not been issued by the county government.

Section 214 of the by law requires that any public building where the floor is more than 20 feet above the ground level should be provided with firefighting equipment that may include one or more of the following; hydrants, hose reels and fire appliances, external conations portable

fire appliances, water storage tanks, dry risers, sprinkler, drencher and water spray spring protector system.

Section 194 requires that where sewer exists, the occupants of the nearby premises shall apply to the local authority for a permit to connect to the sewer and all the waste water must be discharged to the sewers. Finally, section 196 provides that the county government may refuse to admit to sewer any trade waste or any other effluent unless it has been treated in an approved manner. In this regard, the county government may cause the occupier of the premise to construct an approved manhole connected to the pipe conveying such effluent. In the development of the project, the proponent will have to comply with the provisions of this Act by complying to the Building code provisions.

3.3.22 The Kenya Roads Act, 2007

This is an Act of Parliament that provided for the establishment of Kenya Road Agencies i.e. Kenya National Highway Authority (KeNHA), the Kenya Urban Roads Authority (KURA) and the Kenya Rural Roads Authority (KeRRA), and provided powers and functions of the authorities.

KeNHA is mandated to manage, develop, rehabilitate and maintain all national roads. Other function vested to this authority relevant to the proposed project are: controlling national roads and road reserves and access to roadside developments; implementing road policies in relation to national roads; ensuring adherence to the rules and guidelines on axle load control prescribed under the Traffic Act (Cap. 403) and under any regulations under this Act; ensuring that the quality of road works is in accordance with such standards; in collaboration with the Ministry responsible for Transport and the Police Department, overseeing the management of traffic and road safety on national roads; collecting and collating all such data related to the use of national roads as may be necessary for efficient forward planning under this Act; monitoring and evaluating the use of national roads; planning the development and maintenance of national roads and liaising and coordinating with other road authorities in planning and on operations in respect of roads.

3.3.23 The Kenya Roads Board Act, 1999

The Act was assented in January 2000. Establishing a board to oversee the road network in Kenya and thereby coordinate its development, rehabilitation and maintenance and to be the principal adviser to the Government on all matters related to Road Development.

The Standard Specifications for Road and Bridge construction has guidelines on environmental protection and mitigation. Standard Specification Clauses 116,117,125,135,137 specifically address protection of the environment, with regard to water, health, safety and accidents, water supply, maintenance of the engineers' staff houses, offices, laboratories, and attendance upon the engineer and his staff. The provisions of these standards and codes must not be contravened during project implementation. These provisions are largely supportive of EMCA, Cap 387 and forms part of the legal basis for environmental mitigation, avoidance, prevention, compensation, restoration and enhancement.

3.3.24 HIV / AIDS Act, 2006

Section 3 of The Act indicated the purpose of the legislation including public awareness and rights to people living with HIV/AIDS. Public awareness shall be achieved through education, public campaigns even at workplaces. This Act's provisions then give the guidelines unto which the project shall follow in educating workers and staff and providing of incentives to combat HIV/AIDs.

3.3.25 Urban Areas and Cities Act No 13 of 2011

This is an Act of Parliament to give effect to Article 184 of the Constitution, to provide for the classification, governance and management of urban areas and cities and to provide for the criteria of establishing urban areas. The Act also provide for the principle of governance and participation of residents of towns and cities. Under the Act a town is an urban area with a population of at least ten thousand residents. Also, under the Act the management of a city and municipality is vested in the county governments. The County Governments may impose such fees, levies and charges for delivery of services by the municipality or the city

3.3.26 The National Gender and Equality Act, 2011

National Gender Equality Commission is a constitutional Commission established by an Act of Parliament in August 2011, 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 Fifteen of the Constitution; and section 8 of NGEC Act (Cap. 15) of 2011, with the objectives of promoting gender equality and freedom from discrimination.

Gender mainstreaming in road projects ensures that the concerns of women and men form an integral dimension of the project design, implementation, operation and the monitoring and evaluation ensures that women and men benefit equally, and that inequality is not perpetuated.

3.3.27 The Sexual Offences Act, 2006 and its amendment 2012

Observing a standard work ethic is recommended to ensure persons from both genders are not subjected to sexual offences. Ample working environment should prevail in all work places in the project, to be enhanced through implementation of a Sexual Misconduct Policy.

3.3.28 Matrimonial Property Act (No. 48 of 2013)

Matrimonial property is property owned or obtained by either or both married spouses before or during their marriage. It is sometimes called 'matrimonial assets.' Matrimonial property includes the matrimonial home; the home that the couple lived in during their marriage. It also includes many other things, not just physical property like land or houses but also things like the contents of the home, furniture and appliances, vehicles that a couple owns while married, and sometimes other things as well. It may include work pensions that either spouse may have, and certain debts that the parties have.

The law that deals with matrimonial property in Kenya is called the *Matrimonial Property Act*. This act only applies to married couples, or couples who are in a Registered Domestic Partnership. This act does not apply to common law couples.

When a married couple separates, either person can apply to the court to divide property, pensions, or debts. These issues, though, are usually dealt with during a divorce. It is important

to speak to a lawyer for advice before dividing property, pensions, or debts. Once a couple is divorced, these issues are usually finished. You usually can't re-open them in the future if you've made a mistake. Compensation during resettlement needs to follows the legal provisions.

3.3.29 Persons with Disability Act, Chapter 133

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. (2) A qualified employee with a disability shall be subject to the same terms and 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 all parties involved.

3.3.30 Security Laws (Amendment) Act, 2014

This act entails a legal framework and jurisdiction on security matters. It is a constitutional entitlement to live and feel secure from agents that may compromise ones' life and safety. Security measures are vital in this project following past terrorist experiences reported in the area; the contractor shall embark on a community policing program to be executed by a competent security firm. It is recommended that the government takes keen in providing adequate support to enhance the security of persons involved in this project and the community at large, which will translate to provision of critical intelligence that will trigger a review of the existing security measures and tactics, among other advantages such as security expertise and artillery.

3.4 National institutional / Administrative framework for the proposed project

There are various national institutions that are important in road project matters related to environmental management in Kenya. These are described in the following sections.

3.4.1 The National Environment Management Authority

The National Environmental Management Authority (NEMA) exercises general supervision and, co-ordination of all matters relating to the environment. NEMA is also the principal instrument of the government in the implementation of all policies relating to the environment. The Authority reviews EIA project and study reports for the proposed projects, visits the project sites to verify information provided in the report and issues EIA licenses if it considers that all the issues relevant to proposed projects have been identified and mitigation measures to manage them have been proposed.

3.4.2 The County and Sub-County Environment Committees

The County and Sub-County Environmental Committees contribute to decentralization of activities undertaken by NEMA. This has enabled local communities to have greater access to environmental management information. It has also enabled the County and Sub-County

Environment Committees to conduct quick site visits and review of reports of proposed projects. Since the proposed project traverses through several Counties, the review of the report will be done at a National level for issuance of EIA license. However, it is also recommended that the EIA report should also be reviewed in each of the counties to create awareness and obtain ownership at county level. In fact, it is a practice and legal requirement that the review at County level be done before the ESIA Report is approved to NEMA.

3.4.3 Ministry of Transport, Infrastructure, Housing and Urban Development (MoTIHUD)

MoTIHUD is charged with the responsibility of providing basic infrastructure facilities to the public. These infrastructure facilities include development, rehabilitation and maintenance of the road network in the country. The Ministry will provide funding mechanisms and general guiding policies for this project.

3.4.4 The Kenya Roads Board

The Kenya Roads Board was established in 2000 through an Act of Parliament (The Kenya Roads Board, 1999, No. 7) and mandated to do these functions, among others, to: co-ordinate the implementation of all policies relating to the development, rehabilitation and maintenance of the road network; co-ordinate the development, rehabilitation and maintenance of the road network with a view to achieving efficiency, cost effectiveness and safety; administer the funds derived from the fuel levy and any other funds that may accrue to it; monitor the operations or activities undertaken by road agencies in the development, rehabilitation and maintenance of roads and evaluate, by means of technical, financial and performance audits, the delivery of works and many other.

3.4.5 Kenya National Highways Authority (KeNHA)

The Kenya National Highways Authority (KeNHA) is a State Corporation established under the Kenya Roads Act, 2007 with the responsibility for management, development, rehabilitation and maintenance of national roads of class A, B and C. The proposed road will be managed by KeNHA since it's classified as Class A.

KeNHA has an established Environmental and Social Management Department to facilitate compliance of road projects with the requirements of environmental laws and regulations. This office advises KeNHA projects on various compliance issues. The office also has established linkages with NEMA. Projects contracts should be reviewed by this office directly or through the environment supervisor. Regarding the implementation of the social and economic aspects of the ESMP, it is proposed that the Resident Engineer works closely with the Environmental and Social Manager of KeNHA to ensure compliance to national policies and guidelines.

3.4.6 Directorate of Occupational Safety and Health Services (DOSHS)

The Directorate of Occupational Safety and Health Services (DOSHS) is one of departments within the Ministry of Labour and East African Community Affairs, whose primary objective is to ensure safety, health and welfare of all workers in all workplaces. Unsafe and unhealthy work environment causes accidents, diseases, disasters and environmental pollution that occasion huge economic and social burdens to individuals and enterprises thereby stifling

economic and social growth. DOSHS will provide OSH permits for workplaces of the project including campsites and quarries.

3.4.7 Kenya Wildlife Service (KWS)

KWS is a state corporation that was established with the mandate to conserve and manage wildlife in Kenya, and to enforce related laws and regulations. It undertakes conservation and management of wildlife resources across all protected and unprotected areas systems in collaboration with stakeholders. KWS will guide and monitor road construction through animal migratory routes.

3.4.8 Water Resources Authority (WRA)

Water Resources Authority (WRA) is a state corporation established under Section 11 of the Water Act, 2016. Pursuant to Section 6 of the Act, the Authority is an Agent of the National Government responsible for regulating the management and use of water resources. The Water Act, 2016 makes extensive provisions on the Authority's role in regulating the use and management of water resources. WRA was operationalized on 21st of April, 2017 vide Gazette Notice No. 59. However, the Authority has been in existence for 12 years following its establishment under the Water Act, 2002 as Water Resources Management Authority (WRMA). WRA will provide the necessary borehole and water extraction permits from local streams.

3.4.9 Kenya Forest Service (KFS)

KFS is a corporate body established under the Forest Conservation and Management Act of 2016. The Act which was operationalized on 31st March 2017, gave the Service's mandate as "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". The revegetation of areas cleared for the project and material sites will be guided by regional KFS officers, especially in terms of the best tree species.

3.4.10 The National Museums of Kenya (NMK)

Is a state corporation established by an Act of Parliament, the National Museums and Heritage Act, 2006 no. 6 of 2006. NMK is a multi-disciplinary institution whose role is to collect, preserve, study, document and present Kenya's past and present cultural and natural heritage. This is for the purposes of enhancing knowledge, appreciation, respect and sustainable utilization of these resources for the benefit of Kenya and the world, for now and posterity. NMK will provide guidelines in case any discoveries or existing cultural and natural heritage resources within the project area.

3.4.11 National Land Commission (NCL)

NLC manages public land on behalf of the national and county governments, initiates investigations into present or historical land injustices and recommend appropriate redress, and monitor and have oversight responsibilities over land use planning throughout the country. It will undertake a key role in delivering land acquired through compulsory acquisition for the project.

3.5 International conventions and guidelines

There are number Multi-Lateral Environmental Agreements (MEAs) that are relevant to the proposed project. These are described in the following section.

3.5.1 Vienna Convention on the Protection of the Ozone Layer

This was an Intergovernmental negotiation for an international agreement to phase out ozone depleting substances concluded in March 1985 which saw the adoption of the Vienna Convention for the Protection of the Ozone Layer. This Convention encourages intergovernmental cooperation on research, systematic observation of the ozone layer, monitoring of CFC production, and the exchange of information.

3.5.2 United Nations Convention on Biological Diversity (UNCBD)

The purpose of this convention is to ensure the conservation and sustainable use of biodiversity. Kenya signed the convention on 5th June 1992 and ratified the same on 26th July 1992. The National Environment Management Authority (NEMA) is the National Focal Point to this Convention. The provisions of this Convention have been integrated in many laws of Kenya.

3.5.3 African Convention on the Conservation of Nature and Natural Resources

This convention reaffirms the importance of natural resources both renewable and non-renewable, particularly the soil, water, flora and fauna. The main objective is to facilitate sustainable use of the above resources. The convention was adopted in Algiers on 15th September 1968 and came into force on 16th June 1969.

3.5.4 Convention on International Trade in Endangered Species

This Convention was adopted on 3rd March 1973 and came into force on 1st July 1975. The purpose of the Convention is to regulate the international trade in wild plants and animals that are at risk of extinction because of trade. The Convention seeks to control trade not only in live species but also in dead specimen and their derivatives. The Kenya Government ratified CITES on 13th December 1978. The lead agency for the CITES in Kenya is the Kenya Wildlife Service (KWS).

3.5.5 The World Commission on Environment and Development (The Brundtland Commission of 1987)

The Commission in its 1987 report dubbed "Our Common Future" focused on the environmental aspects of development, the emphasis on sustainable development that produces no lasting damage to the biosphere and to ecosystems. In addition to environmental sustainability is economic and social sustainability. Economic sustainable development is development for which progress towards environmental and social sustainability occurs within available financial resources. While social sustainable development is development that maintains the cohesion of a society and its ability to help its members work together to achieve common goals, while at the same time meeting individual needs for health and well-being, adequate nutrition, and shelter, cultural expression and political involvement. The key aspect of sustainability is the interdependence of generations.

3.5.6 The Ramsar Convention for the conservation and sustainable utilization of wetlands

The Ramsar Convention (formally known as the Convention on Wetlands of International Importance, especially as Waterfowl Habitat) is an international treaty for the conservation and sustainable utilization of wetlands, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. Appropriate mitigation measures will need to be implemented as detailed in the Environmental Management Plan.

3.5.7 United Nations Convention to Combat Desertification (UNCCD)

The above Convention was adopted on 17th June 1994 in Paris and came into force on 26th December 1996.Kenya ratified the Convention in 24th June 1997. The purpose of the UNCCD is to address the problem of the degradation of land by desertification and the impact of drought particularly in arid and dry semi-humid areas. NEMA is the focal point for the Convention.

3.5.8 The 1992 United Nations Framework Convention on Climate Change (UNFCCC)

The primary purpose of the convention is to establish methods to minimize global warming and the emission of the greenhouse gases. The UNFCCC was adopted on 9th May 1992 and came into force on 21st March 1994. The Convention has been ratified by 189 states. Kenya ratified the Convention on 30th August1994. NEMA is the focal point for the Convention.

3.5.9 The Paris Agreement

This agreement was adopted on 12th December 2015 at the 21st session of the Conference of the Parties to the United Nations Framework Convention on Climate Change in Paris; it then came into force on 4th November 2016 after meeting the ratification threshold. The Agreement provides the framework to address climate change for a safer and sustainable future; it has an objective of preventing a global temperature increase above 1.5 degrees Celsius relative to pre-industrial levels by reduction of Greenhouse gas emissions. Kenya ratified the Paris Agreement and welcomed it into force on 28th December 2016. As at now a total of 171 parties out of 197 have ratified the agreement.

3.5.10 Rio Declaration on Environment and Development

The Rio Declaration on Environment and Development, often shortened to Rio Declaration, was a short document produced at the 1992 United Nations "Conference on Environment and Development" (UNCED), informally known as the Earth Summit. The declaration aimed at establishing a new and equitable global partnership through the creation of new levels of co-operation among States, key sectors of societies and people, working towards international agreements which respect the interests of all and protect the integrity of the global environmental and developmental system, recognizing the integral and interdependent nature of the Earth, our home. The Rio Declaration consisted of 27 principles intended to guide countries in future sustainable development. It was signed by over 170 countries.

Principle 17 of the Rio Declaration provides key relevance to the proposed project; the principle denotes that environmental impact assessment as a national instrument shall be undertaken for proposed activities that are likely to have a significant impact on the environment and are subject to a decision of a competent national authority.

3.5.11 Earth Summit on Sustainable Development Agenda 21

Agenda 21 is a non-binding, voluntarily implemented action plan of the United Nations regarding sustainable development. It is a product of the Earth Summit (UN Conference on Environment and Development) held in Rio de Janeiro, Brazil, in 1992. It is also regarded as an action agenda for the UN, other multilateral organizations, and individual governments around the world that can be executed at local, national, and global levels. The "21" in Agenda 21 refers to the 21st Century. Agenda 21 Section I on Social and Economic Dimensions is directed toward combating poverty, especially in developing countries, changing consumption patterns, promoting health, achieving a more sustainable population, and sustainable settlement in decision making.

Section II on Conservation and Management of Resources for Development Includes atmospheric protection, combating deforestation, protecting fragile environments, conservation of biological diversity (biodiversity), control of pollution and the management of biotechnology, and radioactive wastes.

Section III focuses on strengthening the Role of Major Groups including the roles of children and youth, women, NGOs, local authorities, business and industry, and workers; and strengthening the role of indigenous peoples, their communities, and farmers. Kenya continues to implement Agenda 21 to support sustainable development through the integration of environmental concerns into the national development policies, plans, and programmes. Also relevant is the implementation of Agenda 17. The proposed project would need to be consistent with the objectives of Agenda 21.

3.5.12 Convention on the Rights of the Child

The Convention on the Rights of the Child (CRC), 1989 is the most comprehensive compilation of international legal standards for the protection of the human rights of children. The CRC is also the most widely ratified international human rights treaty, ratified by all countries in the world, apart from two.

The 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.

3.5.13 Convention on the Elimination of all forms of Discrimination against Women

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.

3.5.14 International Labour Organization

The International Labour Organization (ILO) is built on the constitutional principle that universal and lasting peace can be established only if it is based upon social justice. The ILO has generated such hallmarks of industrial society as the eight-hour working day, maternity

protection, child-labour laws, and a range of policies which promote workplace safety and peaceful industrial relations.

The ILO has four principal strategic objectives:

- To promote and realize standards, and fundamental principles and rights at work.
- To create greater opportunities for women and men to secure decent employment.
- To enhance the coverage and effectiveness of social protection for all.
- To strengthen tri-parties and social dialogue.

The key ILO Conventions applicable to the proposed road project include:

- Equal Remuneration Convention (1951) (No. 100) - Calls for equal pay and benefits for men and women for work of equal value.
- Discrimination (Employment and Occupation) Convention (1958) (No. 111) - Calls for a national policy to eliminate discrimination in access to employment, training, and working conditions, on grounds of race, colour, sex, religion, political opinion, national extraction or social origin, and to promote equality of opportunity and treatment.
- Minimum Age Convention (1973) (No. 138) - Aims at the abolition of child labour, stipulating that the minimum age for admission to employment shall not be less than the age of completion of compulsory schooling.
- Worst Forms of Child Labour Convention (1999) (No. 182) - Calls for immediate and effective measures to secure the prohibition and elimination of the worst forms of child labour which include slavery and similar practices, forced recruitment for use in armed conflict, use in prostitution and pornography, any illicit activity, as well as work which is likely to harm the health, safety, and morals of children.

3.5.15 Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs) are a new, universal set of goals, targets and indicators that UN member states will be expected to use to frame their agendas and political policies over the next 15 years. The SDGs include 17 Sustainable Development Goals and 169 targets. The 17 sustainable development goals (SDGs) include

GOAL 1: No Poverty
GOAL 2: Zero Hunger
GOAL 3: Good Health and Well-being
GOAL 4: Quality Education
GOAL 5: Gender Equality
GOAL 6: Clean Water and Sanitation
GOAL 7: Affordable and Clean Energy
GOAL 8: Decent Work and Economic Growth
GOAL 9: Industry, Innovation and Infrastructure
GOAL 10: Reduced Inequality
GOAL 11: Sustainable Cities and Communities
GOAL 12: Responsible Consumption and Production

GOAL 13: Climate Action
GOAL 14: Life Below Water
GOAL 15: Life on Land
GOAL 16: Peace and Justice Strong Institutions
GOAL 17: Partnerships to achieve the Goal

The GOALs seek to build on the Millennium Development Goals that expired in 2015. Most notably SDGs are integrated, indivisible and balance the three dimensions of sustainable development: the economic, social and environmental. This road project is expected to cut-across the three dimensions of sustainable development hence making SDGs a key reference point. The SDGs are also linked to several Kenyan legal frameworks such as Water Act, Forestry Act, and EMCA Cap 387.

CHAPTER 4.0: BASELINE ENVIRONMENTAL AND SOCIO-ECONOMIC PARAMETERS

4.1 Introduction

This chapter examines the baseline environmental, ecological, socio-economic and cultural characteristics of the route through which the proposed Isinya-Konza-Malili road will pass. Information concerning the existing environmental conditions and the respective areas that are under the project's area of influence is detailed herein. The objective is to document the status quo for establishing and assessing the impacts of the project in future. The road traverses through three counties namely; Kajiado, Makueni and Machakos. The area is moderately settled, characterized by a rolling terrain and land with very high potential for livestock and horticulture farming.

4.1.1 Administrative Setting

The road project is located in three counties which are Kajiado, Machakos and Makueni. Kajiado County is within the Nairobi Metropolis. It consists of five sub-counties namely Kajiado central, Kajiado south, Kajiado east, Kajiado west, Kajiado north. It also consists of twenty-five (25) wards. Machakos County is divided into eight sub-counties namely; Mavoko, Kathiani, Machakos, Matungulu, Yatta, Masinga, Mwala, and Kangundo. They are further divided into forty (40) wards. Makueni is the third county in this project having the following sub-counties namely; Makueni, Mbooni, Kibwezi East, Kibwezi West, Kaiti and Kilome. These are further divided into thirty (30) wards and sixty sub wards (60).

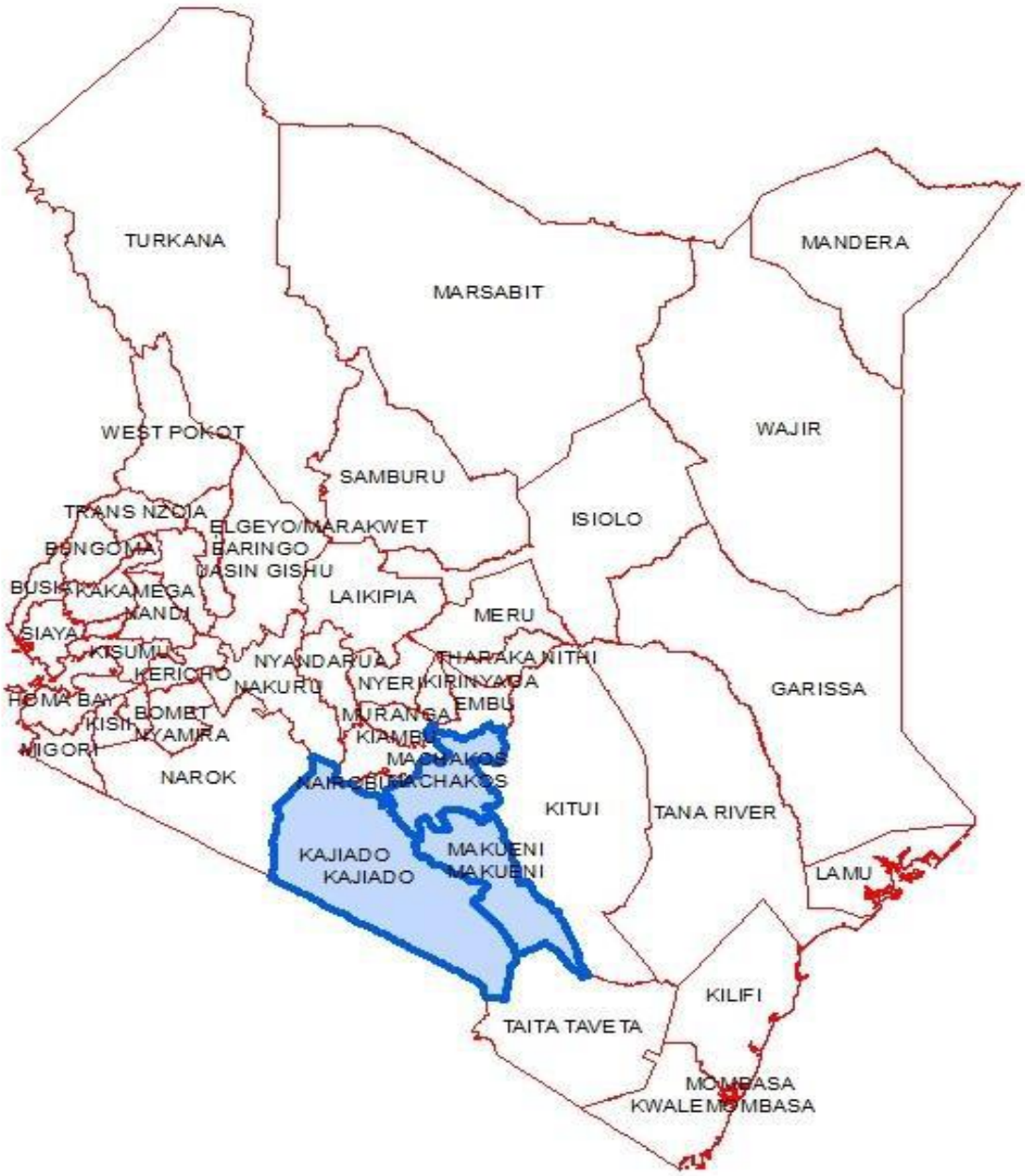


Figure 2: Map showing the three counties traversed by the road project

The project road commences at Isinya Town at the junction of Athi River-Namanga Road (A2) and B50 Roads and ends at Malili Town at the junction with Mombasa-Nairobi Road (A8). The project road is approximately 50Km long, mainly located in Kajiado County (38Km) and short sections in Machakos and Makueni Counties.

4.2 Project Biophysical Description

4.2.1 Topography

a. Kajiado County

Kajiado County is characterized by plains, valleys and occasional volcanic hills. The lowest altitude is about 500 meters above sea level at Lake Magadi while the highest is 2500 metres above sea level in Ngong Hills. The landscape within the county is divided into Rift Valley,

Athi Kapiti plains and Central Broken Ground. The Rift Valley is an elongated depression on the western side of the county running from North to South. It is characterized by steep walls forming plateaus, scarps and structural plains which forms features such as Mount Suswa and Lake Magadi. The altitude ranges between 600 and 1740metres above sea level. The Central Broken Ground is an area stretching 20-70 kilometres wide from the North Eastern boarder across the county to the southwest where altitude ranges from 1220 to 2073 metres above sea level.

b. Machakos County

The County has unique physical and topographical features. These include hills rising between 1800-2100m above sea level and Yatta plateau, which is elevated to about 1700m above sea level and slopes to the South East. There are isolated hills in the North West. In the plains, the soils are well-drained, shallow, dark and red clay soils. In addition, the vegetation across the entire County varies according to the altitude. The plains receive less rainfall and are characterized by open grassland with scattered trees like the areas around Konza where the project traverses as compared to high altitude areas, which receive high rainfall and have dense vegetation.

c. Makueni County

The county lies in the arid and semi-arid zones of the eastern region of the country. The major physical features in Makueni County include the volcanic Chyulu hills which lie along the southwest border of the county in Kibwezi West Constituency, Mbooni Hills in Mbooni constituency and Kilungu Hills in Kaiti constituency which rise to 1,900m above sea level. The county terrain is generally low-lying from 600m above sea level in Tsavo at the southern end of the county.

4.2.2 Geology and Soils

a. Kajiado County

The County has three geological regions namely Quaternary volcanic, Pleistocene and basement rock soils. Quaternary Volcanic soil is found in the Rift Valley. Basement System Rocks which comprise various gneisses, cists, quartzite and crystalline limestone, are found mainly along the river valleys and some parts of the plains. Pleistocene soils are found in the inland drainage lake system around Lake Amboseli. Quarrying of building materials is also done within the county.

b. Machakos County

The rocks in the area consist of intensely folded Basement Rock system of gneisses and schists which include limestone, amphibolites and quartzite as well as the predominating biotite granitoid gneisses. The rocks have been metamorphosed and grainsized to a considerable degree. Overlying the Basement system rocks to the western part are the Kapiti Phonolites, lava of Miocene age.

c. Makueni County

The general area is covered by thin sandy soil overlying rocks of the metamorphic system, generally a combination of gneisses and schist's. The area comprises of erosional resistant hills composed of granitoid gneisses and which the rocks are also exposed at the valleys where seasonal streams meanders exposing the fractured gneisses and schist. The geology of the

project area consists of depositional sandy soils, gneisses and schist's. However, the rocks are locally weathered and fractured which makes it possible for the enhancement of the water recharge mechanisms. The Precambrian rocks are predominantly found in the area. These rocks are locally covered by a very thin layer of top sandy soil which supports a grass cover, shrubs, scattered acacia trees and other vegetation. The rocks occur as folded and fractured gneisses and schist's with all forms of weathering and in some cases form very steep hills. When found they are represented by layered fine grained schist's and coarse-grained gneisses that have been invaded by pink quartzo-felspathic pegmatites. Biotite, hornblende and quartz feldspar gneisses are abundant in the area. The fractured and weathered zones of these rocks are normally aquiferous. Sandy deposits have covered the wide depositional valley through which a seasonal stream meanders draining south west.

4.2.3 Climate

a) **Kajiado County** has a bi-modal rainfall pattern. The short rains fall between October and December while the long rains fall between March and May. There is a general rainfall gradient that increases with altitude. The bimodal rainfall pattern is not uniform across the County. The long rains (March to May) are more pronounced in the western part of the county while the short (October to December) rains are heavier in the eastern part. The rainfall amount ranges from as low as 300mm in the Amboseli basin to as high as 1250mm in the Ngong hills and the slopes of Mt. Kilimanjaro. Temperatures vary both with altitude and season. The annual rainfall trend for Kajiado East, North, Central and West vary from the years 1970 to 2013 and indicates high level of inter-annual variation. Rainfall is becoming highly variable and unpredictable especially in recent decades and the year 2000 was recorded as the driest year. The highest temperatures of about 34℃ are recorded around Lake Magadi while the lowest of 100℃ is experienced at Loitokitok on the eastern slopes of Mt. Kilimanjaro. The coolest period is between July and August, while the hottest months are from November to April.
b) **Makueni County** experiences two rainy seasons, the long rains occurring in March /April while the short rains occur in November/December. The hilly parts of Mbooni and Kilungu receive 800-1200mm of rainfall per year. High temperatures of 35.8 ℃ are experienced in the low-lying areas causing high evaporation which worsens the dry conditions. Climate variations and extreme differences in temperatures can be explained by change in altitude. The areas to the North such as Kilungu and Mbooni hills are usually cool with temperatures ranging from 20.2℃ to 24.6℃, while the low-lying areas of the Makueni South such as Kitise are usually hot. Generally, the county experiences high temperatures during the day and low temperatures at night. During the dry periods between May and October the lower parts of the county experience severe heat. The Northern part of the county is hilly with medium rainfall ranging from 800mm to 1200mm and has high potential for food crop production. This part of the County, covering mainly in Kilungu and Kaiti has few natural and planted forests the area is therefore suitable for horticulture and dairy farming. Over time, the county has experienced climate change and variability which includes insufficient rain and prolonged dry spells among others. Human activities such as farming on hill tops, charcoal burning, and sand harvesting have contributed to this scenario. As a result,

there has been crop failure affecting the food security and thus economic activities. Water scarcity has also become worse due to this condition. Increase in population puts a lot of pressure on land and other resources. To mitigate the effects of water scarcity, the community has resulted into construction of sand dams which are capable of retaining water. Soil erosion control measures are also being undertaken.

c) **Machakos County** receives bimodal rainfall with short rains in October and December while the long rains from March to May. The rainfall range is between 500mm and 1250mm, which is unevenly distributed and unreliable. The altitude mainly influences rainfall distribution in the county. The high areas such as Mua, Iveti and Kangundo receive an average rainfall of 1000mm while the lowland areas receive about 500mm. Temperatures vary between 18˚C and 29˚C throughout the year. The dry spells mainly occur from January to March and August to October

4.2.4 Surface and Ground Water Resources

Kajiado County lies in the semi-arid and arid zones with mean annual precipitation being approximately 400 mm/year. Largely, the county does not have a reliable source of water with the main sources of water being seasonal rivers, shallow wells, springs, dams, water pans and boreholes. Kajiado County is an Arid and Semi-Arid Land (ASAL) characterized by an acute shortage of clean and safe water for drinking and other domestic uses. According to the County Statistical Abstract 2015, only 67.2 percent of the total population have access to safe water. The number of households (HH) with an access to piped and portable water is about 36.8 percent of the total population.

The main sources of water in the rural areas are water pans, dams and protected springs with the most reliable source being boreholes. There are 1150 public boreholes which are commonly managed by communities. However, the county is still water stressed. In order to ensure availability and sustainable management of water, there is need to achieve universal equitable access to safe and affordable drinking water. Plans are underway to expand water distribution infrastructure by extending Nolturesh water pipeline by 100 Kms; Construction of 3 mega dams; and Construction of 80 sand dams by the end of plan period and sinking of boreholes to public schools.

Plate 3: One of the shallow water pan at Km 13, Kajiado County

Machakos County is a water scarce County with its water situation levels below the national natural endowment of 647m_3 per capita per year. Its arid and semi-arid areas are critically limited in water endowment. This serious water stress adversely affects food production and often disrupts economic development. To address the water scarcity situation, more investment in water storage infrastructure should be done to increase water storage per capita.

Water resources in the County are mainly seasonal rivers, dams and springs. Furthermore, the County has two perennial rivers. One of them traverses the County namely Athi River and the other namely Tana River forms the County boundary with Embu and Tharaka Nithi counties. The dams include Maruba, which is the main source of the water consumed in Machakos town whereas Masinga dam on Tana River is shared between Machakos and Embu counties. In addition, several earth dams and springs across the County serve as water resources. Underground water sources (boreholes and wells) supplement surface water sources. Most of these water sources are under threat of pollution from agricultural chemicals, urban and industrial wastes especially Athi River, which is under threat of pollution from the Nairobi city and adjacent towns. The water resources are also under pressure for use in agricultural irrigation, domestic, industrial and use for hydroelectric power generation. **Makueni County** has two permanent rivers; Athi and Kibwezi. There are four protected springs and 117 boreholes. Households with piped water are 12671 while 27752 households have access to potable water. There are 289 water pans and 159 surface dams.

The water demand in the county is 22,113m_3/day and the developed sources have an average production of 13,607m_3/day. There are two major rivers; Athi which is permanent and Thwake which is semi-permanent. Other big rivers include Kaiti, Muooni and Kikuu all of which are seasonal. There are 278 earth dams with a storage capacity of 3,265,543M_3 while the sand dams are 118. There are four protected springs and 117 boreholes.

4.2.5 Solid Waste Management

There are seven public dumpsites managed by the County Government of **Kajiado**. The dumpsites include Kajiado, Kitengela, Bissil, Ngong, Loitokitok, Mashuuru and Isinya dumpsites. The County Government has availed 8 No. garbage collection trucks and loaders which collect garbage at designated areas within the urban areas. There are 10. No litter bins in Rongai, Ngong and Kiserian. There are several private investors mandated to collect garbage from homesteads at a fee ending at the dumpsites. However, plans have been initiated to relocate Ngong dumpsite with World Bank conducting feasibility studies. The County introduced the *taka ni mali* initiative with the aim of promoting and sensitizing the community to take charge of waste as they generate income.

In **Machakos county:** There are several bodies whose mandate is to regulate and control the use and management of water resources, namely: Water Resources Authority (WRA) **–** this body regulates, manages and protects water resources, National Environmental Management Authority (NEMA) **–** this body formulates and implements policies on water resource use and conservation, Water Services Regulatory Board (WASREB) – this body sets and regulates

water tariffs for Water Service Providers (WSPs),Ministry of Water & Irrigation – both National and County Government, Water Resource Users Associations (WRUAs) − It's a grassroots water resources management and conflict resolution body. The County Government has improved sanitation through provision of super clean and free toilets in public places such as bus parks and market centres across the County. This aims to make Machakos County an open defecation free County. There are two sewer lines in Machakos and Athi River towns. However, the former is partially connected to sewer lines- this includes parts of Kariobangi and Mjini where more than 50% use pit latrines. Garbage disposal is done by the County Government, private firms and individual households.

Makueni County has various issues with the sanitation and waste management. All the major towns lack sewerage facilities and the sanitation condition is worsened by water shortage. The local community has however embraced the use of toilets and currently about 80 per cent of the households have access pit latrines.

4.2.6 Noise and Vibration

Noise and vibration will be a key feature in the construction activities of the proposed project due to machinery and equipment's that will be deployed. Heavy construction equipment frequently creates loud noise level. Moving machines and incoming vehicles delivering construction materials are the potential sources of noise. High noise level may distract concentration, cause difficulties in speech communication and increase the risk of accidents. Long term exposure to excessive noise may cause permanent hearing damage.

4.2.7 Flora and Fauna

Kajiado County- The County boasts of a wide range diverse fauna and flora. The animals include Wildebeests, gazelles, zebras, warthogs, hyenas, giraffes, elephants, lions, leopards and elands and diverse bird species. Areas designed for game reserves are; Amboseli National Park which covers a total of 392Km^2 and Chyulu conservation area which is 445Km^2. These areas fall within range lands.

Plate 4: Vegetation dominated by *Acacia* spp across the three counties

Machakos County- The vegetation types in Machakos County are influenced by altitude, rainfall, soils and rivers. The types include: forest types (hilltop), woodlands, bushland and shrub land, and dwarf shrub grassland. The forest types occur on hilltops above 1500 m a.s.l in over 10 m tall with interlocking cover. The woodlands are usually 10-20 m tall with a canopy of between 50 – 79 % with well-developed herbaceous cover of dwarf shrub understory. Bushland and shrub land are scattered and 6- 10 m tall and mostly thorny. Lastly, dwarf shrub grasslands consist of woody plants of less than 1 m tall occurring mainly in the Central part of the County. Species common in Machakos County include: indigenous forest types tree like *Croton macrostachyus, Albizia gumnifera*, *Ficus thornigii;* plantation forests in the hilltops with trees such cypress, pines, and eucalyptus. Common in the wetter regions for woodlands Combretum species, Comnihora species in the drier areas and Enchea spp, *Croton macrostachus,* Ravetateifana, Vanguewa spp, Terminalia spp. The project area is an urban centre where vegetation has become scarce due to developments.

Fauna- Machakos County is has wildlife resources mostly found in private ranches. Oldonyo Sabuk National Park is located to the North of the County; the Southern area of the county experiences wildlife migrating from Kajiado County. The wildlife includes zebras, wildebeest, Giraffes, Thomson gazelle, Lion, Cheetah, and buffalo, ostriches, impalas, and dikdiks among many other. There are no existing faunal habitats within the Town because of urban development. Wild fauna species are rare in the settlements but a few bird species, rodents, reptiles, and insects still exist. Domesticate animals such as goats, cows, dogs, cats, and chicken are kept by the residents.

Makueni County- the flora and fauna found in the area is the indigenous vegetation cover which has been tampered with to give way to subsistence cultivation and poles and timber for houses construction. However, the tree planting exercise of exotic trees that is being carried out by the local population is slowing promoting the environmental conservation especially in the institutions of learning, business buildings and residential houses.

4.3 SOCIAL-ECONOMIC BASELINE SURVEY

4.3.1 Population and Demography

The 2018 projected population for **Kajiado County** stands at 1,112,823 with male population constituting of 50.2 percent and female population constituting of 49.8 percent of the total population. The population is projected to be 1,236,723 in 2020 and 1,306,723 at the end of plan period. The county's population growth is 5.5 percent occasioned by migration from the neighboring counties attracted by employment opportunities and availability of land for settlement. Analysis of the county's population depicts that children between ages 0-4 years are more than other population categories contributing 16 percent of the total population. Ages 5-9 years and 10-14 years follows accounting for 14 percent and 12 percent respectively. Population aged 60 years and above represents 3.3 percent of the population. The 2018 projected population reflects a sex ratio of 1:1 reflecting an equal population of female to male.

Machakos County had a population of 1,421,932 as presented by the Kenya national Bureau of Statistics 2019 Census. It has a population density of 235 per square Kilometer. The total population of the County was 1,098,584 as per the 2009 Kenya Population and Housing Census. The projected population for the year 2018, 2020 and 2022 is 1,426,211, 1,511,377 and 1,601,629 respectively.

The population for different age cohorts is almost equally distributed. This is as indicated in table 3 below. The projected male population stands at 705,118 while that of the female stands at 721,094 in 2018. This translates to a sex ratio of 1:1.02. The total urban population as at 2009 was 562,425 and projected to 730,156 in 2018. The populations of the year 2020 and 2022 were projected to be 773,757 and 819,962 respectively. This represents approximately 51.2 per cent of the total county population. Kangundo – Tala has the highest urban population projected at 283,737 in 2018. Machakos urban population is projected at 194,787. This can be attributed to it being an administrative and recreational centre. Machakos also has plenty of social amenities like hospitals, universities and colleges. Mavoko has a projected urban population of 178,131. This can be attributed to it being an industrial town, real estate ventures and its proximity to Nairobi. There is need to expand the social amenities in these areas to cater for the increasing population.

Makueni County on the other hand had a projected population at 922,183 in 2012 consisting of 449,036 males and 473,147 females. This is an increase from 884,253 persons as per the 2009 by Kenya National Population and Housing Census. The annual population growth rate stands at 1.4 per cent while the male-female sex ratio stands at 100:105. As at 2018, the population of Makueni County was at 987,653 and 121 people per square kilometer. In the county 14.3 per cent of the population is below the age five years as compared to 1.8 per cent of the population who are above 80 years of age. The five to nine-year group has highest number of persons at 138,986, representing 15.1 per cent of the total population. The population reduces as the age progresses reaching the lowest number at the 75-79 age cohort which constitutes 0.8 per cent of the total population.

4.3.2 Human Settlement

Human settlement pattern in the **Kajiado County** is divided into urban and rural, with majority of the population settling in urban areas compared to rural areas. The county has experienced intensified population pressure that has triggered land use/cover change compounded by climate change. Expansion of settlement areas due to population influx from the City has increased the demand for housing and other infrastructural development in the county. This has seen sprawling of settlements with and outside the boarders of major towns in the county. Major urban areas include Ngong, Ongata Rongai, Kitengela, Ngong and Loitokitok.

Privatization of land tenure, subdivision and commercialization of communal rangelands have resulted to further disaggregation of human settlement in the county. The rural community who were formally nomadic pastoralists settle and have to alternatively manage cattle on their parcels thus leading to land degradation while reducing flora and fauna. This has further compounded into human-wildlife conflict that is rampant across the county.

Plate 5: Clustered settlements at KM 14, Kajiado County

The absence of a county spatial planning framework in **Machakos** has led to the proliferation of informal settlements, congestion, environmental degradation, unplanned urban centres, pressure on agricultural land and land use conflicts. People in Machakos County tend to cluster within town centres while rural areas are sparsely populated.

In **Makueni County,** enormous developments set to emerge in and around the Konza Technology City will redefine Makueni County human settlement pattern and transform the economic activities of not only Makueni but also Machakos and Kajiado Counties. To city will be served by water from Thwake Multipurpose dam which is being constructed. Further Mombasa-Nairobi highway will be expanded from Konza to Nairobi from dual carriage to one way. There are 25 settlement schemes in Kibwezi West and East Constituencies. There is need to have a permanent solution to the squatter problem.

4.3.3 Health Settings

In **Kajiado County,** there are four (4) sub county hospitals; Kajiado, Loitokitok, Ngong and Kitengela; sixteen (17) health centres and seventy-eight (78) dispensaries run by the county government. There are also six (6) hospitals, thirteen (13) nursing homes, seven (7) health centres, twenty-seven (27) dispensaries and one hundred and one (101) clinics which are either run by private, faith based, community based and other non-government organizations. The county has 92 community health units initiated out of which only 78 are active. The doctor population ratio is 1:26,094, Public Health Staff is 1: 7,619, and the nurse population ratio is 1: 1,068. The average distance to a health facility is 14.3 km with only 9.9 percent of the population within a distance of less than a Kilometer to a health facility.

Plate 6: Dispensaries along the project road, Kajiado County

In **Machakos County,** the construction of health facilities programme through Economic Stimulus Programme (ESP) and Constituency Development Fund (CDF) led to increase in health facilities in all sub-counties. The County Government has greatly improved the health facilities with one Level 5 hospital located at Machakos town and four Level 4 hospitals in Kathiani, Mwala, Matuu and Kangundo. Other health facilities by ownership include 193 under the County Government, 32 owned by FBOs, 9 owned by NGOs and 128 private-owned. The total health facilities in the County are 367. Most of the health facilities are found in the urban areas. Patients/clients in rural areas travel longer distances to access health services. In response, the County Government has instituted measures to ensure access to well-equipped health centres within the wards.

Makueni County on the other hand, the health sector has played a major role in ensuring that most of the county's population can access affordable healthcare services. There is Makueni level five hospital, six level four hospitals at Kilungu, Makindu, Mbooni, Kibwezi, Mukaa and Nzaui. The county also has 21 level three, 113 dispensaries and eleven private clinics in the county. Most of the public health institutions lack sufficient drugs, equipment, and transport and health personnel. The bed capacity in the county stands at 616 and doctor population ratio is 1:22,712 which is below the accepted standards. There are nine VCTs and 138 counsellors in the county which need to be increased to accommodate the population. The average household distance to health facility is six Kilometres which is way below the national recommended distance of four Kilometers.

4.3.4 Infrastructure and Access

The total length of roads in **Kajiado County** is 2,419.2 Km which include 1,111.9 Km of earth roads, 932.3 Km of murram and 375 Km of bitumen (County Statistical Abstract 2015). The five major tarmac roads in the county are Emali-Loitokitok; Namanga-Kitengela, Isinya-Kiserian, Magadi-Mbagathi and Kiserian-Ngong. The County has two modern bus parks namely Kitengela and Ngong.

The Standard Gauge Railway (SGR) traverses the county through parts of Kajiado East and North with a major SGR terminus at Emali. A major underpass tunnel which covers 4.5km situated in Em-Bulbul – Ngong is near completion. The metre gauge railway is used as a means of transport for soda-ash and other by-products and as well serving residents with commuter services in towns and areas such as Singiraine, Kenya Marble Quaries (KMQ), Kajiado and Elangata-Wuas. There are seven airstrips in Kajiado County, with at least one in each Sub-

county. The airstrips are in Kajiado town, Loitokitok, Olooloitikosh, Ngong, Magadi, Daraja and Amboseli National Park.

Plate 7: SGR and Metre Railway crossing the project road at the border of Kajiado and Machakos Counties

Machakos County has an averagely good road network. Major roads include the Mombasa Highway, Machakos-Kitui, and Machakos – Wote, Garissa and Kangundo roads, among others. The County has successfully constructed the following roads among others, the Mwala –Kithimani road, Kathiani – Kangundo road and Athi river road. It has also upgraded most access roads within the County. There are ongoing road initiatives in the County through partnership with the national government and other development partners. These include dualing of Mombasa road (Namanga road interchange to Makutano Kyumbi), Koma – Konza, Matuu – Ekalakala, Kenol-Kaseve, Tala -Oldonyo Sabuk roads, among others.

Makueni County has a total road network of 3,203.5 Km of which 453.8Kms is bitumen, 555.2Kms gravel, and 2,198.6Kms surface roads. The main roads in the county are Katumani-Wote-Makindu road, Masii-Mbumbuni road Salama-Kikoko and Mombasa road. The bitumen roads are in fairly good condition but most of the gravel and surface roads are in poor state which makes them impassable during rain seasons.

The county is traversed by a railway line which covers 140 Kms. Major railway stations are Makindu, Kibwezi, Mtito-Andei and Emali. It also has one airstrip situated in Makindu and it is operational.

4.3.5 Education

Kajiado County has a total number of 888 ECD Centres with a total population of 61,225 children. Out of this, the percentage of boys enrolled stands high at 53 percent in comparison to the population of girls which is 47 percent. Kajiado North leads in the enrolment which is 27,468 representing 45 percent of the total enrolment. Net enrolment rate is 86 percent. There are 3 facilities that cater for children with special needs: Enkijape Pre-Primary in Loitokitok for hearing impaired; Primary Boys boarding in Kajiado for the visually impaired; and AIC Childcare in Kajiado for multiple needs. The overall retention rate stands at 67 percent with Kajiado East leading at 98 percent. The completion and transition rates are relatively high which stands at 83 and 89 percent respectively. However, the dropout rate stands at 19 percent

which may necessitate. The County has a total of 771 primary schools comprising of 446 public and 325 private schools. The total population of pupil stands at 154,677 translating to a teacher / pupil ratio of 1:43. The net enrolment rate is substantial at 77 percent with the highest record in Kajiado North. Nonetheless, the County Government has a responsibility of attaining 100 percent enrolment rate. The retention and completion rates stand at 63 percent and 77 percent. This may mean that a sizeable number of children drop out of school hence lacking the minimum basic education especially in the rural areas. This may be attributed to the distribution of distance to nearest public primary schools which shows a population of over 60 percent trek between 1.1- 4.9 Kms. Lack of mobile school programme attributes to the high dropout rate especially during the drought seasons.

- **Secondary Education**

The county has a total record of 121 secondary schools with 70 being public and 51 private schools. The net enrolment rate stands at 54 percent with the county recording a substantial drop out rate at 15 percent with the rural areas still taking the lead at an average dropout rate of 30 percent. Community distance distribution to the nearest public secondary school still remains high especially in the remote areas across the County. This may attribute to the high dropout rate together with lack of mobile education program in the county.

- **Technical and Vocational Training Centres (TVETs)**

TVETs are aimed at equipping trainees with practical skills and entrepreneurial skills that will enable them get opportunities and help better their lives as they contribute towards achieving the countries aspirations under the Vision 2030. The county is home to the Maasai Technical Training Institute (MTTI).

Vocational Training Centres is a sole mandate of the county government. Kajiado County has five operational polytechnics (Olekasasi in Kajiado North; Isinya in Kajiado East; Oltiasika and Namelok in Kajiado South; and Entasopia) in Kajiado West. Meto polytechnic is non-operational while the county plans to open two more in Oloolua and Saikeri. Trainees acquire varied skills in courses offered including fashion design and garment making; Motor vehicle mechanic; Carpentry and joinery; Information, Communications and Technology (ICT); Building and Construction; Hair dressing and Beauty therapy; Leather work; Electrical and electronic courses among others.

- **Tertiary Education**

The County has five private universities and two private university campuses. Other training institutions include teachers training colleges and commercial colleges spread across the main towns. The county plans to establish Olkejuado University of Applied Technology (OLKUAT), a public university aimed at providing technical skills aimed at providing the much-needed manpower in varied fields of the economy.

- **Adult and continuing Education and Non formal Education**

Literacy level in the county is 65 percent with higher literacy levels being registered in urban areas compared to rural areas. The County has 156 Adult Education Centres which include basic, non-formal, adult and continuing education alongside a Multi-Purpose Training Centre. Overall enrolment is 2,775 adults education department to carry out a research and work towards its reduction.

Literacy levels in **Machakos County** stand at 92.4% of which male and female literacy levels is 95.4% and 89.4% respectively. Education status in the county is as in the table below.

Population with KCPE certificate	**Population with KCSE certificate**	**Population with College certificate**	**Population with diploma certificate**	**Population with degree certificate**	**population with no qualification**
32.4%	19.9%	1.8%	2.6%	1.5%	40.1

- **Youth Polytechnics**

The County has 37 youth polytechnics spread across the County with a population of 3,150 students and 260 instructors. This figure is bound to increase as the County Government embarks on promotion of skilled based centres.

- **Tertiary Education**

There are three fully fledged universities in the County i.e. Machakos University, Daystar University and Scott Christian University located in Mavoko and Machakos Constituencies. In addition, there are other university colleges and various learning institutions located in the major towns across the County. The County also has 2 public medical training colleges namely Manza and Machakos and 2 teacher training colleges which are Kilimambogo and Machakos.

- **Adult Education and continuing Education**

There are 209 adult education registered centres offering basic education with a student population of 6,672 and 161 teachers. The enrolment of females in adult education is higher as compared to males; like in 2016, the females and males were 5,726 and 946 respectively.

- **Technical, Vocational Education and Training**

There are 23 registered TVETs in the County offering certificate and diploma courses in technical skills. Notable training institutions in the County include Agriculture Training Centre (ATC), Kenya Meat Training Institute (KMTI), National Industrial Training Authority (NITA) and National youth service school of Agriculture.

- **Special Schools**

The county has two special schools. The Machakos School for the blind and Machakos school for the deaf which caters for the sight and hearing impairment respectively.

Makueni County

- **Pre-School Education**

The county has 1,510 Early Childhood Development (ECD) Centres with a total enrolment of 41,820 composed of 21,922 boys and 19,898 girls. There is a high retention rate of 94.4 per cent and average of two years of attendance. There are 1315 teachers translating into a teacher pupil ratio is 1:25.

- **Primary Education**

The county has 982 primary schools out of which 914 are government owned while 68 are private owned. The total enrolment is 269,752 pupils and 7,242 teachers which translate into a teacher pupil ratio of 1:37. The retention rate is 93 per cent. Onn average most of the pupils (70 per cent) cover a long distance of 5Km and more to the nearest school. The Gross

Enrolment rate in primary school stands at 120 per cent meaning there are many children who are above age 6-13 age group who are in primary school.

- **Literacy**

The illiteracy rate in the county is 22.41 per cent against the national level of 28.59 per cent. This shows that, the county is better off compared to the whole country.

- **Secondary Education**

By the year 2012 there were 339 secondary schools with a total enrolment of 75,985 and a retention rate of 86 per cent. With a total of 2300 teachers, the county has a teacher pupil ratio of 1:33. The transition rate from primary to secondary school is 60 per cent while Gross Enrolment rate stands at 76. 6 per cent.

- **Tertiary Education**

The county has 12 tertiary institutions and two university satellite campuses. Shortage of University and National Polytechnics to accommodate the high numbers of students from secondary Schools, impacts negatively in career development.

Plate 8: Tertiary technical colleges adjacent to project road at Malili town

4.3.6 Information Communication and Technology

Mobile telephony connectivity in **Kajiado** County is at 60 percent with major signal instabilities in parts of Kajiado West, South and Central. Internet connectivity have been enhanced within the county headquarters due to availability of fibre optic cables but have major signal oscillations in other parts of the county. Most areas are served with radio and television services with some areas having low signal frequencies. According to the 2009 census, landline connectivity was 0.9 percent in Kajiado Central constituency, 0.6 percent in Loitokitok and 10.6 percent in Kajiado North. Kajiado County has three (3) Huduma Centres located within Kajiado town, Ngong and Kisamis. This has enhanced transparency, efficiency and easy accessibility of public services to all. There are six (6) post offices situated in Kitengela, Ongata Rongai, Kajiado, Ngong, Namanga, and Loitokitok.

Machakos County network coverage within the County is of 85 per cent of the total area. However, areas such as Kibauni and Yathui in Mwala, and Kalama in Machakos have a poor

network coverage. The number of land line connection is 327 and its use is on the decline particularly because the use of internet as the main source of communication is on the rise and with the availability of fibre optic then the reliance on the landlines is on the decrease. There are 14 post offices and 20 sub-post offices which are fairly distributed within the County. Radio ownership is 96 per cent which is attributed to low cost of purchase and maintenance while Television coverage is 58 per cent.

In **Makueni County,** there is only one registered private courier service provider, 13 post offices and seven sub-post offices spread in all major urban centres. The private sector through the public service vehicles also offers the courier services. The county is well served by and regional radio services but Television signal reception is poor and is mainly available through pay stations. There are 37 cyber cafes located Wote and Mtito-Andei towns and other major urban centres. The mobile phone coverage stands at 85 per cent. Most of the counties' residents also own mobile phones which has in turn created new opportunities in communication industry, particularly in the mobile money transfer and mobile banking. The world has become a global village with the advent of Information Communication and Technology (ICT). The Konza Techno City an ICT park which is one of the flagship projects in the vision 2030 has started at Malili in Mukaa Sub County along the Mombasa-Nairobi highway. The city is expected to create 20,000 jobs. The Techno City will operate under the Special Economic Zone Act and the Special Economic Zone Act in order spur the country's economy. The city will be implemented in phases. it is meant to become a global leader in the field of ICT housing Kenya's International Financial Centre, a World Class Convention Centre and Light electronic manufacturing. The city will be constructed through public private partnership and funding from World Bank and the government. The city therefore will nurture and encourage a source of income an employment and act as a means of technology transfer. The enormous developments set to emerge in and around the Konza Technology City will redefine Makueni County human settlement pattern and transform the economic activities of not only Makueni but also Machakos and Kajiado Counties. To city will be served by water from Thwake Multipurpose dam which is being constructed. Further Mombasa-Nairobi highway will be expanded from Konza to Nairobi from dual carriage to one way.

4.3.7 Energy

The main energy sources in **Kajiado** County are firewood, electricity, charcoal, solar and petroleum products. Out of 173,464 households across Kajiado County, only 69,098 households are connected to electricity accounting for 39.8 percent of the households, with highest number of households being in the urban areas. Other sources of energy underexploited include wind, solar and geothermal. In **Machakos County,** the main source of energy for cooking and lighting is wood and electricity respectively. Other sources of energy across the County are solar, wind, biogas, gas, charcoal and paraffin. Masinga dam is one of the Seven Folks dams, which produce hydroelectric power for the national electricity grid. There is increasing connectivity to the national grid across the County because of the implementation of „last mile" power project by the national government.

Electricity coverage within **Makueni** County has been expanded through the rural electrification programme. More than 2000 households have been connected. Electricity is mostly used in the households for lighting purposes. There is need to upscale connections

particularly in the upcoming markets and institutions. The county experiences long hours of sunshine that has not been exploited to provide solar energy largely. This is largely due to lack of financial capabilities and low awareness of technologies for installation and utilization of this environmentally friendly renewable source of energy. Firewood is the major source of cooking fuel accounting for 84.8 per cent of households, followed by charcoal at 11.1per cent. However, this poses a great danger to the environment. Paraffin is the most used source of energy for lighting in the households at 69 per cent followed by electricity and solar at 5.9 per cent and 3.8 per cent respectively.

Plate 9: High powered cables crossing the project road at Malili town

4.3.8 Land and Land Use

Land is considered an important factor of production and development. **Kajiado County** is endowed with vast land and diverse land resources within the arid and semi-arid zones of Kenya. It must therefore be put to best and sustainable use. The county. The predominant activity on the land is livestock farming where majority of the local residents in rural areas (particularly the *Maasai*) practice pastoralism. There are however areas where small and medium scale crop farming is practiced in high potential areas such as Ngong, Loitokitok, and Nkuruman. Flower farming is mainly practiced in large scale within Isinya and Kitengela areas. Horticultural farming is also picking targeting both the local and international markets.

Due to increased demand on land and pressure from the Nairobi City, rapid urban development is also taking place across the county. These include industrial development, massive housing developments, quarrying/mining, among others. The county is also home to important natural resources such as Amboseli National Park, Ngong Hills, Oloolua Forest, Lake Magadi, Oldonyo Orok in Namanga, Maparasha Hills, Oloorgisalie historical site, several wildlife sanctuaries such as Kimana, among others. The high demand for land for various use has significantly contributed to increased land subdivision and fragmentation of agricultural land into unsustainable portions hence affecting rural livelihoods.

Plate 10: Irrigational agriculture along the project road, Kajiado County

Land use in **Machakos County** urban centres is generally mixed development. There are no clear-cut zones for specific land uses in the county. This is because all the existing physical development plans except Machakos New Town Local Physical Development Plan are outdated hence not in force. There is no well-defined zoning policy in the county that guides land use development in all its urban centres sometimes leading to overlaps and mixing of incompatible land uses. There are 2 basic land use structures which are rural and urban. Rural: Agriculture (arable), Urban: residential, commercial, industrial, recreational, wildlife, rangeland.

- **Agriculture land use**

Agriculture is the dominant land use in Machakos County with over 75% of the land in Machakos County is used for agricultural purpose. About 20% of the total land of Machakos County is cultivated. Most people live on their farms and sub-divide them for different uses.

- **Residential land use**

In general, the residential land use in the County is mainly concentrated in urban centres. Low-density residential land use is mainly observed as one moves away from the urban centres. The current growth of the residential land use is largely informal since most developments do not seek development permits. However, the rural setting that dominates Machakos County presents a scenario where people live on a portion of land where they do their farming.

- **Commercial land use**

The commercial activities are mainly concentrated along the main roads and highways passing through the urban centres, rural centres and market centres forming a linear pattern. The commercial activities here include retail outlets, stalls and street traders, hotels/restaurants. Similarly, more pockets of commercial nodes are emerging within some of the residential areas but in an informal trend.

- **Industrial land use**

Most of the heavy industries in Machakos County are concentrated in Mavoko Sub County. The other towns mainly have light industrial establishments. Machakos County has a potential for agricultural and fruit processing plants mainly for maize and other grains grown as well as indigenous and exotic mango fruits.

- **Educational land use**

There are more than 896 public primary schools, 301 public secondary schools, 147 private primary schools, 73 private secondary schools, village polytechnics, colleges and universities such as Daystar University.

- **Recreational facilities land use**

Most of the County's urban centres have inadequate recreational facilities. The open spaces in existence are not easily accessible and lack the necessary facilities for recreation purposes with exception of Machakos People's Park in Machakos Town which is open to the public for range of recreational activities such as boat ridding, children games, events, zip-line, filming etc.

Makueni County- the County has a total arable land of 5042.69Km2 which is 74 percent of the total area. A total of 1,762.71Km2 is non-arable accounting for 21.9 percent of the total area. Part of the 2,023 Ha of land that Konza Technology City lies in the county. There are no water masses or industrial area in the county while the urban area accounts for only 7.4 percent of the total area.

Most of the land is used for agricultural purposes since most people depend on agriculture and livestock for their livelihood. The County has potential in horticulture and dairy farming especially the hilly parts of Kilungu and Mbooni west sub counties. The lowlands are used for livestock keeping, cotton and fruit production. Fruits grown are mainly mangoes, pawpaw and oranges. These areas include; Kathonzweni, Mbooni East, Nzaui and Makueni sub counties. There is an upcoming fruit processing plant at Wote town to process the fruits as well as a ginnery for cotton processing. This will go a long way in value addition for these products.

- **Mean Holding Size**

The county has a mean holding size of 1.58 Ha. This means that every household occupies or owns an average area equivalent to 1.58 Ha. This is high compared to the national mean holding of 0.97Ha per household.

- **Percentage of Land with Title Deed**

In the county 186,814 land owners have title deeds which is only 19.8 per cent of all land owners. The percentage is low compared to the national figure where 39.4 per cent of land owners in the country have title deeds.

4.3.9 Crop and Livestock Production

Kajiado County Main crops produced are maize, beans, Irish potatoes, tomatoes, capsicum, water melon, cow peas, vegetables and bananas. Kajiado South Sub County is the main producer of maize for both subsistence and commercial purposes. In Kajiado south sub county, the area under maize production is 25,950 Ha annually, while the area under beans is 40,650 Ha annually. Tomato farming is also common in the county with 1,510 Ha across the county and Kajiado South leading with 940 Ha under cultivation. The county is in the process of completing a tomato processing factory in Namelok in Kajiado South with an aim of tomato chain and value addition.

- **Acreage under food and cash crops**

The total acreage under food crops and cash crops is 52,775 Ha and 17,354 Ha respectively.

- **Average farm sizes**

The average farm sizes for small scale is 0.5 Ha and 10 Ha for large scale farming.

- **Main storage facilities**

Kajiado South have a main storage facility as National Cereal and Produce Board (NCPB) stores and receives a substantial harvest for maize crops although it's mainly from subsistence farming. The farmers have home granaries and stores. Kajiado Central and Kajiado north also have their main storage facility as NCPB.

The county major cattle breeds are Sahiwal, zebu, Borans and exotic. Kajiado demonstration farm provides Sahiwal breeding bulls to the pastoralists. The main sheep breeds are red Maasai and dorper. Goat breeds are galla, small east African and German alpine. Average annual milk production per year is 912,721 litres, beef production is 6639 tones, mutton production is 642, 750 Kgs, chevon production is 536,505, poultry production is 345,600 and egg production is 1,440,000 trays.

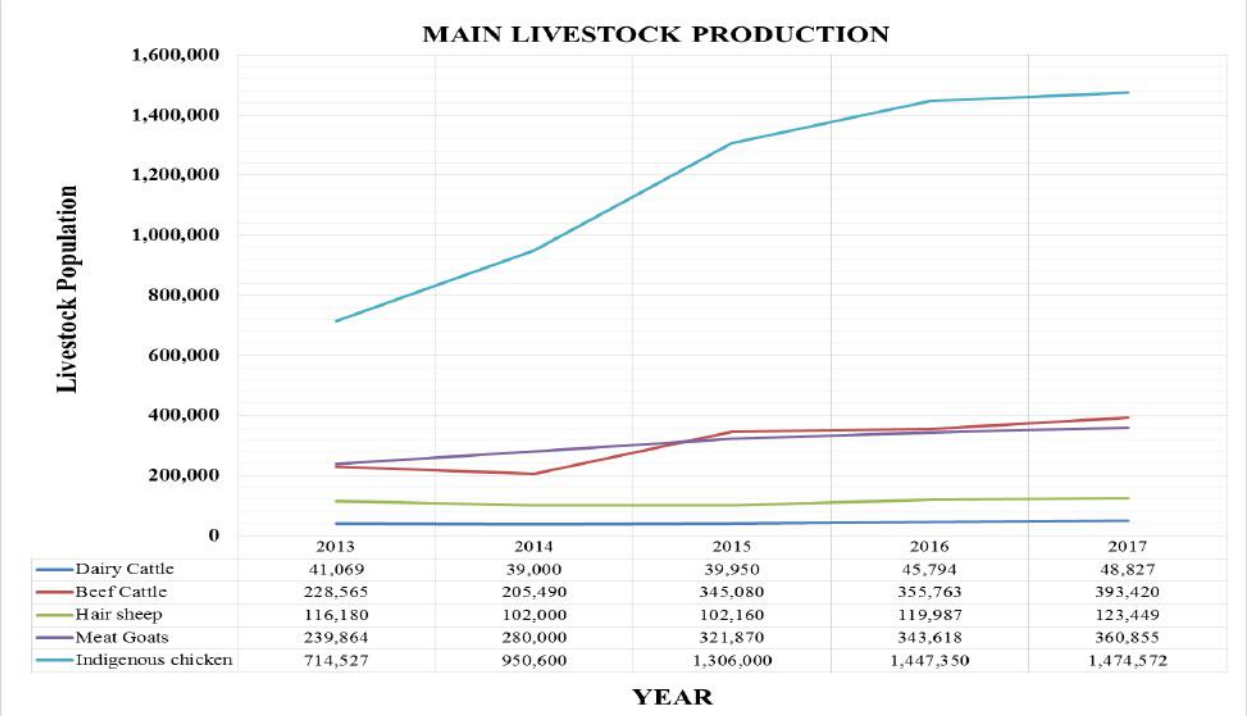
Approximately 60% of total land area in **Machakos County** is arable. Agriculture is the main activity carried out in most of the sub-counties. The main cash crops are coffee, mangoes, citrus, French beans, pineapples, flowers, sorghum and vegetables. The food crops grown include maize, beans, pigeon peas, green grams, cowpeas and cassava which are cultivated in small scale. The County aims to increase the productivity of arable land through use of quality farm inputs, appropriate mechanization, irrigation and good agricultural practices. Maize and beans are the main food crops grown across the County with 62,000Ha and 38,000Ha respectively. Mangoes and coffee are the major cash crops with 6,000Ha and 5,000Ha respectively. Between 2013 and 2017 there was general increase in livestock populations with indigenous chicken registering the highest growth in numbers. This is attributed to free indigenous chicks' program being implemented by Department of Agriculture, Livestock and Fisheries.

There are 14 livestock markets distributed across 6 sub-counties where large scale livestock trading takes place.

Plate 11: Showing livestock keeping in the area

- **Ranching**

The County has 13 ranches namely Kasisi, B&T Malinda, Carol Malinda, Machakos ranch, Kyelu, Lukenya, Game ranch, Maanzoni, Kakenyi, Kapiti, Mwambi, New Astra and Lisa.



	2013	2014	2015	2016	2017
Dairy Cattle	41,069	39,000	39,950	45,794	48,827
Beef Cattle	228,565	205,490	345,080	355,763	393,420
Hair sheep	116,180	102,000	102,160	119,987	123,449
Meat Goats	239,864	280,000	321,870	343,618	360,855
Indigenous chicken	714,527	950,600	1,306,000	1,447,350	1,474,572

Three (3) are located in Machakos Sub-county while thirteen (13) in Mavoko Sub-county. The livestock in these ranches include cattle, sheep and goats.

Source: Directorate of Livestock, Machakos County 2017

The main crops produced in the **Makueni County** are Maize, Green grams, pigeon peas and sorghum. Mangoes, pawpaw and oranges are also being produced. Grafted mangoes are vastly gaining momentum due to the high demand and favourable conditions.

- **Acreage under Food Crops and Cash Crops**

The total area under cash and food crop is 23,356 Ha and 65,453 Ha respectively which is 2.9 per cent and 8.1 per cent respectively of the total county area.

- **Average Farm Size**

The average farm size is 3.44 Ha for small farmers and 30.4Ha for large scale farmers. Small farms are the common one. However, there are no ranches in the county.

- **Main Storage Facilities**

Granaries are the main storage facility used in the county mostly for the cereals harvested. Despite the presence of storage facilities, the county experience aflatoxin cases whenever there is bumper harvest. There is a National Cereals and Produce Board store at Wote which provides supplies of cereals, seeds and fertilizer at reduced cost. The organic farming performance is marginal with about 16.83Ha being under organic production.

- **Main Livestock Bred and Ranches**

Livestock production is a major economic activity in the county. The main breeds reared include livestock (dairy cattle, beef cattle, sheep, goats and donkeys, Poultry farming, pig farming, bee keeping and fish).

- **Ranches**

The county has 12 branches with a total area of 45,916 Hectares. Kima estate and Kiu ranches are owned by cooperatives while Aimi ma Kilungu and Malili ranches are owned by companies. There are eight ranches owned by individuals which includes Stanley & sons, Sultan Estates, Uathimo Farm, Mwaani, Muiu farm, Nzai farm, Kalima and New Ashtra.

4.3.10 Tourism

Tourism in **Kajiado County** is mainly an economic and social occurrence. Amboseli National Park is one of the 9 No. major tourist attraction sites sitting on 39,206 Ha; and home to a range of African wildlife and over 400 species of birds. Other attraction sites include: Lake Magadi; Lake Kwenia; Ngong Hills, Chyulu Hills; Olorgesaile pre historic site; Mt Suswa, a remarkable double crater volcano with a complex braided system of lava tubes and caves; Ol Doinyo Orok Mountain and; Nguruman Escarpment; rich Maasai culture among others.

- **Classified / major hotels**

According to the Tourism Regulatory Authority Regulations, (2014) there are three (3) classified tourism hotels within the County. Amboseli Sopa Lodge has 83 rooms with 166 bed capacity while Kibo Safaris Camp has 60 rooms with 120 bed capacity, which are three-star hotels. Amboseli Serena Lodge Kajiado has 92 rooms and 184 bed capacity, which is a four-star hotel. These hotels are located in Kajiado South Sub-County.

- **Main wildlife**

The County hosts a variety of wildlife including leopard, cheetah, wild dog, buffalo, elephant, giraffe, zebra, lion, hippos, hyenas, blue wildebeest, crocodile, mongoose, hyrax, gerenuk, lesser kudu, porcupine and a prolific birdlife that features over 600 species among others.

- **Wildlife conservation areas**

There are 24 wildlife conservancies sitting on 314,691Ha with Amboseli ecosystem in Kajiado South having 18 conservancies with 190,607Ha and the rest of the county having 9 Conservancies

covering 124,084Ha. The major conservancies include Shompole (15,000Ha), Eselenkei (15,000Ha); Olgulului Ololarrashi (12140Ha), Olkiramatian (10,000Ha), Ilaingurunyoni (12,000Ha); Kitenden (10,400Ha), Empaash (12,140Ha); Rombo Emampuli (10,000Ha) and Olenarika (10,000Ha).

- **Total number of tourists**

According to Economic Survey, 2017, number of visitors to Amboseli national park increased from 86,900 in 2015 to 114,600 in 2016, representing a rise of 31.9 percent. However, number of visitors to Olorgesaile historical site reduced from 1,100 in 2015 to 400 in 2016, indicating a decrease of 63.6 percent (Economic Survey, 2017). The County Government in collaboration with other stakeholders needs to enhance tourism promotions and diversification of tourism products to attract more tourists.

Machakos County is home to major tourist attraction sites. These include Ol Donyo Sabuk National Park, Fourteen Falls, Iveti hills, Lukenya hills, Mcmillian Castle, Kyamwilu gravitational defying area, Komarock shrine, Masaku Footprint Rock in Kiima Kimwe, AIC Mumbuni (the first church in Machakos), wood carving in Wamunyu, Yathui traditional shrine, Masinga dam, Makongo valley, Yatta Plateau, Katoloni Prayer mountain, Maanzoni Sanctuary, Machakos People‟s Park and Kenyatta Stadium. The Kenyatta Stadium is a facility that attracts local, national and international events such as soccer, rugby, celebrations among others. In addition, the County hosts beautiful hotels that attract conference and conventional activities. The main wildlife in the County include antelopes, zebras, wildbeasts, elands, giraffes, Thomson's gazelles, grant gazelles, elephants, hippopotamus, buffaloes, waterbucks, lions, cheetahs, leopards, warthogs, ostriches, impalas, dik-diks, hyena, reedbucks and a variety of birds.

Makueni County shares a small part of the famous Tsavo National park which is considered as one of the world's biodiversity strongholds. Tourism activities are mainly confined within the park which is rich in diverse wildlife which include the famous 'big five' consisting of Maasai lion, black rhino, cape buffalo, red elephant and leopard. The park also is also home to a great variety of bird life such as the black kite, crowned crane, lovebird and the sacred Ibis. To support tourism there are three one-star hotels situated in Wote and Mtito Andei.

There is a need to invest in more tourism class hotels as establishment of Konza ICT Park is in addition expected to enhance the potential of tourism in the County.

- **Main tourist attractions, National Parks/Reserves**

The county shares a small part of the famous Tsavo National park which is considered as one of the world's biodiversity strongholds. There is also the Kyulu hill game reserve in Kibwezi.

- **Main Wildlife**

Tourism activities are mainly confined within the park which is rich in diverse wildlife which include the famous 'big five' consisting of Maasai Lion, Black Rhino, Cape Buffalo, Red Elephant and Leopard. The park also is also home to a great variety of bird life such as the Black Kite, Crowned crane, Lovebird and the sacred Ibis.

- **Tourist class hotels/restaurants, bed occupancy :**To support tourism there are three one-star hotels situated in Wote and Mtito Andei. There is a need to invest in more tourism

class hotels as establishment of Konza ICT Park is in addition expected to enhance the potential of tourism in the County.

Plate 12: Wildlife along project road near Malili

4.3.11 HIV/AIDS

Kajiado County records high awareness on HIV and AIDS, with 99.3 percent of women and 100 percent of men reporting awareness. The county HIV prevalence rate is 3.9 percent compared to the National prevalence of 6 percent. The county aims to attain 90 percent awareness where all people living with HIV know their status, 90 percent of all people diagnosed with HIV infection receive sustained antiretroviral therapy and 90 percent of all people receiving antiretroviral therapy have viral suppression by 2020. **Makueni County** has registered a decline in HIV prevalence from a high of approximately 10.30 per cent in 2006 to a low of approximately four per cent in 2012. Cases related to HIV/Aids are still the leading killer among the productive segment (ages 15-45 years) majority of whom are women. There are nine VCTs and 138 counsellors in the county which need to be increased to accommodate the population. **Machakos County** on the other hand has a HIV prevalence rate of 4.6 per cent. The National Aids Control Council has put in place various programmes within the County geared towards reducing the prevalence of HIV/AIDS. These programmes include setting up Voluntary Counselling and Testing (VCT) centres. Free antiretroviral drugs are provided to patients in designated health facilities. The government is also supporting the Orphans and Vulnerable Children (OVCs) through cash transfer and other mitigation programmes such as income-generating activities funded under Total War against Aids (TOWA).

CHAPTER 5.0: STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION

5.1 Introduction

This chapter describes the process of public consultation and participation that were followed to identify the key issues and impacts of the proposed project. Stakeholder Engagement and Public Participation Process is an integral aspect of successful decision making in the ESIA processes for major developments. Public participation is a key requirement as stipulated in Article 69 Section 1 of the Kenyan Constitution, 2010, Legal Notice 101 of the Environmental Management and Coordination Act (EMCA), Cap 387 Section 58, for achieving the fundamental principles of sustainable development in ESIA, Section 3 of the EIA/EA regulations, 2003 and Section 87 & 113 of the County Governments Act, 2012.

It is an important process through which stakeholders including beneficiaries and members of public living in project areas (both public and private), are given an opportunity to contribute to the overall project design by making recommendations and raising concerns projects before they are implemented. In addition, the process creates a sense of responsibility, commitment and local ownership for smooth implementation.

5.2 Objectives for consultation and public participation

The general objectives of the consultation and public participation were to:

- Disseminate and inform the stakeholders about the project with special reference to its key components and location.
- Create awareness among the public on the need for the ESIA for the proposed project.
- Gather comments, suggestions and concerns of the interested and affected parties.
- Incorporate the information collected in the ESIA study.

5.3 Public participation

Public Consultations were organized through the Deputy County Commissioners, chiefs and sub-chiefs in which the invitations covered the broad spectrum of community members likely to be affected by the project within the roads corridor of influence.

Public meetings were held at the DCC's Office Isinya and Mukaa and Public barazas at Isinya multipurpose social hall, Emaparasuai Primary School at Osewuan, Chiefs office at Ilpolosat centre and at Malili trading centre. During these meetings project's key features, design and scope were discussed. Members of the public (see attached questionnaires) working, residing and those owning business properties along the proposed Isinya-Konza-Malili road project were interviewed using a standard questionnaire in order to gather their opinions and views on project benefits, impacts of the current state of the road section, likely adverse impacts of the proposed road, the mitigation measures for the possible negative impacts and how they would the local communities be involved in the project to make it a success. Interviews also assisted in the identification of miscellaneous issues that if overlooked may introduce conflicts that may hamper the implementation of the project.

KeNHA enumerated to the stakeholders benefits of implementing the proposed project some of which included convenience in transportation, increased opportunities for income generating

activities and general growth of the area. During consultations the proposed project was entirely accepted by the various stakeholders, but their major concerns were commencement date, land acquisition and compensation, storm water management, road safety for children and livestock, employment opportunities for the locals and extension of corporate social responsibility. In response, KeNHA informed that the project construction scope includes;

- Provision of drainage structures including bridges and box/pipe culverts to address issues of storm water;
- Provision of bumps, speed limits and signages to mitigate risks of livestock/wildlife killings;
- Soil/slope protection works;
- Re-alignments of some sections to improve on road safety;
- Placement of road informative signages;
- Road markings; and
- Improvement on junctions.

Concerns raised through the questionnaires administered and during the public barazas were analysed and responded to in the table below and the minutes attached in this report.

5.4 Summary of the Issues Raised;

a. Positive comments obtained during the public consultation meetings

Construstruction and operation of Isinya-Konza-Malili road is likely to trigger the following socio-economic benefits as were highlighted by the stakeholders:

- **Creation of employment opportunities**: The residents expressed that the construction and operation of the road would lead to job opportunities for locals. During construction, drivers, masons, engineers, steel-fixers, carpenters will gain employment. The stakeholders expressed that priority of employment opportunities for skilled, semi-skilled and unskilled labour should, be given to the local community.

- **Increased business opportunities**: The public and stakeholders suggested that the road would open the area to investors and this will lead to growth of new and older market centers and towns. There will also be improved transportation of farm produce and business goods thereby improving business along the entire road project.

- **Improved social infrastructure**: The public explained that the road would lead to growth of water, electricity and telecommunication infrastructure in the area. They also specified that CSR activities such as drilling of boreholes, building of markets, schools will improve the area infrastructure.

- **Faster means of transport**: The public and stakeholders affirmed that the road will result in the shortening of travel time and reduction of the cost of transportation. This will lead to an increase in the speed of delivery of farm produce and transacting business hence saving money.

- **Easy, cheap and fast movement of people**: The public noted that the road will result in faster and speedy movements and affordable fares

- **Easy and fast movement of goods**: The locals said that since the road is mainly used to transport perishable goods, they normally face a lot of losses during adverse weather

condition. The tarmacking of the road will thus make the road passable in all times of the year making it easy to transport goods.

- **Potential for increased economic activities*:*** The residents are optimistic that upon completion of the road project, that more opportunities for business will be realized. Another additional benefit will be improved efficiency of delivery of agricultural produce, livestock to markets within and out of their areas will be more efficient and withstand all weather conditions. Improved roads condition to bitumen standards means that costs of travel from one point to the other will be lowered because of shorter time taken to travel. Break down and maintenance costs associated with roads conditions will also be reduced. This means that the returns to the residents will be higher than the current case

b. Negative concerns of the stakeholders

However the stakeholders associated the construction and operation of the road with some of the following aspect:

- **Increased Accidents**: Upgrading of the road may lead to increased accident due to the improved state of the road. Therefore speedbumps and rumble strips should be erected near settlements, public institutions and town centers. Proper signage should be provided and guard's rails installed on river crossing throughout the road.
- **Noise pollution**: The public stated that construction activities would result to noise pollution. Vibrations and noise from the construction machinery may be excessive and result into noise around and within public institutions. The public were assured that the Contractor will abide by the Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009 Legal Notice No. 61 and the OSHA, 2007
- **Dust generation**: The public said that the earthworks, excavation of borrow pits, quarrying and haulage of materials during construction will result to air pollution through dust generation. The public were assured that the contractor will mitigate air pollution through the sprinkling of water on dusty roads, observing speed limits for vehicles, erection of speed calming measures in towns, public institutions and settlement and provision PPEs for the workers.
- **Waste disposal and spoils**: The public stated that the workers campsites, borrow pits and quarries would produce waste and spoils. They stated that the area is free from solid waste pollution and thus the contractor should ensure that they leave the environment clean. The public were assured that the contractor will dispose all generated waste by ensuring that all waste is properly collected and disposed as per existing legal requirement to ensure a clean and healthy environment for all.
- **Loss of vegetation cover**: The public stated that the road will lead to clearance of vegetation and trees along the road reserve and in areas where borrow pits and campsites will be put. They suggested that the contractor should replant any cut trees and revegetate cleared areas.

- **Displacement of local communities and loss of property**: The public stated that there were concerned that the project will lead to displacement and property take during road construction. The public were assured that as the situation is currently not displacement has been identified as the corridor was sufficient. However, if there will be need to get additional space, then due process will be followed where a detailed RAP study will be conducted for property valuation and compensation.
- **Increase in the spread of STD, HIV and AIDS:** The residents along the proposed road corridor expressed concern that there would be an increase in incidences of sexually transmitted diseases including HIV and AIDS especially during construction of the road because of increased prostitution. The project proponent will need to work jointly with appropriate county and national government public health agencies to come up with a comprehensive STD, HIV and AIDs control programme during the construction and operational phases of the project.

Plate 13: DCC Isinya Sub-County and KeNHA officer addressing the public at Isinya Multipurpose Social Hall

Plate 14: Public participation at Emaparasuai Primary school-Isinya Sub County

Plate 15: Public baraza at Malili town and Consultation at Mkaa DCC's office

Plate 16: Public Participation at Ilpolosat chief's office, Isinya Sub County

CHAPTER 6: ANALYSIS OF PROJECT ALTERNATIVES

6.1 Introduction

This section analyses the project alternatives in terms of site, transport alternatives, materials and technology scale, solid waste and wastewater management options and shall involve studying design alternatives and analyzing them based the environmental costs and benefits this shall involve studying the technology, design, capital investments, operation and maintenance requirements among others.

6.2 No-Construct/No Project Alternative

The 'No Project Alternative': assumes that the implementation of the project does not go ahead, implying a continuation of the current situation leaving the socio-economic prospects of the area dormant and inhibition of free flow of traffic within project area and the periphery. This is not a preferred option by either the road users, communities bordering the project road or the country in general since it has economic, social and environmental implications.

Under the No action alternative, no improvements will be undertaken; the resultant socio-economic benefits of the developments would be foregone. The anticipated environmental and social impacts resulting from construction and operation of the development would not occur.

6.3 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 the project area leaving the road as the most important link between the counties transversed by the proposed roads. The proposed project road is an existing murram road and it's upgrading which will involve some significant realignment to meet its dual nature.

6.4 Analysis of Alternative Route/Realignment

Currently, there exist no other alternative routes that could be constructed economically since the proposed road earmarked for upgrade is usable and only tarmacking is required to improve its standards.

6.4 Upgrading of the road

6.4.1 Isinya Bypass

'B'class roads are designed within 60m wide corridor. However, the current road has an existing road reserve of only 15m. Various considerations were made including the cost associated with land take, disruptions of the economic activities, utility supplies and drainage within Isinya town. Land acquisition costs were found to be enormous due to permanent structures along the stretch alongside loses incurred by businessmen/women associated with lose of customers, demolitions of the structures and re-location. Isinya town does not have a defined sewage system hence residents make use of septic tanks and pit latrines for effluent disposal. If the construction and widening of the existing road is allowed, there will be spillages of raw sewage within the town due to the usage of the aforementioned haphazard waste disposal methods. Environmentally, this compromises the health and safety of the residents.

6.4.2 Re-alignments at Km 8-14 and Km 24-24

Major realignments are proposed between Km 8-14 and 24-28 to avoid meandering and sharp corners of the existing road alignment due to design parameters requirements of a class B road. Between Km 8-14 the existing road passes through grown and established *Acacia xanthophea* canopies, fish ponds, water pans and very sharp corners (*the place is known as Corner Mbaya*) and without consideration of re-alignment, the mentions features will be interfered with and design parameters for class B would not have been achieved.

6.5 Upgrading of the road

Since road transport is the major form of transport in the region, upgrading the road to bitumen standards will enhance movement of goods and people. The project is on an existing alignment implying lower construction costs and lower environmental and social impacts compared to developing a new alignment. Upgrading of the road has the following potential implications:

- Increased traffic that will impact on the fauna, towns, public institution, schools and residential dwellings
- The improvement will affect environmental features i.e. biological and physical features.
- Possible displacement/ relocation of people and demolition of structures; especially business premises and institutions incase additional space is required for construction

Upgrading of the road will enhance traffic flow, save travel time, reduce travel cost thus improve accessibility, enhance mobility and improve welfares. This is perhaps the most preferred option

6.5 Alternative Road Building Technologies

a. Concrete Paving

Concrete is typically only used for local roads in urban areas. Concrete is more long lasting than asphalt and significantly stronger as well, but is quite expensive to lay and maintain.

b. Asphalt Paving

Asphalt paving is one of the most common type of construction technique. Advantages of this form of road construction are that the pavement produces relatively little noise, its relative low cost compared to other materials, and that is relatively easy to repair and maintain as well. However, asphalt is significantly less durable. This is perhaps the most preferred option for this project considering the location and cost implications.

CHAPTER 7.0: GRIEVANCE REDRESS MECHANISM

7.1 Background

This section describes the Project's Grievance Redress Mechanism to be adopted. The overall objective of the GRM is to establish an effective communication channel among the stakeholders for providing a timely and efficient two-way feedback mechanism to address any grievances and complaints against the project from multiple stakeholders and Project Affected. This GRM complies with the Law of Kenya and international best practices. In the course of upgrading the Isinya-Konza-Malili road project, grievances, complaints as well as disputes are expected to arise from several stages of the project including design and implementation phase. There is likely to be raised expectations pertaining to property values and dispute in ownership which could translate in constant grievances owing to the proximity of the project road to the Nairobi Metropolis.

7.2 Objectives of the GRM

The overall objective of the GRM is to ensure system existence of receiving and solving grievances in the project levels. One of the duties of the project implementation team is to prevent grievances through the established system and implementation of the mitigation measures in the ESMP.
Specific objectives of the GRM are:

- To provide community and stakeholders in general with a clear process for providing comment and raising grievances;
- To provide a platform for stakeholders to raise comments and concerns;
- To structure and manage the handling of comments, responses and grievances, and allow monitoring of effectiveness of the mechanism; and
- To ensure that comments, responses and grievances are handled in a fair and transparent manner in line with KeNHA internal policies and other best practices.

Some of the grievances expected during project implementation include:

- Considerations in employment opportunities;
- Labour disputes with the contractor;
- Land disputes i.e. un-adjudicated land claims and buyer and original owner dispute;
- Environmental and safety complaints;
- Social disputes i.e. relationships; and
- Compensation disputes i.e. who deserves to be compensated, delay in compensation and detailed relocation and many others.

7.3 Proposed Procedure

For avoidance of doubt, the Chief Grievance Handling Officer will be the Resident Officer. Everybody else will acts on RE's behalf and reports to him/her.

Anyone will be able to submit a grievance to the project, if they believe any practice by the project is having a detrimental impact on the community, the environment, or on their quality of life. They may also submit comments and suggestions on how such issues can be handled or prevented.

Stakeholder sensitization on the GRM will be undertaken during community and stakeholder meetings scheduled under the project's SEP. Instruments for grievance redress mechanism, complaint registration form and grievance resolution form are attached in **Appendix 3 and Appendix 4** respectively. The steps taken for receiving and handling grievances is as follows:

Step 1: Submitting a Complaint

A complaint can be submitted to the Contractor's Social and Environment Officer (SEO) the Consultant's SS Expert or the Community Liaison Officer (CLO) in the following ways:

- During regular public meetings held with the communities;
- Through Consultative Forums with stakeholders;
- During any informal meetings;
- Through communication directly with management – for example a letter addressed to site management, or other operational offices;
- By telephone including use of text messages / short message service (SMS) from cell phones;
- Placing a comment in the community suggestion boxes at the site office; and
- By registering a complaint in the Grievance Log Form at the contractor or consultant's office.

Regardless of the form of submission, the contractor's or consultant's SS Expert/ Community Liaison Officer will be responsible for ensuring that all complaints are logged in a **Grievance Form.** Where necessary, the specific SS Expert will arrange for a meeting with the concerned parties so as to document the grievance.

All grievances reported to the Consultant will be filed in a dedicated **file stored in the RE's Office**.

The Consultant's SS Experts will also track resolution of grievances filed with the Contractor through regular inspection of the **Contractor's Grievance File and Grievance Log**.

The summary of all complaints (from both the Contractor and Consultant's Grievance File) must also be logged in the **Grievance Register** upon logging for tracking of the resolution process.

The Register will also be stored in the RE's Office.

All resolutions will be communicated to the affected parties in writing and a copy of the **signed acceptance / rejection of the ruling** by the complainant stored in the Grievance File.

Step 2a: Assess and Assign

On receiving the complaint, the Contractor's Social Safeguard Expert/Community Liaison Officer will carry out the following steps;

i. Verify and establish the communication channels of the grievances by identify mode of communication to be used to communicate feedback and responses.
ii. Contact the concerned aggrieved and complainant parties and initiated communication on way forward to commence investigation.
iii. Determine the mode and different ways of commencing assessment process.
iv. Ensure confidentiality is upheld in most levels of assessment process.
v. Carry out assessment process by identify and reaching out key parties involved in grievances.
vi. Cross examine by triangulating issues raised and determine the key factors wanting redress.
vii. Assign key informants to specific task during assessment process ensure credibility of information is up to required standard.
viii. Ensure documentation of all data and information is secured and protected.
ix. Ensure each party commit to their words by signing the documents and assessment materials for authentication process.
x. With each party, carry out validation process of information to ensure acceptance and commitment of each party in assessment process.

Step 2b: Providing the Response /Acknowledgement

For general grievances, a resolution must be communicated to the complainant within 5 working days of logging of the grievance. However, grievances will first be categorized for resolution based on validity and priority level by the SS Expert with full knowledge of the RE, as below:

- High-Resolved / Actioned within 2 working days;
- Medium-resolved / Actioned within 4 working days;
- Low-Resolved / Actioned within 5 working days.

Prioritization will be based on the risks as determined by the environmental and social safeguards for the project as defined in the ESMP, the project license, Kenyan EHS policies and other best practices.

Where no immediate corrective action[1] is possible, the complainant will be notified in writing within two working days of logging of the grievance on what the next steps are.

Step 2c: Investigating the Grievance

If the grievance has to be investigated, then the SS Expert will aim to complete investigation within one week after the grievance first log-in. Depending on the nature of the grievance, the approach and personnel involved in the investigation will vary.

With the full involvement of the RE, the SS Expert will then co-ordinate the constitution of the investigative team and the participants of the grievance hearing. The Investigation Report will at a minimum outline the approach taken, the participants, evidence collected and recommendations of the investigations.

A hearing will then be held within two working days of the submission of the investigation report and a resolution given.

Step 3: For Unresolved Grievances

If resolution is not met, it will be escalated to relevant external parties such as the officers of the Deputy County Commissioner on the ground, or any other relevant authority. However, in such a case, KeNHA will be notified prior to involvement of these external parties for a no-objection.

In accordance with the laws of Kenya, parties have the right to go to the court system including the Land and Environment Court. This will be the next option if all else fails.

However, the main principle of this mechanism is to deal with complaints as soon as is practicable, expeditiously and in a transparent manner so as to avoid complainants deferring to the justice System.

7.4 Management of Grievances under the project RAP

The grievance mechanism for the resettlement process was developed during the ESIA and RAP Studies. The key aspects of the mechanisms are presented below:

Table 4: Proposed grievance framework

Proposed Grievance Framework
Grievances related to the construction of the proposed Isinya-Konza-Road Project will be handled through negotiations, which will be aimed at achieving consensus following the proposed procedures outlined below: 1. Grievances will be filed by the person affected by the project with the Local Grievance Committee, who in consultation with the relevant Local Compensation Committee and the consultant's representative (in all likelihood, the socioeconomic survey valuer), will act within 15 days after receipt of the grievance. 2. If no understanding or amicable solution can be reached, or if the affected person does not receive a response from the Local Grievance Committee within 15 days after receipt of the grievance, s/he can appeal to the Commissioner of Lands through the auspices of the local Ministry of Lands officer who is to act on the grievance within 15 days of its filing. 3. If the affected person is not satisfied with the decision of the Commissioner of Lands (or his delegate), s/he, as a last resort, may submit the complaint to a court of law. All grievances received in writing (or written when received verbally) will be documented.

CHAPTER 8.0 ANALYSIS OF ENVIRONMENTAL IMPACTS

8.1 Definition and classification of impacts

An impact in this context refers to any change that is likely to cause change in the environmental or socio-economic setting. The impacts can be either negative or positive. The impacts may also be direct or indirect, localised dispersed or cumulative if they add to the already existing impacts. They may also occur immediately or may be delayed in their timing. Another description used is if the impacts are permanent in their persistence or temporary. The impacts are also described using the phase that they occur in i.e. planning, operation or construction.

The baseline biophysical and social environmental parameters established in **Chapter 4** are critically examined in this section in relation to the potential environmental and socio-economic impacts of the proposed road upgrading project. In addition to adhering to the mitigations below, the contractor needs to comply with the requisite national legislation and regulations that are outlined in **Chapter 3** of this report.

This Chapter identifies the potential environmental and social impacts of the proposed project, based on the components of the explained data collection methods and procedures mentioned in Chapter 1 sub chapter 1.5, in the context of the baseline conditions that have been established in Chapter 4, and with due regard to applicable legislation described in Chapter 3. The predicted impacts are then assessed using the Leopold matrix as explained below.

8.2 The Leopold matrix

The Leopold matrix is a grid that is used to identify the interaction between project activities, which are displayed along one axis, and environmental characteristics, which are displayed along the other axis. For the identification of impacts, a breakdown of the environment into elements or factors that may be affected and a breakdown of the various actions or activities of the project under study will be done.

8.3 Impact identification and evaluation

The Leopold matrix is an effective method of predicting impacts quantitatively. Quantification means using numbers to indicate the impact. It is helpful in presenting information in summary form to give readers an overview of the impact characteristics of the Project and the alternatives to it.

Once the list of impacts or changes on the different elements of the medium has been established they are characterized using the following features and criteria:

- Sign (Nature)
- Type
- Intensity.
- Extension.
- Time.
- Reversibility
- Recoverability
- Persistence.

Table 5: Description of the terms used

Sign /Nature of the impact	**Alludes to the beneficial nature (+), bad (-)**
Intensity	It refers to the degree of impact on the factor, in the specific area in which it operates. Ranked from 1 to 3. The three expressed as an almost total destruction of the factor in the area in which the effect occurs
Type	Refers to the nature of the impact, direct (3) indirect (2) or cumulative (1)
Extension/Location	An area of influence covered by the impact in relation to the project environment. In this sense, if the action produces a much localized effect within the space, it is considered that the impact is low (1). If, however, the effect does not support a precise location within the project environment, having a pervasive influence beyond the project footprint, the impact will be large (3). Intermediate situations are considered as partial (2).
Timing	Refers to the moment of occurrence, the time lag between the onset of action and effect on the appearance of the corresponding factor. We consider three categories according to this time period is zero, up to 2 years, or more than two years, which are called respectively as immediately (3), medium term (2), and long term (1).
Reversibility	It refers to the possibility of reconstructing the initial conditions once the effect. Can be characterized as short-term (1), medium term (2) and impossible (3).
Recoverability	It refers to the possibility of providing or not the corrective measures to avoid or minimize impact. For impacts with positive sign will not express their recoverability
Duration/ Persistence	Refers to the time that supposedly stays the effect, from the onset of the action in question. Two situations are considered, depending on whether the action produces a temporary effect (1) or permanent (3). It is therefore this generic characterization because spaces are not discrete time course associated with these categories and because in any case, it is very difficult, in the

	limit, to discern on temporary or permanent effects.

A logical and systematic approach was taken for impact identification. The aim was to take into account all the important environmental/project impacts and interactions, making sure that indirect and cumulative effects, which may be potentially significant, are not inadvertently omitted. Individual environmental issue were also viewed in respect to the different facets of the project.

The rating evaluation will be as follows:

Table 6: Key of the Rating Parameters

EVALUATION PARAMETER	RATING	RATING
Nature of impact (NI)	-Positive -Negative -Uncertain	+ - -/+
Type of impact (TI)	-Direct -Indirect -Cumulative	3 2 1
Extent(EXT)	-Disperse -Medium -Localized	3 2 1
Intensity (IT)	-Major -Medium -Minor	3 2 1
Reversibility (R)	-Short term, easily reversible -Long term, partially reversible -Not reversible	1 2 3
Timing (TM)	-Immediate -Medium -Delayed, long term	3 2 1
Persistence (PI)	-Temporary effect -Permanent effect	1 3
Phase	-O -C	Operational period Construction period

8.5 Impact magnitude Indicators

As pointed in *LEGAL NOTICE No. 101 THE ENVIRONMENTAL (IMPACT AND AUDIT) REGULATIONS, 2003 ARRANGEMENT OF REGULATIONS, SECOND SCHEDULE* the following issues may, among others, be considered in the making of environmental impact assessments.

- Impacts on the Physical Environment
- Impact on the Biological Environment
- Impact on socio-economic environment

The Magnitude or Importance impact represents the entity or significance of the effect, includes the degree of incidence and the "form" of that effect, represented by other attributes. Its value is clear from taking the attributes described by the following formula.

Imp = Sign (3Iij + 2Eij +Tmij + Pij + Rij),

Where:

Imp: Importance or magnitude of the impact generated by the action on the project I j element of the medium

Ii: Intensity of the impact generated by the action on the project I j element of the medium.

Ei: Extent of the impact generated by the action on the project I j element of the medium.

Tmi: Timing, the moment of impact generated by the action on the project I j element of the medium.

Pi: persistence of effect, from the onset of the action in question.

Ri: Possibility of reversibility.

In this study only two impact characterization parameters included in the matrix are not considered in the impact magnitude valuation formula, these are the "type" and "recoverability" (WB methodology, 1995).

Table 7: Environmental Impact Matrix

Topic	Element	Action	Impacts	TI	EX	IT	R	TM	PI	Phase	MG
Vegetation	*Ground cover*	*Project foot print*	Extent of vegetation clearance required	3	1	2	2	3	1	C/O	14
	Plant species	*Clearance to create space*	Loss of mature indigenous/ medicinal species	2	1	1	2	3	1	C/O	11
		Clearance to meet increased energy requirement	Accelerated degradation of vegetation	2	1	2	2	2	3	C/O	15
Soil Resources	*Soil physical properties*	*Civil and general works*	Loss of top soil hence alterations of soil profile	2	1	1	2	1	1	C/O	9
	Soil contamination	*Civil and general works*	Activities likely to lead to soil pollution	2	1	2	2	1	1	C	12
	Soil Erosion	*Civil and general works*	Exposure to erosion agents	3	2	2	1	2	1	C/O	14
Water Resources	*Water Quality*	*Civil and general works*	Contamination of downstream surface water	2	3	1	2	1	1	C	13
	Water Quality	*Civil and general works*	Contamination of ground water sources	2	3	2	2	1	1	C/O	16
	Water Quantity	*Water channelling*	Increased surface runoff and resulting soil erosion from channeled water	2	1	2	1	2	1	C/O	12
	Water Quantity	*Water abstraction for construction*	Alteration of water supply as a result of abstraction	2	3	1	1	1	1	C	12
Air Quality	*Air pollution*	*Civil and general works*	Dust and/or smoke generation during works	3	1	2	1	3	1	C	13
	Air pollution	*Traffic during operation*	Increased CO2 emission from use of fossil fuel	1	1	1	2	1	3	O	11

Aesthetics	*Impact on the landscape*	*Civil and general works*	Change of visual of visual impacts (features, vegetation removal)	2	1	2	1	3	1	C	13
Noise and Vibrations	*Excessive vibration above ambient*	*Civil and general works and operation*	Consider machine type and extent of vibration during construction	3	1	2	1	3	1	C/O	13
Waste management	*Solid waste*	*waste generation and handling*	Ingestion by livestock and wildlife	1	3	2	2	2	1	C/O	17
			Reduction in aesthetics	2	2	2	1	3	1	C/O	15
Invasive weed	*Invasive weed species*	*Civil and general works*	Activities likely to aid in proliferation of the weed	2	3	2	2	1	1	C	16
Topography	*Material sites*	*Civil and general works and project footprint*	Extent of vegetation clearance associated with quarries	3	1	2	1	3	1	C	13
Occupational safety and health	*Disease, accidents and injuries*	*Civil and general works*	Accidents, injury and exposure to diseases for the workers and road users	3	1	2	2	2	1	C/O	13
Social disruptions	*Works across trading centres*	*Civil and general works*	Impacts on trade and movement	2	1	2	1	1	1	C	11
	Resettlement	*Civil and general works*	Family disruptions and relocation of business premises	2	3	1	2	1	2	C/O	14

The impacts have been rated in the table 3 above. The impact rating quantitative figures range from 10-17. These have been categorised into

High 18 and above

Medium 17 - 15

Low to insignificant 14 and below

Rating	Element	Action	Impacts
MEDIUM	*Solid waste*	*waste generation and handling*	Ingestion by livestock and wildlife
	Water Quality	*Civil and general works*	Contamination of ground water sources
	Invasive weed species	*Civil and general works*	Activities likely to aid in proliferation of the weed
	Vegetation	*Clearance to meet increased energy requirement*	Accelerated degradation of vegetation
	Solid waste	*waste generation and handling*	Reduction in aesthetics
	Ground cover	*Project foot print*	Extent of vegetation clearance required
	Soil Erosion	*Civil and general works*	Exposure to erosion agents
	Resettlement	*Civil and general works*	Family disruptions and relocation of business premises
LOW	*Water Quality*	*Civil and general works*	Contamination of downstream surface water
	Air pollution	*Civil and general works*	Dust and/or smoke generation during works
	Impact on the landscape	*Civil and general works*	Change of visual of visual impacts (features, vegetation removal)
	Excessive vibration above ambient	*Civil and general works and operation*	Consider machine type and extent of vibration during construction
	Material sites	*Civil and general works and project footprint*	Extent of vegetation clearance associated with quarries
	Disease, accidents and injuries	*Civil and general works*	Accidents, injury and exposure to diseases for the workers and road users

	Soil contamination	*Civil and general works*	Activities likely to lead to soil pollution
	Water Quantity	*Water channelling*	Increased surface runoff and resulting soil erosion from channeled water
	Water Quantity	*Water abstraction for construction*	Alteration of water supply as a result of abstraction
		Clearance to create space	Loss of mature indigenous/ medicinal species
	Air pollution	*Traffic during operation*	Increased CO^2 emission from use of fossil fuel
	Works across trading centres	*Civil and general works*	Impacts on trade and movement
	Soil Physical properties	*Civil and general works*	Loss of top soil hence alterations of soil profile

8.6 Potential environmental and social impacts

8.6.1 Potential Construction Phase Positive Impacts

The project road is connecting A8 at Malili with A2 at Isinya and it's the only section of the B50 road untarmacked. Once the project road is complete it will largely revitalize the socio-economic growth of the areas as enumerated below:

8.6.1.1 Gains in the local and national economy

Through the provision of employment to the locals, income from the salaries and wages will improve the economy of the town centres and the county at large. The contractor is also expected to purchase most of his materials from the project area and as such contribute positively to the local and national economy. The materials for construction will also be sourced from other areas within the nation hence positively affecting the national economy.

8.6.1.2 Transfer of skills

During construction of the road, many people from within and without the area will be employed to provide different services. As such, the local people will learn new skills from the civil engineers, welders, masons and other employees that come from outside.

8.6.2 Potential Operation Phase Positive Impacts

8.6.2.2 Increased Business Opportunities and Improvement of Local Socio-Economy

The road upgrade will increase business and boost the economy of the five counties. The road provides national, regional and local links. This will expand the market centres hence expanding and attracting investors and businessmen. This will improve incomes, transportation of goods, commodities and services will be transported everyday along the road as market days are allocated to each of the main trading centres during the week. The new road will also lead to the expansion of various businesses in various towns located along the road. There is high possibility of expansion of petrol stations, hotels and restaurants, shopping malls, etc. due to increased number of motor vehicles (and people) using the route

Construction of the road will reduce the travel time and travel costs of people and goods within the five counties and beyond. It will also lead to an increased number of bus and matatus operators hence making transportation cheaper and efficient. Related to that is the transportation of goods and farm produce to the markets which will be facilitated by the new road. This road will provide an essential link for delivery of agricultural inputs produce and products in the project area;

a. Increased access to markets;
b. Reduced wastage due to spoilage due to lack of access to the markets;
c. Access to value chain centre viz, buying centres, factories and subsequently reducing transport/marketing cost;
d. Easy access by the extension officers to educate farmers on good production practices

8.6.2.3 Improved Road Safety

Road projects can lead to reduction in accidents when they involve significant improvements in vertical and horizontal alignments, improved carriageway width, junction layout or greater separation of pedestrians, non-motorized traffic and motor vehicles. The improvement of the project road may lead to significantly increased running speeds; the standard speed of the road will be 80 Km/hr - 100 Km/hr and is likely to induce significant generation of traffic. This will shorten the travelling time and transportation cost. The proposed project design will contribute to improving road safety and the comfort of road users in several ways such as; Sight distance and visibility especially at approaches to bridges will be improved; Road signs (both warning and directional) and road markings will be included in the design; adequate shoulders will be designed throughout its road corridor.

8.6.2.4 Improved aesthetics

The current condition of the road generates a lot of dust with the effect visible on the surrounding vegetation bordering the road alignment. The upgrading of the road to bitumen standards will lead to improved aesthetics of the area.

8.6.2.5 Urbanization

Completion of the proposed road will lead to the rapid development and expansion of town centres (Isinya, Osewuan, Ilpolosat, Konza and Malili) to provide support services for the revamped transportation corridors. Such sporadic development may affect designated land use in some urban and other centres. Agricultural land may convert to residential or even commercial. However increased population in the area due to new opportunities puts pressure on land use, land cover and change in designated land-use which will be managed through urban and town planning by the county Government.

8.6.3 Negative Impacts and Mitigation Measures

8.6.3.1 Topography and Geology

Impacts

- Destabilization of terrain stability during earthwork, excavations
- Alteration of baseline landforms during excavations, earthworks
- Accelerated erosion after earthworks
- Development of pits at material sites (quarries and borrow pits)

Mitigation Measures

- Slope gradient maintenance and controlled borrow pits and quarry excavation to ensure gentle phases
- Erosion control measures in excavated borrow pits areas and working sites along the road
- Site reclamation or rehabilitation during decommissioning phase of the project.

Residual Impacts*: (Magnitude, Geographic Extent, Duration, Significance, Reversibility)*

- During the construction phase the noted impacts will have a medium magnitude, with a localized geographical extent. Their duration will be short-term during earth works and not reversible. The impacts will have localized major significance.
- During decommissioning stage, noted impacts, earthwork related impacts will be reversed through rehabilitation process, which will include slopes protection, rehabilitation of material sites and borrow pits.

Recommendations

Contractor to adhere to the ESMP

8.6.3.2 Air Pollution

Impacts

In the construction phase, the excavations, demolitions, and transportation of building materials will result in the emissions of large amounts of dust within the project site and surrounding areas. Asphalt, concrete and batching plants are also possible sources of dust and air pollution within the project area. The diversion of traffic in the construction phase will also contribute to dust emissions.

Mitigation Measures

- Sprinkling of water on dry and dusty surfaces regularly including the access roads and diversion tracks.
- Add suitable soil stabilizers on access roads or pave access roads to control dust.
- Erection of dust screens around buildings under construction especially at the workers' camps. Dust control measures should be adopted at concrete batching plants, providing adequate PPE to staffs, canopying loading points and erecting dust screens around the plant.

- The contractor is expected to conduct separate ESIAs for the batching plants and monitor the dust levels periodically
- Collecting storm water and use to de-dust the construction site and the all-weather access roads if volumes stored are sufficient.
- Comply with personal protective clothing requirement for dusty areas such as dust masks and protective glasses.
- Enforce onsite speed limit regulations.
- Re-vegetating exposed areas during the operation phase of the project.
- Sprinkling water along the diversion routes or earth along the road section.
- Slowing the speed of traffic by using bumps and/ or clearly marked road signs may contribute to reducing dust levels.
- Haulage routes will need to be identified and maintained by watering to minimize the impact of dust.
- Dust control mechanisms at the gravel borrow sites through extraction in wet conditions and transport in covered trucks.
- Implement dust control measures at the quarry sites and aggregate crushing sites.
- Covering heaps and berms of soil.
- Adhere to the Environmental Management and Co-ordination (Air Quality) Regulations, 2014.

To mitigate exhaust emissions, it will be mandatory to:

- Procure machines, equipment and vehicles which are environmental friendly.
- Ensure machines and vehicles are properly and regularly maintained.
- Discourage plant operators and drivers of construction vehicles from unnecessary revving and idling.
- Limit construction traffic movement and operations to the most necessary activities through adequate planning.
- Sensitize construction drivers and machinery operators to switch off engines when not being used.
- Ensuring that the construction machines, equipment and vehicles have the requisite inspection certificate.
- Control the speed of the traffic movement by through adequate policing and monitoring.
- Adhere to the Environmental Management and Co-ordination, Fossil Fuel Emission Control Regulations 2006.

Residual Impacts *(Nature of Impact, Geographic Scale, Significance)*
Negligible; Temporary, Local, Minor. Only to be experienced within the construction sites, quarries and during material haulage.

Recommendations
Contractor to adhere to the ESMP

8.6.3.3 Noise and Vibrations

Impacts

Because of excavation, construction and demolition works, there will be high noise and vibration levels in the project area. Noise and vibrations will emanate from transportation vehicles, construction machinery, metal grinding and cutting equipment, and among others. Excavation works will also cause vibration and noise. Quarries and borrow pits that will be used for sourcing of road construction material will also result to noise emissions.

Mitigation Measures

- Sensitize drivers of construction vehicles and machinery operators to switch off engines or machinery that are not being used.
- Ensure that all vehicles and construction machinery are kept in good condition all the time to avoid excessive noise generation.
- Ensure that all workers wear ear muffs and other personal protective gear/equipment when working in noisy sections.
- Undertake loud noise and vibration level activities during off-peak hours during the day (i.e. between 8.00 am and 5.00 pm).
- Acquire Noise and Excessive Vibrations Pollution Control Permit and comply with conditions provided by the Environment Management and Coordination, Noise and Excessive Vibrations Pollution Control Regulations 2009.
- Support facilities such as hard rock quarries should adopt controlled blasting techniques, preventing flying rock debris and high intensity vibrations.
- The management should equally observe relevant explosives use and blasting permits provided by the Inspector of Mines and Geology.
- Blasting activities along the road corridor and associated quarries should adhere to the provisions of the blasting Act and the NEMA Environment Management and Coordination, Noise and Excessive Vibrations Pollution Control Regulations 2009.

Residual Impacts *(Nature of Impact, Geographic Scale, Significance)*
The nature of impact is negligible. The impacts geographical scale will mainly be localized to construction sites only and impacts significance will be negligible.

Recommendations

Contractor to comply with the ESMP

8.6.3.4 Waste Management

Impacts

Volumes of solid wastes will be produced during the construction phases of the project development. Solid waste materials will be generated during earthworks as well as from various packaging materials. The entire road project area is full of black cotton soil not quite good for road construction earth works and will need to carted away. Solid waste generation during operation and maintenance activities will include road resurfacing waste (e.g. removal of the old road surface material), road litter, illegally dumped waste, or general solid waste from campsites; vegetation waste from the clearance of road reserves;

and sediment and sludge from storm-water drainage system. Paint waste may also be generated from road and bridge maintenance (e.g. due to removal of old paint from road stripping and bridges prior to re-painting).

Mitigation Measures

- Maximizing the rate of recycling of existing road resurfacing waste either in the aggregate;
- Incorporating recyclable materials (e.g. glass, scrap tires, certain types of slag and ashes) to reduce the volume and cost of new asphalt and concrete mixes.
- Collecting road litter or illegally dumped waste and managing it according to the recommendations in the General EHS Guidelines and Waste Management Regulations, 2006.
- Provision of bottle and can trash disposal receptacles at parking lots to avoid littering along the road.
- Obsolete products should be managed as a hazardous waste as described in the General EHS Guidelines.
- Collecting animal carcasses in a timely manner and disposing them through prompt burial or other environmentally safe methods.
- 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.
- Management of all removed paint materials suspected or confirmed of containing lead as a hazardous waste.
- Develop and implement a Construction Waste Management Plan before start of the project.
- Sub-contract a licensed waste handling firm to collect solid wastes on regular basis and dispose off in approved dumping sites.
- Drainage outfalls should be properly constructed to reduce the erosion from surface runoff and storm water.
- Comply with provisions of the Environmental Management and Co-ordination, Waste Management Regulations 2006.

Residual Impacts

The residual impacts are as follows:

- The impact of excavation waste is expected to be slight, negative and for short-term.
- The impact of construction waste is expected to be imperceptible.
- The impact of operational waste is expected to be imperceptible.

Recommendations

Contractor to comply with the ESMP

8.6.3.5 Road Safety

Impacts

While the upgrading of the Isinya-Konza-Malili road is expected to improve road safety, there is likelihood of new numbers of incidents arising from potential high speeds and vandalism of road furniture such as guard rails that contribute to road safety. Other impacts include;

- Possible interference with the normal flow of traffic during construction will have potential effects on travel times.
- Generation of dust and gaseous emissions from machinery may have potential implications to public health.
- Potential disruption of drainage systems leading to possible ponding and hence attracting vectors breeding.
- Potential risks to road safety from trucks transporting construction materials to the road sections.
- Possible health risks from elevated noise levels, especially for any night time construction activities.
- Risks to pedestrians and wildlife moving within the road corridor during the works (pedestrian – traffic conflicts, slips and falls into drains and embankments, etc.).

Mitigation Measures

- Before commencement of construction activities, the contractor, shall be required to come up with Traffic Management Plan to aid traffic movements at sites;
- The contractor will be required to place trained traffic marshals strategically at operations sites;
- Installation and maintenance of appropriate road safety provisions (road furniture, speed controls etc.) before commissioning as well as during the operation of the project.

Residual Impacts *(Nature of Impact, Geographic Scale, Significance)*

- During construction phase, the nature of impact is negligible. The impacts geographical scale will mainly be localized to construction sites only and impacts significance will be of major significance.
- During operation phase, the impacts will be localized and significant.

Recommendations

Contractor to adhere to the ESMP

8.6.3.6 Material Sites and Material Haulage

Impacts

The impacts anticipated from materials extractions and haulage such as to include the following;

- Potential elevated noise emanating from materials extraction activities and delivery trucks to the immediate residents.
- Vibrations from the material extraction machinery have a potential to cause cracking of buildings.
- Over-abstraction of water for construction from public sources of water could compromise on availability of the same for basic social needs.
- Emission of dust and gaseous discharges from material abstraction machinery will create potential aesthetic pollution, air pollution and risks to health.
- Removal of vegetation cover and top soils affects the land soil quality.
- Borrow pits left open have potential health and safety risks to the local communities, children and their animals.
- Sources of sand mainly outside the project area have potential risks to damage the river beds.

Mitigation Measures

- Environmental impact assessments (EIA) to be undertaken prior to extraction of materials from identified sites and approved by NEMA.
- Operations of the materials sites to be guided by respective management plans established and approved under the ESIA,
- Material extractions and delivery should only be done during the day.
- If borrow pits and quarries are operated, they be fenced off.
- Proper handling and management of liquid effluent and used waste oil to forestall incidence of surface water bodies
- Any abstraction of water from the existing river systems or from boreholes should be undertaken after acquisition of the prerequisite licenses,
- Rehabilitation of materials sites to take place upon exhaustion (Contractors will provide appropriate rehabilitation plans for each material site).
- If commercial material sources are adopted, the Contractor(s) should ensure due diligence process is followed by the suppliers at all times,
- Material extraction and haulage should be done in dump conditions to keep dust low, especially if it is located within settled areas.

Residual Impacts *(Nature of Impact, Geographic Scale, Significance)*

- During the construction phase the noted impacts will have a medium magnitude, with a localized geographical extent. Their duration will be short-term during earth works and not reversible. The impacts will have localized major significance.
- During decommissioning stage, noted impacts, earthwork related impacts will be reversed through rehabilitation process, which will include slopes protection, rehabilitation of material sites and borrow pits.

Recommendations

Contractor to adhere to the ESMP

8.6.3.7 Health Aspects

Impacts The residents along the proposed road corridor expressed concern that there would be an increase in incidences of sexually transmitted diseases including HIV and AIDS especially during construction of the road because of increased prostitution.
Mitigation Measures • Develop a comprehensive STDS, HIV and AIDs awareness and control programmes such as provision of condoms to workers both male and female. • Provision of STDs, HIV and AIDS prevention measures to workers. • Creation of awareness of STDs, HIV/AIDS in workers camps through trainings and installation of posters. • Adhere to and implement the Sexual Offences Act, 2006 and its amendment 2012.

8.6.3.8 Occupational Health and Safety Impacts

Impacts The Occupational safety and health issues associated with the construction and operation of the proposed road will include; physical hazards, chemical hazards and noise hazards. Chemical hazards in road construction, operations, and maintenance activities will principally be associated with exposures to road construction materials, dust during construction; exhaust emissions from heavy equipment and motor vehicles during all construction activities. Road construction and maintenance personnel can be exposed to a variety of physical hazards from operating machinery and moving vehicles but also working at elevation on bridges and overpasses. 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 a possibility of accidents when transporting workers to the construction sites and social ills.
Mitigation Measures • 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. • Establishment of work zones to separate pedestrians and livestock travelling by foot from vehicular traffic and equipment by routing of traffic to alternative roads where possible. • Regular issuance of appropriate PPEs and regular trainings on proper use and maintenance of PPEs • Conduct basic Occupational Health Training programs to construction workers during construction phase. • Ensure workers are oriented to the specific hazards of individual work assignment. • Conduct toolbox talks focusing on relevant health and safety issues.

- HIV/AIDS, STDs awareness, training and prevention services to be offered throughout the project period.
- A Code of Conduct should be distributed to all workers, and health personnel should reinforce their efforts to combat diseases during the construction period.
- Workers to be sensitized on the consequences of social ills and promiscuous behaviour (over consumption of alcohol, STDs, HIV /AIDS etc.).
- Contractor to establish mobile clinic within the construction sites
- Use protective barriers to shield the public from vehicular traffic, regulation of traffic flow by warning lights, design of the work space to eliminate or decrease blind spots, and ensure reduction of vehicle speeds in work zones.
- Training of workers in safety issues related to their activities, such as the hazards of working on foot around equipment and vehicles.
- Issuance of permits to work when undertaking hazardous tasks
- Ensure safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety apparel and proper illumination for the work space (while controlling glare so as not to blind workers and passing motorists).
- Barricade the area around which elevated work is taking place to prevent unauthorized access. Working under personnel on elevated structures should be avoided.
- Hoisting and lifting equipment should be rated and properly maintained, and operators trained in their use.
- Elevating platforms should be maintained and operated according to established safety procedures including use of fall protection measures (e.g. railings).
- Use of the correct asphalt product for each specific application and ensuring application at the correct temperature to reduce the fuming of bitumen during normal handling.
- Maintenance of work vehicles and machinery to minimize air emissions.
- Reduction of engine idling time in construction sites; Use of extenders or other means to direct diesel exhaust away from the operator;
- Ventilation of indoor areas where vehicles or engines are operated or use of exhaust extractor hose attachments to divert exhaust outside.

Residual Impacts *(Nature of Impact, Geographic Scale, Significance)*

- During construction phase: Negligible; Temporary, Local, Minor. Only to be experienced within the construction sites, quarries and during material haulage.
- During operational phase: Negligible nature of impacts which will be temporary, localized and of minor significance.

Recommendations

Contractor to adhere to the ESMP

8.6.3.9 Loss of Biodiversity

Impacts

Potential impacts to biodiversity could arise due to the physical disturbance during the construction, contamination of the environment due to chemical/ oil spillage or leakage and inappropriate liquid and solid waste disposal mechanisms. Removal of vegetation and topsoil during the construction and also creation of deviations and other ancillary facilities will lead to impacts such as a loss of wildlife habitat, reduction in plant diversity, potential for increased erosion, and potential for the introduction of invasive flora species. Indirect impacts to vegetation would include increased deposition of dust, spread of invasive and noxious species, aquatic pollution, water quality deterioration, and the increased potential for wildfires. Dust settling on vegetation may alter or limit plants' abilities to photosynthesize and/or reproduce. These processes may lead to the reduction in habitat, food and nutrient supplies and breeding areas.

Mitigation Measures

- Separate EIAs should be conducted for camps, borrow pits, quarries, boreholes (if any) and other ancillary facilities.
- Minimize clearing and disruption of riparian vegetation.
- Provide adequate protection against scour and erosion; and consider the onset of the rainy season with respect to construction schedules.
- Minimize clearing of indigenous plant species and replanting of indigenous plant species in disturbed areas.
- Explore opportunities for habitat enhancement through reduced clearance to conserve or restoration native species.
- Employ vegetation rehabilitation techniques to recover lost plant cover such as Reforestation and Afforestation.
- The contractor is expected to comply with the National Sand Harvesting Guidelines provided by NEMA and the County Governments
- Undertake an inventory/ Review existing information on species and habitats in the project area. Contact appropriate agencies early in the planning process to identify potentially sensitive ecological resources that may be present in the project area.
- Conduct pre-disturbance surveys in order to locate site facilities away from important ecological resources (e.g., wetlands, important upland habitats, sensitive species populations).
- Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance.
- Install proper signages and speed calming measures in areas that are known to be fauna dispersal areas.

Residual Impacts: (*Value/Sensitivity, Magnitude of Impact, Significance)*

- Impacts of High Sensitivity value:
- Their magnitude is minor

- Their significance is adverse

Recommendations

Comply with recommendations in the ESMP.

8.6.3.10 Impacts on surface water quality

Impacts

There will be an increase in the generation of wastewater and sewage during the construction phase of the project. The increases will take place at construction camp sites and in various towns located along the road. This is attributed to increased activities in these towns. There will be impact due to oil spillage, disposal practices of used oil, oil filters during the construction of the project. Possible impacts include: pollution of groundwater sources during construction phase (bridges construction work) interference with existing community water sources during construction phase, infiltration of contaminants from on-site activities into soils, pollution and degradation of water quality of underlying aquifer during earthwork, excavations, oil wastes from the camp/garage and impact to human health through direct exposure to contaminated drinking contaminated.

Mitigation Measures

- Drainage structures that will be constructed –cross culverts, at the river courses be at appropriate positions.
- Stone pitching and side drains to cover meaningful lengths along the prone protection areas.
- Timing of the construction of proposed bridges to coincide with dry periods when water levels in the rivers are low to avoid possible water pollution.
- Contractor to avoid dumping of waste materials within the riparian zones/ within the watercourses.
- Bitumen trucks should be washed at designated areas only.

Residual Impacts *(Nature of Impact, Geographic Scale, Significance)*

- During construction phase the noted impacts have low significance since they are site based and localized to construction sites only. They have minimal significance due to their limited site specific geographical scale.
- During operational phase, the listed impacts will have low magnitude of impacts along the 417.5km road project (extent).

Recommendations

Contractor to adhere to the ESMP

8.6.3.11 Land Resources

Impacts

The construction of the proposed road project requires substantial quantities of materials that will be sourced from either existing or new borrow pits and quarries. This will impact

in areas where such materials will be obtained from and hence a recommendation that those sites should undertake site specific EIAs before authorization of quarrying activities. The extraction and transportation of these materials will also result in the distortion of the ground structure, vegetation loss, dust emission, oil spills, noise and increase potential for accidents. Such sites if artisanal in nature may pose safety issues to the public due to possible falls. Further, the quarries and borrow pits associated with extraction of raw materials may collect water which will form ponds especially during rainy seasons. Such stagnant water is highly suitable breeding grounds for mosquitoes and other diseases vectors thereby bringing about water borne diseases such as malaria, cholera, and typhoid. Other impacts will include: Loss of and productivity potential; Permanent loss of natural (material) resources; and increased susceptibility to soil erosion.

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Mitigation Measures

- The materials should be sourced from an approved site after ESIA/ EIAs are done per borrow site or quarry;
- There should be adequate re-use of the excavated waste materials;
- Temporary nuisance should be addressed by organizing a public "baraza" where the public can be made aware of the impending road works;
- Blasting should take place at designated times and the affected public within approximately 5km radius duly informed;
- The borrow pits should be clearly indicated on a plan and approved by the relevant authorities such as County Departments and Department of Mines and Geology;
- Where compensation and relocation are required, land value should be determined by independent surveyor/ valuer or other component body such as the Ministry of Lands;
- The explosives should not be kept on the sites; instead they should be delivered to the site as and when necessary from special storehouses managed by the contractor;
- There should be adequate landscaping, backfilling and draining of the depressed areas to prevent breeding grounds for disease vectors, this should be ascertained by KeNHA or NEMA County Directors;
- The borrow pits and quarries should be located more than 500 metres from the watercourses and in a position that should facilitate the prevention of storm water run-off to prevent run off from the site entering the water course; Adequate notice should be given in advance to the nearby communities of the intention to excavate the borrow pits and quarries.

Residual Impacts: (*Value/Sensitivity, Magnitude of Impact, Significance)*
The noted impacts have high significance in relation to respective site specific land use. The impacts have minimal significance due to their limited site specific geographical scale.

Recommendations

The Contractor to comply with ESMP requirements

8.6.3.12 Increased rate of soil erosion

Impacts

Construction of the road will involve creation of a large impervious surface that restricts the infiltration of rainwater. This leads to high generation of surface runoff that flows on the sides of the road in drainage ditches. Where the surface runoff is channeled directly to bare steep slopes with loose soil, it can lead to serious soil erosion problems. This can undermine the stability of the road including associated facilities such as bridges. Sediment and erosion from construction activities and storm water runoff may also increase turbidity of surface waters.

Mitigation Measures

- Cut and fill areas: Road design activities should aim at balancing and fill activities to reduce the net quantities of soil either for disposal or borrowing. All cut, and fill sites will be replanted with sod grass to complete cover while the edge of the road reserve will be marked with a row of locally adapted tree species.
- Project will avoid opening new materials borrow sites: In as much as possible, hard rock will be sourced from existing quarries. However, there may be need to open up new quarries in some areas. Such opening will be followed by rehabilitation of the quarry site prior to closure of the contract. An Environmental Management and social Plan is expected to be developed and cleared for each of the material site opened under the project.
- Rehabilitation of borrow areas: During quarrying and other works involving removal of top soil, each layer not required should be stockpiled separately for re-use to reinstate quarries and other material sources after exhaustion. Towards mitigation of craters left behind after material extraction, all land acquired for material extraction will be backfilled and re-instated. Where the top soil does not fill the pit, water draining tunnels will be constructed to prevent /minimize stagnation of water.
- The contractor will source building materials such as gravel, sand, ballast and hard core at the project locality. Consultation should be held with the community members and their representatives on the best sites to source materials and rehabilitation measures should be agreed.
- It is recommended that environmental impact monitoring should be conducted for such activities or in consultation with County Director to ensure environmental conservation and rehabilitation after use. The contractor should ensure application of acceptable environmental performance standards and that the negative impacts of their activities at the extraction sites are considerably well mitigated.
- To reduce the negative impacts on availability and to ensure sustainability of the materials, the contractor should only extract what will be required through accurate budgeting and estimation of actual construction requirements. This shall ensure that materials are not extracted or purchased in excessive quantities. Moreover, the contractor will ensure that wastage, damage or loss (through run-off, wind, etc.) of

materials at the construction site is minimal, as these would lead to additional demand for and extraction or purchase of the materials.

- In addition to the above measures, the contractor should consider reuse of excavated materials and use of recycled materials. This will lead to reduction in the amount of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.
- All exhausted quarries and borrow pits should be isolated, protected and rehabilitated to usable state before the contract closure.

Residual Impact *(Magnitude, Geographic Extent, Duration, Significance, Reversibility)*

- During Construction phase the impacts' magnitude will be low and localized within the construction sites only. Impacts duration will be intermittent and short term over rainy weeks/months during the construction. Their significance will be minor and not reversible in case they occur.

Recommendations

The Contractor to comply with the ESMP during construction

8.6.3.13 Soil contamination

Impacts: The analysis of the potential project impact discussed in this section is related to the possibility that during the implementation of the proposed road project activities, poor waste management, and oil/fuel and chemical leaks will contaminate the soil, thus affecting its quality.

Pollution of soil may result from discharge of fuel, chemicals and construction material spillage onto soil. Biodegradable and non-biodegradable wastes will be generated during the construction phase. These will include stones, sand, steel (metallic bars), insulators and other construction materials. Plastic wastes such as mineral water bottles, polythene bags, jerry cans, and other plastic accessories may also be generated at the camps and in the fields. Organic wastes such as foodstuff and human waste will also be generated at the camps and work centres. Accidental spillages of oil and grease from the garage, workshops, asphalt plant, fueling station, crusher site, fuel off-loading sections and construction machineries may also result in soil contamination.

These wastes, if not well managed, have the potential to contaminate the surrounding soil and alter both its chemical and physical properties thus affecting its productivity. The impact is only envisaged during construction phase.

Mitigation Measures

- The Contractor shall ensure that all wastes generated during construction activities such as conductors, steel and metallic bars, insulators and other accessories are collected and disposed of appropriately at designated sites;
- All plastic waste generated (at campsites and in the course of undertaking works) such as mineral water bottles, polythene bags, jerry cans, will be collected preferably in mobile vans and handed over to a licensed waste collector or re used;

- Soil and gravel should be shaped and compacted immediately after transport to its destination. Spoil from the earthworks should be dumped in a central place and covered
- Maintain spill kits at the contractor's garage, workshops and those areas experiencing spillages.
- Storage of oil and tar drums should be done on concrete floors to prevent exposure of soil to contamination
- Construction activities should be carried out during the warm seasons. This will aid in compaction of the surface material and reduce the loss of soil and gravel by storm water runoff
- Re-vegetation of excavated areas to ensure ground stability.
- Scour checks and stone pitching should be done on steep sections of the road to minimize erosion
- The waste management hierarchy will be followed during the construction phase. According to this hierarchy, source reduction of waste will be the first option and disposal of unavoidable waste as option of the last resort;
- Undertake routine preventive maintenance of motorised equipment to avoid any fuel leakage and spills;
- Storage of fuels and oils should be undertaken in a manner that does not allow leakage to the soil as the fuel can readily infiltrate the soils polluting the soils, ground and surface water; and Collect and dispose of all waste generated from project activities in accordance with EMCA (Waste Management) Regulations 2006 and international best practice

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Residual Impact *(Magnitude, Geographic Extent, Duration, Significance, Reversibility)*
The impacts' magnitude will be low and localized within the construction sites only. Impacts duration will be intermittent and short term over weeks/months within the construction sites only. Their significance will be minor and not reversible in case they occur.

Recommendations
The Contractor to comply with the ESMP during construction

8.6.3.14 Social Impacts

Impacts
During the implementation of project activities, the local social service sector will be overwhelmed by the presence of project employees who may be in need of these services. If the project leads to in-migration, it will increase pressure on social service infrastructure like housing, health, water sources and sanitation facilities in the area when people move into the community in anticipation of employment opportunities. With an increase in the population of the area boosted by the project employees the social set up of the area will be affected. This change may be in the form of lost social norms and morality, an increase in school drop-

out due to cheap labor, child labor, and increased incidences of HIV/AIDS and other communicable diseases.
Mitigation Measures • The contractor should develop and implement labour influx plan, an employee code of conduct and child protection strategy during the project implementation phase. • The project is located in areas that are settled therefore most of the workers may end up renting accommodation in the towns and from home owners. For those who may reside in cams provided by the contractor, the camps camp will have the necessary social service amenities like health, water and sanitation facilities for the workers.
Residual Impacts *(Nature of Impact, Geographic Scale, Significance)* The nature of impacts (will be negligible along proposed project road. The impacts geographical scale will mainly be localized to construction sites only and impacts significance will be negligible.
Recommendations Contractor to comply with the ESMP

8.6.3.15 Displacement of People

Impacts There is inadequate road reserve since the existing ROW is only 15m wide. Consequently, there will be significant land uptake as guided by the project design. In such an eventuality, a comprehensive Resettlement Action Plan (RAP) shall be developed in order to take care of the project affected persons.
Mitigation Measures • Relocate all facilities affected in consultations with various parties affected with respect to water, sewerage, pipelines, and electricity. • Involvement and continuous consultation of key stakeholders and community members with respect to water, pipelines, and electricity at all stages of the project cycle. • Use of an integrated approach in planning public utilities by sharing most transport corridors for roads, water, sewerage, electricity lines, etc. • Provision of employment in the project for the squatters where possible. • Put in place a grievance redress mechanism as discussed in chapter Seven (7) of this report.
Residual Impacts *(Nature of Impact, Geographic Scale, Significance)* The nature of impacts will be negligible. The impacts geographical scale will mainly be localized to construction sites only and impacts significance will be negligible.
Recommendations Contractor to comply with the ESMP

8.6.4 Cumulative Impacts

Cumulative impacts are the impacts, which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.

There will be no impact to fauna due to the limited spatial scale and short temporal duration of the project, in relation to the present human and environmental pressures that they are exposed to. No threatened species of flora was identified in the area during the field surveys, while there exist faunal species within the dispersals of the road traverse.

In the context of previous road construction projects that have been completed all over the county no significant environmental impacts have been recorded, therefore the proposed project is expected to register a very insignificant impacts. In this regards, the cumulative impacts on the soils, vegetation, habitat and biodiversity of the area are considered insignificant.

Due to the spatially restricted scale of the project, any inadvertent pollution arising from the operations would be localised and mostly site-specific, but it is expected that such incidents will not arise on the basis of the proposed mitigations. The scale of fugitive particulate material and the generation gaseous emissions and their impacts on the surrounding environment will be negligible on account of the scale of the operation, its temporary nature, and the mitigations that have been proposed.

CHAPTER 9.0: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

9.1 Introduction

Environmental and Social Management Plan (ESMP) is an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced. Environmental and Social Management Plan (ESMP) involves the protection, conservation and sustainable use of the various social and environment elements or components. The ESMP for the proposed project provides all the details of project activities, potential impacts, suggested mitigation measures, desired outcomes, objective indicators, responsibilities and commitments proposed to minimize environmental impacts of activities, including, monitoring and evaluation during implementation and decommissioning phases of the project.

The tool for achieving this is the incorporation of an Environmental and Social Management Plan (ESMP) into the ESIA to ensure adherence and future compliance with legislation, good environmental performance, and integration of environmental and social issues into the project decision. The ESMP provides the means of assessing the accuracy of the predicted project impacts and the monitoring of the effectiveness of the proposed mitigation measures contained in the ESIA study report. The ESMP should therefore indicate how the environmental concerns highlighted in the ESIA would be managed.

9.2 Objectives of the ESMP

The objectives of the ESMP are to:

- Adhere and address necessary legal frameworks and other requirements;
- Promote environmental management and communicate the aims and goals of the project ESMP to all stakeholders;
- Incorporate environmental management into project design and operating procedures;
- Ensure all workers, contractors, sub-contractors and others involved in the project meet all legal and institutional requirements with regard to environmental management;
- Provide a framework for implementing commitments of the project (i.e. mitigation measures identified in the EIA);
- Prepare and maintain records of project environmental performance (i.e. monitoring, audits and compliance rating); and
- Prepare an environmental monitoring plan whose aim is to ensure that the negative environmental impacts identified in Chapter 7 of this EIA report are effectively mitigated by way of design, construction, operational and decommissioning stages of the project.
- Respond to unforeseen events and
- Provide feedback for continual improvement in environmental performance

9.3 Cost of implementation of the ESMPs

For effective implementation of the ESMPs, the project must establish an Environment, Health and Safety (EHS) unit that will be responsible for *Project environmental Monitoring and Evaluation to ensure compliance to NEMA.* The project contractor will be required to produce

periodic reports on project environment monitoring to be sent to the concerned agencies for information and supervision. The contractor will be responsible for all costs of implementing the project's EIA license conditions, including the ESMPs and the actual costs of public involvement in the ESIA process. Hence all costs proposed in the ESMPs below will be incurred by the project contractor. The costs outlined are current costs mainly for project environmental monitoring and evaluation to ensure compliance to NEMA. To estimate future costs, an increase to cover annual inflation should be applied. The costs for actual activities should be included in the main bill of quantities of the project.

Table 8: Environmental and Social Management Plan – Design, Construction, Operation and Decommissioning Phases

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Design and construction phase				
Topography and Geology	• Slope gradient maintenance and controlled borrow pits and quarry excavation to avoid vertical phases • Erosion control measures in excavated borrow pits areas and working sites along the road • Site reclamation or rehabilitation during decommissioning phase of the project	Contractor/KeNHA/Supervision Consultant	Continuous	-As appropriate
Noise Pollution and Vibrations	• Sensitize drivers of construction vehicles and machinery operators to switch off engines or machinery that are not being used. • Ensure that all vehicles and construction machinery are kept in good condition all the time to avoid excessive noise generation. • Ensure that all workers wear ear muffs and other personal protective gear/equipment when working in noisy sections. • Ensure machines are switched off when not in use. • Undertake loud noise and vibration level activities during off-peak hours during the day (i.e. between 8.00 am and 5.00 pm).	Contractor/KeNHA/Supervision Consultant	Monthly	- As appropriate - - - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Air Pollution due to Dust Generation and Air Emissions	• Sprinkling of water on dry and dusty surfaces regularly including the access roads. • Use of waste water to sprinkle at the construction site to reduce excessive dust. • Adherence to personal protective clothing such as dust masks. • Enforce onsite speed limit regulations. • Ensure machines and vehicles are properly and regularly maintained. • Erection of speed calming measures near public institutions such as schools, hospitals and town centres	Contractor/KeNHA/Supervision Consultant	Monthly	As appropriate - - - -
Solid Waste Generation	• Maximizing the rate of recycling of road resurfacing waste either in the aggregate (e.g. reclaimed asphalt pavement or reclaimed concrete material) or as a base; • Incorporating recyclable materials to reduce the volume and cost of new asphalt and concrete mixes. • Contracting of an ordinary waste and hazardous waste handler to collect and appropriately dispose wastes from camp sites • Collecting road litter or illegally dumped waste and managing it according to the recommendations in the General EHS Guidelines.	Contractor/KeNHA/Supervision Consultant	Monthly	- - As appropriate -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Surface water quality	• Provision of bottle and can recycling and trash disposal receptacles at parking lots to avoid littering along the road. • Grinding of removed, old road surface material and re-use in paving, or stockpiling the reclaim for road bed or other uses (Thika –Magumu-Njabini). Old, removed asphalt may contain tar and polycyclic aromatic hydrocarbons and may require management as a hazardous waste. • Develop and implement a Construction Waste Management Plan before start of the project. • Construct communal septic tank linked to a constructed wetland system. • Promote recycling of wastewater in construction activities. • Ensure wastewater is channeled and treated in sewerage plants or disposed in septic tanks • Ensure regular maintenance of plumbing system to avoid spillage of wastewater. • Discharge of partially treated sewage into septic tanks • Ensure regular maintenance of plumbing system and septic tanks to avoid spillage of raw sewage.	Contractor/KeNHA/Supervision Consultant	Monthly	As appropriate - As appropriate - - - - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Water Abstraction and Consumption	• Install water conserving taps and toilets. • Drainage structures that will be constructed –cross culverts, at the river courses be at appropriate positions. • Stone pitching and side drains to cover meaningful lengths along the prone protection areas. • Timing of the construction of proposed bridges to coincide with dry periods when water levels in the rivers are low to avoid possible water pollution. • Contractor to avoid dumping of waste materials within the riparian zones/ within the watercourses. • Bitumen trucks should be washed at designated areas only.	Contractor/KeNHA/Supervision Consultant	Continuous	- As appropriate -
Soil Erosion	• Ensure surface runoff generated on impervious surface is not channeled directly to steep slopes. • Provide grassed water ways along the access roads. • Construct flow breaks on roadside drainage channels. • The contractor will source building materials such as gravel, sand, ballast and hard core at the project locality. • Consultation should be held with the community members and their representatives on the best sites to	Contractor/KeNHA/Supervision Consultant	continuous	- - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	source materials and rehabilitation measures should be agreed • All exhausted quarries and borrow pits should be isolated, protected and rehabilitated to usable state before the contract closure.			-
Loss of Vegetation Cover and Biodiversity	• Siting roads and support facilities to avoid critical terrestrial habitat by utilizing existing transport corridors. • Minimize clearing and disruption of riparian vegetation. • Provide adequate protection against scour and erosion and consider the onset of the rainy season with respect to construction schedules. • Minimize removal of indigenous plant species and replant indigenous plant species in disturbed areas. • Explore opportunities for habitat enhancement	Contractor/KeNHA/Supervision Consultant/KFS/KWS	Monthly	- - - As appropriate -
Health Aspect	• Develop a comprehensive STDS, HIV and AIDs awareness and control Programmes such as provision of condoms to workers both male and female. • Creation of awareness of STDs, HIV/AIDS in workers camps through trainings and installation of posters. • Adhere to and implement the Sexual Offences Act, 2006 and its amendment 2012.	Contractor/KeNHA/Supervision Consultant/County Governments	Monthly	As appropriate -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Road Safety	• Avoid long traffic diversion roads. • Water diversions to ensure dust is minimized hence easier visibility for drivers. • Ensure Installation and maintenance of all construction signs, signals, markings, and other devices used to regulate traffic, including posted speed limits, warnings of sharp turns, or other special road conditions. • Advance information on communication systems will be an advantage to users. • Make Traffic circulation changes as per the Traffic Act Cap 403.	Contractor/KeNHA/Supervision Consultant	Periodically	- As appropriate As appropriate - -
Occupational Health and Safety	• Development of a transportation management plan for road construction that includes measures to ensure work zone safety. • Establishment of work zones to separate workers on foot from traffic and equipment by routing of traffic to alternative roads. • Use protective barriers to shield workers from traffic vehicles, regulation of traffic flow by warning lights, design of the work space to eliminate or decrease blind spots, and ensure reduction of maximum vehicle speeds in work zones.	Contractor/KeNHA/Supervision Consultant	Monthly	- - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Disturbance to flora and fauna	• Training of workers in safety issues related to their activities. • Ensure safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety apparel and proper illumination for the work space. • Barricade the area around which elevated work is taking place to prevent unauthorized access. • Use of the correct asphalt product for each specific application and ensuring application at the correct temperature to reduce the fuming of bitumen during normal handling. • Training on correct PPE use and provision of adequate PPEs • Siting roads and support facilities to avoid critical terrestrial and aquatic habitat by utilizing existing transport corridors. • Avoidance or modification of construction activities during the breeding season and other sensitive seasons or times of day to account for potentially negative effects. • Minimize clearance and disruption of riparian vegetation. • Minimize removal of indigenous plant species, and replant indigenous plant species in disturbed areas.	Contractor/KeNHA/Supervision Consultant/ KWS/KFS	Monthly	- - As appropriate - - - - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	• Explore opportunities for habitat enhancement through reduced clearance to conserve or restore native species.			
Possible Displacement of People	• Relocate all facilities affected in consultations with various parties affected with respect to water, sewerage, pipelines, and electricity. • Involvement and continuous consultation of key stakeholders and community members with respect to water, pipelines, and electricity at all stages of the project cycle. • Use of an integrated approach in planning public utilities by sharing most transport corridors for roads, water, sewerage, electricity lines, etc. • Provision of employment in the project for the squatters where possible. • Put in place a grievance redress mechanism as discussed in chapter Seven (7) of this report.	Contractor/KeNHA/Supervision Consultant	Continuous	As appropriate

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Material Sites and Material Haulage	• Environmental impact assessments (EIA) to be undertaken prior to extraction of materials from identified sites and approved by NEMA. • Operations of the materials sites to be guided by respective management plans established and approved under the ESIA, • Material extractions and delivery should only be done during the day. • If borrow pits and quarries are operated, they be fenced off. • Proper handling and management of liquid effluent and used waste oil to forestall incidence of surface water bodies • Any abstraction of water from the existing river systems or from boreholes should be undertaken after acquisition of the prerequisite licenses, • Rehabilitation of materials sites to take place upon exhaustion (Contractors will provide appropriate rehabilitation plans for each material site). • If commercial material sources are adopted, the Contractor(s) should ensure due diligence process is followed by the suppliers at all times,	Contractor/KeNHA/Supervision Consultant	Quarterly	As appropriate - - - - - - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	• Material extraction and haulage should be done in dump conditions to keep dust low, especially if it is located within settled areas.			-
Operational phase				
Noise Pollution and Excessive Vibrations	• Enforcement of Traffic Act regulations to ensure that all vehicles using the road are in good condition all the time to avoid excessive noise generation. • Install speed control measures in town areas and near public institutions • Install no hooting signs in sensitive areas such as near schools, etc.	Contractor/KeNHA	Monthly	- As appropriate PPC
Impacts on flora and Fauna biodiversity	• Liaise with KWS to ensure that important wildlife crossing corridors and dispersal areas are not affected • Maintenance of road signs at appropriate areas to warn drivers on wildlife crossing paths.	Contractor/ KeNHA/KFS/KWS	Continuous	- As appropriate -
Increased Generation of Storm Water	• Use of storm water management practices that slow peak runoff flow, reduce sediment load and increase infiltration. • Regular inspection and maintenance of permanent erosion and runoff control features. • Use of vegetated swales, filter strips, terracing, check dams, detention	Contractor/KeNHA	Continuous	- - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	ponds or basins, infiltration trenches and infiltration basins. • Repair works to be carried out in dry weather to prevent runoff of asphalt or cement materials.			-
Loss of human and animal life due to increased road accidents	• Install speed calming measures next to public institutions , towns and settlement • Provide road signages all along the road • Conduct road safety sensitization Programmes. • Carry out Risk Assessment to identify risk areas and provide appropriate prevention measures.	Contractor/KeNHA	Continuous	- - As appropriate -
Road Safety	• Installation and maintenance of speed control and traffic calming devices at pedestrian crossing areas. • Installation and maintenance of all signs, signals, markings, and other devices used to regulate traffic, specifically those related to pedestrian facilities • Installation and maintenance of all signs, signals, markings, and other devices used to regulate traffic, including posted speed limits, warnings of sharp turns, or other special road conditions. • Installation of measures to reduce collisions between animals and vehicles (e.g. use of signs to alert	Contractor/KeNHA	Continuous	As appropriate - - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	drivers on road segments where animals frequently cross). • Prepare an emergency preparedness and response plan in coordination with the local community and local emergency responders. • Comply with OSHA 2007 requirements, they include; o Carrying out Safety Audits. o Implementing DOSHS improvement orders. o Carrying out EHS Risk Assessments. • Involve all the relevant stakeholders during the audit so as to incorporate suggested EHS measures into the report.			- - - - - -
Increased Generation of Solid Waste	• Maximizing the rate of recycling of road resurfacing waste either in the aggregate (e.g. reclaimed asphalt pavement or reclaimed concrete material) or as a base. • Incorporating recyclable materials to reduce the volume and cost of new asphalt and concrete mixes. • Collecting road litter or illegally dumped waste and managing it according to the recommendations in the General EHS Guidelines. • Provision of bottle and can recycling and trash disposal receptacles at parking lots and bus	Contractor/KeNHA	Continuous	- - - As appropriate

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	stops to avoid littering along the road. • Collecting animal carcasses in a timely manner and disposing them through prompt burial or other environmentally safe methods. • 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. • Management of all removed paint materials suspected or confirmed of containing lead as hazardous waste. • Grinding of removed, old road surface material and re-use in paving, or stockpiling the reclaim for road bed or other uses. • Ensure implementation of the project's operation phase Waste Management Plan. • Comply with EMCA Cap 387 Waste Management Regulations, 2006.			- - - -
Occupational Health and Safety	• When undertaking road repairs, use protective barriers to shield workers from traffic vehicles, regulation of traffic flow by warning lights, design of the work space to eliminate or decrease blind spots,	Contractor/KeNHA	Continuous	-

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	and ensure reduction of maximum vehicle speeds in work zones. • Training of workers in safety issues related to road maintenance activities. • When undertaking road repairs, ensure safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety apparel and proper illumination. • When repairing the road, use asphalt product of appropriate specification and ensure application at the correct temperature to reduce the fuming of bitumen during normal handling. • Maintenance of work vehicles and machinery to minimize air emissions. • Reduction of engine idling time in construction sites; Use of extenders or other means to direct diesel exhaust away from the operator. • Ventilation of indoor areas where vehicles or engines are operated or use of exhaust extractor hose attachments to divert exhaust outside. • Carry out Safety Audits. • Implement DOSHS improvement orders.			- - - - - - - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
Soil Quality Degradation	• Rehabilitate borrow areas. • Revegetate cleared areas. • Ensure proper drainage infrastructure along the road. • Used oil and spills should be disposed in an environmental friendly manner.	Contractor/KeNHA/Public	Continuous	As appropriate As appropriate - -
Risk of spread of invasive species	• Reduce open gaps in road reserves by planting appropriate tree species suitable for highway or road side tree planting • Monitor composition of species regenerating along road reserves and take prompt actions in case of emergence of invasive species • Carry out routine road reserves maintenance mainly to clear bushes that may harbor invasive species.	Contractor/KeNHA/Public	Continuous	As appropriate
DECOMMISSIONING PHASE				
Demolition waste	• Use of an integrated solid waste management system i.e. through a hierarchy of options: o Source reduction o Recycling o Composting and reuse o Combustion o Sanitary land filling. • All buildings, machinery, equipment, and others that will not be used for other purposes must be	Contractor/KeNHA	at the time of decommissioning	- - - - - - -

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	removed and recycled/reused as far as possible. • All foundations must be removed and recycled, reused or disposed of at a licensed disposal site. • Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site. • Donate reusable demolition waste to charitable organizations, individuals and institutions.			- - -
Noise and Vibration	• Sensitize workforce including drivers of construction vehicles. • Install sound barriers for pile driving activity. • Install portable barriers to shield compressors and other small stationary equipment where necessary. • Proper maintenance of all equipment. • Workers near high level noise to wear safety and protective gear.	Contractor/KeNHA	at the time of decommissioning	As appropriate As appropriate - - -
Dust Emission	• Spray demolished piles of earth with water. • Avoid pouring dust materials from elevated areas to ground.	Contractor/KeNHA	at the time of decommissioning	As appropriate As appropriate

Possible impacts	Mitigation measures	Responsible party	Frequency/Timing	Budget (Kshs)
	• Cover all trucks hauling soil, sand and other loose materials. • Provide dust screen where necessary.			As appropriate As appropriate
Site degradation	• Implement an appropriate re-vegetation programme to restore the site to its original status. • Consider use of indigenous plant species in revegetation.	Contractor/KeNHA	at the time of decommissioning	As appropriate -

9.3 GENERAL EHS PLANS REQUIREMENTS IN CONSTRUCTION PROJECT

9.3.1 Occupational Health and Safety Plans

The plan should be having details on the following listed topics.

Table 9: Health and Safety Plan Content

No	CONTENTS OF THE HEALTH AND SAFETY PLAN	CLARIFICATIONS
1	Contractors Health & Safety Policy / Statement	The policy should be placed at selected places within the camp(s) and offices. It should be clear, visible and legible in English and Kiswahili.
2	Management & Supervision Organizational Chart.	This will be in form of a flow chart, to be displayed clearly in specific offices at the camps. It will assist in identifying the respective management staff and supervisors.
3	Construction Risk Assessment	The assessment should consist: (i) Risk assessment leader, (ii) Risk assessment team members (iii) Date of risk assessment.

		This will involve Identifying the risks, their description, probability of getting involved in the risk and impacts from the risk. A description of control measures/procedures/methods to manage the risk will be provided.
4	Fall Protection Plan	This will involve listing risk types, their description, probability of getting involved in the risk and impacts from the risk. Control measures/procedures/methods to manage the risk and the responsible person.
5	Hazardous Work/Activities-Method Statements	Hazardous work/Activity (HWA) method statement will be provided by listing the HWA, their description, Method To be followed / Used to safely carry Out the hazardous activity and the responsible person.
6	Personal Protective Equipment Requirements	A billboard with clear drawing of PPEs and their description will be provided.
7	Measures to Control the Condition and Use of Tools and Equipment	Description of various tools will be provided. Measures & procedures to ensure safe condition & use of tool/equipment and responsible person named.
8	Fire Prevention and Control Measures	Details of control and safety measures to be taken during storage and use of the inflammable substance
9	Environmental Protection Measures	A schedule of waste materials and effluents types of wastes will be identified. Description of waste/effluent generated on the site will be provided. Disposal/ effluent disposal methods and procedures to be named. Further, name and contact details of the company responsible for disposal of waste will be provided.
10	First Aid Arrangements -	First Aid Arrangements will include: Name(s) of first aiders on the work site. Number of and location of first aid boxes Details of other first aid/emergency medical arrangements made
11	Construction Site Signage	There will be a graphic illustration of the signage and the description on where to use/wear.

9.3.1.1 Occupational and Safety Concerns during Construction Phase

Based on the identified hazards, the contractor shall evaluate the risk by considering the likelihood of occurrence and severity. The likelihood of occurrence shall be based on Very Low, Low, Medium, High or Very High. A numerical system can also be used ranging from 1 to 5. The extent of the rating shall be based on the controls that the contractor has put in place. It shows an evaluation of the risk, severity and causal factors.
The risk assessment shall be used to priories the remedial measures. Risks with high evaluation scores shall be given priority for remedying the situations.

9.3.1.2 Occupational and Safety Concerns during Operation Phase

There are some periods towards the end of the construction phase that the road may be opened intermittently for public use. During these periods the workers may still be undertaking construction works on the project road. This implies that the workers shall be exposed to vehicles and pedestrians form the public with risks of accidents that can lead to serious accidents and fatalities.
Towards this, the remedy shall be:

- to enhance safety signage to forewarn the road users that the road is still under construction some sections
- Use traffic marshals to direct other road users
- Demarcate work areas with physical barriers. These barriers should have on them retroreflective materials for enhanced vision in the night
- Where appropriate, slow down traffic by use of bumps, rumble strips or zigzag bollards where appropriate.

9.3.2 Borrow Pit/Quarry Rehabilitation Plan

Table 10: Material Site History, Description of Current Status and Details on Decommissioning

Name of Material Site	Sites operational Functional history	Records Of Assessment Activity By Authority (NEMA, OSHA etc.)	Records on Contractors Interaction with Owner and Local Community	Impacts on the Site and Community due to Interactions
Names of material site to be indicated after selection by the contractor	• When it was last utilized? • Was there any agreement on rehabilitation? • Was it rehabilitated after use?	• Are records available or not available?	• Were there any records (official correspondence) between stakeholders?	• Were there any impacts? • How were they addressed?
	DETAILS ON PROPOSED DECOMMISSIONING			
	Alternative consideration	**Type of Decommissioning Approach**	**s of Work**	**Technical Baseline and Assumptions for the Project**
	• List of alternatives (water pan, do nothing alternative, fill up, dump site etc.).	• Involve the quarry owners in planning the decommissioning type	• Clarification on work schedule with details of decommissioning activities.	• List and review the assumptions and possible impacts
	MANAGEMENT OF THE MATERIAL SITE			
	Contract Out, Use of Construction Manager	Training	Schedule	

Name of Material Site	Sites operational Functional history	Records Of Assessment Activity By Authority (NEMA, OSHA etc.)	Records on Contractors Interaction with Owner and Local Community	Impacts on the Site and Community due to Interactions
	• Details of contract type	• Details of contract type		
	WORK AND ENVIRONMENTAL PROTECTION DURING DECOMMISSIONING			
Names of material site to be indicated after selection by the contractor	**Occupational Safety**	**Occupational Exposure**	**Environnemental Compliance Program (Audits etc.)**	**Safety Analysis and Review of Decommissioning Activities**
	• OSHA guidelines to be adhered to	• Occupational exposures and mitigation.	• Were Audits carried out, EMP adhered to etc.	• Details on the safety analysis while decommissioning.
	WASTE MANAGEMENT			
	Waste Minimization Techniques Used	Waste Handling	Waste Management	
	FINAL SITE SURVEY			
	Independent Verification Inspection by NEMA County Environmental Officer		Independent Verification by Community Leaders	

9.3.2.1 Borrow Pits and Quarries Reinstatement during and After Project Completion

The Contractor, in consultation with the RE and the supervising environmental consultant to coordinate in implementing the EMP on borrow pits and quarries. Status of the material sites should be reported on monthly basis and when need be during the monthly progress meeting between the Contractor, Client and the supervising engineers.

9.3.2.2 Suggested Contents of Borrow-pit/Quarry Lease Agreement

Owners of the possible material sites will likely to be gullible while making legally binding agreement with the Contractor – in case the contractor intends to acquire material from such land parcels and hence the related agreements.

To avoid the Contractor coming up with a one-sided unconscionable agreement while leasing a material site, it will be necessary that an ESIA should be done before the starting the extraction of construction materials. The ESIA should have a copy of the Lease Agreement made between the lessor and the lessee. Parallel to NEMA's ESIA approval process, the following issues should be complied with.

Before the Start of Quarrying Activities

i. Copies of the Agreement should be presented to the following people for approval:
    a) Area NEMA County Director, to be included in the ESIA report for the site.
    b) KeNHA's Deputy Director for Environment and Social Safeguards
    c) Area Chief or sub-chief
    d) Community opinion leaders, - a man and a woman.
ii. Once the above listed stakeholders have reviewed and commented on the proposed agreement, the project's Resident Engineer will give the final decision on the proposed material borrow site, either reject it or accept it, based on the comments from a) – d) above.
iii. KeNHA – the project proponent – in consultation with NEMA will thereafter make the final decision.
iv. To facilitate fast review of the agreement, a template with a compliance checklist will be given to the stakeholders a) to d) above to ascertain Contractor's level of compliance.

After Completion of Quarrying Activates

i. A certificate of material site reinstatement should be filled in by a) to d) and later handed over to the RE, KeNHA for approval
ii. Outstanding issues should be handled by the Contractor in reference to the agreement

9.3.3 Vehicle/Traffic Management Plan

During construction phase of the proposed road, the Contractor should manage the Motorized and Non-motorized traffic in the following ways:

- To ensure that disruptions to traffic and road transport are minimized.
- To ensure that the roads remain open to traffic during construction activities;
- Prior to construction activities, the Contractor will install all signs, barriers and control devices needed to ensure the safe use of the road by traffic and pedestrians.
- Information, warning and direction signs will be incorporated provided at specific places along the project road. Vandalized signs should be replaced.
- County authorities and residents in a working area will be consulted before any detours for construction or diverted public traffic are established;
- Disposal sites and haul routes will be identified and coordinated with local officials;
- Construction vehicles will use temporary roads constructed for that purpose to minimize damage to agricultural land and local access roads.
- Where local roads are used, e.g. haulage of raw material from identified sites, they will be maintained and reinstated to their original condition after the completion of work.

9.3.4 Waste Management Plan

Specific sources of liquid and solid waste will be:

i) Bulk earthworks,
ii) Waste from site office/camp,
iii) Used spare parts from trucks, plant and equipment

Some of the waste will include waste oil, effluent disposal (septic tanks), drilling slurries and drilling fluids, wastewater from site and dredging. The table below has details on managing the waste during construction period.

Table 11: Waste Management Plan during Construction Phase

Process	**Waste Management during Construction Phase**		
Actions	**Requirements**	**Responsibility**	**Timing**
	Spoils from bulk earthworks will be stockpiled and reused where possible	Construction Manager	Throughout the Construction period
	Waste from site office/camp and repairs and maintenance will be segregated at source and	Site Office Project Manger	Throughout construction works

	disposed as per the procedure for solid waste management		
Performance Indicators	No waste will be deliberately or unintentionally released	Site Manager / Construction Manager	Throughout construction works
Monitoring	Waste quantities measured and recorded on a daily basis	Site Office Project Manager	Throughout construction works
Reporting	Reporting to Site Office Project Manager and HSE Advisor	All staff	Throughout construction works
	Any reporting to Resident Engineer and NEMA	Site Office Project Manager	Throughout construction works
Corrective Actions	Awareness and training of waste handling.	Site Office Project Manager	Throughout construction works

9.3.5 Camp Design / Installation Plan

The Contractor's camp(s) for labour, accommodation, offices and construction plant sites shall be identified based on the following guidelines.

- The camp should be constructed in accordance with contract documents, adhering to the specified and required standards.
- The construction site shall be located minimum distance from the road project site and away from any settlement (Min 1km). This will keep off unauthorized persons into the camp and the associated and unnecessary interference.
- The camp should be enclosed with boundary wall, with only one guarded entrance.
- Movement of the workers, in and out of the camp - should be registered during the nighttime. This will prevent possible illegal activities, e.g. pilfering of camp's items, ill behaviour from workers at night etc.
- Camp activities should not create any disturbance to the local community.
- Operation of the plant and machinery should be restricted to daytime only
- Care should be taken while starting and moving the heavy vehicles, there is a possibility that children of near settlement may be playing with machinery parked outside the camps.

9.3.6 Ancillary Plans

Ancillary plans for the Construction sites should include:

Facilities at the Workmen's Camp

- Potable water supply in quantity and quality,
- Safe access road is required at camps

- Waste (all kind of solid and liquid wastes) generated should be disposed of in accordance with NEMA's Waste Management Regulations) 2006, Part II, Solid Waste, which has provisions on disposal methods

Sanitation Facilities

- Construction camp shall be provided with sanitary latrines and urinals.
- Closed drainage systems and the proper treatment systems according to the local conditions should be constructed for the proper flow and effective treatment. The sewage system built for the camp will be operated properly to avoid health hazard, ground water and soil pollution.
- Compost pits will be constructed for the disposal of the garbage and other biodegradable wastes generated from the camps. Proper collection, transportation and disposal of the wastes will be ensured.

Health care Facilities:

- Health problems of the workers should be taken care of by providing basic health care facilities through a health centre set up at the construction camps.
- The health centre will have at least a qualified medical staff (part time), duty staff, medicines and minimum medical facilities to tackle first-aid requirements for minor accidental cases.
- Arrangements and contacts should be made with the nearest hospital to refer patients of major illnesses or critical cases.
-

9.3.7 Spills Prevention and Response Plan

The spill prevention and response plan will provide the Contractor general guidance and procedures to manage project site operations which have potential to cause environmental damage and procedures to follow in case spill occurs. The following discharges - potential pollutants - are likely to occur during construction phase.

i) Wastewater from washout of concrete;
ii) Wastewater from washout and cleanout of paint, form release oils, concrete grinding slurry, curing compounds and other construction materials;
iii) Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;
iv) Soaps, solvents, or detergents used in vehicle and equipment washing; and
v) Toxic or hazardous substances from a spill or other release.

Table 12: Issues of Concern in the Spills Response Plan

	Contractors Areas of Concern in the Plan	Examples of Issues of Concern in the Plan
1	Contractor Responsibilities	• Contractor to follow proper procedures storage and handling of hazardous materials. • Train employees to control the identified waste and recyclable products in the containers provided. • Maintain Material Safety Data Sheets (MSDS) on file for hazardous chemicals used on the project and ensure employees follow all of the incorporated requirements. • Use correct PPEs.
2	Fueling and Maintenance of Equipment or Vehicles	• Use drip pans and absorbents under or around leaky vehicles; • Dispose of or recycle oil and oily wastes in accordance with NEMA. • Clean up spills or contaminated surfaces immediately, using dry clean up measures and eliminate the source of the spill to prevent discharge or a furtherance of an ongoing discharge
3	Washing of Equipment and Vehicles.	• Provide an effective means of minimizing the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other types of washing. • Avoid washing activities in the existing water courses.
4	Disposal of Waste Products	• Separate hazardous waste from construction waste. • Store waste in sealed containers, which are constructed of suitable materials to prevent leakage and corrosion, and which are labeled. • Provide waste containers (e.g., dumpster or trash receptacle) of sufficient size and number to contain construction and domestic wastes.

In complying with the corrective actions in spillage management, the Contractor is responsible to comply with Hazardous Spill Prevention and Response Plan.
Contractor's non-compliance to spill containment control measures will be communicated to the Resident engineer and supervising OHS advisor,

9.3.8 Emergency Response Plan (ERP)

Emergency/Disaster Preparedness Plans for the Proposed Road Project

The contractor shall develop and implement the guidelines for emergency/disaster preparedness and response as provided below:

- Objective:
  - To define emergency situations that may arise during the construction phase of the project;
  - To prepare emergency response plans in line with the identified emergency situations;
  - To put systems in place to equip facility with emergency equipment;

- To put mechanisms in place to test the emergency procedures and propose improvements.
- Keep contacts, both internal and external, of persons in charge for management of emergencies and disasters.

- Emergency situations have been defined as follows:
  - Occupational health and safety
    - Fire outbreak
    - Flooding
    - Fatality on site
    - Serious accident leading to multiple personal injuries
    - Illness due to food poisoning
    - Mass illnesses arising from inhalation and contact with hazardous chemicals
  - Environmental incidents/Disasters
    - Incidents / accidents that may lead to stoppage of works for more than 1 working day;
    - Incidents that may significantly impart negatively on the project and lead to negative publicity within the project neighborhood and to the media
    - Incidents that may cause damage and harm to the environment, especially pollution to soil, water sources and air pollution.
- The process for Identification of Significant Occupational Safety and Health Risks; Identification of Significant Environment all Aspects has come up with the following as emergency situations that are likely to occur:
  - Occupational Health and Safety incidents:
    - Fire outbreak at residential and offices camps, heavy equipment, plants and motor vehicles;
    - Fatality at site;
    - Multiple serious injuries;
    - Food poisoning from worker's canteen;
    - Camp invasion scare
  - Environmental and social incidents
    - Fire outbreak at the Camp, equipment, and plants;
    - Oil spillage leading to surface and ground water contamination and soil degradation;
    - Chemicals spillage, fire;
    - Camp invasion by local residents due to perceived injustices ranging from employment opportunities, degradation of environment and moral related issues due to labour influx.
- Preventative measures:
  - All Emergency measures shall have preventative measures documented and implemented. These shall be outlined in the risk assessments conducted in section 2 above
  - Whenever new or modifications of processes are put in place, the risk assessment shall be reviewed to incorporate the modification or introduction of new processes.

- Repair and Maintenance of emergency equipment
  - An initial fire survey shall be done jointly with a DOSHS approved fire inspector;
  - Emergency equipment shall be procured as per the recommendation if the fire inspector;
  - Once the equipment has been procured and installed, there shall be monthly inspections by the Health and Safety Officer who shall record observations in a prescribed format. For equipment that shall require top up, services for repair and maintenance shall be sought;
  - Periodic repairs and shall be conducted on quarterly basis or as per the advice of emergency equipment and service provider.
- Emergency response team

An emergency response team shall be constituted. This team shall have the membership and responsibilities as shown in

Table 13: Composition and Tasks of Emergency/Disaster Preparedness Response Team

	EMERGENCY ROLE	**RESPONSIBILITIES DURING EMERGENCIES**
1.	Emergency Controller	- The overall coordinator of reported emergencies - Monitor the situation as it unfolds - Contact with GoK Officers and the Consultants Engineers - Give media brief where need be - Delegate the duties to any other manager where necessary
2.	Assistant Emergency Controller	- Deputize the emergency controller - Liaise with affected stakeholder stakeholders - Update the emergency controller on feedback from stakeholders
3.	Emergency Coordinator	- Liaise with the emergency services on site - Liaise with affected stakeholders - Give feedback to the Emergency controller - Spearhead the roll call at the assembly points - Announce all clear once the emergency situation eases up - Write the report and learning arising from the emergency response. Distribute the report to the emergency team
4.	Assistant Emergency Coordinator	- Deputize the Emergency controller - Coordinate and translate with the Chinese workers
5.	Emergency Marshalls	- Ensure emergency alarm is raised - Mobilize workers in their areas of jurisdiction - Where safe to so, ensure that the emergency situation is averted - Ensure all workers, visitors and sub-contractors have evacuated to the assembly point

- Emergency drills/practices

- An emergency response centre shall be established on site. Likewise, an alternative emergency centre shall be designated in event that the aforementioned response centre is rendered out of use;
- A response plan shall be developed for each of the identified emergency situations;
- Each of the identified drills shall undergo tests at least once a year
- Lessons learnt during the drills shall be documented and improvements for future drills and emergencies proposed and implemented in the next drill / emergency.

- Emergency contacts
  - Emergency contacts shall be documented and distributed in all offices and notice boards including security gatehouses;
  - The contacts shall include: police, fire emergency services, ambulance services
  - The contacts list shall be revised at least once a year to ascertain validity telephone numbers and individual's names.

9.3.9 Environmental Awareness Plan

The plan will focus on training, awareness and competence for the site staff with the objective of making them able to work and address tasks that have the potential to cause a significant environmental impact. Environmental awareness and training shall be achieved by:

- Site induction, including relevant environmental issues.
- Environmental posters and site notices.
- Method statement and risk assessment briefings.
- Toolbox talks, including instruction on incident response procedures.
- Key project specific environmental issues briefings.

9.3.10: Decommissioning Plans for the camps and other installations

A decommissioning and abandonment plan for camps and ancillary facilities should be prepared at least three months prior to decommissioning. The plan should consider the following:

• Relocating all un-used tools and equipment to an appropriate storage site.

• Any equipment that has gone into waste should be treated as waste and disposed of in Appropriate ways for example re-use, recycle, reduce or sold to recycling plants

• Demolition of any additional structures that were constructed/installed by the contractor

• Dispose of all the generated waste in accordance with the waste management plan and waste management regulations

• Clean up of the site and handover the site to the Client and demobilize/withdraw all personnel that had been posted to the site including the security personnel. A handover acknowledgement should be written/documented.

• An Environmental Evaluation Report (EER) should be prepared to determine if the activities carried out at the site have caused any detrimental effects and if any so as to discuss mitigations and restoration measures.

• In-depth Environmental Studies for the actual removal of equipment (demolition) to be carried out.

9.4 ENVIRONMENTAL MONITORING

Environmental monitoring is the systematic measurement of key environmental indicators over time within a particular geographic area. Monitoring should focus on the most significant impacts identified in the ESIA. The main aim of ESIA monitoring is to provide the information required to ensure that project implementation has the least possible negative environmental impacts on the people and environment. Various types of monitoring activity are currently in practice. During the ESIA study baseline monitoring on basic environmental parameters in the project area of influence was conducted. Subsequent monitoring would help assess the changes in those parameters over time against the baseline. Other main types of environmental monitoring that will be conducted are briefly described below:

(a) Impact Monitoring

The biophysical and socio-economical (including public health) parameters within the project area, must be measured during the project construction and operational/ utilization phase in order to detect environmental changes, which may have occurred as a result of project implementation e.g. air emission, dust, noise, water pollution etc. (European Commission, 1999).

(b) Compliance Monitoring

This form of monitoring employs a periodic sampling method, or continuous recording of specific environmental quality indicators or pollution levels to ensure project compliance with recommended environmental protection standards. This type of monitoring should be regular and performed over a long period of duration so as to gather sufficient data to draw accurate conclusion concerning project impact

Table 14; Environmental Monitoring Plan

Monitoring Impacts	Frequency			Methodological indicators	Responsible entity
	Construction	Operation/Utilization	Decommissioning		
1. Noise and vibration impacts	Daily observation; monthly noise level analysis	Semi-annually noise measurements	Daily observation; monthly noise level analysis	Noise level quarterly analysis on log of vehicles and machine servicing; trees planted; Number of noise licenses issued Number of PPE provided/ issued and sensitization meetings held.	KeNHA & Contractor NEMA Respective County Government

Monitoring Impacts	Frequency			Methodological indicators	Responsible entity
	Construction	**Operation/Utilization**	**Decommissioning**		
2. Impacts on air quality	Daily dust observation; monthly air quality analysis	Monthly air quality analysis	Daily dust observation; monthly air quality analysis	Daily dust observation; quarterly air sampling and lab analysis; Quarterly reports on PPE provided; log off vehicle and machine servicing; sensitization meetings held; frequency of sprinkling water	KeNHA & Contractor NEMA
3. Disturbance of faunal species	Twice monthly m monitoring of reported cases of wildlife disturbances	-	-	Reports on wildlife sighted; meeting with KWS and bush clearing	KeNHA & Contractor NEMA KWS
4. Destruction of existing habitats and vegetation	Daily vegetation monitoring	-	-	Reports on site zoning program; community initiatives held on tree planting; Number of invasive species identified Landscaping programme or re- vegetation.	KeNHA & Contractor KFS NEMA
5. Oil spills	-Daily management of spills -	-	Daily spills audit and inspections Spill Kit	Reports of oil trapping equipment installed; number of oil spill incidents and corrective measures taken	KeNHA & Contractor NEMA
6. Solid and liquid waste generation	Weekly accounting of waste and collection	Monthly reporting of waste recorded on the road	Weekly wastes generated	Reports on waste management plans developed Amount of waste generated; Facility provided for handling and storage of waste	KeNHA & the Contractor NEMA Relevant County Government

Monitoring Impacts	Frequency			Methodological indicators	Responsible entity
	Construction	**Operation/Utilization**	**Decommissioning**		
				Methods employed for waste disposal Training meetings held Waste water quality analysis results Reports on liquid waste management plans Number of inspections to help identify leaking or blocked pipes.	
7. Soil erosion	Daily monitoring	-	-	Reports on storm water management and soil erosion control plans o site Amount of surface run-off and roof catchment harvested Water harvesting and storage facilities installed	KeNHA & Contractor NEMA Relevant County Government
8. Visual and aesthetic impacts	Quarterly assessment	-	-	Reports on public consultations held Landscaping program designed and implemented	KeNHA & Contractor
9. Cultural heritage and Archaeological find	Monthly assessment and analysis of recorded chance finds	-	-	Reports on heritage areas and archaeological chance finds encountered	KeNHA & Contractor NMK
10. Traffic issues	Daily traffic monitoring	Annual traffic assessment/ studies	-	Traffic diversions and management plans Number of vehicles recorded in weekly basis Number of accidents resulting	KeNHA & Contractor

Monitoring Impacts	Frequency			Methodological indicators	Responsible entity
	Construction	**Operation/Utilization**	**Decommissioning**		
11. Health and Safety issues	Daily cases reported	Monthly assessment	Daily cases	Quarterly reports on health and safety plans HSE training programs Records of incidents, accidents, investigations and corrective action undertaken PPE provided, warnings posted, HSE issues closed out and Permit to Works System issued.	KeNHA & Contractor NEMA DOSHS Relevant County Government
12. . Increase in social vices	Monthly reporting of the statistics	Semi-annually assessment by third parties	Monthly undertaking of statistics	Reports on sensitization forums; sessions held on guidance and counselling on HIV/AIDs and other STDs, Number of condoms issued out	KeNHA & Contractor Relevant County Government
13. Land take – Resettlement and Loss of use	Monthly reported value of land compensation and resettlement	-	-	Reports of RAP implementation including compensation for land, structures and crops/ trees damage	KeNHA & Contractor National Land Commission relevant County Government
14. Pressure on existing infrastructure	Daily assessment	-	Daily reporting	Reports of the number of people accessing social infrastructure Reported cases of grievances or conflicts with the community Number of grievances addressed	KeNHA & The Contractor Samburu County Government
15. Rehabilitation of project site and	-	-	Monthly	Reports on vegetation program developed Number of borrow pits and quarries restored	KeNHA & Contractor NEMA

Monitoring Impacts	Frequency			Methodological indicators	Responsible entity
	Construction	**Operation/Utilization**	**Decommissioning**		
associated areas				Number of tree species planted	Relevant County Government

CHAPTER 10.0. CLIMATE CHANGE AND ROAD INFRASTRUCTURE

Historically, in the road pavement designing process, a stationary climate is assumed. Pavements are designed based on moisture and temperature patterns reflecting the history of the local climate. However, this assumption may be challenged under a changing climate. With projected climate changes over the next several decades, a pavement could be subjected to very different climatic conditions over the design life than was originally expected.

The GOK. (1987): Ministry of Roads Design Manual for Roads and Bridges stipulates that the life span of a flexible pavement, based on the road design chosen, is typically 20-25 years. This period is long enough to allow the impact of climate change to be revealed. The impact has the ability to accumulate and show its significance before or at the end of the service life. Over the years, the earth's climate is changing due to the global warming which also has an effect on road infrastructure. Precipitation, temperate, solar radiation, wind and sea level rise are key elements of the environment that act on the flexible pavement resulting in accelerated deterioration.

High temperatures will cause roads to easily develop cracks within a short period after their construction and also reduce the life of asphalt road surfaces (Philip, 2010), while high precipitation will allow new roads to easily develop potholes while existing potholes will deepen fast. High precipitation in Kenya has been associated with a lot of road failures, compromised structures and extensive siltation as depicted in the pictures below.

Plate 17: Constructed drifts along the proposed road project which get affected during heavy rains

Plate 18: Sections of the road project experiencing sheet flows during rainy season

To counter the impacts of the various climate change related implications a number of strategies can be adopted:

a. Road Specific

Road specific is one of the major categorizes which is focus on road strengthen including raising the road level, adjust side slope and paving surface. This adaptation options can be applied in flood/drought prone areas.

i. Raising Road Level

This is one solution to adapt to climate change events, especially flooding. The road surface level will be raised to an elevation higher than expected flood level to reduce risk of road damage and to prevent an inaccessible road during flood event. Ideally the road design level should be 0.5 m higher than highest expected flood level.

ii. Adjusting Side Slope

Side slope should be adjusted from 1:2 to 1:3 or flatter to prevent flood damage and erosion from road surface runoff. Adjusting side slopes from 1:2 to 1:3 will also increase traffic safety of the road.

b. Paving Road Surface

In areas that experience high precipitation, paved roads offer better resistance to flooding, will drain the water from the surface more easily and will reduce the risk of potholes and water stagnation on the road surface. Paved surface will also reduce the risk of water penetrating and submerging the road construction layers and thereby reducing the bearing capacity of the road.

During the dry season, paved road surfaces will reduce the risk of dust on and around the road. It will increase traffic safety on the road and improve the environment for people living along the road.

c. Drainage

A good road drainage system, which is properly maintained, is vital for all type of roads. A good drainage system conveys water from the surface of the road, as well from the different layers of the road structure, to a safe exit (stream or cross drainage structure). The drainage system also intercepts surface water flowing towards the road and conveys water across the road in a controlled fashion. The destructive power of water increases exponentially as its velocity increases. Therefore, water must not be allowed to develop sufficient volume or velocity so as to cause excessive wear along ditches, at culverts or along exposed running surfaces, cuts or fills.

The presence of excess water within the roadway will adversely affect the properties of the materials with which it was constructed. Cut or fill failures, road surface erosion and weakened subgrades followed by a mass failure are all products of inadequate or poorly-designed drainage.

Different types of drainage structures can be utilized: cross drainage, ditches and drains, French drains, drain deflectors, underdrains, scour checks, and cut-off ditches or catch water ditches

d. Erosion

Erosion is expected to be a major problem, with possible increased rainfall, and to prevent increased erosion might be an important adaptation option to climate change. Some methods to protect the road and its drainage system include retaining walls, gabion boxes, rip-rap and grass sodding

e Realignment

Realignment is a good solution for climate change adaptation. The cost of new road construction could be lower than the maintenance cost of the present road, especially for roads located close to rivers frequently flooded and causing road damage.

f **Revised Road Design Standards**

Climate change factors should be added to road design standards, especially focusing on areas with major risks of flooding that might cause erosion and damage to the road. The most important factors are the road levels, the cross drainage of the road and erosion protection of the road.

g Green Planning

This entails tree planting along roads which helps in increasing forest cover in the country and also serve as a carbon sink.

h **Monitoring**

All roads should be regularly monitored in order to control and propose improvement of the road as well as the area around the road. If an early warning system is established in the area, it should be maintained and monitored regularly.

CHAPTER 11.0: CONCLUSION AND RECOMMEDNDATIONS

11.1 CONCLUSION

The Isinya-Konza-Malili road is an important missing link connecting Athi River-Namanga (A2) Road at Isinya and Mombasa-Nairobi (A8) Road at Malili. With the other sections of the B50 either paved or under construction, this is the only section which remains untarmacked to date. As such, the upgrading of the section will ensure the paving of the entire B50 road thereby facilitating movement and trade between the three Counties transversed by the road whilst serving as a connector of A8 and A2 at both junctions of Malili and Isinya respectively.

The Environmental and social impacts was carried out in view of identifying adverse impacts which might be associated with the road construction and propose strategies for minimizing and mitigating them during planning, construction and operation phases of the road. The impacts identified are manageable through application of mitigation measures wherever they occur. Since the road has been in existence, the construction will endeavor to follow the existing alignment. However there will be adjustments at specific sections due to the proposed interchanges and re-alignments which will necessitate land acquisition. Resettlement action plan will be employed in this case.

The findings of the Environmental and Social Impact Assessment (ESIA) study establishes that the road project will elicit positive impacts on the socio-economic environment of the area. The key positive impacts will be a wider and safer transport network, increase in operation of public service vehicles, local economic stimulus, and creation of employment and business opportunities. The road project will equally have negative impacts both in the construction, operation and decommissioning phases, if appropriate mitigation and support measures are not applied. The study proposes various interventions on various adverse impacts identified in different phases of the project and it is hoped that they will be applied adequately to minimize and mitigate the effects. The main negative impacts during construction include but are not limited to temporary disruption of public water utilities that will affect water supply, electricity supply interruption due to re-routing power lines, air pollution, soil erosion, pollution and sedimentation of existing surface water resources, increased incidence in HIV/AIDS and STIs, and conflicts arising between the community and contractor.

11.2 RECOMMENDATIONS

The report has strived to give comprehensive mitigation measures and environmental management and monitoring mechanisms which if put in place will minimize or completely eliminate the possible negative impacts. The environmental management and monitoring mechanisms developed in this report should be strictly adhered to, to ensure that the project remains environmentally and technically sound throughout its life. The following recommendations should be adhered to:

- Slope gradient maintenance and controlled borrow pits and quarry excavation to avoid vertical phases
- Erosion control measures in excavated borrow pits areas and working sites along the road
- Site reclamation or rehabilitation during decommissioning phase of the project
- Sprinkling of water on dry and dusty surfaces regularly including the access roads and diversion tracks.
- Add suitable soil stabilizers on access roads or pave access roads to control dust.
- Erection of dust screens around buildings under construction especially at the workers' camps. Dust control measures should be adopted at concrete batching plants, providing adequate PPE to staffs, canopying loading points and erecting dust screens around the plant.
- Ensure machines and vehicles are properly and regularly maintained.
- Discourage plant operators and drivers of construction vehicles from unnecessary revving and idling.
- Limit construction traffic movement and operations to the most necessary activities through adequate planning.
- Sensitize construction drivers and machinery operators to switch off engines when not being used.
- Ensuring that the construction machines, equipment and vehicles have the requisite inspection certificate.
- Ensure that all workers wear ear muffs and other personal protective gear/equipment when working in noisy sections.
- Undertake loud noise and vibration level activities during off-peak hours during the day (i.e. between 8.00 am and 5.00 pm).
- Acquire Noise and Excessive Vibrations Pollution Control Permit and comply with conditions provided by the Environment Management and Coordination, Noise and Excessive Vibrations Pollution Control Regulations 2009.
- Incorporating recyclable materials (e.g. glass, scrap tires, certain types of slag and ashes) to reduce the volume and cost of new asphalt and concrete mixes.
- Collecting road litter or illegally dumped waste and managing it according to the recommendations in the General EHS Guidelines and Waste Management Regulations, 2006.
- Provision of bottle and can trash disposal receptacles at parking lots to avoid littering along the road.
- Before commencement of construction activities, the contractor, shall be required to come up with Traffic Management Plan to aid traffic movements at sites;

- The contractor will be required to place trained traffic marshals strategically at operations sites;
- Installation and maintenance of appropriate road safety provisions (road furniture, speed controls etc.) before commissioning as well as during the operation of the project.
- Environmental impact assessments (EIA) to be undertaken prior to extraction of materials from identified sites and approved by NEMA.
- Operations of the materials sites to be guided by respective management plans established and approved under the ESIA,
- Material extractions and delivery should only be done during the day.
- If borrow pits and quarries are operated, they be fenced off.
- Develop a comprehensive STDS, HIV and AIDs awareness and control programmes such as provision of condoms to workers both male and female.
- Provision of STDs, HIV and AIDS prevention measures to workers.
- Creation of awareness of STDs, HIV/AIDS in workers camps through trainings and installation of posters.
- Adhere to and implement the Sexual Offences Act, 2006 and its amendment 2012.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.
- Establishment of work zones to separate pedestrians and livestock travelling by foot from vehicular traffic and equipment by routing of traffic to alternative roads where possible.
- Regular issuance of appropriate PPEs and regular trainings on proper use and maintenance of PPEs
- Conduct basic Occupational Health Training programs to construction workers during construction phase.
- Separate EIAs should be conducted for camps, borrow pits, quarries, boreholes (if any) and other ancillary facilities.
- Minimize clearing and disruption of riparian vegetation.
- Provide adequate protection against scour and erosion; and consider the onset of the rainy season with respect to construction schedules.
- Minimize clearing of indigenous plant species and replanting of indigenous plant species in disturbed areas
- Stone pitching and side drains to cover meaningful lengths along the prone protection areas.
- Timing of the construction of proposed bridges to coincide with dry periods when water levels in the rivers are low to avoid possible water pollution.
- Contractor to avoid dumping of waste materials within the riparian zones/ within the watercourses.

- The contractor should develop and implement labour influx plan, an employee code of conduct and child protection strategy during the project implementation phase.

CHAPTER 12.0 REFERENCES

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APPENDICIES

APPENDIX 1. EXPERT LICENSES

APPENDIX 2: PUBLIC CONSULTATION MINUTES

Kenya National Highways Authority
Quality Highways, Better Connections
Barabara Plaza, Block A & C, Jomo Kenyatta International Airport (JKIA), Off Airport South Road, along Mazao Road,
P.O Box 49712 - 00100 Nairobi, **Tel** 020 - 4954000 / 0700 423 606 **Email** dg@kenha.co.ke / Website www.kenha.co.ke

MINUTES OF THE PUBLIC PARTICIPATION MEETING FOR THE PROPOSED CONSTRUCTION OF ISINYA – KONZA (MALILI) (B50) ROAD: 50KM HELD ON 8TH SEPTEMBER 2020 AT ISINYA SOCIAL HALL

ATTENDEES: (See attached Attendance List)

1. KeNHA Representatives (client)
2. Local Administration Representative
3. Members of community

AGENDA

1. Prayers and Introduction
2. Opening remarks
3. Project Description
4. Preliminary Session
5. Closing remarks

MINUTE	DISCUSSION
MIN 1/09/2020	**Prayers and Introduction** The meeting was called to order at 11.00 am by the area ACC followed by a word of prayer by village elder Emmanuel Kitoipei. The ACC led the introductory session for all stakeholders and the local administrators.
MIN 2/09/2020	**Opening Remarks- Laban (Chief Isinya)** The area ACC enlightened the locals on the benefits of the road such as provision of employment, economic growth of Isinya town, transfer of new skills to locals and ease of transport within and beyond their local borders.
MIN 3/09/2020	**Brief on KeNHA Mandate and project Rationale- KeNHA Safeguards Team** The participants were informed that KeNHA is mandated to construct, maintain and rehabilitate international trunk roads class A, national trunk roads class B and the superhighways. The participants were informed that the development of the road will provide an important missing link that connects roads A2 and A8 i.e. connection for Narok-

	Kajiado- Machakos and Makueni or Mombasa traffic hence would promote social welfare, economic activities as well as provision of wider road network to the proposed Konza City and its environs within the project zone of influence. The improvement of the road to bitumen standards will increase the traffic capacity thereby realizing travel time savings, vehicle operating cost savings and enhanced road safety. Further, Kenya's economic potential and more specifically the realization of proposed Konza city goals and objectives would be unlocked by this proposed missing link in addition to socio-economic development in the project area, promoting housing development, livestock farming, educational institutions, market centres etc. In general, the project is well aligned with the Big 4 Agenda. The participants were informed that the projects development is at the preliminary stage and therefore urged to co-operate with the surveyors on site as they are collecting data for finalization of the project design. They were also informed that as soon as the design is complete, disclosure will be done for the general community and Persons who's their parcels of land will be affected by the project. Community living along the project road will be continuously engaged on the intention to acquire land to accommodate the intended development, as well as any concern that might arise as a result of the proposed development. Participant were also sensitized on the proposed measures put in place in case there is a grievance affecting the community. KeNHA will institute and operationalize grievance redress mechanism in consultation with the administration and community, the GRM will help address any related grievances against the project. Emphasis was laid on compensation as locals were assured that compensation will done before construction in areas and where there is no dispute. Complimentary initiatives like HIV/AIDS and Road Safety Awareness and Training were highlighted as some of the components that will be incorporated in the project during implementation stage to provide awareness.
MIN 4/09/2020	**Project Description- KeNHA Surveyor** The participants were informed that the project road commences at Isinya Town at the junction of Athi River-Namanga Road (A2) and B50 Roads and ends at Malili Town at the junction with Mombasa –Nairobi Road (A8). The project road is approximately 50Km long, mainly located in Kajiado County (38Km) and short sections in Machakos and Makueni Counties. The road traverses a rolling terrain and land with very high potential for livestock and horticulture farming. The width of the existing Right of Way (ROW) ranges between 15m and 18m for Class E road, but the road has been reclassified to Class B road. This will require the road corridor to be widened to a minimum of 60m which will involve major acquisition of land for the ROW of the project road. The participants were also informed that the road was initially proposed to go through Isinya Town, however it was impossible for the road to achieve the proposed 60M width therefore a 3.1 Km bypass will be constructed 1.5km from Isinya Town.

	Further, the team elaborated on the project construction scope which includes; • Constructing Isinya Town – Malili town (B50) Road to 2-way single carriageway bitumen standard road. • Non-motorized Transport Infrastructure i.e. Cycle lanes and walkways, at selected settlement areas. • Provision of drainage structures including bridges and box/pipe culverts	
MIN 5/09/2020	**Plenary Session**	
Name	**Question/Concerns /Comments**	**Responses**
Nakile Sironka	How will compensation be done in areas with dispute?	Compensation will not be done for land with dispute and the land owners urged to ensure they settle any land disputes through the various systems in place in the Country before the project commences.
Peter D Meeli	Is compensation done before or after the project starts?	The compensation due process will take place and compensation will be undertaken upon before commencement of the project.
	How will the government ensure safe movement of people and livestock across the road?	The road construction scope also entails; Pedestrian underpasses and overpasses, Non-motorized Transport Infrastructure i.e. Cycle lanes and walkways, at selected settlement areas and animals crossings, speed bumps and signs all geared to ensure safety as well as protecting livelihoods.
	Will the movement of the road to bypass kill their town?	The 1.5Km road from town joining the 3.1km by pass will also be tarmacked among other access roads in town thus ensuring grown and continuity in the centres.
	Will the locals be considered for labour during implementation of the project?	80% of the labour will be given priority to the locals.
	Does the government allow locals to have their own land Valuer and lawyer?	Yes, the laws one to have their own valuer who will work hand in hand with the National land Commission land valuer, as well as a lawyer.
	Everyone love development and will support the project due to the benefits that will be accrued from the development. However, we need proper sensitization on the detailed projects impacts and mitigation measures	This was Noted, and KeNHA will ensure continuous community engagements at all the stages of the project development and implementation stage.

Michael Sawaina	He mentioned that the project is supported since the current road is in bad condition especially during the rainy season, but KeNHA should ensure community concerns are addressed.	This was Noted, KeNHA assured that a Grievance redress mechanism will be instituted to address any project related grievance or concern.
	He mentioned that they were angered by KeNHA surveyors who trace passed that lands without their consent	KeNHA team apologized and community agreed that hence fourth, they are welcomed to undertake the survey exercise inside their farms.
	He mentioned that they experienced problems with KETRACO and SGR due to small sections of land left after acquisition, requested KeNHA to acquire the entire parcel of land in case a small portion is left after acquisition.	They were informed that KeNHA will work in consultation with NLC and entirely acquire all small sections of the lands left and will issue the land owners with new title deeds of the sections acquired for road construction.
MIN 6/09/2020	**Closing Remarks-Mr Stanly Too (DCC- Isinya Sub County** The Deputy County Commissioner urged the locals to be aware of both the negative and positive impacts of the project. He assured the locals that his office has a mandate of handling disputes. The DCC asked the locals to ensure they have settled all disputes and they have their tittles in their names before the project begins Continuous engagement will continue with the community to share information on the road project. **Closing Remarks - KeNHA** The team thanked the locals for attending the meeting.	
MIN 7/09/2020	**Adjournment** The meeting was adjourned by the DCC at 1.00 pm followed by a word of prayer.	

Kenya National Highways Authority
Quality Highways, Better Connections
Barabara Plaza, Block A & C, Jomo Kenyatta International Airport (JKIA), Off Airport South Road, along Mazao Road,
P.O Box 49712 - 00100 Nairobi, **Tel** 020 - 4954000 / 0700 423 606 **Email** dg@kenha.co.ke / Website www.kenha.co.ke

MINUTES OF THE PUBLIC PARTICIPATION MEETING FOR THE PROPOSED CONSTRUCTION OF ISINYA – KONZA (MALILI) (B50) ROAD: 50KM HELD AT EMAMPARUSUAI PRIMARY SCHOOL ON 9TH SEPTEMBER 2020

ATTENDEES: (See attached Attendance List)

4. KeNHA Representatives (client)
5. Local Administration Representative
6. Members of community

AGENDA

1. Prayers and Introduction
2. Opening remarks
3. Project Description
4. Preliminary Session
5. Closing remarks

MINUTE	DISCUSSION
MIN 1/09/2020	**Prayers and Introduction** The meeting was called to order at 11.00 am by the area ACC followed by a word of prayer by village elder. The area Chief led the introductory session for all stakeholders and the local administrators.
MIN 2/09/2020	**Opening Remarks- Robert (Chief Ilpolosat)** The chair urged the residents to embrace the project and work hand in hand with the government from the preliminary stage of the project to the final stage. He mentioned to the locals on the benefits of the road development such as provision of employment, economic growth of Isinya town, transfer of new skills to locals and ease of transport within and beyond their local borders.

MIN 3/09/2020	**Brief on KeNHA Mandate and project Rationale- KeNHA Safeguards Team** The participants were informed that KeNHA is mandated to construct, maintain and rehabilitate international trunk roads class A, national trunk roads class B and the superhighways. The participants were informed that the development of the road will provide an important missing link that connects roads A2 and A8 i.e. connection for Narok-Kajiado-Machakos and Makueni or Mombasa traffic hence would promote social welfare, economic activities as well as provision of wider road network to the proposed Konza City and its environs within the project zone of influence. The improvement of the road to bitumen standards will increase the traffic capacity thereby realizing travel time savings, vehicle operating cost savings and enhanced road safety. Further, Kenya's economic potential and more specifically the realization of proposed Konza city goals and objectives would be unlocked by this proposed missing link in addition to socio-economic development in the project area, promoting housing development, livestock farming, educational institutions, market centres etc. In general, the project is well aligned with the Big 4 Agenda. The participants were informed that the projects development is at the preliminary stage and therefore urged to co-operate with the surveyors on site as they are collecting data for finalization of the project design. They were also informed that as soon as the design is complete, disclosure will be done for the general community and Persons who's their parcels of land will be affected by the project. Community living along the project road will be continuously engaged on the intention to acquire land to accommodate the intended development, as well as any concern that might arise as a result of the proposed development.

	Participant were also sensitized on the proposed measures put in place in case there is a grievance affecting the community. KeNHA will institute and operationalize grievance redress mechanism in consultation with the administration and community, the GRM will help address any related grievances against the project. Emphasis was laid on compensation as locals were assured that compensation will done before construction in areas and where there is no dispute. Complimentary initiatives like HIV/AIDS and Road Safety Awareness and Training were highlighted as some of the components that will be incorporated in the project during implementation stage to provide awareness.
MIN 4/09/2020	**Project Description- KeNHA Surveyor** The participants were informed that the project road commences at Isinya Town at the junction of Athi River-Namanga Road (A2) and B50 Roads and ends at Malili Town at the junction with Mombasa –Nairobi Road (A8). The project road is approximately 50Km long, mainly located in Kajiado County (38Km) and short sections in Machakos and Makueni Counties. The road traverses a rolling terrain and land with very high potential for livestock and horticulture farming. The width of the existing Right of Way (ROW) ranges between 15m and 18m for Class E road, but the road has been reclassified to Class B road. This will require the road corridor to be widened to a minimum of 60m which will involve major acquisition of land for the ROW of the project road. The participants were also informed that the road was initially proposed to go through Isinya Town, however it was impossible for the road to achieve the proposed 60M width therefore a 3.1 Km bypass will be constructed 1.5km from Isinya Town.

		Further, the team elaborated on the project construction scope which includes; • Constructing Isinya Town – Malili town (B50) Road to 2-way single carriageway bitumen standard road. • Non-motorized Transport Infrastructure i.e. Cycle lanes and walkways, at selected settlement areas. • Provision of drainage structures including bridges and box/pipe culverts
MIN 5/09/2020		**Plenary Session**
Name	**Question/Concerns /Comments**	**Responses**
Moisasi Napuyet	How will compensation be done in areas with dispute?	Compensation will not be done for land with dispute and the land owners urged to ensure they settle any land disputes through the various systems in place in the Country before the project commences.
	Is there proposed realignment of corner Mbaya Section, since the section has land dispute	The new realignment will be further from the corner mbaya section and therefore the area disputed will be avoided.
William Sapur	What CSR plans are in place for the locals?	Access roads to government facilities will be done, boreholes dug during construction will be left to the locals. Further, this depends on the agreement between the county and the National Government.
	Is public land also compensated?	Public land will be compensated just like any other private property if acquired by the government
Rongoine Malikia	He mentioned that the area is prone to flooding and wanted to know if there is any help that the community can get especially for their children crossing rivers to school.	The road construction scope also entails replacing the drifts with bridges, providing culverts for water passage and ensuring access to homesteads.
	He stated that the proposed road will cut through have of his lad and wanted to know the provisions to ensure his livestock are safe as they access grazing fields on both sides of the road.	The road construction scope also entails; Pedestrian underpasses and overpasses, Non-motorized Transport Infrastructure i.e. Cycle lanes and walkways, at selected settlement areas and animals crossings, speed bumps and signs all geared to ensure safety as well as protecting livelihoods.

MIN 6/09/2020	**Closing Remarks** The KeNHA team urged the locals to be aware of both the negative and positive impacts of the project. The team thanked the locals for attending the meeting. The locals were also requested to ensure they have settled all disputes and they have their tittles in their names before the project begins. The school head teacher (Julius Parkanta) requested the team to consider building toilets for the school during construction. The area Chief thanked the residents for attending the meeting and urged them to settle their disputes.
MIN 7/09/2020	**Adjournment** The meeting was adjourned by the Chief at 12.00 noon followed by a word of prayer.

MINUTE	DISCUSSION
MIN 1/09/2020	**Prayers and Introduction** The meeting was called to order at 13.00 pm by the area Chief followed by a word of prayer by a village elder. The chair then accorded the panel an opportunity to introduce themselves.
MIN 2/09/2020	**Opening Remarks- Robert (Chief Ilpolosat Location)** The chair urged the residents to embrace the project and work hand in hand with the government from the preliminary stage of the project to the final stage. He mentioned to the locals on the benefits of the road development such as provision of employment, economic growth of Isinya town, transfer of new skills to locals and ease of transport within and beyond their local borders.
MIN 3/09/2020	**Brief on KeNHA Mandate and project Rationale- KeNHA Safeguards Team** The participants were informed that KeNHA is mandated to construct, maintain and rehabilitate international trunk roads class A, national trunk roads class B and the superhighways. The participants were informed that the development of the road will provide an important missing link that connects roads A2 and A8 i.e. connection for Narok-Kajiado-Machakos and Makueni or Mombasa traffic hence would promote social welfare, economic activities as well as provision of wider road network to the proposed Konza City and its environs within the project zone of influence. The improvement of the road to bitumen standards will increase the traffic capacity thereby realizing travel time savings, vehicle operating cost savings and enhanced road safety. Further, Kenya's economic potential and more specifically the realization of proposed Konza city goals and objectives would be unlocked by this proposed missing link in addition to socio-economic development in the project area, promoting housing development, livestock farming, educational institutions, market centres etc. In general, the project is well aligned with the Big 4 Agenda. The participants were informed that the projects development is at the preliminary stage and therefore urged to co-operate with the surveyors on site as they are collecting data for finalization of the project design.

	They were also informed that as soon as the design is complete, disclosure will be done for the general community and Persons who's their parcels of land will be affected by the project. Community living along the project road will be continuously engaged on the intention to acquire land to accommodate the intended development, as well as any concern that might arise as a result of the proposed development. Participant were also sensitized on the proposed measures put in place in case there is a grievance affecting the community. KeNHA will institute and operationalize grievance redress mechanism in consultation with the administration and community, the GRM will help address any related grievances against the project. Emphasis was laid on compensation as locals were assured that compensation will done before construction in areas and where there is no dispute. Complimentary initiatives like HIV/AIDS and Road Safety Awareness and Training were highlighted as some of the components that will be incorporated in the project during implementation stage to provide awareness.
MIN 4/09/2020	**Project Description- KeNHA Surveyor** The participants were informed that the project road commences at Isinya Town at the junction of Athi River-Namanga Road (A2) and B50 Roads and ends at Malili Town at the junction with Mombasa –Nairobi Road (A8). The project road is approximately 50Km long, mainly located in Kajiado County (38Km) and short sections in Machakos and Makueni Counties. The road traverses a rolling terrain and land with very high potential for livestock and horticulture farming. The width of the existing Right of Way (ROW) ranges between 15m and 18m for Class E road, but the road has been reclassified to Class B road. This will require the road corridor to be widened to a minimum of 60m which will involve major acquisition of land for the ROW of the project road.

		The participants were also informed that the road was initially proposed to go through Isinya Town, however it was impossible for the road to achieve the proposed 60M width therefore a 3.1 Km bypass will be constructed 1.5km from Isinya Town. Further, the team elaborated on the project construction scope which includes; • Constructing Isinya Town – Malili town (B50) Road to 2-way single carriageway bitumen standard road. • Non-motorized Transport Infrastructure i.e. Cycle lanes and walkways, at selected settlement areas. • Provision of drainage structures including bridges and box/pipe culverts
MIN 5/09/2020		**Plenary Session**
Name	**Question/Concerns /Comments**	**Responses**
Peter	Access the hospitals and public spaces has always been a challenge during rainy season. He appreciated and welcomed the road project, since the benefits the road will bring are very many. He requested KeNHA to inform the community of the time frame for the project.	This was noted. Continuous Engagement with the local community will continue to share information on the progress made so far on development of the project and timelines.
George Musungu	Community Social Responsibility should be considered for public amenities for the community.	Access roads to government facilities will be done, boreholes dug during construction will be left to the locals. Further, this depends on the agreement between the county and the National Government.
Gideon	His request was to the government to fast track the planning process so that the road construction can start immediately. He also requested for consideration in tarmacking the roads next to public amenities.	This was noted.

	He stated that the proposed road will cut through have of his lad and wanted to know the provisions to ensure his livestock are safe as they access grazing fields on both sides of the road.	The road construction scope also entails; Pedestrian underpasses and overpasses, Non-motorized Transport Infrastructure i.e. Cycle lanes and walkways, at selected settlement areas and animals crossings, speed bumps and signs all geared to ensure safety as well as protecting livelihoods.
MIN 6/09/2020		**Closing Remarks** The KeNHA team urged the locals to be aware of both the negative and positive impacts of the project. The team thanked the locals for attending the meeting. The locals were also requested to ensure they have settled all disputes and they have their tittles in their names before the project begins. A village elder, George Musungu appreciated the project and assured the KeNHA team of their full co-operation throughout the project duration.
MIN 7/09/2020		**Adjournment** The meeting was adjourned by the Chief at 2.30 pm followed by a word of prayer.

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MINUTES OF THE PUBLIC PARTICIPATION MEETING FOR THE PROPOSED CONSTRUCTION OF ISINYA – KONZA (MALILI) (B50) ROAD: 50KM HELD AT ILPOLOSAT CHIEF'S OFFICE ON 9TH SEPTEMBER 2020

ATTENDEES: (See attached Attendance List)

7. KeNHA Representatives (client)
8. Local Administration Representative
9. Members of community

AGENDA

1. Prayers and Introduction
2. Opening remarks
3. Project Description
4. Preliminary Session
5. Closing remarks

MINUTE	DISCUSSION
MIN 1/09/2020	**Prayers and Introduction** The meeting was called to order by the DCC Mukaa at 10.30am followed by a brief meeting with all the local authority, a representative from the MCAs office, village elders and administrative police from the area at the office of the DCC. This was followed by a public Baraza at Malili town
MIN 2/09/2020	**Opening Remarks-** The DCC commended the authority for the project. He further went on to enlighten the locals on the importance of such a road to their community: economic expansion, provision of employment, growth of their town generally improvement of their livelihoods. The chair urged the residents to embrace the project and work hand in hand with the government from the preliminary stage of the project to the final stage. He mentioned to the locals on the benefits of the road development such as provision of employment, economic growth of Isinya town, transfer of new skills to locals and ease of transport within and beyond their local borders.
MIN 3/09/2020	**Brief on KeNHA Mandate and project Rationale-KeNHA Safeguards Team** The participants were informed that KeNHA is mandated to construct, maintain and rehabilitate international trunk roads class A, national trunk roads class B and the superhighways. The participants were informed that the development of the road will provide an important missing link that connects roads A2 and A8 i.e. connection for Narok-Kajiado- Machakos and Makueni or Mombasa traffic hence would promote social welfare, economic activities as well as provision of wider road network to the proposed Konza City and its environs within the project zone of influence. The improvement of the road to bitumen standards will increase the traffic capacity thereby realizing travel time savings, vehicle operating cost savings and enhanced road safety. Further, Kenya's economic potential and more specifically the realization of proposed Konza city goals and objectives would be unlocked by this proposed missing link in addition to socio-economic development in the project area, promoting housing development, livestock farming, educational institutions, market centres etc. In general, the project is well aligned with the Big 4 Agenda.

	The participants were informed that the projects development is at the preliminary stage and therefore urged to co-operate with the surveyors on site as they are collecting data for finalization of the project design. They were also informed that as soon as the design is complete, disclosure will be done for the general community and Persons who's their parcels of land will be affected by the project. Community living along the project road will be continuously engaged on the intention to acquire land to accommodate the intended development, as well as any concern that might arise as a result of the proposed development. Participant were also sensitized on the proposed measures put in place in case there is a grievance affecting the community. KeNHA will institute and operationalize grievance redress mechanism in consultation with the administration and community, the GRM will help address any related grievances against the project. Emphasis was laid on compensation as locals were assured that compensation will done before construction in areas and where there is no dispute. Complimentary initiatives like HIV/AIDS and Road Safety Awareness and Training were highlighted as some of the components that will be incorporated in the project during implementation stage to provide awareness.
MIN 4/09/2020	**Project Description- KeNHA Surveyor** The participants were informed that the project road commences at Isinya Town at the junction of Athi River-Namanga Road (A2) and B50 Roads and ends at Malili Town at the junction with Mombasa –Nairobi Road (A8). The project road is approximately 50Km long, mainly located in Kajiado County (38Km) and short sections in Machakos and Makueni Counties. The road traverses a rolling terrain and land with very high potential for livestock and horticulture farming. The width of the existing Right of Way (ROW) ranges between 15m and 18m for Class E road, but the road has been reclassified to Class B road. This will require the road corridor to be widened to a minimum of 60m which will involve major acquisition of land for the ROW of the project road. The participants were also informed that the road was initially proposed to go through Isinya Town, however it was impossible for the road to achieve the proposed 60M

		width therefore a 3.1 Km bypass will be constructed 1.5km from Isinya Town. Further, the team elaborated on the project construction scope which includes; • Constructing Isinya Town – Malili town (B50) Road to 2-way single carriageway bitumen standard road. • Non-motorized Transport Infrastructure i.e. Cycle lanes and walkways, at selected settlement areas. • Provision of drainage structures including bridges and box/pipe culverts
MIN 5/09/2020		**Plenary Session**
Name	**Question/Concerns /Comments**	**Responses**
David Makau	How will the locals benefit from the project they do not have enough schools?	They should liaise with their leaders to build schools it is not the mandate of KeNHA to build schools but can provide access roads to the schools.
	What is the standard minimum wage for casual laborers? Contractors working on in the area are not paying as per the labour guidelines,	The project will consult with the labor office regarding daily rates/minimum wage for unskilled workers. KeNHA will also develop a labour management plan that will guide the contractor on labour influx management.
Juakali chairman	He Requested the project to consider constructing Jua Kali Sheds for Traders and also issue adequate notice for traders who are on the road.	KeNHA in consultation with the administration and county government will discuss to come up with a sustainable solution for the traders, Traders will be issued with adequate notice to relocate from the road reserve.
Paul Mutua	Will the locals especially youth be considered for employment in the project?	Yes, 80% of the work force will be prioritized for the locals.
Lilian Mwikali	Will ladies be considered during employment of locals? The project should consider addressing women issues, especially harassment at work place during construction,	According to GOK (affirmative action) women should be considered in 30% allocation of all jobs. The project will have a sub component of HIV/AIDS awareness and training that will also entail sensitization and training of Gender Based Violence mitigation measures.

MIN 6/09/2020	**Closing Remarks** The KeNHA team thanked the locals for attending the meeting urged the residents to co-operate to ensure the road becomes a success and assured all residents' compensation shall be done in the proper way. The DCC went further to urge the residents to raise issues of payments to the labor department before the commencement of the project.
MIN 7/09/2020	**Adjournment** The meeting was adjourned by the DCC at 1300hrs followed by a word of prayer. The meeting was adjourned by the Chief at 2.30 pm followed by a word of prayer.

APPENDIX 8: QUESTIONNAIRES