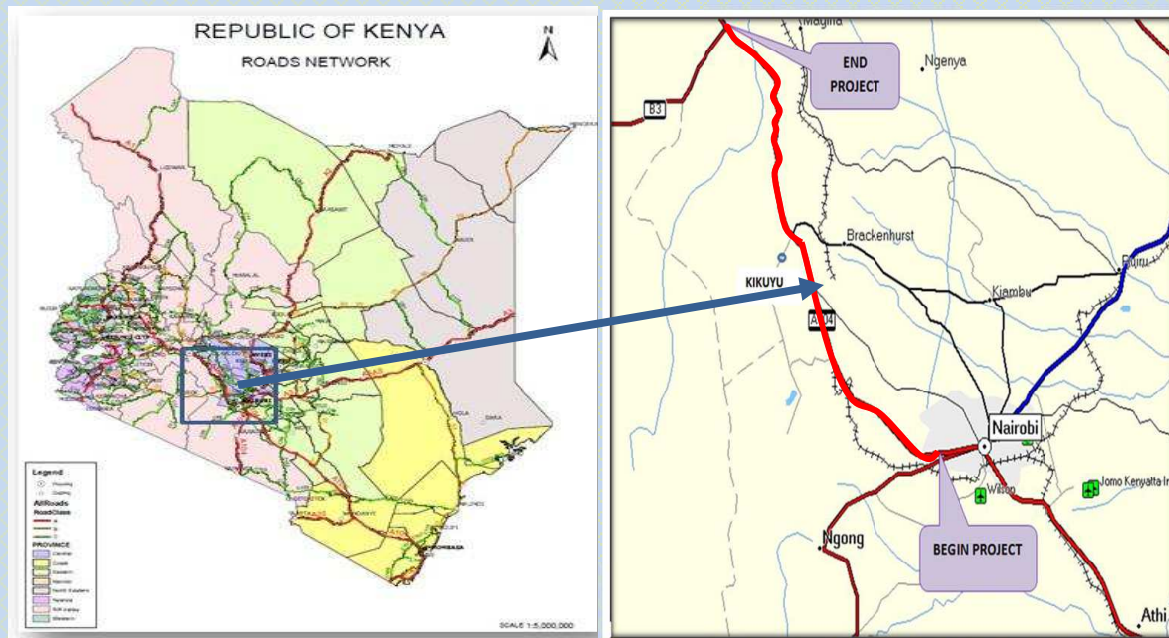




**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY  
REPORT  
OF  
THE PROPOSED REHABILITATION AND CAPACITY  
ENHANCEMENT OF ROAD A104 FROM JAMES GICHURU ROAD  
JUNCTION TO RIRONI (A104/ B3 JUNCTION)**



**JULY 2016**

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**ASSIGNMENT:** Consultancy Services for Feasibility Study ,Preliminary Engineering Design, Environmental Impact Assessment, Social Impact Assessment ,Detailed Engineering Design and Preparation of Bid Documents for the Rehabilitation and Capacity Enhancement of Road A104 from James Gichuru Road Junction to Rironi (A104/ B3 Junction)

**REPORT TITLE:** Environmental and Social Impact Assessment Study Report of the proposed Rehabilitation and Capacity Enhancement of Road A104 from James Gichuru Road Junction to Rironi (A104/ B3 Junction)

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**DISCLAIMER:**

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## List of Acronyms/Abbreviations

GoK	Government of Kenya
KeNHA	Kenya National Highways Authority
NEMA	National Environmental Management Authority
NEC	National Environment Committee
DEC	District Environment Committee
TAC	Technical Advisory Committee
EMCA	Environmental Management and Co-ordination Act
EIA	Environmental Impact Assessment
EA	Environmental Audit
ESMP	Environmental and Social Management Plan
NLC	National Land Commission
RAP	Resettlement Action Plan
PaPs	Project Affected Persons
BRT	Bus Rapid Transit
NEAP	National Environment Action Plan
CBO	Community Based Organization
PEC	Poverty Eradication Commission
WSSD	World Summit for Social Development
HIV/AIDS	Human Immuno Virus/Acquired Immuno-Deficiency Syndrome
CPP	Consultations and Public Participation
CBD	Central Business District
KWS	Kenya Wildlife Service
KPLC	Kenya Power and Lighting Company
NGO	Non Governmental Organization
FIDIC	International Federation of Consulting Engineers
PSV	Public Service Vehicle
KEBS	Kenya Bureau of Standards
ISO	International Standard Organization
RE	Resident Engineer
PHO	Public Health Officer
PD	Public Disclosure
EMS	Environment Management System
VCT	Voluntary Counseling Centre
WARMA	Water Resources Management Authority
KRB	Kenya Roads Board
MoWI	Ministry of Water and Irrigation
OH&S	Occupational Health and Safety
DBM	Dense Bitumen Macadam
AASHTO	Association of American State Highway and Transportation Officials
NMT	Non Motorized Traffic
GHGs	Green Houses Gases
PWMP	Project Waste Management Plan
WB. OP	World Bank Operational Policy
R&R	Resettlement and Rehabilitation
IEC	Information Education and Communication
STDs	Sexually Transmitted Diseases
BoQ	Bill of Quantities
<b>Units:</b>	
KM	Kilometers
M	Meters
MM	Millimeters
°C	Degrees Celsius
%	Percentage
amsl	above mean sea level
Msc	Master of Science
Bsc	Bachelor of Science
Chem	Chemistry
NMT	Non Motorized traffic
MT	Motorized Traffic

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## Executive Summary

### 1. Introduction

The Government of the Republic of Kenya (GoK) has developed and is implementing several initiatives aimed at addressing traffic congestion in the vicinity of Nairobi through rehabilitation and traffic capacity enhancement of major national roads with an overall objective of enhancing safety, reducing road user costs (vehicle running cost, fuel consumption and travel time) and thereby promoting trade and socio economic development. Among the national roads targeted for improvement is a section of the larger Road A104 that traverses Nairobi and Kiambu Counties.

The Kenya National Highways Authority (KeNHA), a state corporation established under the Roads Act 2007 charged with the responsibility for the management, development, rehabilitation and maintenance of national highways hereinafter referred to as the “Project Proponent” or “Client” contracted Eser Project Engineering Company in joint venture with Botek Bosphorus Technical Consulting Company to carry out a Feasibility Study, Preliminary Engineering Design, Environmental and Social Impact Assessment, Detailed Engineering Design and Preparation of Bid Documents for the Rehabilitation and Capacity Enhancement of Road A104 from James Gichuru Road Junction to Rironi (A104/ B3 Junction). This document takes into account cognizance of the requirements of Environmental Management and Co-ordination Act, 1999, It presents the Environment and Social Implications of the proposed rehabilitation and capacity enhancement of the project road as required by clause 3 and 4 of the client’s Terms of Reference.

The proposed project road traverses Nairobi and Kiambu counties with 6.8 km traversing Nairobi County while the remaining 18.3 km traverses Kiambu County. The project will involve rehabilitation of existing pavement, widening of the carriageway from the current two lanes, provision of non motorized traffic facilities, incorporation of a BRT corridor for future BRT development, improvement of the road drainage and other infrastructural improvements. A comprehensive description of the project features has been detailed under chapter four of this report.

The ESIA exercise methodology involved an integrated approach where data collection was achieved through a comprehensive literature review, field surveys and consultations with experts and the project stakeholders. The exercise involved collection of relevant baseline and legislative data and public opinion and concerns that have been analyzed to come up with conclusive recommendations to alleviate any foreseen environmental and socio-economic impacts associated with the road rehabilitation and capacity enhancement.



## 2. Environmental Legislative, Regulatory, Policy and Administrative Framework

The ESIA has carefully taken into account legal requirements stipulated in the Environmental Management and Co-ordination Act, Cap 387, and its subsequent supplements and other significant legal, regulatory and policy framework regulating projects' development in the country among which include Traffic Act Cap 403, Water Act Cap 372, The Constitution of Kenya 2010, Land Act 2012, Valuers' Act Chapter 532, Land Registration Act 2012, Public Health Act Cap 242, Occupational Safety and Health Act Cap 2007, Land Acquisition act cap 295, Environmental (impact assessment and audit) regulations(2003), EMC (water quality) regulations(2006), EMC (waste management) regulations(2006), Kenya Road policies , National Environment Action Plan (NEAP), National Climate Change Action Plan(2013-2017)Environmental and Development Policy (Sessional Paper No.6 1999), World Bank(WB) safeguard policies among other legislations, regulations and polices spanning over the various development sectors.

## 3. Project Baseline Inventory

The project road covers the section of A104 highway commencing at James Gichuru Road Junction and ending at Rironi (A104/B3 Junction). Length of the highway section is 25.1 km, taking into account the side roads and connection roads which are 24.5 km; the total length of the roads within this project is 49.6 km. There are also nine elevated interchanges and one at grade junction. The road is currently of bitumen standard and is a dual carriageway.

The project area is situated in the Central Highlands of Kenya and enjoys a pleasant climate for most of the year with temperatures averaging between 10 and 28 °C. There are two rainy seasons, the first being from March to the end of May and the second shorter season running from October to the end of November. The sunniest time of the year is December to March and the cloudiest time is from June to September. The mean annual rainfall is 1150 mm.

Generally, the project area lies within the Athi River Basin and drains into Athi River .There are no streams or major rivers intersecting the section of the greater A104 road encompassing this particular project. The area surrounding the project road is endowed with many surface and sub-surface water resources, about 90% of which comprises both surface water resources and ground water potential. The road is currently drained by box and pipe culverts.

The starting point of the project, that is the James Gichuru Road Junction, is at 1773 m above mean sea level (amsl). Between Km: 12+350 to 25+300 the landscape is flat and rolling at some parts. Between Km 25+300 – 26+800 the road passes through a mountainous land and reaches a gradient

of 8%. At Km: 26+300 the amsl is 2076 m. Between Km: 26+800 – 37+668 the landscape is flat and rolling at some parts. At the project end, the altitude above mean sea level (amsl) is 2295 m.

The geology of the area is comprised of volcanic layers of basalts, trachytes, phonolites and tuffs all overlain by thick layers of clay soil which retains water for an extended period of time after the rains and this partly recharges aquifers in the area.

The total population of Nairobi West sub-county in which the project road traverses was projected to be 1,259,699 by year 2012 and this is expected to grow. From the age of 20 years, the male population is higher than the female population while for the extreme age groups, the female population is more than the male population. The population for Kiambu West sub-county stands at 493,158 as at year 2012, this is expected to grow with the growing number of immigrants flocking Nairobi and Kiambu counties to seek for employment.

Land use in the area varies along the road, between Km: 12+350 and 31+600 the main activity is that of small holdings with small scale traders active along the road. The area between km 31+600 up to project end (Muguga and Rironi), population density is low and the residents are predominantly agricultural. The urban areas of Westlands, Uthiru, Kabete and Kikuyu form a dormitory for people working in Nairobi City and are majorly occupied by commercial and residential housing and business premises.

All the major urban infrastructures including a centralized sewer system are available in the area, they include; water supply, power supply, communication network and road network.

Community services such as education, health care centers, recreational centers and churches are in the neighborhood of the project road. Emergency facilities (fire brigade, ambulances and police) are within reach.

The main mode of transport in the area includes use of 14 seater 'Matatus' and minibuses which ferry passengers to and from Nairobi's CBD thorough the project road; the road also connects Western, Rift Valley and Nyanza regions provinces with the rest of the country and also connects the main sea port of Mombasa with Uganda and Rwanda.

#### **4. Project Description**

Different design aspects of the project road have been detailed in the various engineering design reports. The project road has been designed with the objective of maximizing comfort of the road

users while ensuring there is no compromise on road safety to both motorized and non-motorized traffic. The road rehabilitation will involve the following major improvements:

- ❖ Expansion of the section from A104/James Gichuru road Junction to Uthiru shopping center from the current two lanes either way to three lanes either way, a walkway either way and collector roads. A Bus Rapid Transit (BRT) corridor will be provided for future development (i.e. 5 years after opening up of the road)
- ❖ Expansion of the section from Uthiru Shopping center to Gitaru from two lanes to three lanes, a walkway either way and collector roads
- ❖ Expansion of the section from Gitaru to Rironi from two lanes to four lanes, a walkway either way and collector roads
- ❖ Attainment of grade separation at the Waiyaki way/James Gichuru road junction and modification of interchanges/bridge intersections at various locations
- ❖ Construction of NMT facilities (walkways, pedestrian overpasses, cycle tracks, bus stops)
- ❖ Reconfiguration of the storm water drainage system
- ❖ Rehabilitation of service roads

The design process captured the following key components:

- ❖ Topographical surveys
- ❖ Traffic Studies
- ❖ Soils, Materials and Pavement Investigations
- ❖ Geometry of the road which includes vertical and horizontal alignments and road cross-section
- ❖ Pavement Design
- ❖ Hydrological and Hydraulic studies
- ❖ Resettlement Action Plan Study
- ❖ Environmental and Social Studies
- ❖ Detailed Cost Estimates
- ❖ Economic Evaluation

The project road will follow the existing alignment as closely as possible, compatible with design standard requirements; the additional lanes will largely use the available space in between the roads of the highway. However, some minimal realignment is foreseen, particularly in sections with sharp bends. New drainage structures, including box and pipe culverts, will be constructed or rehabilitated while junctions and accesses will be improved in line with safety and capacity requirements. Service roads will be considered and non motorized traffic will be catered for fully in the design. Construction will involve use of heavy machinery and considerable earthworks. Large quantities of construction materials will be used, mainly bitumen, gravel, hard stone, natural sand, graded crushed stone, cement, lime, etc. Stones and gravel to some extent will be sourced locally. The projected traffic

volume, which the road will have to accommodate, the selected design speed and the proposed level of service determined the choice of cross-section.

It is expected that the project will be constructed over a period of three (3) years and one (1) year dedicated to Procurement. The total project cost estimate is Kshs. 24.78 Billion.

## **5. Project alternatives**

The standard approach in looking for solutions to mitigate against the impacts on environment is to consider alternative ways of achieving the same project objectives with a view of recommending the alternative with the minimum level of impact severities on environment at large.

No project alternative: This option is the most viable alternative from an extreme environmental perspective as it ensures non-interference with existing environmental conditions. This alternative on the other hand would mean that the road continues to be in its current state which is deplorable and has weighed heavily on the road users. Travel times have increased significantly due to increased traffic volume handled by the road. All the positive impacts accruing from the road rehabilitation and capacity enhancement would also not be felt. This option is thus out of the question considering that the project implementers have gone a step further to come up with a plan to harmonize the road upgrading with the environment.

Alternative Project routing: From the TOR, the road corridor is in existence and any deviation from existing alignment would introduce further negative impacts of displacement of locals due to massive private land acquisition which would increase the project budget cost. The current road alignment which is serving local people is to be maintained and expanded to accommodate more traffic volume and reduce conflict areas therefore there is no alternative route. This would also mean an extra cost of carrying out detailed feasibility analysis for an alternative route.

Alternative construction materials and construction technology: The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Materials will be locally sourced from licensed dealers for environmental sustainability Equipment and machinery that is environmental friendly will be given first priority without compromising on cost or availability of other factors. Construction materials are readily available in the area hence no sophisticated mode of materials acquisition is anticipated.

Waste management: A lot of solid waste will be generated during the construction phase of the project cycle. An integrated solid waste management system is recommendable. A project waste

management strategy will be developed by the contractor prior to commencement of the construction works to ensure that all waste material is managed sustainably; this plan will be in compliance with local and international waste management regulations and guidelines.

## **6. Consultations and Public Participation**

Stakeholder involvement was achieved through a public participation exercise where workshops were conducted with project stakeholders at every stage of the design and consultative meetings with the local community held at each administrative location. Structured and semi structured questionnaires were also issued and direct interviews conducted with the local community to reach as many stakeholders as possible. The stakeholders considered ranged from the local community residing on the road side, local business vendors, government organizations, learning institutions, private sector, nongovernmental organizations, religious organizations, transporters and owners of PSV vehicles.

The aim of this exercise was to ensure that views, opinions, concerns and recommendations of the stakeholders are considered during project planning, design, construction, operational and decommissioning phase of the project. During questionnaire administration, a total of ninety three (93) respondents were interviewed. The stakeholder respondents were drawn from 7 locations spanning the entire section covered by the project road. Majority of the respondents constituted the local community and business community, 90% of the total respondents cited using the road on a daily basis to travel to their places of work, transport their business wares, to travel upcountry and access their property.

The respondents noted with concern that the number of accidents due to the current status of the road are many e.g. those accessing private property or joining the highway from their property especially around Nairobi School and Waruku area lack deceleration/acceleration lanes. It was also noted that there are high rates of NMT/MT accidents due to lack of safe pedestrian crossings. The residents of Rironi who are mainly farmers are not able to safely cross their produce in wheelbarrows due to the middle concrete barrier on the project road. The existing foot bridge lacks a ramp for these wheel barrows and motorbikes.

The respondents fully embraced the proposed project but mentioned a few negative impacts that should be addressed which include; Displacement of business vendors operating on the road side, increased traffic volume/traffic disruption due to ongoing construction works, dust, and noise etc. Among the benefits noted to accrue from the proposed project include; reduced traffic, employment creation, reduced vehicle maintenance costs, value addition to property and general development.

The respondents suggested that locals be given first priority in employment during the construction period, youth representation be allowed during decision making, the locals to be involved in HIV/AIDS sensitization programmes, materials such as gravel and hard stone to be sourced from local suppliers.

## 7. Potential Environmental and Social Impacts Identification , Analysis and Mitigation

It is no doubt that positive as well as negative environmental impacts associated with the road rehabilitation will emanate. A summary of the notable potential positive and negative impacts are summarized below:

### **Positive impacts:**

- ❖ Improved transport system and accessibility(reduced traffic congestion and improved safety )
- ❖ Opening up of Nairobi County to business
- ❖ Improved Government Revenue
- ❖ Creation of Employment for both skilled and unskilled labor
- ❖ Tourism Boost
- ❖ Improved trade and commerce in the area
- ❖ Improved provision of socio-cultural services including health and education
- ❖ Reduced road maintenance costs
- ❖ Reduction in travel time
- ❖ Improved safety

### **Negative impacts:**

#### *Construction Phase*

- ❖ Loss of land due to acquisition of private land to pave way for new road reserve
- ❖ Displacement of informal businesses along the highway's road reserve
- ❖ Loss of livelihood and interference with resources and sensitive receptors during construction
- ❖ Loss of habitat and biodiversity
- ❖ Dust and exhaust emissions
- ❖ Noise Pollution
- ❖ Contamination of soil and water resources
- ❖ Potential degradation/soil erosion at road reserve, material borrow sites and quarries
- ❖ Increased waste generation
- ❖ Interference with socio-cultural set up i.e. gender inequality, displacement of locals, increased pedestrian and RTA accidents, discrimination of disabled persons in employment

- ❖ Increased demand/strain on existing physical infrastructure and services
- ❖ Climate changes impacts such as Increased GHG (Green House Gases) emissions due to continued growth in transport industry , Loss of biodiversity, Loss of land, crops, coastal structures and ecosystems due to SLR , Droughts, reduced river flows and related crop failures and human-wildlife conflicts , Spread of diseases such as malaria, cholera etc

#### *Operation Phase*

- ❖ Potential for pollution by debris left behind during demobilization
- ❖ Loss of source of livelihood for site staff due to project closure
- ❖ Immigration of workers
- ❖ Interference with traffic flow during periodic and routine maintenance works
- ❖ Increased number of RTA accidents
- ❖ Loss of funds due to theft of road furniture

#### *Decommissioning Phase*

- ❖ Increased waste generation
- ❖ Dust
- ❖ Interference with road users
- ❖ Noise and vibration

#### **Mitigation measures:**

The above impacts shall be mitigated as detailed under chapter six and seven of this report, among the mitigation measures for the three project phases (Construction, operation and Decommissioning) proposed include:-

#### *Construction Phase:*

- ❖ A resettlement Action Plan for the proposed project was done to enable compensation/relocation of all PaPs
- ❖ Private land owners will be compensated for loss of land at prevailing market value. All assets including existing trees and crops on affected land will be compensated fully
- ❖ Vendors with temporary structures will be relocated to a site near where they were carrying out their businesses to maintain their clientele base while for vendors with bigger kiosks, an appropriate site will be identified with the help of the local authority and their structures relocated.
- ❖ Timely notice and assistance to relocate to any appropriate site within the area will be given to all PaPs through appropriate means.
- ❖ Watering of dusty excavated areas and diversions during the drier seasons to suppress dust.



- ❖ Site enclosure to provide buffer against dust propagation at camp site.
- ❖ Diverting vehicular traffic using the road away from construction site to avoid visual intrusion to drivers due to dust
- ❖ Control speed and movement of construction vehicles by erecting speed bumps.
- ❖ Provide all construction workers with protective equipment/wear
- ❖ Restricting construction hours to daytime only(i.e. 8.00 am to 5.30 pm) especially around settlement areas, hospitals , worship centers , schools and market centers
- ❖ Establish an inspection plan program and a response procedure for all construction equipment/machinery and vehicles
- ❖ Come up with spill control procedures
- ❖ Limit land disturbance to areas meant for construction works
- ❖ Create a landscape schedule to be implemented for planting trees, grass cover on road side and material sites to substitute for lost vegetation
- ❖ Compact and stabilize the soil structure to allow for plant re-growth
- ❖ Set up land rehabilitation programme for road reserve and borrow pits/quarries
- ❖ Excavation, clearing, blasting and cutting to be limited to project area
- ❖ Ensure management of excavation activities especially during rainy conditions
- ❖ Providing adequate number of sanitary facilities to workers and visitors to the site for their sanitary convenience
- ❖ Source for alternative and convenient water sources e.g. use of water pooled in abandoned quarries. Promoting recycling and reuse of water and harvesting surface run off into open reservoirs during rainy season
- ❖ Apply to Kenya Power for electricity connection or use alternative energy sources like generators and come up with water and energy conservation measures
- ❖ Design and build suitably sized drainage structures that do not overly constrict water flow e.g. use of lined channels in severe incidences
- ❖ Enhance gender sensitivity and reduce gender and disabled persons discrimination in construction activities
- ❖ Give equal opportunities for both men and women for skilled and unskilled work and also disabled persons
- ❖ Involve women groups in environmental management of the works such as construction of gabions.
- ❖ Put up facilities for disabled persons such as special sanitary facilities for their convenience
- ❖ Factor non motorized traffic in the design by providing cycling lanes , pedestrian overpasses, walkways , zebra crossings and speed bumps at market centers and areas with learning institutions , provide road furniture warning drivers of children and animals crossing the road, provide sheds at bus termini on all market centers.

- ❖ Factor in the safety of motorized traffic in the design by providing warning signs furniture of such features as sharp bend ahead, black spot areas etc
- ❖ Provide service roads in all market centers and short access sections along the corridor and access culverts on all minor and road junctions
- ❖ Engage the local community in road maintenance activities
- ❖ Sensitize the local community on optimal and wise use of the road to improve social and economic growth
- ❖ All machinery and other moving parts of machinery must be enclosed or guarded to protect injury and operated by qualified personnel.
- ❖ Warning and safety signage indicating that construction is in progress should be clearly shown and fully equipped first aid kits provided
- ❖ Persons providing food for workers at the site must have all the necessary public health licenses.
- ❖ Provision must be put in place for a Health and Safety committee with representatives from workers and employers , the contractor will also designate a qualified safety officer from the committee
- ❖ All workers and visitors to the site to be provided with full protective gear
- ❖ All human traffic to be directed away from the site area to avoid unwarranted accidents
- ❖ All workers to be trained on first aid skills in case of emergency response
- ❖ All vehicles delivering materials to site will be controlled to avoid inconveniences to other motorists and pedestrians
- ❖ Fire extinguishers shall be provided at construction site/camp and strategically positioned, regularly maintained and serviced and workers trained on how to handle them
- ❖ Provide fire hazard signs in danger zones) such as “NO SMOKING SIGNS”.
- ❖ The contractor to provide contacts of the nearest fire brigade, ambulance service provider and police hotline at the site office in-case of emergency for convenient access by all persons
- ❖ Strict hiring guidelines will be adopted during the hiring of workers to lock out bad elements.
- ❖ Security lighting shall be provided within the project camp sites for night purpose
- ❖ Securing a workmen’s compensation cover for all the workers.
- ❖ All workers should be sensitized on social issues such as drug and alcohol abuse, rape, corruption, theft, education, politically related violence and diseases such as HIV/AIDS.
- ❖ Contractor to devise a communication plan with the locals to ensure prior notice is issued on all matters concerning the construction processes and schedules
- ❖ The contractor will prepare a Project Waste Management Plan (PWMP) that will see to it that all waste is disposed off optimally and at NEMA/county designated disposal facilities
- ❖ Development of an extensive mass transit system in the form of bus rapid transit (BRT) corridors which will ensure reduced traffic congestion, improved local air quality and improved road safety which will reduce cumulative effects of climate change

- ❖ Creating climate change training material and programmes for target groups of stakeholders and specific groups, i.e. women, men, children, youth, people with disabilities, religious groups

*Operation Phase:*

- ❖ Disposal of all debris and restoration of site to original conditions.
- ❖ The contractor and the supervising team to re-absorb the site staff to other projects as required/necessary
- ❖ Provision of counseling and testing for HIV/AIDS to incoming construction personnel;
- ❖ Strengthening of advocacy through awareness training in HIV/AIDS and other STDs; including encouraging the use of preventive measures like condoms and
- ❖ Avail condom dispensers to construction staff
- ❖ The contractor to make use of road traffic control signs during maintenance works
- ❖ Maintenance works to be limited to off peak hours when traffic flow is not heavy
- ❖ Necessary diversions to be planned in advance for alternative use during maintenance works
- ❖ Installation and use of relevant road safety signs/furniture on the project road
- ❖ construction of road bumps,
- ❖ Initiation of a road safety awareness program.
- ❖ Routine/periodic maintenance of the road should be done to ensure that the road remains in good condition
- ❖ Use alternative materials that will deter theft of road furniture
- ❖ Give heavy penalty to criminals to reduce theft of road signs and furniture

*Decommissioning Phase:*

- ❖ Appropriate diversions to be created and directional signage used to direct the road users.
- ❖ Contractor to give employees prior notice on the laying off plan
- ❖ Spraying of dry soils with water in excavated areas and diversions to suppress dust.
- ❖ Diverting vehicular traffic using the project road away from construction site with appropriate signage to avoid visual intrusion to drivers due to too much dust
- ❖ Site enclosure to provide buffer against dust propagation at camp site.

## **8. Conclusions and Recommendations**

The local community and other stakeholders are ready to embrace the proposed project if their fears and concerns are taken into account during the project implementation and agree that the potential negative impacts are manageable. With improved roads, the living standards of the local community and the rest of the nation will be enhanced; accessibility to other parts of the country, market centers

and basic social services is expected to improve. Safety of road users will be enhanced and trade and commerce improved.

An Environmental and Social Management and Monitoring Plan has been devised to aid the project implementers with a clear guideline into ensuring that all potential negative impacts are mitigated. The EMP clearly outlines the persons responsible for monitoring implementation of these measures and these should form an integral part of decision making during the project implementation. The ESMP budget has been devised (table 7.2) and catered for in the project cost estimates. In view of this, NEMA should issue a license to the project proponent to facilitate commencement of the project implementation.

The proponent must adhere and implement in full the proposed Environmental and Social Management and Monitoring Plan. Its' implementation must be monitored by the representative of the engineer, to ensure total compliance.

The proponent must observe adherence to the relevant legislations discussed under chapter 2 of this report and in particular Occupational Safety and Health Act-2007, World Bank Policy on involuntary Resettlement Water quality regulations and waste management regulations.

The proponent must adhere to the conditions that will be attached to the EIA license. The proponent must confirm adherence in writing to the Director General-NEMA.

## 1.0 INTRODUCTION

### 1.1. Project Background and Rationale for an Environmental Impact Assessment

The Government of the Republic of Kenya (GoK) has developed and is implementing several initiatives aimed at addressing traffic congestion in the vicinity of Nairobi through rehabilitation and traffic capacity enhancement of major national roads with an overall objective of enhancing safety, reducing road user costs (vehicle running cost, fuel consumption and travel time) and thereby promoting trade and socio economic development. Among the national roads targeted for improvement is a section of the larger Road A104 that traverses Nairobi and Kiambu Counties.

The Kenya National Highways Authority (KeNHA), a state corporation established under the Roads Act 2007 charged with the responsibility for the management, development, rehabilitation and maintenance of national highways contracted Eser Project Engineering Company in joint venture with Botek Bosphorus Technical Consulting Company to carry out a Feasibility Study, Preliminary Engineering Design, Environmental Impact Assessment, Social Impact Assessment, Detailed Engineering Design and Preparation of Bid Documents for the Rehabilitation and Capacity Enhancement of Road A104 from James Gichuru Road Junction to Rironi (A104/ B3 Junction).

The length of the section under rehabilitation is 25.1 Km, the project commences at the A104/ James Gichuru Road junction GPS coordinates (252382E, 9861003N) and ends at A1/4/B3 junction, GPS coordinates (236716E, 9874967N). The planned rehabilitation and capacity enhancement involves rehabilitation of existing pavement, widening of the carriageway from the current two lanes, provision of non motorized traffic facilities, incorporation of a BRT corridor for future BRT development , improvement of the road drainage and other infrastructural improvements. A comprehensive description of the project features has been detailed under chapter four of this report.

This document takes into account cognizance of the requirements of Environmental Management and Co-ordination Act, 1999; it presents the Environment and Social Implications of the proposed rehabilitation and capacity enhancement of the project road as required by clause 3 and 4 of the client's Terms of Reference.

Part 3 of the second schedule of section 58 of the Environmental Management and Coordination Act CAP 387, specifies the following items under transportation to undergo an Environmental Impact Assessment:

- a) All major roads

- b) All roads in scenic, wooded or mountainous areas and wetlands
- c) Railway lines
- d) Airport and airfields
- e) Oil and gas pipelines
- f) Water transport

It can be noted that the road in question which is class "A" would be classified as major in terms of (a) above. Further, this report is prepared in accordance with section 7 of the legal Notice No 101: The Environmental (Impact Assessment and Audit) Regulations 2003 and World Bank safeguard policy on environmental assessment.

## **1.2. Client's Terms of Reference**

The Consultant is to conduct analyses, which shall detail the positive and negative effects of the development of the project on the environment, and recommend appropriate solutions to minimize any undesirable effects resulting from improvement of the road. The ESIA shall be conducted in accordance with World Bank guidelines and the Environmental Management and Coordination Act CAP 387 schedule II including the EIA and EA regulations of 2003.

The analyses shall include, but not limited to the following factors:

- a) The role of the project in the development plans at national and regional level;
- b) Preservation of areas and land use of particular value including agricultural and natural conservation areas, forests and other important natural resources, cultural and historic sites, etc.;
- c) Disturbance of vegetation and plans for re-vegetation and conservation of biodiversity.
- d) The prevention of soil erosion and sedimentation;
- e) The presentation of health hazards arising from ponding water and pollution of water courses and/or sources;
- f) Measures for the rehabilitation of sources of construction materials, borrow pits and quarries;
- g) Health and sanitation for the road construction labor units;
- h) The avoidance of and reduction of visual intrusion; and
- i) Assessment of the impact on demographic factors including the prevention of undesirable roadside developments, and recommended regulations and measures to limit negative impact on adjacent communities and areas.

This environmental and Social Impact Assessment must conform to the Environmental Management and Coordination Act (EMCA) Cap 387, Section 58, and the National Environment Management Authority (NEMA) regulations of 2003.

### 1.3. Objectives of this Environmental and Social Impact Assessment

- ❖ The primary aim of this ESIA is to determine the full implications of the project road rehabilitation on the natural, human – built up and heritage environments.
- ❖ Identify all potential significant adverse environmental and social impacts of the project
- ❖ Verify compliance with the environmental regulations and relevant standards including world bank safeguard policies
- ❖ Generate baseline environmental data that will be used to monitor and evaluate the mitigation measures implemented during the project life cycle.
- ❖ Description of the project, its various stages and outputs that will have influence on the environment
- ❖ Analysis of the various project alternatives and justification of best alternatives chosen
- ❖ To identify and assess possible impacts during construction and after.
- ❖ To provide a scope of sustainable and cost effective mitigation for any negative impacts and the enhancement of the positive impacts.
- ❖ Development of an Environmental and Social management and monitoring plan that will be used as benchmark for ensuring that environmental safeguards are adhered to during construction and operational phases of the project.
- ❖ To develop a budget for implementation of the ESMP and monitoring Plan.
- ❖ To liaise with interested parties in order to seek their views and identify and quantify categories of project affected persons (PaPs) who would require some form of assistance , compensation , rehabilitation or relocation.
- ❖ Verify the adherence and compliance of the project life cycle activities to World Bank safeguard policies.

### 1.4. ESIA scope, approach and methodology

The EIA process involved an integrated approach where data collection was achieved through a comprehensive literature review, field surveys and consultations with experts and the project stakeholders. The process involved the following;

- ❖ Review of previous reports ,county development profiles, road design manuals , regulations , standards and guidelines and other published and unpublished work on the environment of the project area;
- ❖ Field investigations
- ❖ Public consultations
- ❖ Understanding and description of the proposed project , its alternatives and justification of best options chosen



- ❖ Collation of baseline data on environmental and socio-economic conditions of the project area.
- ❖ Analysis and description of all significant changes expected due to the proposed project, both positive and negative encompassing environmental , ecological and social impacts as a result of interaction between the proposed project and the environment that are likely to bring about changes in the baseline environmental and social conditions .
- ❖ Finally, formulation of an environmental and social management and monitoring plan based on proposals for preventive, compensatory and mitigative measures during project implementation and during the lifespan of the road.

The field survey adopted various techniques of baseline data collection on the existing environmental conditions, namely:

- ❖ Field observations and recordings including photography along the project road and its vicinity.
- ❖ Use of checklists and matrices for determining potential environmental impacts and analysis respectively.
- ❖ Discussions with key informants/locals along the road and its vicinity.

The socio-economic impact assessment was handled as a discrete activity. Combinations of recognized tools for assessing socio-economic impacts of such a project were employed in the exercise. Review of development plans and other documented information on the project area was also carried out. Fieldwork, coupled with collection of existing data alongside interviews with a wide spectrum of members of the society, farmers, business community, professionals and selected institutions formed the basis of evaluating potential socio-economic impacts of the project. This allowed a situational analysis on relationship between construction and operation of the road against human dimensions.

It is recognized that CPP is an important process in ESIA process and is specifically to ensure community involvement and to create a sense of responsibility and commitment towards implementation of the project. Considering the high population in the project area and the diverse number of stakeholders involved, use of questionnaires, interpersonal contacts and consultations with stakeholders drawn from 7 locations was considered at the local level while joint workshops were held at every stage of the design to draw in the corporate sector. The public participation process was also used as an avenue to inform the general public about the proposed project and to give all stakeholders an opportunity to express their concerns regarding possible impacts of the project and their mitigation measures. The contents of the detailed activities during the CPP are contained in Chapter five of this report.

## **2.0 ADMINISTRATIVE, LEGISLATIVE, REGULATORY AND POLICY FRAMEWORK**

### **2.1. General**

It is now accepted that development projects must be economically viable, socially acceptable, and environmentally sound. The Government of Kenya has established regulations to facilitate the process of EIA and EA. The regulations are contained in the Kenya Gazette Supplement No.56, legislative supplement No. 31, and legal notice No. 101 of 2003. It is now mandatory that developments of certain types and magnitudes must undergo an EIA prior to implementation. In this section, pieces of legislation, regulations and policies that are relevant to this project from an environmental perspective are described. In doing so, the socio-economic and biophysical circumstances prevailing in the project area guided the selection of the pieces of legislation, regulations and policies.

### **2.2. Administrative framework**

In 2001, the government established the administrative structures to implement the EMCA Act.

The two main administrative structures are;

#### **(i) The National Environmental Council (NEC)**

The National Environmental Council is responsible for policy formulation and directions for the purposes of the Act. The council also sets national goals and objectives and determines policies and priorities for the protection of the environment.

#### **(ii) The National Environmental Management Authority (NEMA)**

National Environment Management Authority is a corporate body established under the EMCA Act. NEMA has the legal authority to exercise general supervision and coordination over all matters relating to the environment, and is the principal instrument of the government charged with the implementation of all policies relating to the environment. In detail, NEMA functions include the co-ordination of various environmental management activities, initiation of legislative proposals and submission of such proposals to the Attorney General, research, investigations and surveys in the field of environment. NEMA undertakes to enhance environmental education and awareness on the need for sound environmental management. In addition, NEMA advises the Government on regional and international agreements to which Kenya should be a party, and issue an annual report on the

state of the environment in Kenya. NEMA is also charged with the responsibility for the execution of the Environmental Impact Assessment (EIA) and Environmental Audit (EA).

Other bodies in various cadres that have been appointed to offer environmental administrative procedures on behalf of GoK include Provincial Environment Committee (PEC), District Environment Committee (DEC), the National Environment Tribunal (NET) and Technical Advisory Committee (TAC).

*(iii) The Standards and Enforcement Review Committee*

The EMCA provides for the establishment and enforcement of environmental quality standards to be set by a technical committee of NEMA. This is known as the Standards and Enforcement Review Committee (SERC).

## **2.3. Legislative framework**

### **2.3.1 Environment Management and Coordination Act, 1999**

The Environmental Management and Coordination Act, Cap 387 received assent on 6 January 2000 gazetted on 14<sup>th</sup> January 2000 and revised in 2015. The main objectives of the Act are to;

- ❖ Provide guidelines for the management of an appropriate legal and institutional framework for the management of the environment in Kenya.
- ❖ Provide a framework of legislation for over 77 statutes in Kenya that contain environmental provisions.
- ❖ Provide guidelines for environmental impact assessment, environmental audit and monitoring, environmental quality standards and environmental protection orders.

*EMCA requirements for environmental assessment and audits:*

The second schedule to the Act lists the projects for which an EIA and EA must be carried out. Section 68 of the Act specifies that accurate records should be maintained and annual reports submitted to NEMA as required.

According to the Act, every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. It is worth noting that the entitlement to a clean and healthy environment carries a correlative duty. Hence there is not only the entitlement to a clean and healthy environment, but also the duty to ensure that the environment is not degraded in order to facilitate one's own as well as other person's enjoyment of the environment.

According to section 58 of the act, an environmental impact assessment needs to be carried out on all projects specified in the second schedule of the act that are likely to have a significant impact on the environment.

This proposed project is considered to fall under the second schedule of the Act.

Part VII section 68 of the same Act requires proponents of projects or undertakings to carry out annual environmental audits in order to determine the level of compliance with statements made during the EIA. The audit report should also be submitted to NEMA.

### **2.3.2 Traffic Act, Cap. 403**

The Act empowers police officers to stop and remove from the road vehicles producing noxious emissions or to charge their owners in a court of law. Under the Traffic Rule, every motor vehicle shall be constructed, maintained and used that no avoidable smoke or visible vapor is emitted there from.

Pollution of the atmosphere occurs on the highway either by use of adulterated petroleum products or unroad worthy vehicles, aircraft, rail-locomotives and ships. The Traffic Act requires that the vehicles shall only use the fuel specified in the vehicle license.

The control of vehicular pollution is an example of grossly inadequate standards and enforcement. The Traffic Act prohibits the operation of motor vehicles that emit black fumes that pollute the air and cause visibility problems. The problem with this requirement is that there is no standard measure or definition of what constitutes black fumes or visibility problems. The Act does not address specific pollutants that are particularly harmful, such as Lead and Carbon monoxide.

### **2.3.3 Water Act Cap. 372**

Besides dealing with issues of Water Conservation, the Department of Water also deals with issues of water pollution. The Water Act prohibits water pollution and gives control devices by giving such conditions in the water use permit as will ensure that pollutant substances are not left in any water supply. The Water Act states that any person who by act neglects, causes any source of supply, the water from which is used or is likely to be used for human consumption or domestic purposes, or for manufacturing of food or drinks for human consumption, to be polluted, shall be guilty of an offence.

The Act prohibits among others the unlawful interference with watercourse or body of water and prohibits the release of water without a permit, and specifies penalties for polluting water used for human consumption. Any person who unlawfully throws or conveys or causes to be conveyed any rubbish, dust, refuse, effluent, trade wastes or other offensive or unwholesome matter or thing into or

near any body of water in such a manner as to cause or likely to cause pollution thereof, shall be guilty of an offence, punishable by a fine.

#### **2.3.4 Public Health Act, Cap.242**

This piece of legislation is relevant for the workmen's camps and at sites of concentrated works. It also applies to sections across heavily populated areas. Part IX, section 115 of the Act states that no person or institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires local authorities to take all lawful, necessary and reasonable practicable measures to maintain areas under their jurisdiction clean and sanitary conditions up to standard and to prevent occurrence of nuisance or condition that can expose workers to injury such as may occur at construction work sites.

Such nuisance or conditions are defined under section 188 as wastes, sewers drains or refuse pits in such a state, situated or constructed in the opinion of the medical officer of health to be offensive or injurious to health. Noxious matter or waste flowing or discharged from any site in to a public street or into the gutter or side channel or nuisance. Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbor rats or other vermin.

Part XII section 136 states that all collections of water, sewage, rubbish, refuse and other fluids, which permits or facilitate the breeding or multiplication of pests shall be deemed nuisance and are liable to be dealt with in the manner provided by this Act.

#### **2.3.5 Occupational Safety and Health Act 2007 and Regulations**

The Act sets minimum standards that are to be maintained in workplaces to safeguard health, safety and welfare of workers. These are all aimed at elimination of hazards from workplaces. The act further requires all workplaces to display the abstract of the act for all workers to read and remind themselves on how to protect themselves from hazards. The act also makes it mandatory for occupiers or employers to provide personal protective equipment and all practicable means to prevent injury to health of workers who are exposed to any potentially harmful substances or conditions.

Even though the Factories and Other Places of Works Act (Cap 514) was repealed, there are regulations which were enacted under the Act which are still operational under OSHA and are relevant to this project. These are:

- ❖ The Factories (Building Operations and Works of Engineering Construction) Rules 1984;
- ❖ The Factories (Wood Working Machinery) Rules 1959;

- ❖ The Factories (Eye Protection) Rules 1978;
- ❖ The Factories (Electric Power) (Special) Rules 1978;
- ❖ The Factories and Other Places of Work (Health & Safety Committees) Rules 2004;
- ❖ The Factories and Other Places of Work (Medical Examination) Rules 2005;
- ❖ The Factories and Other Places of Work (Noise Prevention and Control) Rules 2005; and
- ❖ The Factories and Other Places of Work (Fire Risk Reduction) Rules 2006.

### **2.3.6 Wildlife Conservation and Management Act (CAP 376)**

The enactment of the Wildlife Conservation and Management Act of 1976 established the legal provisions for the new policies. The Act specified regulations that were to be enforced through the Kenya Wildlife Service (KWS) and the Ministry of Environment, Natural Resources and Wildlife.

A Sessional paper of 1975 reinforced the Act. The key point in the Sessional paper is that "The government holds in trust for present and future generations nationally and globally the biological diversity represented by Kenya's extraordinary variety of animals, plants and ecosystems ranging from coral reefs to alpine moorlands and from deserts to forests. Special emphasis is placed on conserving Kenya's assemblage of large mammals found in few other places on earth"

The Act expressly prohibits handling of wildlife in any form, including trade in animals or their parts, hunting and consumption without a license from KWS.

### **2.3.7 Chief's Authority Act, CAP 128**

This Act empowers chiefs to:

Prevent the pollution of water in any stream, watercourse or water hole and prevent the obstruction of any stream or watercourse;

- ❖ Prohibit vegetation destruction and the wasteful destruction of any stream or watercourse;
- ❖ Prohibit any act that might cause damage to any work constructed or maintained for the benefit of the community;
- ❖ Control grass fires;
- ❖ Regulate the use of artificial water supplies constructed from public funds; and
- ❖ The Act provides for the Minister to authorize any chief to issue orders for work or services for the conservation of natural resources.

*It shall be ensured that all construction machinery and equipment are maintained regularly to avoid extreme pollution to the environment.*

### **2.3.8 Land Acquisition Act, CAP.295**

The Act provides for the compulsory or otherwise acquisition of land from private ownership for the benefit of the general public. Section 3 states that when the Minister is satisfied on the need

for acquisition, notice will be issued through the Kenya Gazette and copies delivered to all the persons affected. Full compensation for any damage resulting from the entry onto land to do things such as survey upon necessary authorization will be undertaken in accordance with section 5 of the Act. Likewise where land is acquired compulsorily, full compensation shall be paid promptly to all persons affected in accordance to sections 8 and 10 along the following parameters:

- ❖ Area of land acquired,
- ❖ The value of the property in the opinion of the Commissioner of land ( after valuation),
- ❖ Amount of the compensation pay
- ❖ Market value of the property,
- ❖ Damages sustained from the severance of the land parcel from the land,
- ❖ Damages to other property in the process of acquiring the said land parcel,
- ❖ Consequences of changing residence or place of business by the land owners,
- ❖ Damages from diminution of profits of the land acquired.

Part II of the Act allows for the temporary acquisition of the land for utilization in promotion of the public good for periods not exceeding 5 years. At the expiry of the period, the Commissioner of Land shall vacate the land and undertake to restore the land to the conditions it was before. Any damages or reduction of value shall be compensated to the landowners. A resettlement action plan (RAP) has been prepared for this project in a separate volume

*The proposed road expansion shall require acquisition of additional land for the required new road reserve. This will majorly affect adjoining private landowners. The RAP report will act as a guiding principal in compensation of PaPs for any private land acquired by the proponent.*

### **2.3.9 Penal Code Act Cap 63**

The Penal Code ranks among the oldest colonial statutes on air quality management. Enacted in 1930, it contains a chapter entitled “Offences against Health and Convenience.” The code strictly prohibits the releasing of foul air that affects the health of persons. Anyone who voluntarily violates the atmosphere at any place, to make it noxious to health of persons on general dwelling or carrying on business in the neighborhood of a public way is guilty of a misdemeanor, i.e. imprisonment not exceeding two years with no option of a fine.

The code prohibits fouling of air by industrialists and manufacturers etc. Under this code any person who for the purpose of a trade or otherwise makes loud noise or offensive or awful smells in such places and circumstances as to annoy a 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 a fine.



*All construction workers will be provided with protective masks and respirators.*

### **2.3.10 Land Planning Act, Cap 303**

Section 9 of the subsidiary legislation (The development and use of land regulations 1961) requires that before the local authorities submit any plans to the Minister for approval, steps should be taken as may be necessary to acquaint the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should also be submitted. This is intended to reduce conflict with other interests such as settlement and other social and economic activities.

### **2.3.11 Way leaves Act (Cap 292) Laws of Kenya**

Section 3 of the Act states that the government may carry any works through, over or under any land whatsoever provided it shall not interfere with any existing building or structures of an ongoing activity. Notice, however, will be given one month before carrying out any such works (section 4) with full description of the intended works and targeted place for inspection. Any damages caused by the works would then be compensated to the owner as per this section. Finally section 8 states that any person without consent causes any building to be newly erected on a way leave, or cause hindrance along the way leave shall be guilty of an offence and any alteration will be done at his/her costs.

### **2.3.12 Constitution of Kenya 2010**

A new constitution was promulgated on 27<sup>th</sup> August 2010, and became the supreme legislation of Kenya. This document contains eighteen chapters and six Schedules, where the chapters elaborate on the following: sovereignty of the people and supremacy of the constitution; the republic; citizenship; the bill of rights; land and environment; leadership and integrity; representation of the people; the legislature; the executive; judiciary; devolved government; public finance; the public service; national security; commissions and independent offices; amendment of this constitution; general provisions; and transitional and consequential provisions.

#### ***1. Provisions of the new constitution on equity and non-discrimination:***

The constitution is based on the principles of equity, equality, social justice and non-discrimination. Article 27 of the constitution provides for the grounds upon which somebody should not be discriminated which include race, sex, pregnancy, marital status, health status, ethnic or social origin, color, age, disability, religion, conscience, belief, culture, dress, language or birth. Women and men and other marginalized communities are granted equal rights to opportunities in political, economic, cultural and social spheres (27(3)).

*During project implementation, the contractor will be required to recruit laborers without any form of discrimination; an express condition in the contract will be evoked under special specifications to ensure that women, youth and persons with disability are given equal opportunity during recruitment of both skilled and unskilled labor.*

## **2. Provisions of the new constitution on environment:**

Environmental provisions are included in Chapter Four, under 'Rights and Fundamental Freedoms', Chapter Five, under 'Environment and Natural Resources', and Chapter Ten, under 'Judicial Authority and Legal System'. The Fourth Schedule also includes environmental provisions under 'Distribution of functions between National and County Governments' and the Fifth Schedule titled 'Legislation to be enacted by Parliament'.

Environmental rights and freedoms are presented in Article 42 of the new constitution, which states: *Every person has the right to a clean and healthy environment, which includes the right:-*

- (a) To have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69; and*
- (b) To have obligations relating to the environment fulfilled under Article 70.*

The right to a clean and healthy environment was merely implied in the previous (1964) constitution under the 'right to life' (Section 71) since the constitution did not contain explicit environmental provisions. The improvement made in the new (2010) constitution is first and foremost, the statement that a clean and healthy environment is everyone's right, as well as further elaboration on what exactly is meant when conferring this right.

The right to a clean and healthy environment was previously acknowledged in the Environmental Management and Coordination Act of 1999 (EMCA). However, the elevation of this right to constitutional status has only been achieved in the new constitution. Article 69 of the new constitution, by stating '*The State shall establish systems of environmental impact assessment, environmental audit and monitoring of the environment*', encourages the continued establishment of systems to further support EIA and environmental audit and monitoring.

Section 69 (1): The State shall—

- a. ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;*
- b. work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;*

- c. *protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;*
- d. *encourage public participation in the management, protection and conservation of the environment;*
- e. *protect genetic resources and biological diversity;*
- f. *establish systems of environmental impact assessment, environmental audit and monitoring of the environment;*
- g. *eliminate processes and activities that are likely to endanger the environment; and*
- h. *utilize the environment and natural resources for the benefit of the people of Kenya.*

The second part of Article 69 of the new constitution states: *'Every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.'* This can be viewed as confirmation by the State of its commitment to sustainable management, and the expectation of support, in the execution of these activities, from its citizens.

Section 70 provides for enforcement of environmental rights thus:-

1. If a person alleges that a right to a clean and healthy environment recognized and protected under Article 42 has been, is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress in addition to any other legal remedies that are available in respect to the same matter.
2. On application under clause (1), the court may make any order, or give any directions, it considers appropriate—
  - a. to prevent, stop or discontinue any act or omission that is harmful to the environment;
  - b. to compel any public officer to take measures to prevent or discontinue any act or omission that is harmful to the environment; or
  - c. to provide compensation for any victim of a violation of the right to a clean and healthy environment.
3. For the purposes of this Article, an applicant does not have to demonstrate that any person has incurred loss or suffered injury.

*In conformity with this, an EMP has been devised to ensure that:*

- *All negative impacts resulting from activities of this project such as noise , dust and increased waste generation are mitigated*
- *Health and Safety measures are put in place for all workers in the contractor's camp*
- *Landscaping i.e. planting of trees , grass cover on road side and material borrow sites is carried out to substitute for lost vegetation among other recommendations*

- *A contact telephone will be provided via which the public may seek information or make a complaint concerning the project. In the event that any complaints are received in respect to a clean and healthy environment, consultation and investigation would be undertaken to assess the nature of the concerns and identify options to mitigate the causative factors. Communication channels will always be open to ensure proper and prompt responses to any complaints that may arise from the project.*

### **3. Provisions of the new constitution on acquisition of private property**

The Constitution of Kenya, 2010 protects the sanctity of private property rights and states that no property can be compulsorily acquired by the Government except in accordance with law. Article 40(3) states:

*“The State shall not deprive a person of property of any description, or of any interest in, or right over, property of any description, unless the deprivation results from an acquisition of land or an interest in land or a conversion of an interest in land, or title to land, in accordance with Chapter Five; or is for a public purpose or in the public interest and is carried out in accordance with this Constitution and any Act of Parliament that –*

- (i) Requires prompt payment in full, of just compensation to the person; and*
- (ii) Allows any person who has an interest in or right over, that property a right of access to a court of law*

The Constitution empowers the state to exercise the authority of compulsory acquisition. Land Act 2012 (LA) designates the National Land Commission (NLC) as the agency empowered to compulsorily acquire land. Article 40 of the Constitution provides that the state may deprive owners of property only if the deprivation is "for a public purpose or in the public interest," which includes public buildings, roads, way leaves, drainage, irrigation canals among others. The state's exercise of this power is left at the discretion of National Land Commission, and requires the state to make full and prompt payment of "just compensation" and an opportunity for appeal to court.

Article 40 (3) (a) refers to acquisition and conversion of all kinds of land in Kenya (private, public, community land and foreign interests in land). The Constitution further provides that payment of compensation shall be made to “occupants in good faith” of land acquired by the state who do not hold title for such land [Article 40 (4)]. An occupant in good faith is a “bona fide” occupant. On the other hand, under the Constitution, those who have acquired land illegally are not regarded as deserving any compensation [Article 40 (6)].

*A Resettlement action plan study was conducted to identify all land parcels to be acquired. The NLC will facilitate full compensation for any land acquired for purposes of this project to the rightful owners in liaison with the project proponent.*

### **2.3.13 The Land Act (No. 6 of 2012)**

The Land Act is the Kenya's framework legislation regulating compulsory acquisition of land (i.e. land, houses, easements etc.). The Land Act was adopted on 2<sup>nd</sup> May 2012 and provides for sustainable administration and management of land and land based resources including compulsory acquisition.

Section 107 (1) provides for the power of entry to inspect land. Sub-section (1) states that whenever the national or county government is satisfied that it may be necessary to acquire some particular land under section 110, the respective Cabinet Secretary or the County Executive Committee Member shall submit a request for acquisition of public land to the Commission to acquire the land on its behalf. Sub-section (2) requires that the Commission prescribe a criteria and guidelines to be adhered to by the acquiring authorities in the acquisition of land.

Sub-section(5) stipulates that upon approval of a request under sub-section (1), the Commission shall publish a notice to that effect in the Gazette and the county Gazette, and shall deliver a copy of the notice to the Registrar and every person who appears to the Commission to be interested in the land.

Sub-section (8) states that all land to be compulsorily acquired shall be geo-referenced and authenticated by the office or authority responsible for survey at both the national and county government

Under Section 108 (1) The Commission may authorize, in writing, any person, to enter upon any land specified in a notice published under section 107 and inspect the land and to do all things that may be reasonably necessary to ascertain whether the land is suitable for the intended purpose.

Section 109 provides payment for damage for inspection. As soon as practicable after entry has been made under section 108, the Commission shall promptly pay in full, just compensation for any damage resulting from the entry.

Section 110 (1) stipulates that land may be acquired compulsorily under this Part if the Commission certifies, in writing, that the land is required for public purposes or in the public interest as related to and necessary for fulfillment of the stated public purpose.

Section 111 (1) states that if land is acquired compulsorily under this Act, just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. Under Subsection (2), The Commission shall make rules to regulate the assessment of just compensation.

Section 112 (1) requires that at least thirty days after publishing the notice of intention to acquire land, the Commission shall appoint a date for an inquiry to hear issues of propriety and claims for compensation by persons interested in the land, and shall

- (a) cause notice of the inquiry to be published in the Gazette or county Gazette at least fifteen days before the inquiry; and
- (b) serve a copy of the notice on every person who appears to the Commission to be interested or who claims to be interested in the land.

Section 113 (1) requires that upon the conclusion of the inquiry, the Commission shall prepare a written award, in which the Commission shall make a separate award of compensation for every person whom the Commission has determined to have an interest in the land. Every award shall be filed in the office of the Commission (Subsection 4).

Part III of the Land Act 2012, section 113 (2a) states that “the Commission shall determine the value of land with conclusive evidence of (i) the size of land to be acquired; (ii) the value, in the opinion of the Commission, of the land; (iii) the amount of compensation payable, whether the owners of land have or have not appeared at the inquiry.”

Market value of the property, which is determined at the date of the publication of the acquisition notice must be taken into account when determining compensation. Determination of the value has to take into consideration the conditions of the title and the regulations that classify the land use e.g. agricultural, residential, commercial or industrial. Increased market value is disregarded when:

- ❖ It is accrued by improvements made within two years before the date of the publication of the acquisition notice, unless it is proved that such improvement was made in good faith and not in contemplation of the proceedings for compulsory acquisition. It is accrued by land use contrary to the law or detrimental to the health of the occupiers of the premises or public health.
- ❖ Any damages sustained or likely to be sustained by reason of severing such land from other land owned by the claimant.
- ❖ Any damage sustained or likely to be sustained if the acquisition of the land had negative effects on other property owned by the claimant.
- ❖ Reasonable expenses, if as a consequence of the acquisition, the claimant was compelled to change his residence or place of business (i.e., compensation for disruption to the claimant’s life).
- ❖ Any damage from loss of profits over the land occurring between the date of the publication of

the acquisition notice and the date the NLC takes possession of the land.

Section 114 (2) stipulates that upon acquisition of land, and prior to taking possession of the land, the Commission may agree with the person who owned that land that instead of receiving an award, the person shall receive a grant of land, not exceeding in value the amount of compensation which the Commission considers would have been awarded, and upon the conclusion of the agreement that person shall be deemed to have conclusively been awarded and to have received all the compensation to which that person is entitled in respect of the interest in that land.

Section 115 stipulates that upon the conclusion of the inquiry, and once the NLC has determined the amount of compensation, NLC will prepare and serve a written award of compensation to each legitimate claimant. NLC will publish these awards which will be considered “final and conclusive evidence” of the area of the land to be acquired, the value of the land and the amount payable as compensation. Land Act, Section 115 further stipulates that an award shall not be invalidated by reason only of a discrepancy between the area specified in the award and the actual area of the land. Compensation cannot include attorney’s fees, costs of obtaining advice, and costs incurred in preparing and submitting written claims.

A notice of award and offer of compensation shall be served to each person by the Commission. Section 120 provides that “first offer compensation shall be paid promptly” to all persons interested in land. Section 119 provides a different condition and states that the NLC “as soon as practicable” will pay such compensation. Where such amount is not paid on or before the taking of the land, the NLC must pay interest on the awarded amount at the market rate yearly, calculated from the date the State takes possession until the date of the payment.

In cases of dispute, the Commission may at any time pay the amount of the compensation into a special compensation account held by the Commission, notifying the owner of the land accordingly. If the amount of any compensation awarded is not paid, the Commission shall on or before the taking of possession of the land, open a special account into which the Commission shall pay interest on the amount awarded at the rate prevailing bank rates from the time of taking possession until the time of payment.

Once the first offer payment has been awarded, the NLC will serve notice to landowners on the property indicating the date the Government will take possession. Upon taking possession of land, the commission shall ensure payment of just compensation in full. When this has been done, NLC removes the ownership of private land from the register of private ownership and the land is vested in the national or county Government as public land free from any encumbrances (Section 115 & 116).



On the other side, the Commission also has the power to obtain temporary occupation of land. However, the commission shall as soon as is practicable, before taking possession, pay full and just compensation to all persons interested in the land.

In cases of where there is an urgent necessity for the acquisition of land, and it would be contrary to the public interest for the acquisition to be delayed by following the normal procedures of compulsory acquisition under this Act, the Commission may take possession of uncultivated or pasture or arable land upon the expiration of fifteen days from the date of publication of the notice of intention to acquire. On the expiration of that time NLC shall, notwithstanding that no award has been made, take possession of that land. If the documents evidencing title to the land acquired have not been previously delivered, the Commission shall, in writing, require the person having possession of the documents of title to deliver them to the Registrar, and thereupon that person shall forthwith deliver the documents to the Registrar. On receipt of the documents of title, the Registrar shall — cancel the title documents if the whole of the land comprised in the documents has been acquired; if only part of the land comprised in the documents has been acquired, the Registrar shall register the resultant parcels and cause to be issued, to the parties, title documents in respect of the resultant parcels. If the documents are not forthcoming, the Registrar will cause an entry to be made in the register recording the acquisition of the land under this Act.

Part IX of the Land Act provides for settlement programs. Under Section 134 (1), The Commission shall, on behalf of the national and county governments, implement settlement programmes to provide access to land for shelter and livelihood.

Subsection (2) stipulates that settlement programmes shall, include, but not be limited to provision of access to land to squatters, persons displaced by natural causes, development projects, conservation, internal conflicts or other such causes that may lead to movement and displacement.

*A resettlement action plan has been prepared identifying all private parcels of land and persons whose land will be acquired for purposes of this project. The same will be handed over to NLC and procedure for compensation duly followed to ensure just compensation.*

#### **2.3.14 The Valuers' Act, Chapter 532**

Compensation awards will be made by the National Land Commission based on land valuation determined by registered Valuers. Besides, the Valuers' Act establishes the Valuers'

Registration Board, which regulates the activities and practice of registered Valuers. All Valuers must be registered with the Board to practice in Kenya.

### **2.3.15 The Land Registration Act (No. 3 of 2012)**

The Act principally concerns the registration of interests in land. This Act applies to: (a) registration of interests in all public land as declared by Article 62 of the Constitution; (b) registration of interests in all private land as declared by Article 64 of the Constitution; and (c) registration and recording of community interests in land. The National Land Commission in consultation with national and county governments may, by order in the Gazette, constitute an area or areas of land to be a land registration unit and may at any time vary the limits of any such units. The land registration units shall be established at county level and at such other levels to ensure reasonable access to land administration and registration services. There shall be maintained in each registration unit, a community land register.

The Act also, among other things: defines powers of the Chief Land Registrar, County Land Registrars or any other land registrars; provides for survey and mapping of land; defines the effects of registration; provides for certificates of title; declares dispositions regarding lease, charge or interest in land other than in accordance with this Act or other legislation without legal effect; provides for the protection of persons receiving land; makes special provisions for the registration of leases and charges; places certain restrictions on dispositions regarding interests in land; provides with respect to registration of rights regarding co-tenancy and partition; provides with respect to easements; defines the jurisdiction for purposes of this Act of the Environment and Land Court established by the Environment and Land Court Act, 2011; and defines offences.

*In compliance with this act, all due procedures will be followed in matters regarding land acquisition and relevant authorities shall be engaged.*

### **2.3.16 National Land Commission Act, 2012 (No. 5 of 2012).**

This Act provides with respect to the administration, structure, operations, powers, responsibilities and (additional) functions of the National Land Commission established by Article 67 of the Constitution and for certain aspects of management and administration of land in accordance with the principles of land policy set out in Article 60 of the Constitution and the national land policy. Pursuant to Article 67(2) of the Constitution, the functions of the Commission shall include the management of public land on behalf of the national and county

governments, the recommendation of a national land policy to the national government, encouraging the application of traditional dispute resolution mechanisms in land conflicts and advising the national government on land registration. The Commission shall recommend legislation to provide for investigation and adjudication of claims arising out of historical land injustices for the purposes of Article 67 of the Constitution and shall establish county land management boards for purposes of managing public land.

*It shall be ensured that relevant authorities moreso the NLC are engaged in dealing with land related issues such as acquiring of land and compensation.*

### **2.3.17 Other relevant legislations**

The pertinent guidelines/standards governing environmental quality, with respect to human settlement and infrastructural activities, which are of relevance to this project, include the following:

- ❖ Public Roads and Roads of Access Act (Cap. 399)
- ❖ The Government Lands Act, Cap 280
- ❖ The Engineers Act, Cap 530
- ❖ The Land Adjudication Act Cap 244
- ❖ Land Titles Act Cap 282
- ❖ Registration of Titles Act Cap 281
- ❖ Land (Group Representative) Act Cap 287
- ❖ Trust Lands Act Cap. 288
- ❖ The Land Control Act Cap 302
- ❖ Local Government Act. (Cap. 265).
- ❖ Survey Act Cap 299
- ❖ Highway Design Code
- ❖ Work Injury compensation Benefit Act 2007
- ❖ The Malaria Prevention Act (CAP 246)
- ❖ The Wildlife Conservation and Management Act, Cap 376

These pieces of legislation are mostly applicable during the construction phase of the project. It is the responsibility of the contractor to observe nearly all of the Acts enumerated in this section.

## **2.4. Regulatory framework**

### **2.4.1 Environmental (impact assessment and audit) regulations, 2003**

These are entrenched under section 147 of the EMCA, 1999 .They were published in the Kenya Gazette supplement no.56 legislative supplement no. 31, legal notice no.101 of 13<sup>th</sup> June, 2003.The regulations provide a framework for conducting ESIA and Environmental Audit and apply to all policies, plans, programmes, project and activities specified in parts IV, V and the 2<sup>nd</sup> schedule of EMCA 1999.

*A detailed ESIA has been conducted in conformity with these regulations and EMCA, 1999 and an ESIA report prepared for submission to NEMA.*

#### **2.4.2 Environmental Management and Coordination (water quality) regulations, 2006**

The regulations provide for sustainable management of water resources including prevention of water pollution and protection of water resources (Rivers, streams, springs bore/holes, wells etc)in order to protect human health and the environment.

All persons are required to refrain from any actions, which directly or indirectly cause pollution .In order to protect water sources from pollution, these regulations place a restriction on the discharge of effluent into water bodies.

These regulations were published in the Kenya Gazette supplement no.68 legislative supplement no. 36, legal notice no.120 of 29<sup>th</sup> September, 2006.

*In line with this, proper disposal measures of effluent and solid waste have been recommended so as to protect contamination of water resources.*

#### **2.4.3 Environmental Management and Coordination (waste management) regulations, 2006**

The government has established regulations to provide details on management (handling, storage, transportation, disposal and treatment) of various waste streams which include: domestic, industrial, hazardous, toxic, biomedical and radioactive waste with an emphasis on waste minimization and clean production.

The aim of these regulations is to protect human health and the environment; they define the responsibilities of waste generators and the duties and requirements for transportation and disposal of waste. The regulations require a waste generator to dispose waste only to a designated waste receptacle.

These regulations were published in the Kenya gazette supplement no.69 legislative supplement no. 37, legal notice no.121 of 29<sup>th</sup> September, 2006.

*It shall be ensured that cleaner production measures are incorporated and that all waste is disposed off at NEMA/Local authorities designated sites.*

#### **2.4.4 Factories and other places of work rules, 1984**

The factories (Buildings operations and works of engineering construction) rules 1984 are provided under **legal notice No. 40**.

Providers of health, safety and welfare of persons employed in factories and other places of work. The provision requires that all practicable measures be taken to protect persons in places of work from dust, fumes or impurities originating from any process within the work place. The provisions of the act are also relevant to the management of hazardous and non-hazardous wastes, which may arise at the project site. The rules provide for all necessary safety precautions to ensure the health and safety of workers.

The act further requires all workplaces to have stocked first aid boxes under the charge of trained first aid attendants. The factories (Building Operations and Works of Engineering Construction) Rules of 1984 are more specific on standards and requirements for the construction works. These rules state clearly that it is the duty of the proponent to ensure health, safety and welfare of workers and authorized visitors to the site.

The rules also state that qualified and experienced persons must be appointed to act as safety supervisors by the proponent. These persons supervise the enforcement of standards to achieve the objectives mentioned above. The rules have specific sections on excavations, transport, demolitions, formwork and scaffolds, lifting and lifting equipment and other general safety measures.

*The proponents will appoint a reputable contractor who will be responsible in enforcing the requirements during construction and subsequent repairs and maintenance after project completion.*

*Appropriate safety measures proposed include the following:*

- ❖ Provision of protective wear for site workers such as overalls, helmets and gumboots.
- ❖ Provision of an onsite standard first aid kit.
- ❖ Diversion of human traffic away from the construction site.
- ❖ Provision of safe scaffolding to avoid accidental fall by site workers.

#### **2.4.5 Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009**

Part II of the regulations 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 noise will be determined if loud, unreasonable or unusual by factors such as: Time of day, Proximity to residential area, Whether the noise is recurrent, intermittent or constant, The level and intensity of noise, whether the noise has been enhanced in level or range by any type of electronic or mechanical means, whether or not the noise can be controlled without much effort or expense to the person making the noise.

Part III Provision relating to noise from certain sources states that where defined work of construction, demolition, mining or quarrying is to be carried out in an area, the Authority (NEMA) may impose requirements on how the work is to be carried out including but not limited to requirements regarding; Machinery that may be used and the permitted levels of noise as stipulated in the second schedule and third schedule of these regulations.

The regulations further state that any person intending to carry out construction, demolition, mining or quarrying work shall, during the EIA studies:

- ❖ Identify natural resources, land uses or activities, which may be affected by noise or excessive vibrations from construction, demolition, mining or quarrying.
- ❖ Determine the measures which are needed in the plans specifications to minimize or eliminate adverse construction, demolition, mining or quarrying noise or vibration impacts and
- ❖ Incorporate the needed abatement measures in the plans and specifications

## **2.5. National and International Policy framework**

Several policies have been developed over the years to guide the development and management of proposed projects to ensure both economic and social sustainability; these policies are discussed below.

### **2.5.1 World Bank Safeguard Policies**

#### **2.5.1.1 World Bank Operational Policy on Environmental Assessment**

The environmental assessment process provides insights to ascertain the applicability of other WB safeguard policies to specific projects. The policy describes an environmental assessment (EA) process for the proposed project. The breadth, depth, and type of analysis of the EA process depend on the nature, scale, and potential environmental impact of the proposed project. The policy favors preventive measures over mitigatory or compensatory measures, whenever feasible. The operational principles of the policy require the environmental assessment process to undertake the following:

- ❖ Evaluate adequacy of existing legal and institution frameworks, including applicable international environmental agreements. This policy aims to ensure that projects contravening the agreements are not financed.
- ❖ Stakeholder consultation before and during project implementation.
- ❖ Engage service of independent experts to undertake the environmental assessment.
- ❖ Provide measures to link the environmental process and findings with studies of economics, financial, institutional, social and technical analysis of the proposed project.
- ❖ Develop programmes for strengthening of institutional capacity in environmental management.

The requirements of the policy are similar to those of EMCA, which aim to ensure sustainable project implementation. Most of the requirements of this safeguard policy have been responded to in this report, by evaluating the impact of the project, its alternatives, existing legislative framework and, conducting public consultations and by proposing mitigation measures for the potential impacts identified.

#### **2.5.1.2 World Bank Operational Policy on Involuntary Resettlement**

Resettlement due to infrastructure development is not a new phenomenon in Kenya but the government has no Policy Document or Act that aims at ensuring that persons, who suffer displacement and resettlement arising from such development activities, are compensated adequately for their losses at replacement costs. This policy has been designed to mitigate against impoverishment risks associated with Involuntary Resettlement and the restoration or improvement of income earning capacity of the Project Affected Persons (PAP). The policy requires full public participation in resettlement planning and implementation and describes the conditions that borrowers are obliged to meet in operations involving involuntary resettlement. The policy is triggered by the proposed project due to encroachment on the road reserves especially at Kangemi by small scale traders.

The rehabilitation of the road will require those who have encroached into the road reserve to vacate it and according to the OP, they will require resettlement thus the need of developing a RAP. These traders are considered eligible for resettlement according to this policy as the principle policy of this OP is to ensure that development projects sponsored by the Bank do not cause undue disturbance to livelihoods of those who depend on the project or its associated resources. There is therefore a need to develop a Resettlement Action Plan (RAP) for the project that shall propose a procedure that will be followed to ensure that the livelihood of those affected by the project is restored as much as possible.

Further, the World Bank policy on involuntary resettlement emphasizes that any development project should avoid or minimize involuntary resettlement and where this is not feasible, it should

compensate for lost assets at full replacement cost and assist the displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

The World Bank OP 4.12, Annex A (Paragraphs 17-31), describes the scope (level of detail) and the elements that a resettlement plan should include.

WB OP 4.12.(6a) demands that the resettlement plan includes measures to ensure that displaced persons are (i) informed about their options and rights, (ii) consulted on, offered choices among others and provided with technically and economically feasible resettlement alternatives, and (iii) provided prompt and effective compensation at full replacement costs.

WB OP 4.12 (8) requires that particular attention should be paid to the needs of vulnerable groups among those displaced such as those below the poverty line, landless, elderly; women and children and indigenous peoples and ethnic minorities.

WB OP4.12 (12a) states that for households depending on land for their livelihoods preference should be given to land based solutions; however, payment of cash compensation for lost assets may be appropriate where livelihoods are land-based but the land taken for the project is a small fraction (less than 20%) of the affected asset and the residual is economically viable.

WB OP4.12 Para (6 b & c) state that in case of physical relocation, displaced persons should be (i) provided with assistance (such as moving allowances) during relocation; and (ii) provided with residential housing, or housing sites, or, as required, agricultural sites for which a combination of productive potential, location advantages, and other factors is at least equivalent to the advantages of the old site.

WB.OP 4.12 (13 a) stipulates that any displaced persons and their communities and any host communities receiving them should be provided with timely and relevant information, consulted on resettlement options and offered opportunities to participate in planning, implementing and monitoring resettlement.

In addition displaced persons should be offered support after displacement, for a transition period, based on a reasonable estimate of the time likely to be needed to restore their livelihood and standards of living; and provided with development assistance in addition to compensation measures such as land preparation, credit facilities, training, or job opportunities.



WB OP4.12 Para 13 (a) requires that appropriate and accessible grievance mechanisms are established to sort out any issues arising.

#### **2.5.1.3 World Bank Operational Policy on Indigenous People**

This policy requires projects to be designed and implemented in a way that fosters full respect for Indigenous Peoples' dignity, human rights and cultural uniqueness and so that they receive culturally compatible social and economic benefits and do not suffer adverse effects during the development process. This policy is not triggered as the proposed project area is not occupied by IP who identify with the areas according to the OP description of IP.

#### **2.5.1.4 World Bank Operational Policy on Public Disclosure**

This BP encourages Public Disclosure (PD) or Involvement as a means of improving the planning and implementation process of projects. This procedure gives governmental agencies responsibility of monitoring and managing the environmental and social impacts of development projects, particularly those impacting on natural resources and local communities. The policy provides information that ensures that effective PD is carried out by project proponents and their representatives. The BP requires that Public Involvement be integrated with resettlement, compensation and indigenous peoples' studies. Monitoring and grievances address mechanism should also be incorporated in the project plan.

The proposed project incorporated public participation and stakeholder consultations as part of the ESIA, in order to collect the views of the local communities and their leaders for incorporation into the project mitigation plan. The consultation was successful and the community members gave a number of views that have been considered in the mitigation plan.

#### **2.5.1.5 World Bank Policy on physical cultural resources**

This policy addresses physical cultural resources which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community.

Physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development, and as integral parts of a people's cultural identity and practices. The loss of such resources is irreversible, but fortunately, it is often avoidable.

The objective of OP/BP 4.11 on Physical Cultural Resources is to avoid, or mitigate, adverse impacts on cultural resources from development projects that the World Bank finances.

### 2.5.2 Kenya Road policies

The objectives of Kenya Road Policies are based on the following criteria:

- ❖ *Integration*: Ensuring that all road decisions are taken in the context of a coherent, integrated transport policy covering all modes.
- ❖ *Accessibility*: Making it easy to reach the places we wish to get to.
- ❖ *Safety*: Making travel safer
- ❖ *Economy*: Getting good value for money and supporting sustainable economic activity in appropriate locations.
- ❖ *Tackling road congestion*.
- ❖ *Environmental impact*: Both positive and negative, on both the built and the natural environments, and at the global, regional and local levels.

The road policy further emphasizes on the following environment relevant issues:

- ❖ All road improvements need to be sustainable. Consequently, short-run gains from road infrastructure should not obscure wider or long-run damage that may be associated with it.
- ❖ The aim is to limit and where possible reduce damage at local, regional and global levels, taking account of all relevant environmental policies such as those on climate change, local air quality and biodiversity. It is also important to acknowledge positive environmental benefits that the trunk road system can bring.
- ❖ Road improvements have a mixed effect on emissions. By easing congestion they could help reduce emission of some pollutants, but they increase emission of others.

### 2.5.3 National Environment Action Plan (NEAP)

The NEAP for Kenya was prepared in mid 1990s. It was a deliberate policy whose main effort is to integrate environmental considerations into the country's economic and social development.

According to NEAP 1994, the government recognized the negative impacts on ecosystems emanating from development programs that disregarded environmental sustainability. Established in 1990, the plan's effort was to integrate environmental considerations into the country's economic and social development. Under NEAP process, Environmental Impact Assessment was introduced.

#### **2.5.4 National Climate Change Action Plan 2013 -2017**

In recognition of the serious threats posed by climate change, the Government of Kenya has taken and continues to take bold measures to secure the country's development against the risks and impacts of climate change. National Climate Change Action Plan strives towards addressing climate change vulnerability. The Action Plan takes adaptation and mitigation efforts to the next stage of implementation and equips the country to take decisive action in responding to the challenges we face. It encourages people-centered development, ensuring that climate change actions support Kenya's achievement of development goals. It also supports efforts towards the continued attainment of Vision 2030. This Action Plan guides the transition of the country towards a low carbon climate resilient development pathway.

*Potential climate change impacts and their mitigation options have been identified under this report.*

#### **2.5.5 National Climate Change Response Strategy 2010**

The purpose of this strategy is to put in place robust measures needed to address most, if not all, of the challenges posed by climate variability and change. The strategy has recommended massive awareness campaigns so that the public can be sensitized and mobilized to adapt and mitigate against impacts of climate change. Climate change is considered one of the most serious threats to sustainable development globally. Impacts of climate change span across many sectors such as environment, human health, food security, economic activities, natural resources and physical infrastructure. The strategy recognizes the need to enhance coordination of climate change activities in the country with a view of ensuring climate-proof socio-economic development anchored on low carbon path.

#### **2.5.6 National policy on water resources management and development**

It enhances a systematic development of water facilities in all sectors for the promotion of the country's socio-economic progress and also recognizes the by-products of the processes as waste water. It calls for development of appropriate sanitation systems to protect people's health and water resources from pollution.

#### **2.5.7 National Poverty Eradication Plan (NPEP)**

The objective of the NPEP is to reduce the incidences of poverty in both rural and urban areas by 50 percent by the year 2015, as well as to strengthen the capabilities of the poor and vulnerable groups to earn income. It also aims to narrow gender and geographical disparities and create a healthy, better-educated and more productive population. This plan has been prepared in line with the goals

and commitments of the World Summit for Social Development (WSSD) of 1995. The plan focuses on the four WSSD themes of poverty eradication; reduction of unemployment; social integration of the disadvantage people and creation of an enabling economic, political, and cultural environment which can be achieved through developing the transport and communication sector. The plan will be implemented by the Poverty Eradication Commission (PEC) formed in collaboration with Government ministries, Community Based Organization (CBO), private sector, Non-Governmental Organization (NGO), bilateral and multilateral donors.

### **2.5.8 Poverty Reduction Strategy Paper (PRSP)**

The PRSP has the twin objectives of poverty reduction and enhancing economic growth. The paper articulates Kenya's commitment and approach to fighting poverty; with the basic rationale that the war against poverty cannot be won without the participation of the poor themselves.

*The proposed project through improving transport in the area will, contribute towards economic growth, as well as relieve the daily pressure of poverty for sustainable number of people by enabling them reach the markets and suppliers on time. The project will also create jobs for the local community.*

### **2.5.9 Environmental and Development Policy (Sessional Paper No.6 1999)**

As a follow-up to the foregoing, the goal of this policy is to harmonize environmental and developmental goals so as to ensure sustainability. The paper provides comprehensive guidelines and strategies for government action regarding environment and development.

It is recommended that the requirements of this policy are observed, as much by:

- ❖ Taking measures to enhance the water catchment by replanting trees, using clean energy to reduce deforestation;
- ❖ Undertaking environment friendly practices during project implementation;
- ❖ Take measures to reduce pollutants leading to eutrophication of water bodies both above- and underground water bodies; and
- ❖ Rehabilitate project affected areas and public infrastructure among others

### **2.5.10 Sessional Paper No. 3 of 1975 (The Wildlife Policy)**

The key elements of this policy may be summarized as follows:

- ❖ It identifies the primary goal of wildlife conservation as the optimization of returns from wildlife defined broadly to include aesthetic, cultural, scientific and economic gains, taking into account the income from other land uses;
- ❖ It points out the need to identify and implement compatible land uses and fair distribution of

- ❖ benefits derived from wildlife including from both non-consumptive and consumptive uses of wildlife;
- ❖ It underscores the need for an integrated approach to wildlife conservation and management in order to minimize human–wildlife conflicts; and
- ❖ The government assumes the responsibility of paying compensation for damages caused by wildlife.

#### **2.5.11 International Conventions and Treaties**

The applicable International Conventions and Treaties include:

- ❖ The Ramsar Convention on wetland of International Importance of 1971. This convention is important as the construction activities tend to affect wetlands in view of the manner in which the waste from the activities are handled.
- ❖ The Convention on Biological Diversity of 1999 is important because the development project will impact on the flora and fauna. The Convention states that project implementation should take into account the uniqueness of the various ecological zones, while avoiding the environmentally sensitive areas.
- ❖ Convention concerning the protection of workers against occupational hazards in the working environment due to air pollution, noise and vibrations.
- ❖ Convention on protection of workers against radiations.
- ❖ Convention on protection of workers against occupational hazards of air and water pollution at the working place.
- ❖ United Nations Convention to Combat Desertification (UNFCCC) of 1994
- ❖ The World Commission on Environmental and Development (The Brundtland Commission of 1987)
- ❖ Convention concerning the Protection of World Cultural and Natural Heritage, 1972
- ❖ Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora, 1990
- ❖ The Convention of Control of Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly In Africa (UCCD)(1992)

### 3.0 PROJECT BASELINE INVENTORY

#### 3.1. General

The project road covers the section of A104 highway starting at James Gichuru Road Junction and ending at Rironi (A104/B3 Junction).

The proposed project road traverses Nairobi and Kiambu counties with 6.8 km traversing Nairobi County while the remaining 18.3 km traverses Kiambu County. The road passes through Kitisuru, Kangemi, Uthiru, Kinoo, Kikuyu, Gitaru, Muguga, Kerwa and Rironi locations and ends at the junction to B3 road.

Length of the highway section is 25.1 km, adding the side roads and connection roads which are 24.5 km; the total length of the roads within this project is 49.6km. There are also nine elevated interchanges and one at grade junction.

The road is currently to bitumen standard and is a dual carriageway.

#### 3.2. Physical Environment

##### 3.2.1 Climate

The area experiences a bi-modal rainfall pattern with the long rains falling between March and May with a mean rainfall of 1300 mm while the short rains fall between October and December with a mean rainfall of 1000 mm. The sunniest time of year is December to March and the cloudiest time is from June to September. The mean annual rainfall is 1150 mm.

The project area is situated in the Central Highlands of Kenya and enjoys a pleasant climate for most of the year with temperatures averaging between 10 and 28 degrees Celsius. Details of rainfall and maximum and minimum temperatures by month are shown in Table 3.1 below.

**Table 3.1: Climate and Rainfall data**

Month	Rainfall (cm)	Average Sunlight (Hours)	Maximum Temperature (°C)	Minimum Temperature (°C)
January	3.8	9	25	12
February	6.4	9	26	13
March	12.5	9	25	14
April	21.1	7	24	14
May	15.8	6	22	13
June	4.6	6	21	12

Month	Rainfall (cm)	Average Sunlight (Hours)	Maximum Temperature (°C)	Minimum Temperature (°C)
July	1.5	4	21	11
August	2.3	4	21	11
September	3.1	6	24	11
October	5.3	7	24	13
November	10.9	7	23	13
December	8.6	8	23	13

### 3.2.2 Air Quality

Baseline air quality was carried out at two locations along the project road. The assessment of air quality was carried out on 10<sup>th</sup> April 2012.

The assessment was carried out at Zambezi I - Opposite Wida Hotel and Zambezi II - At end of the flyover.

The aim of the assessment was to assess the quality of air along the road with respect to nitrous oxides (NO<sub>x</sub>), sulphur oxides (SO<sub>x</sub>), hydrocarbons (HC), carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), hydrogen sulphide (H<sub>2</sub>S) gases and particulate matter.

**Table 3.2: Air quality results**

Parameter	Results		Tolerant Values (mg/Nm <sup>3</sup> )	Standard
	Z1	Z2		
Hydrogen Sulphide (H <sub>2</sub> S), mg/m <sup>3</sup>	440	712	500	
Sulphur dioxide (SO <sub>2</sub> ), mg/m <sup>3</sup>	89	107	125	WHO standard 20-125 daily 500 (10 min.)
Sulphur Trioxide (SO <sub>3</sub> ), mg/Nm <sup>3</sup>	< 0.01	< 0.01	500	
Nitrogen dioxide (NO <sub>2</sub> ), µg/Nm <sup>3</sup>	69	83	200	Yearly 40 (guideline) Hourly 200 (guideline)
Nitrogen Trioxide (NO <sub>3</sub> ), mg/m <sup>3</sup>	< 0.01	< 0.01	200	
Hydrocarbons (HC's), mg/m <sup>3</sup>	530	616	500	Kenya police department traffic act
Particulate Matter mg/m <sup>3</sup>	11.3	12.5	10	

Source: ESIA Report for proposed NUTRIP ( Norken Ltd: April 2012 )

### 3.2.3 Geology and Soils

The project area is part of the volcano-stratigraphy of the Kedong–Kinangop region on the east side of the central Kenya rift. Four principal phases of volcanic eruption were: widespread Kinangop tuff

ash flows, Limuru flood trachytes, basalts and flood trachytes of the rift floor, Quaternary salic caldera volcanoes.

The geology of the area is comprised of volcanic layers of basalts, trachytes, phonolites and tuffs all overlain by thick layers of clay soil. The soil retains water for an extended period of time after the rains and this partly recharges aquifers in the area. Basalts and trachytes form good aquifers whereas tuffs are aquifers only when fractured. Faults delineated from a study of aerial photographs trend in a North-South direction in conformity with the structural pattern of the eastern branch of the Great Rift Valley.

### **3.2.4 Topography**

Generally, the area is characterized by lower highland in Limuru and Kikuyu divisions and contains plateaus with widely spaced parallel ridges and high structural plains.

The area lies within the altitude 1800m to 2550m above sea level.

The starting point of the project, that is the James Gichuru Road Junction, is at 1773 m above mean sea level (AMSL). Between Km: 12+350 – 25+300 the landscape is flat and rolling at some parts. Between Km 25+300 – 26+800 the road passes through a mountainous land and reaches a gradient of 8%. At Km: 26+300 the AMSL is 2076 m. Between Km: 26+800 – 37+668 the landscape is flat and rolling at some parts. At the project end, the AMSL is 2295 m.

There are residential areas on the left and right sides of the project road. There are farms, plantations and gardens at some sections of these residential areas. Between Km: 12+350 – 19+300 along the road corridor, on the central refuge, and on both sides of the road there are high trees.

### **3.2.5 Surface Water Resources and Hydrology**

Generally, the project area lies within the Athi River Basin and drains into Athi River which in turn drains into the Indian Ocean. There are no streams or major rivers intersecting the section of project road.

The area surrounding the project road is endowed with many surface and sub-surface water resources, about 90% of which comprises both surface water resources and ground water potential.



### 3.3. Biological (Bio-Diversity) and Ecological Conditions

#### 3.3.1 Flora

The area is characterized by natural vegetation ranging from moist and dry forest. All types of indigenous trees exist especially near KARI Headquarters and Nairobi School .The tree species are mainly the *Ficus* as well as the *Croton* species. Some areas have *Grevillea robusta* planted along the road, the areas around Muguga and Limuru are fully cultivated and the original vegetation has been removed.

There is a constructed dam next to the Kenya Sugar Authority headquarters and the Waterfront Gardens Estate. From Uthiru, the area is less built up and has more open grass lands with soft kikuyu grass.

Ecologically sensitive areas include the remnants of a wetland that was drained and is also known as Lake View that is situated around Zambezi area, it is approximately 500 m from the project site.

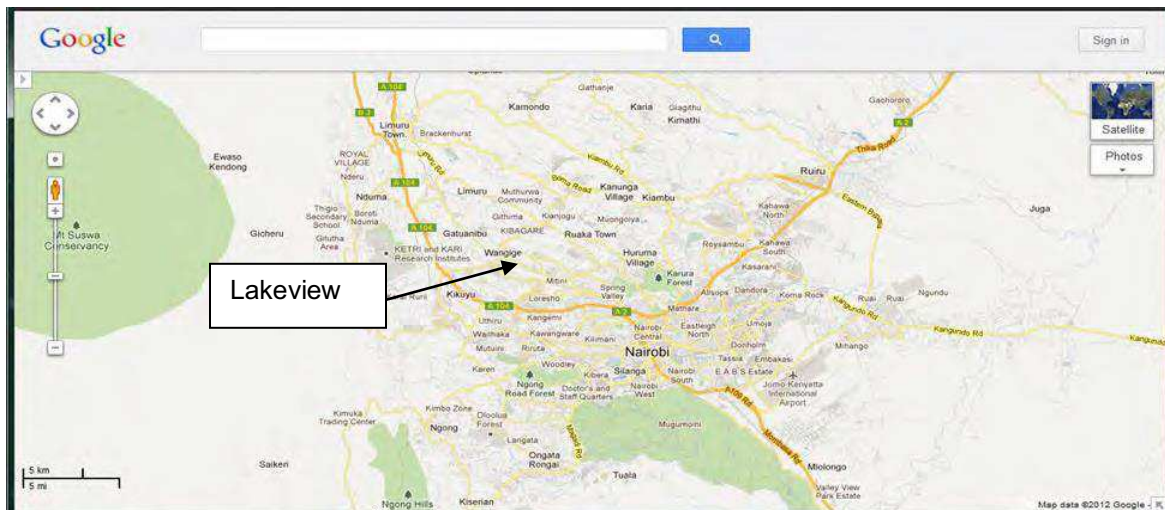


Figure 3.1: Ecologically Sensitive areas in the project area (Source: Google maps)

#### 3.3.2 Fauna

There is a variety of fauna in the area ranging from domestic animals such as donkeys , chicken and cows. Others include Birds (weaver and ladybirds), insects (beetles, spiders and flies), and mammals (moles, rats and squirrels).

### 3.4. Socio-Economic Environment

### **3.4.1 Administrative Location**

The proposed project road traverses Nairobi and Kiambu counties with 6.8 km traversing Nairobi County while the remaining 18.3 km traverses Kiambu County.

The road passes through Kitisuru, Kangemi, Uthiru, Kinoo, Kikuyu, Gitaru, Muguga , Kerwa and Rironi locations and ends at the junction to B3 road.

### **3.4.2 Population Characteristics**

The total population of Nairobi West Sub-county in which part of the project road traverses was projected to be 1,259,699 by year 2012 and this is expected to grow. From the age of 20 years, the male population is higher than the female population while for the extreme age groups, the female population is more than the male population.

Nairobi's large and growing population is one of the main forces driving the city's overwhelming environmental challenges. Ongoing rural to urban migration, high natural birth rates, and poor or inappropriate city planning continue to degrade the city's water and air quality. In turn, environmental degradation has impacts on human health and the economy.

The population for Kiambu West Sub-county as at year 2012 stands at 493,158, this is expected to grow with the growing number of immigrants flocking Nairobi and Kiambu counties to seek employment opportunities.

### **3.4.3 Ethnicity**

Nairobi is a culturally diverse city. All the major Kenyan ethnic groups are represented in the city. These include the Kikuyu, Luo, Luhya, Kalenjin, Kisii, Ameru, Embu, Abakuria and Kamba. While it is difficult to know the exact percentage of the ethnic makeup of Nairobi, there are probably more Kikuyu living in the city than any other group. This is because the Kikuyu make up around 20 percent of the Kenyan population, and their home area borders Nairobi. In addition to the Kenyan African ethnic groups, there is a sizeable population of Asians (people who trace their origins to India and Pakistan), Europeans, and Somalis. Nairobi is also home to a sizeable expatriate (people who have left their homeland) community as numerous embassies and international organizations have offices in the city.

### **3.4.4 Stakeholders in the project area**

The stakeholders identified within the project area ranged from local residents/farmers , local

administration, business community(PSV industry, banks ,small-scale business vendors, Hotels, shops etc.), governmental organizations, learning institutions, non-governmental organizations , religious organizations, among others. Motorists frequenting this road will be most affected by the proposed road. School going children will also be affected.

Informal business vendors operating on existing road reserve were established to be located at 19 locations. There are 712 vendors in the project area, 353 male and 359 female. These vendors have 535 spouses and 1448 children who are dependents. Children are dependants to the adult vendors and are not vendors themselves.

There will be 80 informal traders' structures which will be affected by the road infrastructure.

Table 3.3 below summarizes location point of the vendors, type of businesses affected and number of business vendors affected by the project as presented in the RAP report.

**Table 3.3: Summary of Location of PaPs affected by the project**

S/No.	Location	Type of businesses affected	Total of PaPs
1	Co-operation	Clothing, Motor vehicle garage	8
2	Dagoretti	Charcoal dealer, Furniture, Green grocery and Hardware	6
3	Joash	Others	1
4	Kabete	Clothing, General merchandise, mpesa	3
5	Kangemi	Airtel dealer, Barber shop, Butchery, Cereal, mpese shop, Clothing, restaurant, hawking, Electronics, Furniture, Garage, General merchandise, Green grocery, Hardware, kinyozi, electronics, spares, Mobile phones, computers & accessories, Movie studio, Salon/ cosmetic, Welding and workshop	101
6	Kerwa	Agency financial services, Agrovet, Arc and gas welding, Butchery/mpesa, Electrical shop, Food kiosk, General merchandise, General shop, Hardware, Petro station, Posho mill Salon, Timber sales	14
7	Kikuyu	Beauty salon, Car wash, Hardware, Motorcycle spares, Petro station, Restaurant	7
8	Kinoo	Animal feeds, Hardware, Hawking, Housing, property agency, Laundry, Mali mali, Manufacturing, Medical clinic & lab services, Midland (cafeteria/carwash), Milk bar & eggs, Mineral water distribution Mpesa & general shop, Mpesa/equity agent/ electronic, Phone repair \$accessories, Posho mill, Property management, Pub and Restaurant, Salon, Shoes, Shop & cereals, Supermarket, Timber yard, Unga packaging and Welding, Clothing, Cyber café, Drug store, Dry clean/computer services, Electronics, Food kiosk, Furniture, Gen merchandise, Glass mart, Green grocer, Barbershop, Bank agent	182
9	Kinoo 87	Clothing, Salon, Kinyozi, mpesa, photocopy & equity agent Restaurant and salon	5

S/No.	Location	Type of businesses affected	Total of PaPs
10	Kitasuru	Restaurant, Saloon, Auto spares shop, Barber shop, Butchery Clothing, Drug store, Electronics & mpesa, Financial services and Furniture General merchandise, Green grocery, Hardware, Hotel, Posho mill Restaurant, Saloon, Security, Toilet & water kiosk, Video studio Restaurant, Electrical & electronic workshop/kinyozi, Saloon Barber shop, Café, Clothing, Makaa, Mechanic, Stationery and mpesa, Workshop/welding	45
11	Kiuna	Mechanic, Renting kiosk	2
12	Limuru	General merchandise, Holding company, Welding & kinyozi	4
13	Lolesho	Hardware, Hawking, Housing, property agency, Laundry, Mali mali, Manufacturing, Medical clinic & lab services, Midland (cafeteria/carwash), Milk bar & eggs, Mineral water distribution Mpesa & general shop, Mpesa/equity agent/ electronic, Phone repair \$accessories, Posho mill, Property management, Pub and Restaurant, Salon, Shoes, Shop & cereals, Supermarket, Timber yard, Unga packaging and Welding	36
14	Muthiga	Clothing, Green grocery, Hardware (electricals & mpesa) and Salon	4
15	Ngecha	Butchery, General merchandise, Community water project Cosmetic, printing/photocopy, Drug store, Mpesa, Photo studio Small workshop, Spare shop and Tyre repair	10
16	Risper	Green grocery	1
17	Sigona	Hardware, Hawking, Housing, property agency, Laundry, Mali mali, Manufacturing, Medical clinic & lab services, Midland (cafeteria/carwash), Milk bar & eggs, Mineral water distribution Mpesa & general shop, Mpesa/equity agent/ electronic, Phone repair \$accessories, Posho mill, Property management, Pub and Restaurant, Salon, Shoes, Shop & cereals, Supermarket, Timber yard, Unga packaging and Welding	67
18	Uthiru	Tent hire, Coca Cola kiosk Charcoal Key-cutting lock repair Hardware, Hawking, Housing, property agency, Laundry, Mali mali, Manufacturing, Medical clinic & lab services, Midland (cafeteria/carwash), Milk bar & eggs, Mineral water distribution Mpesa & general shop, Mpesa/equity agent, electronic, Phone repair \$accessories, Posho mill, Property management, Pub and Restaurant, Salon, Shoes, Shop & cereals, Supermarket, Timber yard, Unga packaging and Welding	189
19	Uthiru-junction	General merchandise, Shop, green grocer, cereal, Clothing Barber shop, Mpesa, Equity, KCB agent	27
		<b>Total</b>	<b>712</b>

Source: RAP Report for the proposed rehabilitation and capacity enhancement of road A104 from James Gichuru road junction to Rironi (A104/ B3 junction)

It was established that new road reserve would be acquired to pave way for the project road expansion. Table 3.4. below summarizes the number and acreage of private land parcels to be affected/acquired.

**Table 3.4: Summary of land parcels to be acquired for the road expansion**

S/No.	Location	No of land parcels to be affected	Total area(acres)
1	Muguga/Muguga	82	5.8286
2	Muguga/Gitaru	49	3.509
3	Limuru/Rironi	97	8.1528
4	Limuru/Kamirithu	12	2.1679
5	Area to be confirmed	46	37.9659
6	Dagoretti/Uthiru	79	4.4587
7	Dagoretti/Kinoo	140	6.2643
8	Dagoretti/Kangemi	17	4.3776
9	Reg Section to be confirmed	8	2.4907
<b>TOTAL</b>		<b>530</b>	<b>75.2155</b>

Source: RAP Report for the proposed rehabilitation and capacity enhancement of road A104 from James Gichuru road junction to Rironi (A104/ B3 junction)

### 3.4.1 Settlement Patterns and Housing

The project area is generally densely populated with a majority of the residents living within the Nairobi Central Business District or its environs. The slum areas are however heavily congested, increasing pressure on the available resources such as land, water and energy. A majority of the structures are made of Stone and concrete while in the slums, and shanties, one can find housing structures made of iron sheets, wood and mud.

Most of the Nairobi and its environs residents are tenants as opposed to home owners. This is mainly attributed to the lack of land to set up these houses and the high cost of living.

### 3.4.2 Labor force

Both skilled and un-skilled labour can be found within the project area .A majority however is skilled labour, with the unskilled labour being sourced from the slums or satellite towns.

### 3.4.3 Land Ownership and Use practice

Commercial buildings cover almost 80% of the Nairobi Metropolitan area. Small scale farming can however be found within individual's homes. Land is bought and a title deed is issued to the land owner. The landowner constructs these structures mainly for lease to individuals or businesses.

*A resettlement action plan was carried out as a separate study for this project and is presented in a separate volume.*

The project road lies in a fertile area with dense vegetation cover since it is located in a rainy area.

Land use in the area varies along the project road; between Km: 12+350 and 31+600, the main activity is that of small holdings with small scale traders actively selling their wares along the road.

The area between km 31+600 up to Project end (Muguga and Rironi), population density is low and the residents are predominantly agricultural, they practice subsistence and commercial farming, apples and pears are largely grown, other crops grown include maize, beans, cassava, peas and fruits trees such as mangos.

The urban areas of Westlands, Uthiru, Kabete and Kikuyu form a dormitory for people working in Nairobi City and are majorly occupied by commercial and residential housing and business premises.

### **3.4.4 Agriculture**

#### **3.4.4.1 Crops**

The residents along the project road and its environs practice both subsistence and commercial farming. The main cash crops grown are horticulture. Farmers plant apples, strawberries, mushrooms, silkworms and jatropha so as to increase their incomes. The residents also grow crops for export and to sell to fast moving markets like Nairobi's Muthurwa, Wakulima and Westlands Markets.

The locals also sell their surplus subsistence crops in the local markets like Kangemi and to other small scale traders.

#### **3.4.4.2 Domestic Animals Farming.**

Livestock keeping, rabbit rearing, pig breeding, bee keeping, poultry rearing and fisheries are also practiced. Dairy farming is especially paramount after a dairy cooperative in Wangige began processing milk.

### **3.4.5 Tourism**

Nairobi is not a prime tourist destination, but it does have several tourist attractions. The most famous is the Nairobi National Park. The national park is unique in being the only game-reserve of this nature to border a capital city, or any major city. The park contains many animals including lions, giraffes, and black rhinos. The park is home to over 400 species of birds. The Nairobi Safari Walk is a major attraction to the Nairobi National Park as it offers a rare on-foot experience of the animals.

It's worth noting that opening up of this road will go a long way in not only promoting tourism in the City of Nairobi but also provide easy access of other tourist attraction sites like Lake Naivasha, Lake

Baringo and others which are connected by this road. This will help in improving the general economy of the country.

### 3.4.6 Transportation

The main Mode of transport in the area includes use of Nissan 'Matatus', buses and private cars. Matatus and Buses ply the route served by the project road to ferry passengers to and from work on a daily basis. However, transport of trade goods and access to services is hampered by the huge population served by the road and this usually leads to traffic congestion.

Improvement of this facility thus means a reduction in travel time and savings in cost of travel and provision of access and mobility of goods and services to the local communities.

The project road connects Western, Rift Valley and Nyanza provinces with the rest of the country and also connects the country to Uganda, Rwanda, Southern Sudan, East Congo, Burundi and Northern Tanzania borders.

### 3.4.7 Infrastructure and Services

All the major urban infrastructure are available in the area, they include; water supply, power supply, communication network and road network.

A centralized sewer system is only available up to Kangemi Market, the rest of the population between Uthiru and Rironi make use of septic tanks whereas some residents have dug pit latrines in their compounds.

Access to city council water is only limited up to Kangemi area; the rest of the population makes use of boreholes, shallow wells and supplies from Kikuyu Water and Sanitation Company.

(Kikuyu and Kinoo environs) and Limuru Water and Sanitation Company (Rironi environs).

Community services such as education, health care centers, recreational centers and churches are in the neighborhood of the project road. Emergency facilities (fire brigade, ambulances and police) are within reach.

### 3.4.8 Health

Table 3.5 below summarizes the health facilities and gives the health statistics of Nairobi County. The road improvement can contribute in easing transit of medical services and staff and grant access to health institutions thus promoting health in the area.

**Table 3.5: Health Facilities in Nairobi County**

TYPE	NUMBER*
District Hospitals	3.0
Referral Hospitals	2.0
Dispensaries	156
Health Centres	71
Medical Clinics	144

TYPE	NUMBER*
Maternity Homes	14.0
Health Projects	4.0
Nursing Homes, VCTS's and Others	92
Doctors to Population Ratio: 1: 23,000	

\* Source: Kenya County Networks

According to UNAIDS, the infection rate of HIV/AIDS in Nairobi has reduced from 10% annually to 7% annually. Those orphaned by HIV/AIDS increased from 9% to 11%. HIV/AIDS awareness however increased since currently four out of five persons are aware of the ways in which HIV/AIDS infection can be transmitted.

### 3.4.9 Education

Table 3.6 below outlines the educational institutions and education statistics along the project area.

**Table 3.6: Educational Institutions in Nairobi County**

TYPE	NUMBER	ENROLMENT	Teacher to Student* Ratio
Primary Schools	1,241	335,056	1:1539
Secondary Schools	335	49,728	1:15
Tertiary Institutions	Over 60 (Includes Universities, University Satellite Campuses, Youth Polytechnics, Medical Colleges, Teacher Training Colleges.; Technical Colleges, Aviation Colleges, Hospitality Colleges, and Commercial		
Adult Literacy Classes	Colleges Over 4,700		

\* Public Schools, Source: Kenya County Networks

Improvement of the proposed alignment will contribute to access to educational institutions, transport of materials and staff and also open up the area to teachers who may be willing to relocate to the region.

### 3.4.10 Insecurity and conflict

There are high levels of reported cases of violent armed robberies, burglaries, and carjackings in the project area and its environs. Crime has risen in the recent past as a result of unplanned urbanization, with a minimal number of police stations and a proper security infrastructure. As a security precaution, most large houses have a watch guard, burglar grills, and dogs to patrol their grounds during the night.

Most crimes, however, occur around the poor neighborhoods where it gets dangerous during night hours and also where the poor state of roads create a good environment for easy ambush. However, in the past year, crime has decreased in the city due to increased security and an improved police



presence. Despite that fact, the area traversed by the alignment is a high risk area for carjacking incidences. Motorists plying the route must be cautious at all times. Therefore, opening up of the area will not only promote transport of goods and services but also expose the region for development and improved security.

#### **3.4.11 Urbanization and Motorization**

Urban centers in Kenya have experienced rapid population growth with statistics indicating that urban population had increased from 8.166 million in 1995 to 14.263 million in 2006 resulting in about 42% of the population living in urban centers. The urbanization trend coupled with explosive growth in motorization and a disorganized public transport system has resulted in chronic traffic congestion particularly in Nairobi and Mombasa due to heavy flows during peak hours and competition and conflict for limited road space by road users.

#### **3.4.12 Road Traffic Congestion in Nairobi Metropolitan Area**

Daily traffic volumes along most of major arterial roads in and out of the city have exceeded their design capacity necessitating major improvements. The Nairobi Metropolitan Area Urban Transport Master Plan Study financed by JICA in 2006, highlighted the urgent need to increase the urban transport supply through construction of missing links, improvement of major urban corridors, and a gradual shift to mass transit systems such as Bus Rapid Transit and Light Rail Transit in order to address the current crisis and cope with future developments.

## 4.0 PROJECT DESCRIPTION

### 4.1. General

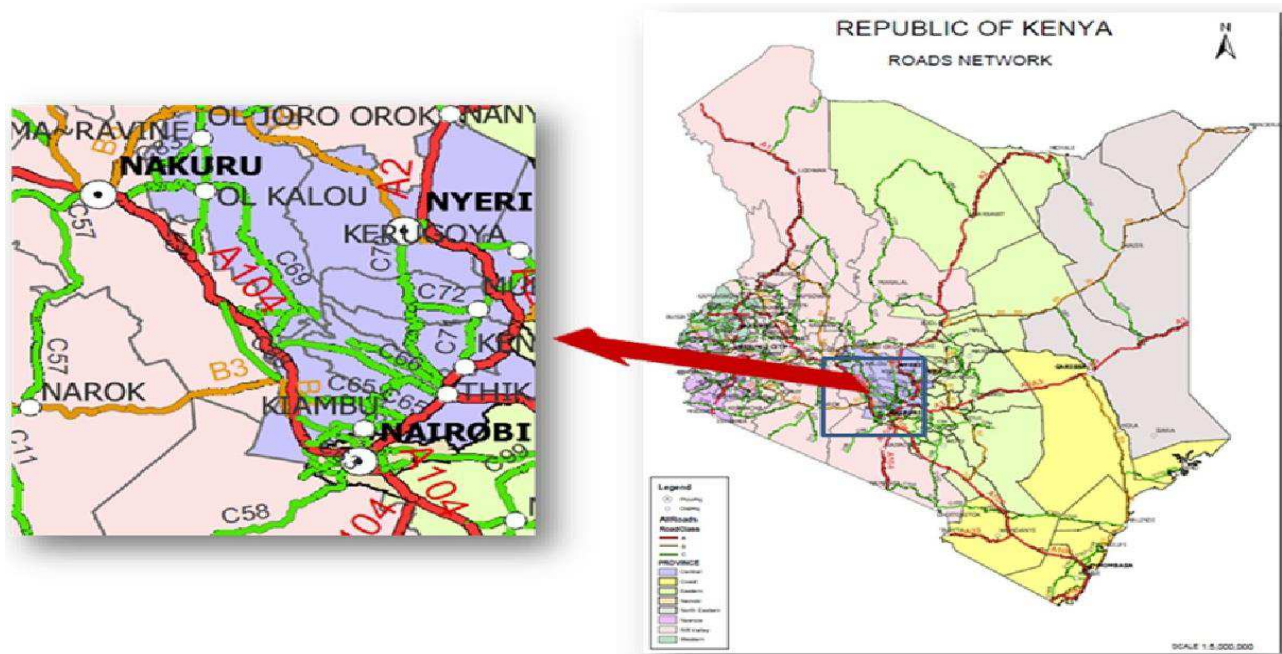
This Report presents the Environment and Social Impact Assessment (ESIA) of Road A104 from James Gichuru Road Junction to Rironi (A104/ B3 Junction) as required by clauses 3 and 4 of the Terms of Reference given by the Client, the Kenya National Highways Authority (KeNHA) on behalf of the Kenya Government.

The planned rehabilitation and capacity enhancement involves rehabilitation of existing pavement, widening of the carriageway from the current two lanes, provision of non motorized traffic facilities, incorporation of a BRT corridor for future BRT development , improvement of the road drainage and other infrastructural improvements.

### 4.2. Project Location

The length of the section under rehabilitation is 25.1 Km, the project commences at the A104/ James Gichuru Road junction GPS coordinates (252382E, 9861003N) and ends at A1/4/B3 junction, GPS coordinates (236716E, 9874967N). A section of the road is located within Nairobi County ;Road start (Km 12+350 to Km 19+150) while the other section ( Km 19+150 to Km 47+350 ) is located within Kiambu County( figure 4.1).

Figure 4.1: Project Location



### 4.3. Project Objectives

On a broader basis, the project objectives are mainly aimed at improving the economic status of the people of Kenya and the larger East and North African community since the project road connects the neighboring countries such as South Sudan, Uganda, Eastern Congo, Rwanda, Burundi and Northern Tanzania to Kenya. This is intended to be achieved by facilitating a faster, safer, and more economical link in terms of vehicle operating costs and time between the various centers and towns at the same time providing a much needed improvement in the road infrastructure in Kenya.

The objectives of the project design include the following;

- a) To formulate the interventions necessary for rehabilitation of existing pavement, widening and any other infrastructural improvements necessary to enhance capacity on the section of the A104 highway from the junction with James Gichuru Road to Rironi (junction with B3). These improvements include but not limited to re-carpeting, addition of lanes, construction of service roads, and reconfiguration of storm water drainage along the alignment or any combination of the foregoing.
- b) To design features for use by non-motorized traffic
- c) To incorporate all the above improvements into a bid document which is fully compatible with current World Bank procurement guidelines

It is envisaged that by rehabilitating and enhancing capacity of this road, travel time will be greatly reduced and safety of all road users increased which accrues to socio-economic gains at a national and international level.

### 4.4. Description of the project road and proposed designs

The description of the road is meant to provide a physical understanding of the road and related existing characteristics, the designs to be adopted and road construction associated activities.

#### 1.4.1 Existing road condition/features

Generally, the project road covers the section of A104 highway starting at James Gichuru Road Junction and ending at Rironi (A104/B3 Junction). The project road traverses Nairobi and Kiambu counties with 6.8 km traversing Nairobi County while the remaining 18.3 km traverses Kiambu County. The road passes through Kitisuru, Kangemi, Uthiru, Kinoo, Kikuyu, Gitaru, Muguga, Kerwa and Rironi locations and ends at the junction to B3 road.

Length of the highway section is 25.1 km. With addition of the side roads and service Roads which are 24.5 km; the total length of the roads within this project totals to 49.6 km.

There are also nine existing grade separated junctions and one at grade junction.

The road is currently a dual carriageway with 2 lanes either way separated by a median concrete New Jersey barrier. Each lane has a width ranging from 3.0-3.5 m with a road reserve of 25 meters either side of which some sections of the road reserve are characterized by encroachment by the local community especially at Kangemi, Uthiru, Kinoo and Zambezi market centers.

The entire project road section has no hydraulic bridges. There are several box culverts, bridge underpasses and single cell 450 mm, 600 mm and 900 mm diameter cross pipe culverts along the project road.

**The road characteristics that necessitated rehabilitation include the following:**

*1. U-turns that lead to the following effects:*

- Long and heavy vehicles occupy other lanes during their turns since turn radii are insufficient.
- They block up and restrict flow
- They add slow traffic to the fast lane
- They add dangerous weaving movements
- Potential for accidents

*2. Inadequate and unmaintained drainage facilities which cause flooding on the road surface especially during heavy rains*

*3. Uncontrolled pedestrian movement due to lack of efficient NMT facilities*

*4. Deterioration of pavement surface:*

- Rironi Bound Carriageway: The first 5.5kms is in reasonable condition as it has been having a recent asphalt concrete overlay. The next km 19.5km is in poor condition with significant distress on the pavement in form of patching, block, longitudinal and transverse cracks, rutting, potholes, depressions, edge breaking and pavement failure.
- Nairobi Bound carriageway: The first 18 Km , the road is in very poor condition with significant distresses in the pavement in form of patching, longitudinal, crocodile, block and transverse cracks, depression and edge breaking. The last 7 km , the road has been partially overlaid with an asphalt concrete layer and patching has been carried out scantily, however, on the shoulders no action was taken and edge breaking has occurred.

*5. Insufficient margins between New Jersey barriers and traffic lines and above standard height of New Jersey barriers*

*6. Rutting on the left lane used by heavy vehicles, rutting depth of up to 70 mm. Due to the density of the rutting, heavy vehicles cannot use this lane.*

7. *Illegal crossing by pedestrians through damaged New Jersey barriers*

8. *Heavy traffic volume*

9. *Worn out Shoulders* : Damage on the shoulders were observed due to Matatus and buses veering off the road to pick and drop passengers

10. *Overlapping*



**Lack of NMT facilities**



**Deterioration of pavement surface**



**Insufficient margins between New Jersey barriers and traffic lines**



**Rutting on the left lane used by heavy vehicles**



**Damaged New Jersey barriers which allow illegal crossing by pedestrians**



**Project road lack of proper drainage**

## 1.4.2 Proposed road Designs/improvement

### 1.4.2.1 General

The project panning and designs have been prepared in detail by a team consisting of a Project Director, Highway Engineers, Structural/Drainage Engineers, Materials Engineers, Surveyors, Environmentalists , Socio-economists among other professionals who have ensured a safe road design by strict adherence to the road design Manuals and various standard design specifications.

The project road has been designed with the objective of maximizing comfort of the road users while ensuring their safety. Different design aspects of the project road have been detailed in the various engineering design reports.

### 1.4.2.2 Design standards

The design standards adopted included but not limited to the following:

- ❖ Kenyan Road Design Manual
- ❖ British Standard – BS 5400
- ❖ HCM - Highway Capacity Manual
- ❖ Kenyan Standard Specifications, 1985
- ❖ Design Horizons: 2026 and 2036 (+10 & +20 Years after opening)
- ❖ Design vehicle (WB 15 AASHTO)
- ❖ British Standard BD 37/01
- ❖ AASHTO - (Standard Specifications for Highway Bridges)

### 1.4.2.3 Design scope

The design process captured the following key components:

- ❖ Topographical surveys
- ❖ Traffic Studies
- ❖ Soils, materials and pavement investigations
- ❖ Geometry of the road which includes vertical and horizontal alignments and road cross-section
- ❖ Pavement Design
- ❖ Hydrological and hydraulic studies
- ❖ Resettlement Action Plan Study
- ❖ Environmental and Social Studies
- ❖ Project Cost Estimates
- ❖ Economic Evaluation

The proposed rehabilitation and capacity enhancement will entail the following improvements:

- ❖ Expansion of the section from A104/James Gichuru road Junction to Uthiru shopping center from the current two lanes either way to three lanes either way, a walkway either way and collector roads. A Bus Rapid Transit (BRT) corridor will be provided for future development (i.e. 5 years after opening up of the road)
- ❖ Expansion of the section from Uthiru Shopping center to Gitaru from two lanes to three lanes, a walkway either way and collector roads
- ❖ Expansion of the section from Gitaru to Rironi from two lanes to four lanes, a walkway either way and collector roads
- ❖ Attainment of grade separation at the Waiyaki way/James Gichuru road junction and modification of interchanges/bridge intersections at various locations
- ❖ Construction of NMT facilities (walkways, pedestrian overpasses, cycle tracks, bus stops)
- ❖ Reconfiguration of the storm water drainage system
- ❖ Rehabilitation of service roads

The project road will follow the existing alignment as closely as possible, compatible with design standard requirements. However, some minimal realignment is foreseen, particularly at Gitaru.

New drainage structures including box and pipe culverts will be constructed or rehabilitated, while junctions and accesses will be improved in line with safety and capacity requirements. Service roads will be introduced as necessary while non motorized traffic will be catered for by use of pedestrian crossings, foot paths etc.

#### 1.4.2.4 Proposed pavement structure and improvements on carriageway and junctions

Table 4.1 below outlines materials and thickness of the various pavement layers.

**Table 4.1: Proposed pavement structure**

Pavement Layer	Material	Thickness
Wearing course	AC	80
Base	DBM	200
Sub-base	Cement and Bitumen Stabilized RAP/GCS	450
Sub-Grade (SSG)	Cement slightly stabilized upper sub-grade (150mm)	

*Shoulders:*

Shoulders will be constructed to the same standard as the carriageway. The width of the shoulders shall be greater or equal to 1.5 m.

The road was broken down into six layout sections during its design; a summary of the proposed improvements is tabulated below:



Table 4.2: Proposed improvements on the project road

Section No. & Name	Chainage	Sub-Section	Proposed improvements
Section 1: James Gichuru Junction- Kangemi Kaptagat Road	Km: 12+350 – Km: 14+950		<ul style="list-style-type: none"> <li>- U-Turns removed</li> <li>- Median left for BRT</li> </ul> <p><i>North Side:</i></p> <ul style="list-style-type: none"> <li>- Existing trumpet type will be improved</li> <li>- Collector road will be extended up to Mukabi Road</li> </ul> <p><i>South Side:</i></p> <ul style="list-style-type: none"> <li>- Existing Diamond ramps will be improved</li> <li>- Existing bridge will be demolished due to BRT addition</li> <li>- Between Km:14+300 – 14+950 collector road will be added</li> </ul> <p><i>Cross-Section:</i></p> <ul style="list-style-type: none"> <li>- Additional Lane from current 2 either way to 3</li> <li>- Addition of Pedestrian walk ways</li> <li>- Collector roads to be added at some sections</li> </ul>
Section 2: Kangemi Kaptagat Road – Naivasha Road	Km: 14+950 – 18+920		<ul style="list-style-type: none"> <li>- Kapenguria Road is designed as dual 2-lane carriageway</li> <li>- U-Turns removed</li> <li>- Median left for BRT</li> </ul> <p><i>North Side:</i></p> <ul style="list-style-type: none"> <li>- Existing trumpet type will be improved</li> </ul> <p><i>South Side:</i></p> <ul style="list-style-type: none"> <li>- Diamond ramps will be added</li> <li>- Trumpet type ramps will be added</li> <li>- Existing bridge will be demolished due to BRT addition</li> </ul> <p><i>Cross-Section:</i></p> <ul style="list-style-type: none"> <li>- Additional Lane from current 2 either way to 3</li> <li>- Addition of Pedestrian walk ways</li> <li>- Collector roads to be added at some sections</li> </ul>
Section 3: Naivasha Road-Kikuyu	Km: 18+920 - 25+300	Sub-Section <b>3.A</b> Km: 18+920 – 20+400 (Naivasha Road - Muhuri Road) and Sub-Section <b>3.B</b> Km: 20+400 – 23+200 (Muhuri Road – Ruthimitu Underpass)	<ul style="list-style-type: none"> <li>- Median left for BRT</li> </ul> <p><i>North side:</i></p> <ul style="list-style-type: none"> <li>- Existing junction and connection roads will be improved</li> <li>- Collector roads will be added</li> </ul> <p><i>South Side:</i></p> <ul style="list-style-type: none"> <li>- Existing junction and connection roads will be improved</li> <li>- Existing bridge will be widened due to BRT corridor addition</li> <li>- Collector roads to be linked to local roads</li> </ul> <p><i>Cross-Section:</i></p> <ul style="list-style-type: none"> <li>- Additional Lane &amp; Pedestrian walk ways</li> <li>- BRT corridor to be added</li> </ul>

Section No. & Name	Chainage	Sub-Section	Proposed improvements
			- Collector roads to be added at some sections
		Sub-Section <b>3.C</b> Km: 23+200 -25+300 (Ruthimitu Underpass – Gitaru Road)	<p><i>North side:</i></p> <ul style="list-style-type: none"> <li>- Existing junction and connection roads will be improved</li> <li>- A Roundabout will be added</li> </ul> <p><i>South Side:</i></p> <ul style="list-style-type: none"> <li>- Existing junction and connection roads will be improved</li> <li>- Existing bridge must be demolished to allow for BRT corridor and a new bridge will be constructed</li> <li>- Inside the loop, BRT last station will be placed</li> <li>- BRT corridor ends at the last station after passing under the left road by a bridge (30 m long and 18.50 m wide)</li> <li>- Collector roads to be linked to local roads</li> </ul> <p>Cross-Section:</p> <ul style="list-style-type: none"> <li>- Additional Lane &amp; Pedestrian walk ways</li> <li>- BRT corridor to be added</li> <li>- Collector roads to be added at some sections</li> <li>- BRT corridor ends at the last station after passing under the left road by a bridge (30 m long and 18.50 m wide)</li> <li>- Central reserve is left wide after end of BRT</li> </ul>
Section 4: Kikuyu –Sigona Golf Club	Km: 25+300 – 26+800		<ul style="list-style-type: none"> <li>- Existing road cross section will be improved</li> <li>- Shoulders proposed to be 2.50 m</li> <li>- Inner shoulders will be increased from 0.50 m to 0.80 m</li> <li>- The existing new jersey barriers width is 0.65 m height is 1.20 m, the proposed width is 0.60 m and height is 0.83 m</li> </ul>
Section 5: Sigona Golf Club – local road	Km: 26+800 – 35+500	Sub-Section <b>5.A.</b> Km: 26+800 - 27+600 (Sigona Golf Club – Zambezi underpass)	<ul style="list-style-type: none"> <li>- Existing road cross section will be improved</li> <li>- Junction connection roads will be improved</li> <li>- Shoulders proposed to be 2.50 m</li> <li>- Inner shoulders will be increased from 0.50 m to 0.80 m</li> <li>- The existing new jersey barriers width is 0.65 m height is 1.20 m, the proposed width is 0.60 m and height is 0.83 m</li> </ul>
		Sub-Section <b>5.B.</b> Km: 27+600 - 29+300 (Zambezi underpass – Kiambaa Underpass)	<ul style="list-style-type: none"> <li>- Existing road cross section will be improved</li> <li>- Junction connection roads will be improved</li> <li>- On the east and west sides, collector roads and local roads were re-designed</li> <li>- Shoulders proposed to be 2.50 m</li> <li>- Inner shoulders will be increased from 0.50 m to 0.80 m</li> <li>- The existing new jersey Barriers width is 0.65 m height is 1.20 m, the proposed width is 0.60 m and height is 0.83 m</li> <li>- Collector road is added on the left side</li> </ul>
	Sub-Section <b>5.C.</b> Km: 29+300 -	- At Km : 30+107 Existing underpass for vehicles and pedestrians was re-	

Section No. & Name	Chainage	Sub-Section	Proposed improvements
		31+700 (Kiambaa Underpass – Ngetha Road - Spenkon)	<ul style="list-style-type: none"> <li>- designed as junction due to school and local traffic</li> <li>- Existing railway bridge at km: 30+730 will be widened according to new cross section type</li> <li>- Existing at grade intersection was replaced by grade separated intersection by using local roads as much as possible to minimize land acquisition</li> <li>- Existing road cross section was improved</li> <li>- Junction connection roads were improved</li> <li>- On the east and west sides, collector roads and local roads were re-designed</li> <li>- Shoulders proposed to be 2.50 m</li> <li>- Inner shoulders will be increased from 0.50 m to 0.80 m</li> <li>- The Existing new jersey barriers width is 0.65 m height is 1.20 m, the proposed width is 0.60 m and height is 0.83 m</li> <li>- On the left side collector roads was designed</li> </ul>
		Sub-Section <b>5.D</b> Km: 31+700 - 35+500 (Ngetha Road - Kiroe/Ngecha – Chunga Mali Rd )	<ul style="list-style-type: none"> <li>- Existing road cross section was improved</li> <li>- Existing bridge will be widened on both sides</li> <li>- Junction connection roads were improved</li> <li>- On the east and west sides, collector roads and local roads are re-designed</li> <li>- Shoulders proposed to be 2.50 m</li> <li>- Inner shoulders will be increased from 0.50 m to 0.80 m</li> <li>- The Existing new jersey barriers width is 0.65 m height is 1.20 m, the proposed width is 0.60 m and height is 0.83 m</li> <li>- Collector roads were redesigned on both sides</li> </ul>
Section 6: Local road – B3 road – Project End	Km: 35+500 - 37+668	Sub-Section <b>6.A</b> Km: 35+500 - 35+727( Kiroe/Ngecha – Chunga Mali Rd – Local Road)	<ul style="list-style-type: none"> <li>- Existing underpass will be extended according to the new design</li> <li>- Existing road cross section was improved</li> <li>- Connection roads were improved</li> <li>- On the east and west sides, collector roads and local roads were re-designed</li> <li>- Shoulders are designed to be 2.50 m</li> <li>- Collector roads were designed at each side</li> <li>- Central reserve width is variable to fit with existing carriageway</li> </ul>
		Sub-Section <b>6.B</b> Km: 35+727( Local Road – A014/B3 Junction)	<ul style="list-style-type: none"> <li>- B3 road is designed as a dual carriageway</li> <li>- Beyond km:36+876 is designed as 2 lane dual carriageway</li> <li>- Existing road cross section was improved</li> <li>- Junction connection roads were improved</li> <li>- Shoulders are designed to be 2.50 m</li> <li>- Collector roads are designed at each side</li> <li>- Central reserve width is variable to fit with existing carriageway</li> </ul>

- Refer to appendix 1 (sheets 1 to 4) for layouts/ profiles of design outcome.

#### 1.4.2.5 Provision for NMT Facilities:

NMT movements along the A104 highway cause risks on traffic safety (Especially between James Gichuru and Naivasha Road junctions).

Pedestrian walkways, busbays and cycle lanes will be provided on the entire road section to provide safe NMT movements.

Existing junction bridges and to be newly designed BRT station ,pedestrian access, underpasses and overpasses will be used by NMT.

Besides, some of the existing underpasses, shall be revised according to road typical cross sections.

#### 1.4.2.6 Bridges

They include Crossing Bridges, Interchange bridges, railway bridges and pedestrian overpasses.

Currently, there is one existing grade junction (James Gichuru/A104) Junction)), 10 interchanges on A104 and one at grade junction, all these will be replaced with interchanges of varying capacities to accommodate the new expansions.

There are three existing intersections (bridges) of rail road on A104; additional bridges will be built on the left and right side to accommodate the expansion.

There are 6 pedestrian overpasses and 11 underpasses; these will be replaced with pedestrian overpasses on 21 locations.

Proposed improvements are tabulated below:

**Table 4.3: Existing interchanges/intersection bridges and proposed improvements on road A104**

Item No	Chainage	Name	Proposed Improvement	Remarks
1	14+930	Kangemi-Bridge	to be demolished, new bridge to be constructed	Existing bridge will be demolished due to BRT addition
2	18+078	Kapenguria-Bridge	to be demolished, new bridge to be constructed	Existing bridge will be demolished due to BRT addition
3	20+380	Muhuri Junc. -Bridge	to be widened	Due to new cross section type
4	23+203	Ruthimutu Junc.- Bridge	to be widened	Due to new cross section type
5	25+048	Gitaru Junc. Bridge	to be demolished, new bridge to be constructed	Existing bridge will be demolished due to BRT addition
6	27+594	Zambezi Junc. - Bridge	to be widened	Due to new cross section type
7	29+305	Kiamba Junc. -Bridge	to be widened	Due to new cross section type

Item No	Chainage	Name	Proposed Improvement	Remarks
8	31+622	Ngetha Junc.(Spenkon)	new bridge to be constructed	New bridge
9	33+143	A 104/Kroe/Ngecha-Chunga Mali Rd. Junc. Bridge	to be widened	Due to new cross section type
10	37+041	A104/B3 Junc.- Bridge	to be demolished, new bridge to be constructed	A104 at junction area and B3 road will be designed as dual carriageway

**Table 4.4: Existing intersections of railroad and proposed improvements on road A104**

Item	Station	Distance(M)	Existing Structure	Proposed improvement	Remarks
1	24+186		Railway Bridge	Additional bridges will be designed on the left side 9.10+10.80 m, and 9.50 m on the right side.	Due to new road cross section
2	24+777	591.08	"	Additional bridges will be designed on the left side 13.00 m, 22m on the right side.	Due to new road cross section
3	30+730	5952.24	"	Additional bridges will be designed on the left side 3.50 m, on the right side.	Due to new road cross section

**Table 4.5: Existing & proposed pedestrian overpasses on road A104**

Item No.	Station	Distance(M)	Remarks
1	13+200.00	0.00	For Deloitte - Touche, BRT station - Nairobi School
2	14+054.00	854.00	For Nairobi Campus- BRT station - African Advanced Level Telecommunication Inst.
3	15+013.00	959.00	For Kangemi Bus terminal-BRT Station-residential areas
4	15+617.00	604.00	For BRT Station-residential areas
5	16+453.00	836.00	For Thiong'o road - BRT Station-residential areas
6	17+355.00	902.00	For New Zealand Hostel - BRT Station-residential areas
7	18+360.00	1005.00	Uthiru - BRT Station-residential areas
8	18+965.00	605.00	For residential areas-BRT station-Uthiru High School
9	19+400.00	435.00	Existing pedestrian overpass bridge is not suitable for newly design road cross section, it will be cancelled, in place of this St:19+865 will be constructed.
10	19+565.00	165.00	For residential areas-BRT station-Uthiru high School
11	20+450.00	885.00	For residential areas-BRT station-bus Station
12	20+872.00	422.00	For residential areas-BRT station-Mama Ngina Kenyatta Primary School
13	21+659.00	787.00	For residential areas-BRT station
14	22+278.00	619.00	For residential areas-BRT station
15	23+938.00	1660.00	For residential areas-BRT station-Rungiri School

Item No.	Station	Distance(M)	Remarks
16	24+567.00	629.00	For residential areas-BRT station
17	27+626.00	3059.00	For residential areas-Bus Station
18	28+738.00	1112.00	For residential areas
19	33+183.00	4445.00	For residential areas
20	34+600.00	1417.00	For Rironi Market - residential areas, Existing pedestrian overpass bridge is not suitable for newly design road cross section , it will be demolish and construct.
21	34+960.00	360.00	

#### 1.4.2.7 Land acquisition

Additional land to allow for the road rehabilitation will be acquired from privately owned land. The total number of private parcels of land to be affected is 530 totaling to 75.2155 acres. The informal businesses established on existing road reserve that will be affected by the project are largely located between Kangemi and Rironi. The vendors do not own permanent business premises but rather operate on makeshift stands, wooden stands and kiosks. The pools of informal businesses are situated at bus stops targeting local commuters and upcountry passengers.

There will be a total of 122 structures that will be affected by the road infrastructure, 42 of these are on privately owned land while 80 are constructed on the road reserve.

A detailed RAP report has been prepared in compliance with World Bank policy on involuntary resettlement identifying all land parcels and affected business PAPs eligible for compensation.

## **4.5. Project Construction Phase**

### **4.4.1 Construction land**

The project will make use of the available road reserve as much as possible. However, acquisition of privately owned land will be required on some sections to pave way for the road expansion. 530 land parcels will be affected totaling to 75.22 acres.

Land to resettle business vendors operating on the road reserve in their vicinities will also be identified.

### **4.4.2 Materials sources**

Possible sources of gravel and hard stone include the following:-

- ❖ Kikuyu quarry for both gravel and hard stone
- ❖ Nyamu borrow Pit-Gravel source
- ❖ Waiyaki quarry-Hard stone source
- ❖ Mutarakwa Quarry-Hard stone source
- ❖ Karai quarry-Hard stone Source
- ❖ Karura quarry- Hard stone Source
- ❖ Bulbul quarry- Hard stone Source
- ❖ Mutambuki Borrow pit-Gravel source
- ❖ Kendong Quarry Naivasha- Hard stone source
- ❖ Gilgil Stone quarry- Naivasha Nakuru road- Hard stone source
- ❖ Kendong quarry and Mlolongo-sand source

### **4.4.3 Construction water sources**

Water for construction purposes is available from an old quarry in Kikuyu impounding a depth of 100m and an area of 2 acres. Water can also be obtained by drilling boreholes (to be left for public use after the construction).

### **4.4.4 Progression of Project Implementation Activities**

A pre-qualified contractor capable of carrying out road construction will undertake construction of the road and associated works. The construction will require a number of temporary facilities namely: equipment & workshop yard, piling pontoon and site offices.

The Construction contract will be based on FIDIC (International Federation of Consulting Engineers) conditions which stipulates that the Contractor must provide a performance bond as well as the following insurances:-

- I. Insurance of Works and Contractors Equipment
- II. Third Party Insurance.

As with all projects involving construction and earth moving activities, the following procedure is proposed;

- i. Securing Approvals and Licenses; before commencing construction works, the Client shall secure all development permits for the permanent works e.g. NEMA license upon approval of this ESIA report.
- ii. The contract agreement shall be signed and the project handed over to the contractor for implementation once the necessary approvals have been secured.
- iii. Procurement by the contractor of a performance bond to ensure that the works shall not be abandoned midway and, if abandoned, would not suffer as the client would still be able to engage another contractor.
- iv. Securing approvals and licenses by the contractor for contractor's installations, water abstraction permit, registration of site as a workplace and any other approval pertaining to temporary works
- v. Mobilisation of the Contractor's machinery, plant and personnel, construction camp including raw materials storage structures and administrative /foramen's office, temporary /permanent accommodation, securing and fencing the construction campsite.
- vi. Land Acquisition and Resettlement /Compensation for land owners and business vendors
- vii. Recruitment of the labour force.
- viii. Identification/familiarisation with materials sources and dumping sites for any unsuitable, excavated or demolished waste materials or any other generated waste.
- ix. Provision of waste disposal facilities such as a temporary latrine for the construction workers and project visitors
- x. Water abstraction-Several water sources have been identified as detailed under subsection 4.4.3
- xi. Construction of workshops
- xii. Delivery of construction materials. All these will be delivered in accordance to an approved construction programme, delivery and materials handling method.
- xiii. Ground investigations- Prior to actual construction works, the Contractor will undertake confirmatory ground investigations over and above the one done by the Design Consultant.
- xiv. Demolition and site clearance - This will include general site clearance of vegetation including their disposal. Where necessary, trees may be cut, their stumps removed and resulting holes backfilled. Existing structures, which are in the way of the construction, will be demolished and disposed. The demolished elements will include brickwork, concrete, masonry blocks, metal



(largely steel) and timber. Utilities such as electricity posts and lines, advertisement bill boards, water pipes etc will be relocated accordingly.

xv. Concrete works- There will be concrete works at certain sections of the road that require reinforcement. In addition, culverts and other drainage structures will be required.

xvi. Earthworks for preparation of road sub-grade and drainage, in addition to auxiliary works within the road corridor. Earthworks activities will include:-

- Site Survey and Setting out.
- Excavation by cutting into topsoil, normal soil, rock or artificial material.
- Trimming some excavated surfaces and disposing off excavated material(s).
- Filling to embankment and general filling with imported natural material other than topsoil. These natural materials include rock; sand and other approved naturally occurring materials.
- Scarifying, watering and compaction of fill layers or in situ road formation level.

xvii. Roads construction and paving:

- Construction of the carriageway
- Precast concrete kerbs and channels to act as restraint to road edges
- Non illuminated traffic signs
- Road Markings to designate carriageway from shoulders
- Non Motorized Traffic (NMT) facilities e.g. walkways, bicycle lanes, zebra crossings and pedestrian overpasses.
- Construction/ modification Rail and road Interchanges

xviii. Construction of detours and access routes

xix. Steel Works-e.g. guard rails

xx. Borrow pits and materials extraction

xxi. Crushing and screening of materials

xxii. Asphalt plant operation

xxiii. Screening, mixing, and stockpiling of aggregates.

xxiv. Heating of bitumen and aggregates separately and then jointly using energy.

xxv. Transportation of asphaltic concrete mixes to the road for laying using paver.

xxvi. Construction of drainage structures, e.g. culverts, check dams/scour checks, etc.

xxvii. Excavation of side drains, mitre drains, and cut-off drains and lining where appropriate.

xxviii. Construction of erosion protection works.

#### 4.4.5 Project Cost Estimates

It is expected that the project will be constructed over a period of three (3) years and one (1) year dedicated to Procurement. The total estimated cost of the project is Kshs. **24.78 billion**. A summary of the project construction cost estimates is presented under appendix five of this report.

#### **4.6. Project Commissioning Phase (Operation and maintenance)**

Other works during post construction and during the life span of the project will involve routine maintenance including periodic inspection and clearance of the road reserve. All these activities combined will have various degrees of impact on both the biophysical and human environment. According to the Environmental Management and Coordination Act of 1999, Road Construction falls under Schedule 2, which means that activities associated with road construction could have potentially serious impacts on the environment. This Environmental and Social Impact Assessment Report includes a management and monitoring plan that is intended to act as a guide in avoiding impacts, and mitigating those, which are unavoidable. The Environmental and Social Management and Monitoring Plan should be used during routine and periodic maintenance of the road to mitigate any potential environmental and social impacts.

Commissioning of the project and issuance of a completion certificate will also include:-

- ❖ Preparation and finalization of as-built drawings for the entire structural and civil engineering works
- ❖ Site reinstatement
- ❖ Site clean up
- ❖ Permanent reinstatement
- ❖ Taking full care of the works during the defects liability period specified in the contract.

#### **4.5.1 Site Reinstatement**

Prior to the commencement of the reinstatement program, the contractor will be required to develop a project specific reinstatement plan.

##### **4.5.1.1 Reinstatement Philosophy**

The reinstatement of the project will be based on the following principles:-

- ❖ Disturbed areas which are not permanent works will be reinstated to pre construction conditions to the greatest practicable extent
- ❖ Disturbed areas will be stabilized to protect the integrity of permanent works.
- ❖ Disturbed areas will be re-vegetated to achieve good and natural landscape ambience.
- ❖ Regular monitoring of reinstated areas will be undertaken until environmental requirements and goals have been achieved.

#### **4.5.1.2 Timing of Reinstatement**

Reinstatement of the project area will be undertaken on a sequential basis dependent on the completion of construction and testing in each area. The site will be cleared of residual construction debris, construction signs and equipment, as part of activities associated with reinstatement.

#### **4.5.2 Site Clean Up**

Prior to de-mobilization of construction personnel and equipment, cleanup activities will be carried out in accordance with environmental standards and industry best practice. Cleanup activities will consist of the removal and/or disposal of temporary structures, equipment, tools and excess material brought on site or generated during the construction and commissioning program.

#### **4.5.3 Permanent Reinstatement**

Permanent reinstatement will be undertaken in all the areas that have been subjected to disturbance by the road construction.

To facilitate natural re-vegetation of disturbed areas, the separately stockpiled excavated material and topsoil will be spread back in the reverse order in which they were excavated.

The key reinstatement principles are summarized below:-

- ❖ Minimize reduction in soil quality and structure during construction
- ❖ Reinstatement all third party assets affected by project activities in accordance with the construction contract documents and other pre-entry agreements.
- ❖ Carry out site landscape on the basis of a landscape plan prepared by a landscape professional.
- ❖ A target minimum cover of pre-existing ground vegetation established within one year of final reinstatement will be set.
- ❖ An aftercare monitoring and corrective action program will be developed and implemented based on examining the bio-restoration process periodically after reinstatement.
- ❖ Any fences, services, structures or other facility affected by the construction works will be repaired or replaced to a condition that is at least as good as that found prior to construction.

### **4.7. Project Decommissioning and Abandonment Plans**

#### **4.6.1 Decommissioning of Existing Facilities**

When the Project becomes unviable, the project proponent will be required to develop a written abandonment plan prior to decommissioning of the road.

#### **4.6.2 Legal Basis**

The proponent will prepare a written abandonment plan within 30 days of determining decommissioning. The plan will detail how the decommissioning will be carried out.

The abandonment plan will be subject to approval by NEMA. An Environment Project Report (EPR) will be prepared prior to implementation of this plan, to assess and minimize potential environmental and social impacts arising from the abandonment operations. This abandonment EPR Study will be submitted to NEMA for consideration.

Upon completion of the abandonment operations, an assessment of contaminated land will be prepared recording the final contamination status of the location of the project facilities. This assessment will be subjected to NEMA approval.

#### **4.6.3 Technical Solutions for Abandonment**

The exact details of how facilities will be abandoned will be determined prior to abandonment and agreed with the Government. Therefore it is not possible to determine at this stage exactly what techniques will be used. However this will be in accordance with recognized international standards.

### **4.8. Project inputs**

The project road will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that saves energy and water will be given first priority without compromising on cost or availability of other factors.

The proposed road is planned to utilise the following materials during its construction;

- ❖ Sand, gravel, hard stone, natural stone, graded crushed stone
- ❖ Concrete blocks
- ❖ Cement
- ❖ Reinforcement steel and its ancillaries.
- ❖ Water
- ❖ Timber for making structural formwork and trusses
- ❖ Decorative paints and glues among other materials.
- ❖ Bitumen
- ❖ Lime and Cement

Equipment/machinery to be used are likely to include hoists, concrete mixers, trucks/lorries, pavers, poker vibrators and excavators.

All these materials and equipments are found in most hardware shops and with all building contractors within Nairobi and its environs.

Most of the machinery will use petroleum products as the source of energy and shall therefore be serviced and utilized to the highest level of proficiency to avoid unnecessary spillage or emissions of petroleum related wastes that might pollute the environment.

Construction labor force of both skilled and non-skilled workers will be sourced from within; they include Foremen and Casual Laborers.

Sand, natural stone and aggregates will be extracted from licensed quarry sites identified under subsection 4.4.2 which lie within the project environs. Timber for formwork will be purchased from licensed timber yards within Nairobi Town and its environs.

#### **4.9. Project Products, By – Products and Waste**

During the construction, operation and decommissioning phases of the project, there will be different types of waste that will be produced as described in this section.

The project will generate inert, non-hazardous and hazardous waste over the period of construction. Operation/use of the road will result in relatively small volumes of routine waste generation. Maintenance and repair activities conducted during the operational lifetime of the project may generate limited volume of waste. Demolition of structures during decommissioning will result in large volumes of debris and other wastes.

##### **4.8.1 Project Waste Management Strategy**

Prior to the commencement of the construction program, the contractor(s) will prepare a Project Waste Management Plan (PWMP). The PWMP will:-

- ❖ Propose a minimization/collection/storage/treatment/re-use/disposal route for each waste stream.
- ❖ Identify potential third party re-users
- ❖ Propose Incinerator types
- ❖ Propose location of waste storage and duties of site personnel with regard to waste management.
- ❖ Identify and describe possible locations of landfills or long-term storage sites.
- ❖ State the methods for properly managing (i.e. training, storing, containerizing, labeling, transporting, disposing) wastes.

- ❖ Describe the transition of control from the contractors to the Proponent, including arrangements for wastes associated with commissioning.

## **4.8.2 Project Waste Management Principles**

### **4.8.2.1 Standards**

The waste management standards to be used for the construction, operation and decommissioning of the roads will be aligned to legal notice 121: Waste Management Regulations 2006. If these regulations do not cover certain aspects of the project then the Contractor and Proponent shall comply with international regulations on environmentally sound management of waste.

### **4.8.2.2 Duty of Care**

The principles of 'duty of care' (i.e. the responsibility of a generator or owner of waste to ensure that it is handled, transported and disposed of in an appropriate manner) for waste and waste ownership by the waste generator will be adopted by the proposed project throughout the construction, commissioning and operation of the project. During construction and commissioning, the contractor will be responsible for duty of care whereas during operations, the Proponent will be the duty holder.

### **4.8.2.3 Waste Inventories and Classification**

Waste inventories will be created to quantify and characterize waste streams at each stage of the project. Separate inventories will be developed for construction wastes and for commissioning/operational wastes.

The volumes of waste requiring ultimate disposal will be minimized both through the control of waste generation and through incineration. Inert and non-hazardous wastes that cannot be reused or recycled may be incinerated in an incinerator designed and operated in accordance with Kenyan waste management guidelines.

### **4.8.2.4 Hierarchy of Waste Management Practices**

Each waste stream will be managed according to the following hierarchy of techniques, in which the technique chosen should be the first in the hierarchy that is safe and practicable:-

- ❖ Eliminate or minimize the waste stream by choice of procedure or technology
- ❖ Re-use as a material
- ❖ Re-use as a fuel
- ❖ Process and re-use as a material
- ❖ Process and re-use as a fuel
- ❖ Incinerator or re-use or landfill the ash.

- ❖ Landfill
- ❖ Landscape- Landfill with appropriate vegetation planted
- ❖ Discharge to a receiving water course (applicable only to wastewater)

#### 4.8.2.5 *Transfer of Waste to Third Parties*

It is expected that there will be a variety of potential third parties that may receive wastes generated during the road construction. These third parties will include commercial waste disposal contractors and entities (corporate or individual) that have the capacity to reuse or recycle individual waste materials.

In general, transfer to third parties for ultimate disposal will only be permitted if the part of their operation that is used for the proposed project waste is licensed. However items such as timber wastes and other re-useable project wastes may be disposed to local population on the basis of case by case review by the contractor.

### 4.8.3 Construction Waste and Emission Inventories

#### 4.8.3.1 *Construction and Commissioning Waste Management*

The Table below presents indicative characteristics of wastes that will be generated by the Proposed Project.

**Table 4.6: Characteristics of Potential Project Wastes**

<b>SOLIDS</b>	<b>METALS</b>
Bituminous material	Welding Rods
Cement (Dust)	Isolated Steel Piles Wasted Lengths
Paper and Cards	Copper (Electrical Wires etc)
Plastic bottles, cans, drums & packaging bags (both polythene and biodegradable)	Reinforcement steel and its ancillaries
<b>Aggregates</b>	<b>SLUDGES</b>
Vehicle parts	Grease
Glass	Paint
Rags and Oil Adsorbents	Oil
Light bulbs and tubes	<b>LIQUIDS</b>
Paint cans and brushes	Wash down water and drum water
Stone and Rocks	Oily water
Tyres	<b>DOMESTIC</b>
Cleared Trees & Branches	Food
Cleared undergrowth, shrubs etc	
Waste Timber	
Concrete Shuttering	

However, there will be an express condition in the contract that, before handing over the project road, and before the contractor is issued with a completion certificate, he will clear the site of all debris, restore it to a state acceptable by the supervising Engineer and environmental consultant, and also, plant trees and grass to the satisfaction of the supervising engineer. The method of

collection, delivery of materials and dumping site shall be strictly as approved by the project Engineer, NEMA and the relevant Councils.

The special specifications will obligate the contractor to dispose off different categories of waste appropriately. For example, steel wasted lengths may easily be taken by the Jua Kali Industry.

In general, the contractor will be required to develop construction specific waste management plans prior to the start of construction work. At the start of the construction contract, the contractor will undertake a waste minimization/treatment/disposal study, guided by the project waste management strategy. The study will identify and quantify the expected wastes and describe:-

- ❖ Proposals for reduction, treatment processing
- ❖ Third parties to whom waste will be transferred for re-use
- ❖ Liaisons with the local Councils to identify and document suitable council disposal sites ground, landfill and incineration facilities.
- ❖ Other locations of landfills or waste storage sites to be adopted if local Council facilities are inadequate.
- ❖ On site incineration facilities to be adopted if local Council facilities are inadequate.

The findings of the study will be used in the development of the construction waste management plans. At a minimum, these plans will include:-

- ❖ A consolidated summary of the applicable regulations and restrictions governing the generation, handling, treatment and disposal of wastes generated during the construction/commissioning phases of the Project.
- ❖ Any permitting requirements for waste treatment or disposal.
- ❖ Detailed method statement for each element of the waste management handling, treatment and disposal process
- ❖ Any third party agreements for waste handling, transfer or disposal

After construction of the road, the waste handling/disposal facilities established by the contractor under the construction program will be closed.

If a waste handling/disposal facility procured by the contractor is closed, the contractor will be required to ensure that it is appropriately de-commissioned (i.e. including capping of any landfills) and the surface will be re-instated according to the Project Reinstatement Strategy. If the facility is retained, it will be transferred to the proponent.



#### **4.8.3.2 Release to the Atmosphere**

Atmospheric emissions will be generated by the proposed road project activities principally during construction of road works. It is anticipated that the most significant components of such emissions will be combustion gases, specifically:-

- ❖ Nitrogen Oxides ( NO<sub>x</sub>)
- ❖ Carbon monoxide ( CO)
- ❖ Sulphur Dioxide ( SO<sub>2</sub>)
- ❖ Particulate matter ( PM)
- ❖ Volatile Organic Compounds
- ❖ Aldehydes
- ❖ Secondary pollutants

#### **4.8.3.3 General Wastewater Disposal**

Wastewater includes all water flows from the temporary site office, work sites and subsidiary operations such as vehicle and equipment washing.

Wastewater from temporary site office should be treated in a septic tank and related soak aways.

Wastewater from the works will generally be from the roadside drains and during curing of concrete works. These wastewaters are not hazardous but should be monitored to ensure that they do not cause adverse effects. Roadside drains should be lined to mitigate against erosion.

#### **4.8.3.4 Atmospheric Emissions during Normal Operations**

During operation, atmospheric emissions will come from vehicular traffic. Emission of pollutants by vehicles has a global impact on climate change. The emissions will vary from time to time depending on the traffic volume, traffic composition, speed of traffic, dispersion dynamics, vehicle emission levels and the road surface.

### **4.10. Project alternatives**

The standard approach in looking for solutions to mitigate against the impacts on environment is to consider alternative ways of achieving the same project objectives with a view of recommending the alternative with the minimum level of impact severities on environment at large.

#### **4.9.1 No project alternative**

This option is the most viable alternative from an extreme environmental perspective as it ensures non-interference with existing physical, biodiversity and social conditions. This alternative on the other hand would mean that the road continues to be in its current state which is deplorable and has weighed heavily on the road users. Travel times have increased significantly due to increased traffic volume handled by the road. All the positive impacts accruing from the road rehabilitation and capacity enhancement would also not be felt. This option is thus out of the question considering that

the project implementers have gone a step further to come up with a plan to harmonize the road rehabilitation with the environment.

#### **4.9.2 Alternative Project routing**

The road network in Kenya is structured on many road links whose classification emanate from the purpose designated for the various links. The links classification is on a hierarchical basis. The highest hierarchy is class 'A' roads, which connect Countries. Class B roads connect Provinces. Class C roads connect districts. Class D roads connect Divisions (or constituencies) while class E roads connect Villages.

From the TOR, the road corridor is in existence and any deviation from existing alignment would introduce further negative impacts of displacement of locals due to massive private land acquisition which would increase the project budget cost. The current road alignment which is serving local people is to be maintained and expanded to accommodate more traffic volume and reduce conflict areas therefore there is no alternative route.

This would also mean an extra cost of carrying out detailed feasibility analysis for an alternative route.

#### **4.9.3 Alternative construction materials and construction technology**

The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Materials will be locally sourced from licensed dealers for environmental sustainability Equipment and machinery that is environmental friendly will be given first priority without compromising on cost or availability of other factors.

Locally available construction materials will be used; gravel and hard stone will be extracted from several quarries that were identified. The sub-grade materials will be obtained from cut and borrow pits approved by the engineer within the locality and improved with lime or cement from local manufacturers.

Water for construction will be abstracted from an old quarry at Kikuyu with an impounding depth of 100 m and 2 acres coverage; this will be augmented with water from boreholes. Construction materials are readily available in the area hence no sophisticated mode of materials acquisition is anticipated.

#### **4.9.4 Waste management**

A lot of solid waste will be generated during the construction phase of the project cycle. An integrated solid waste management system is recommendable. The best alternative would be

source reduction to discourage enormous amounts of waste production. The second option is making use of dust bins and skips and hiring private refuse handlers to collect the waste at a prescribed fee. The third option is combustion of non recyclable materials though this particular alternative would pose an environmental problem due to emission of smoke. A project waste management Strategy will be developed by the contractor prior to commencement of the construction works to ensure that all waste material is managed sustainably; this plan will be in compliance with local and international waste management regulations and guidelines.

## 5.0 CONSULTATIONS AND PUBLIC PARTICIPATION (CPP)

### 5.1. General

The Consultation and Public Participation Process (CPP) is a policy requirement by the Government of Kenya. It is a mandatory procedure as stipulated by EMCA 1999 section 58, on Environmental and Social Impact Assessment for the purpose of achieving the fundamental principles of sustainable development. Section 17 of the Environmental (Impact Assessment and Audit) Regulations of 2003, requires that all ESIA Studies incorporate Public Consultation, the aim of which is to ensure that all stakeholders interested in a proposed project (including project beneficiaries and the general public in the vicinity of the proposed project) are identified and their views, opinions, concerns and recommendations are considered during project planning, design, construction, operation and decommission phases.

### 5.2. Stakeholder composition and briefings

From the exercise, it was established that the dominant group of people and therefore beneficiaries of the road improvement who were classified as stakeholders were as follows:

- Local community
- Business community
- Governmental Organizations
- Learning institutions
- Private Sector/Non Governmental Organizations /corporate world
- Religious Organizations
- Transporters /Matatu/Bus Operators/Owners

Consequently, two approaches were used to interact with these stakeholders as follows:

#### 1. Consultative Meetings

To reach the larger corporate world, private sector and nongovernmental organizations, consultative meetings/workshops were held at every stage of the project design. The agenda of the meeting was as follows:

1. To inform the public about the proposed road project and obtain feedback on acceptability of the project.
2. To present to the general public the proposed designs and give them an opportunity to air their concerns/recommendations for incorporation into the final designs

3. To identify potential social, economic and environmental impacts (both positive and negative) of the proposed road to the community, other road users and the general public during and after construction.

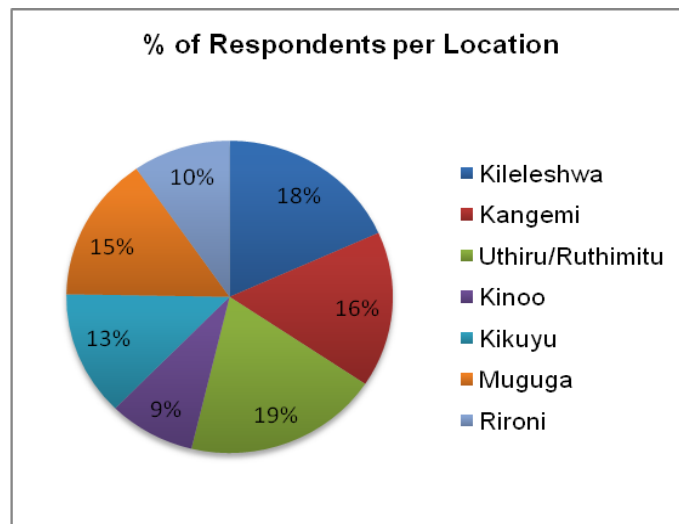
Consultative meetings with the local community were also held at each administrative location.

Minutes of these meetings are appended under appendix 7 of this report.

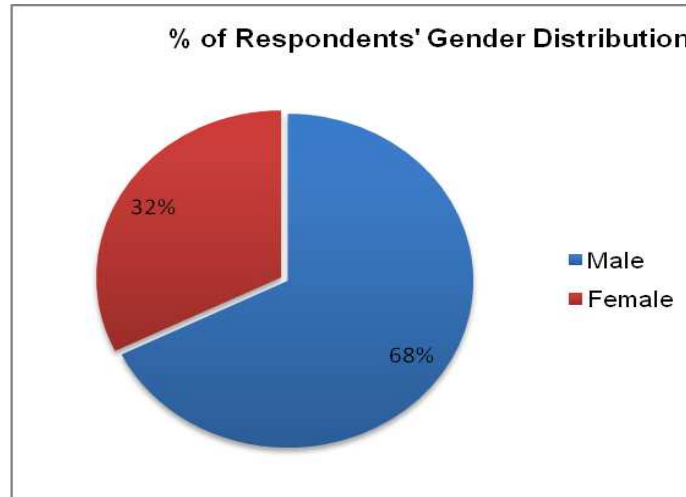
## 2. Questionnaires/oral interviews

Direct interviews (using structured and semi-structured questionnaires) were conducted with members of the public in the month of November 2012; this was aimed at getting to the local community who resided in proximity to the road project. All questionnaires duly filled were compiled and bound in a separate document and forwarded to NEMA; a list of the respondents' details is also attached under appendix 3 of this report. Ninety Three (93) respondents consisting of local residents, local administration, business community, governmental organizations, learning institutions, non-governmental organizations and religious organizations were interviewed. The respondents were from 7 locations spanning over the entire section of the project road being studied, a figurative representation of the % of respondents in each location is illustrated below (Figure 5.1).

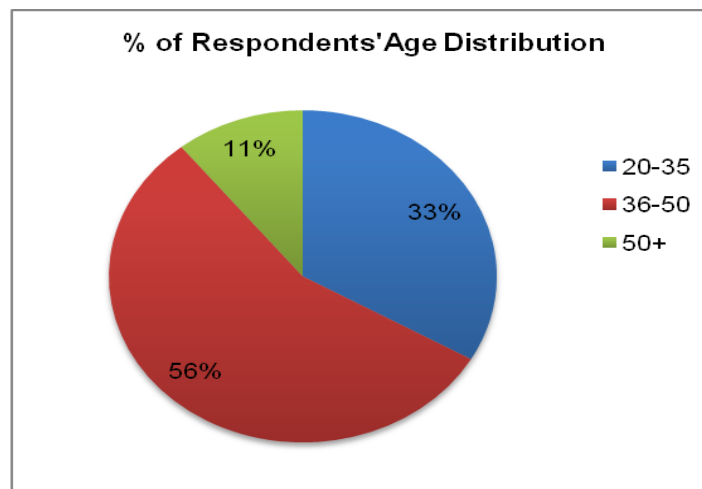
**Figure 5.1: % of Respondents per Location**



Out of the 93 respondents, 32% were female and 68% were male.

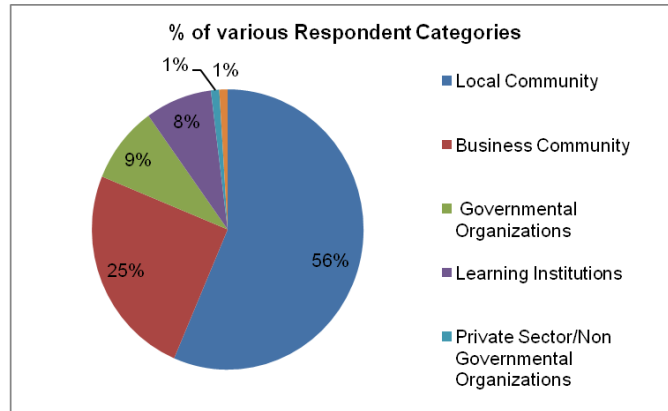
**Figure 5.2: % of Respondents' Gender Distribution**

The ages of the respondents ranged between 20 to 50+ years with majority ranging between ages 36 to 50 years (56%) as indicated in figure 5.3 below.

**Figure 5.3: % of Respondents' Age Distribution**

A majority of those interviewed constituted the local community (56%), business community (25%) and employees in various government organizations (9%) while the remaining 10% were learning institutions, private sector/non-governmental organizations and religious organizations (Figure 5.4).

Out of the 93 interviewees, 94% support the proposed project fully while 2% required a more comprehensive understanding of the project's effects on their property and 4% were non responsive.

**Figure 5.4: % of respondents for various Stakeholder Categories**

### 5.3. Importance/ use of the current road to the community and frequency of road use

90% of the respondents cited to using the road on a daily basis for various activities. The current road is widely used by the community in running their day to day errands, results indicate that majority of the community members are locals residing in the area, business people and employees in various sectors while a few are farmers, thus the road contributes directly to their day to day livelihood. From the responses, the road is mainly utilized as follows:

1. Access to work place located along/off the project road/NCBD
2. Access to private property /residence /land
3. Commuting to and from work /learning institutions to/from satellite towns like Uthiru/ Kinoo/ Kikuyu/Kangemi etc
4. Link to other parts of the country eg Nakuru/Naivasha, Kisii, Kisumu , Kericho etc
5. Link to the Uganda and Rwanda Border
6. Business opportunity/avenue for petrol stations and other business owners
7. Transportation of business goods to other parts of the country, the border and within the locality

### 5.4. Effect of current status/condition of the road on livelihoods

Currently, the state of the road is poor; the entire road is characterized by rutting, raveling and potholes. The road also lacks speed bumps at market centers and pedestrian crossing points and acceleration/deceleration/exit lanes especially at Nairobi School and Waruku area. More than 90% of the respondents stated that the current state of the road has led to numerous accidents especially at Kangemi Foot Bridge, it was also noted that the road lacks safe crossing points for the pedestrians, a summary of the responses on how the current state of the road has affected the community is as follows:

1. Lack of deceleration/acceleration lanes hence accidents especially at KARI, Nairobi School and White House Gated estate

2. Traffic congestion due to high vehicular volume/narrow carriageway, potholes/minor accidents hence delays to get to work/home especially along shopping centers
3. Accidents due to lack of pedestrian crossings /over speeding by vehicles
4. Poor drainage of storm water and lack of access culverts at some accesses to private property which has resulted in flooding during heavy down pour
5. Lack of service roads to access private property, it was noted that most home owners exit directly from the highway especially in Kileleshwa location
6. Road too narrow, traffic jam due to roundabouts
7. Lack of foot paths and cycle tracks for NMTs
8. Impeded crossing due to median concrete barrier especially at Chunga-Mali area and between Rironi Primary School and Kamandura Primary School. Spacing of flyovers too wide apart this has especially inconvenienced the farmers at Rironi area who require animal food to be wheeled to the other side of the highway
9. Presence of potholes in some parts of the highway and service roads due to heavy goods trucks
10. Slow traffic due to cargo trucks
11. Presence of hawkers along the road especially at Kangemi Shopping Center which impedes smooth traffic movement
12. Lack of highway lighting on the road which has led to up rise in insecurity issues
13. Frequent occurrences of accidents attributed to potholes, NMT/MT conflict and over speeding at shopping centers
14. Lack of bus stops

## **5.5. Social, economic and environmental impacts**

### **5.5.1 Positive Impacts anticipated by the community**

With the road in its current dilapidated state, the respondents felt that improvement of the of the road will accrue many direct and indirect benefits to the road users and the local community. A summary of these benefits is as follows;

- ❖ Reduced traffic/decongestion especially during peak hours due to improved road
- ❖ opening up of the area to more development especially attraction of more businesses and setting up of homes/buildings due to better infrastructure
- ❖ Employment creation
- ❖ Reduced speeds due to better designs hence reduction in accident cases
- ❖ With reduced traffic, there will be less fuel consumption , hence more savings on vehicle owners/minimized fuel costs and less carbon monoxide emissions
- ❖ Improved road safety for road users



- ❖ Ease of communication/Enhanced mobility
- ❖ Savings on money and time due to reduced transport costs
- ❖ There will be reduction of pollution
- ❖ Improve the drainage of the area
- ❖ Enhanced security
- ❖ Vehicle maintenance costs will go down
- ❖ Improved tourism investment
- ❖ Value addition to property and general development in the area and the country at large.

#### **5.5.1.1 Suggestions on enhancement of the positive impacts during construction**

Few suggestions were given to enhance the positive impacts, these included:

- ❖ Job creation by giving the locals first priority during recruitment of casuals as opposed to importing from other areas
- ❖ All youth to work on project as casuals to be informed through notices at chiefs offices
- ❖ Allow for representation of youth in decision making
- ❖ The locals should be fully engaged in the project implementation /planning
- ❖ The contractor to make use of locally available materials and local material sites such as quarries and also purchase construction materials from the local community to improve the locals' livelihood
- ❖ Local community to be sensitized by holding sensitization meetings on importance of the road to them, environmental issues and cross cutting issues such as HIV/AIDS and drug use
- ❖ Stakeholder views to be respected and adhered to and they be given chance to air more views
- ❖ Involve locals in determining optimum location of crossing points/foot bridges

#### **5.5.2 Negative impacts cited by the community**

Whereas the community fully embraced the proposed project, few negative impacts that require to be mitigated during the project cycle and their mitigation were cited, a summary of which is as follows:

**Table 5.1: Summary of negative impacts and their mitigation proposed by the respondents**

<b>S/No</b>	<b>Negative Impacts</b>	<b>Mitigation</b>
1	Displacement of businesses hence loss of source of income : Hawkers will lose jobs through demolition of kiosks along the way and business disrupted	-Adequate notice and compensation to affected parties -Minimal interference with adjoining property and in the case of destruction of lawns/gardens, replant vegetation after project completion -Designs to minimize displacement -Contractor to help in fencing off property whose fence has been demolished for moving -Make use of existing road reserve -Look for alternative business locations for the residents /provide

S/No	Negative Impacts	Mitigation
		stalls to displaced vendors along the road after completion
2	Increased traffic	-Police to manage traffic at diversions -Divert some traffic to other routes -Adequately and well maintained divers
3	Dust	-Watering of dusty excavated areas -Carry out construction in the shortest time possible /within minimal time -Reduce dust emissions/dust sources
4	Accidents due to lack of : Deceleration lanes to adjoining property Lack of pedestrian foot paths	-Deceleration lanes/Acceleration lanes to be installed since it is difficult to access adjoining property for people living next to the road since traffic is fast -Safe crossing areas to be installed/foot bridges, walkways -Installation of road signs and matatu/bus stops -Put up rumble strips at populated locations like market centres -Add speed bumps especially around westlands area due speeding trucks -Foot bridges to be fitted to serve institutions like Nairobi and Kianda Schools -Work out safety levels to protect pedestrians -Erect barriers to individual property during construction to minimize accidents
5	Destruction/cutting of trees	-Ensure new trees are replanted after project completion/landscaping
6	Sewer/power lines interruption	-Ensure that sewer lines are not destroyed/electricity lines to be interfered with must be reconnected immediately
7	Oil spills and vegetation destruction	-Proper disposal of used oils -Tree replanting & beautification of affected areas
8	Pollution/smoke	-Divert trucks and other heavy vehicles to other routes
9	Speeding	-Put up speed sign indicators during and after construction
10	Noise by construction machinery/vehicles	-Use machines with tolerable noise levels
11	Dumping of waste Property value will rise	-Create proper dumping sites
12	Traffic disruption during construction	-There should better traffic management, improvement of alternative routing
13	There will be population increase in these area due to immigration of people to the area hence increased cases of social crime	-Enforce population capacity limit via local government. -Contractor to maintain good relationship with the local members of the community -Security officers to be put on high alert

## 5.6. Conclusion

Results from the CPP exercise indicate that that rehabilitation and capacity enhancement of the road would benefit the road users immensely. It being a class "A" road, a lot of activity does take place on this road on a daily basis from commuting to work for many residents in satellite towns, roadside businesses and connection to residential locations. The Area around Rironi was noted to have several farmers using the road for farm produce transportation and other activities, thus, improvement of this road will improve the socio-economic status of its beneficiaries. The positive impacts outweigh the negative impacts which will be mitigated as laid out in the EMP. Emphasize by

the members of the public was put on the recurrent accidents on the highway and the following should be put into great consideration during the project implementation:

- More footbridges and bus stops to be considered especially near learning institutions, local community to be involved in siting their locations
- Access culverts should be installed at all access instances to enhance proper drainage
- Service roads to be set up to avoid conflict between local and through traffic
- Speed bumps to be erected at shopping centers and near learning institutions to control fast moving vehicles
- The local community to be given first priority during recruitment of both skilled and unskilled labor
- Police check points to be put in place on the highway to reduce robberies
- Road signs to be installed appropriately
- Access roads to plots /Feeder roads to be improved and constructed especially at Kiambaa Shopping Center
- Highway lighting to be considered to ensure safety of road users during the night

## 6 POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS IDENTIFICATION, ANALYSIS AND MITIGATION

### 6.1 Impacts Identification

#### 6.1.1 General

Potential positive and negative environmental and socio-economic impacts associated with the proposed project have been identified in this chapter. These impacts have been identified using the checklist method in three phases i.e. the **construction phase, operation and Maintenance phase and decommissioning phase**. The magnitude and significance of these impacts has been weighed using the matrix method. The environmental impacts vary depending on their type, nature, magnitude, extent, timing, duration, certainty and reversibility

#### 6.1.2 Checklist Identifying Potential Impacts

This checklist seeks to establish the environmental and socio-economic factors that will be affected both positively and negatively by the project activities at the various phases. Typical potential environmental attributes to be impacted by the project construction activities in the various project phases were identified as indicated in table 6.1 below;

**Table 6.1: Checklist identifying potential impacts from the Project**

Environmental Attribute/Parameter	Project Phase		
	Construction	Operation & Maintenance	Decommissioning
Water Resources	√	√	√
Air Quality	√	√	√
Soils & Geology	√	√	√
Biodiversity	√	√	√
Noise	√	√	√
Health and Safety aspects	√	√	√
Socio-Cultural Set up	√	√	√
Others	√	√	√

Based on the above checklist, activities during the construction, operational and decommissioning phases of the proposed project will have impact on the environment to various degrees as weighed out in the Leopold Matrix under subsection 6.1.3 below.

### 6.1.3 Impacts Analysis using Leopold Matrix

A Leopold Matrix Table has been adopted in the analysis of the potential impacts as set out in the table below to show the possible impacts and use of completed road.

Significance and magnitude has been based on:

- ❖ Geographical scale (local, national or global)
- ❖ Severity of the impact e.g. level of deviation from background conditions
- ❖ Size of area affected
- ❖ Duration of the effect
- ❖ Violation of legal compliance
- ❖ Overall likelihood of occurrence

The Magnitude/severity of the impacts is designated on a scale of 1-3 as follows;

0-represents no significance

1-represents low significance

2 -represents significant effect

3-high environmental significance

“+”before each number indicates the impact is beneficial (positive).

“(-)”before each number indicates the impact has negative effects

The types of impacts to be considered include the following:

- ❖ Primary impacts
- ❖ Secondary impacts(Occurring away from primary source)
- ❖ Cumulative impacts

**Superscripts:** p-represents a primary impact;

s-represents a secondary impact;

c-represents a cumulative impact

**Table 6.2: Impacts Analysis Using the Leopold Matrix for the Proposed Project**

Project phase/ Activities	Environmental attribute/Parameter								
	Water resources	Air Quality	Soils and Geology	Biodiversity	Climate Change	Noise	Health and safety aspects	Socio Cultural set up	Total
Resettlement and Relocation of facilities	0	-1	0	-1	0	0	-1	-3	-6/24
Land clearance and Site excavation/preparation	-2	-2	-2	-2	-1	-1	-2	+2	-10/24

Construction materials extraction and acquisition	-1 <sup>s</sup>	-1 <sup>s</sup>	-2 <sup>s</sup>	-2 <sup>s</sup>	-1 <sup>s</sup>	-1 <sup>s</sup>	-1 <sup>s</sup>	+3	-6/24
Construction materials handling and storage	-1 <sup>p,s</sup>	-1 <sup>p</sup>	-2 <sup>p</sup>	-1 <sup>p</sup>	-1 <sup>s</sup>	-1 <sup>p</sup>	-2 <sup>p</sup>	0	-9/24
Water and energy use activities.	-2	0	-1	0	-1	0	-2	-1	-7/24
General construction process	-2	-2	-1	-1	-1	-2	-2	+3	-8/24
Waste handling management	-2	-1	-1	0	-1	0	-1	-1	-7/24
<b>Total</b>									<b>-53/168</b>

## 6.2 Potential Positive impacts

The current state of the road is challenging especially to the road users who commute to work on a daily basis to and from the CBD. The road especially during the rainy season is characterized by road traffic snarl up, on average, a commuter from Kikuyu town will take 30 minutes to get to the CBD on a jam free day but due to the snarl ups, one may take up to 3 hours. This results in fare hikes which triple during the rainy season. Rehabilitation and capacity enhancement of the road comes in handy with many benefits.

The benefits accruing from the road rehabilitation and enhancement are as follows;

### 6.2.1 Improved transport system and accessibility

All road junctions within the project road are the major cause of travel time delays, these are poorly designed and hardly accommodate the huge traffic using the road. Travel time is often delayed especially during the rainy season.

Grade separation will be used at all major intersections whereas a BRT corridor will be provided for future development (i.e. 5 years after opening up of the road) to ensure through traffic moves freely without interference from local traffic, this will reduce travel time, improve comfort and safety and lower costs associated with more investment in the PSV sector.

Traffic congestion will be reduced due to improvement of all junctions and widening of the road. Safety will also be enhanced due to introduction of safer NMT (Non-Motorized Traffic) facilities such as pedestrian crossing points, bus stops, walkways and bicycle tracks.

Security will also be improved due to introduction of highway lighting hence reduction in hijacking/ mugging cases which are currently on the rise.

### **6.2.2 Opening up of Nairobi County for business**

The primary objectives of the road project are providing accessibility and offering mobility of goods and services. The commencement and eventual construction of the project road will make the city centre accessible and the conveyance of goods and services will be enhanced.

Nairobi has high potential for industrialization which can be tapped if the infrastructure is built. Similarly, trade can be enhanced between the region and other counties/countries.

The road also serves as an international route to the Southern Sudan, Uganda, Rwanda, Eastern Congo and Southern Tanzania being a class 'A' road. Thus, it's an important highway in serving the neighboring countries in haulage of raw materials, industrial products and food products.

### **6.2.3 Improved Government Revenue**

With improved road transport system in the area, there will be direct and indirect generation of government revenue during the construction and operational phases of the project.

Acquiring of construction materials and equipment and employment of both skilled and unskilled labor will indirectly improve generation of government revenue due to taxes.

During the operation phase of the project, earlier travel time delays will be converted to economical time.

### **6.2.4 Creation of Employment**

During construction of the road, more jobs will be created; both skilled and unskilled labor.

Priority will be given to the local community during hiring of unskilled labor. There will be improved business activity for local business owners such as the cement manufacturers, sand harvesters, quarry owners and local manufacturing industries of building materials such as cement, paints resulting in more employment opportunities in the respective companies.

Employment opportunities will also emanate from other development sectors that will result from the road incentive. Tourists are envisaged to visit Lake Naivasha, Lake Nakuru to view the flamingos and other tourist destination sites. These areas are presumed to be easily accessible with the new facility.

### **6.2.5 Improved trade and commerce in the area**

With reduced travel time, the selling price of commodities will come down due to lower capital investment in terms of transport costs for goods and services. Traders will access goods more easily and thus improved commerce. People commuting to and from the CBD will settle more in the towns served by this road due to easier access of the CBD hence more investment in real estate.

Direct sale of various commodities to construction workers during the construction period will also boost trade in the area.

### **6.2.6 Improved provision of socio-Cultural services**

Improved infrastructure is often accompanied by changes in social amenities and lifestyle including quality of life. There will be substantial positive impact of the improved road on access to major institutions like schools, health facilities, markets and administrative centers. In addition, the functionality of these institutions will be enhanced.

**Improvement in health:** The health infrastructure is relatively poor in the project area. Transportation services are rare and the medical facilities that have been set up require qualified personnel. The improvement of the road is expected to improve the health situation in the area through the availability of drugs, medical personnel and health infrastructures. Most of the diseases such as Malaria, Diseases of Respiratory Systems, Anaemia and Tuberculosis can be reduced if better medical services are provided. As a result, higher life expectancy can be expected which will benefit the nation by producing healthy citizens ultimately increasing the gross national product.

**Improved Education:** Logistics, infrastructure, personnel and financial resources are the major encumbrances in the enhancement of education in the project area. As a result of the proposed road improvement, trained educational staff and social workers will have an incentive and be willing to relocate to the area; thus, the quality of education will be alleviated. Similarly, the improvement of the road will make transport less costly and more efficient, hence the availability of school materials will be easier and delivery of services will be effective and faster.

### **6.2.7 Reduced road maintenance costs**

Rehabilitation of the road will reduce its rate of wear. This will result in reduced annual road maintenance costs of the actual pavement which can be channeled to rehabilitating other more wanting roads.

### **6.2.8 Reduction in travel time**

Travel time is being estimated to be reduced significantly due to the rehabilitation and capacity enhancement of the road. The alignment offers good geometrics in sight distance and most of the previous conflict areas that were creating traffic snarl ups are to be eliminated. Future introduction of a state of the art Bus Rapid Transit (BRT) system is expected to reduce the travel time from Gitaru to the city centre by more than half the current rate. Provision of room for BRT system coupled with the bypasses already being constructed will mean more traffic will be diverted especially the heavy goods trucks hence reducing the current loading on the road and subsequently reducing the travel times for both goods and people. The reduction in travel times means that commodities will be available in the markets on time and passengers will be able to make trips conveniently.



### 6.2.9 Suggestions on Optimization of the positive impacts

To ensure optimization of these positive impacts, it will be ensured that:

- ❖ All casual laborers, Professionals (Contractors, consultants), material suppliers and hired transporters are sourced from within the country.
- ❖ The Contractor to recruit non-skilled labor from the project area locality as opposed to importing casuals. The locals to be informed through appropriate notices at the local chiefs' offices
- ❖ All construction materials to be procured from local investors.
- ❖ The Government could provide incentives to investors in the area, and promote development of sectors such as agriculture and even tourism in the future.
- ❖ Long range plans for provision of water and electricity, at least within accessible distances to the local people.
- ❖ Engage community in road maintenance activities
- ❖ Sensitize the local community on optimal and wise use of the road to improve social and economic growth

## 6.3 Potential Negative Impacts and Mitigation measures

### 6.3.1 Negative impacts during construction phase

#### 6.3.1.1 Acquisition of additional land for expansion of the road

The proposed rehabilitation will have potential effect of creating environmental and social impacts through acquisition of private land for the road expansion and involuntary displacement of persons carrying out livelihood activities within the highway road reserve.

Resettlement action Plan study was conducted in the month of March through to May to establish the number of PaPs to be affected and interventions to be put in place to ensure full compensation of the the PaPS .

The practical Cut-off Date for implementation of the RAP is deemed to be the date at which the census of affected people and affected assets was completed, that is 15<sup>th</sup> of July 2015. No structure established or crops planted in the Project-Affected Area after 15<sup>th</sup> of July 2015 shall be eligible for compensation.

The objectives and scope of the RAP included the following:

- ❖ Conduct a PaPs census to identify the PAPs by the type of loss and extent of displacement, consult with potential PAPs to ensure free prior and informed consultation on the project and its impacts; categorize entitled persons (EPs) according to the eligibility criteria of the resettlement & rehabilitation (R&R) policy of the project and work out entitlements for each EP; and set out the legal and institutional frameworks for implementation of the RAP as well as budgets and timelines.
- ❖ Valuating affected assets at full replacement value and determining any supplementary payments e.g. unit price lists and itemized breakdowns of compensation offers and participation;
- ❖ Devising grievance referral and redress procedures and mechanisms.

Summary of Key findings of the RAP study:

- ❖ There will be need for extended road reserve hence need for acquisition of privately owned land.
- ❖ The total number of parcels of land to be affected is 530
- ❖ The total number of acres of land to be acquired is 75.2155 acres
- ❖ Total number of vendors carrying out informal businesses is 712
- ❖ The informal businesses that will be affected by the project are largely located between Kangemi and Rironi.
- ❖ There will be 122 structures which will be affected by the road infrastructure, 42 of these are on privately owned land while 80 are constructed on road reserve.
- ❖ The affected informal businesses do not own permanent business premises but rather operate on makeshift stands, wooden stands and kiosks. Only 80 vendors have stationery kiosks for doing business. The rest carry out their businesses on known/booked spaces along the roadside. They carry away their merchandise at the end of each day of trading and return to the same spot each day of doing business.
- ❖ The pools of informal businesses are situated at bus stops targeting local commuters and upcountry passengers.
- ❖ All Stakeholders and PAPs support the proposed project as it will open up the area for more business and improve transportation.
- ❖ The Stakeholders and PAPs are very excited that elaborate consultations are being conducted where they are also given audience to air their views and give suggestions on the way forward.

***Impact A1: Acquisition of privately owned land to pave way for new road reserve***

It was established that private land will be acquired to pave way for the road expansion; a total of 530 parcels of land will be affected. Total area to be acquired is 75.22 acres. The total number of structures to be affected are 42.

The table below summarizes the effect.

**Table 6.3: Summary of privately owned land parcels to be acquired for the road expansion**

S/No.	Location	No of land parcels to be affected	Total area(acres)
1	Muguga/Muguga	82	5.8286
2	Muguga/Gitaru	49	3.509
3	Limuru/Rironi	97	8.1528
4	Limuru/Kamirithu	12	2.1679
5	Area to be confirmed	46	37.9659
6	Dagoretti/Uthiru	79	4.4587
7	Dagoretti/Kinoo	140	6.2643
8	Dagoretti/Kangemi	17	4.3776
9	Reg Section to be confirmed	8	2.4907
<b>TOTAL</b>		<b>530</b>	<b>75.2155</b>

**Impact A2: Displacement of informal businesses along the highway**

From the exercise, it was established that several informal traders (vendors) carrying out their businesses next to the road side/on the road reserve will be affected immensely by the construction activities. They are found in the stretch between Kangemi and Rironi and they largely eke their income from selling of fruits, vegetables, confectionery and soft drinks. Only a few sell accessories, second hand clothes and shoes. Majority of these vendors have temporary wooden stands for their businesses while some place their merchandise on plastic paper or mobile hand carts that are quickly taken away for safe keeping at the end of each day's activities. There are only a few secure kiosks that operate next to the highway.

The traders are located at 19 locations along the project road. There are 712 vendors in the project area, 353 male and 359 female. These vendors have 535 spouses and 1448 children who are dependents. Children are dependants to the adult vendors and are not vendors themselves.

There will be 80 informal traders' structures which will be affected by the road infrastructure.

**Table 6.4: Inventory of businesses to be relocated at various sections of the project road**

S/No.	Location	Type of businesses affected	Total of PaPs
1	Co-operation	Clothing, Motor vehicle garage	8
2	Dagoretti	Charcoal dealer, Furniture, Green grocery and Hardware	6
3	Joash	Others	1
4	Kabete	Clothing, General merchandise, mpesa	3

S/No.	Location	Type of businesses affected	Total of PaPs
5	Kangemi	Airtel dealer, Barber shop, Butchery, Cereal, mpesa shop, Clothing, restaurant, hawking, Electronics, Furniture, Garage, General merchandise, Green grocery, Hardware, kinyozi, electronics, spares, Mobile phones, computers & accessories, Movie studio, Salon/ cosmetic, Welding and workshop	101
6	Kerwa	Agency financial services, Agrovet, Arc and gas welding, Butchery/mpesa, Electrical shop, Food kiosk, General merchandise, General shop, Hardware, Petro station, Posho mill Salon, Timber sales	14
7	Kikuyu	Beauty salon, Car wash, Hardware, Motorcycle spares, Petro station, Restaurant	7
8	Kinoo	Animal feeds, Hardware, Hawking, Housing, property agency, Laundry, Mali Mali, Manufacturing, Medical clinic & lab services, Midland (cafeteria/carwash), Milk bar & eggs, Mineral water distribution Mpesa & general shop, Mpesa/equity agent/ electronic, Phone repair \$accessories, Posho mill, Property management, Pub and Restaurant, Salon, Shoes, Shop & cereals, Supermarket, Timber yard, Unga packaging and Welding, Clothing, Cyber café, Drug store, Dry clean/computer services, Electronics, Food kiosk, Furniture, Gen merchandise, Glass mart, Green grocer, Barbershop, Bank agent	182
9	Kinoo 87	Clothing, Salon, Kinyozi, mpesa, photocopy & equity agent Restaurant and salon	5
10	Kitasuru	Restaurant, Saloon, Auto spares shop, Barber shop, Butchery Clothing, Drug store, Electronics & mpesa, Financial services and Furniture General merchandise, Green grocery, Hardware, Hotel, Posho mill Restaurant, Saloon, Security, Toilet & water kiosk, Video studio Restaurant, Electrical & electronic workshop/kinyozi, Saloon Barber shop, Café, Clothing, Makaa, Mechanic, Stationery and mpesa, Workshop/welding	45
11	Kiuna	Mechanic, Renting kiosk	2
12	Limuru	General merchandise, Holding company, Welding & kinyozi	4
13	Lolesho	Hardware, Hawking, Housing, property agency, Laundry, Mali Mali, Manufacturing, Medical clinic & lab services, Midland (cafeteria/carwash), Milk bar & eggs, Mineral water distribution Mpesa & general shop, Mpesa/equity agent/ electronic, Phone repair \$accessories, Posho mill, Property management, Pub and Restaurant, Salon, Shoes, Shop & cereals, Supermarket, Timber yard, Unga packaging and Welding	36
14	Muthiga	Clothing, Green grocery, Hardware (electricals & mpesa) and Salon	4
15	Ngecha	Butchery, General merchandise, Community water project Cosmetic, printing/photocopy, Drug store, Mpesa, Photo studio Small workshop, Spare shop and Tyre repair	10
16	Risper	Green grocery	1
17	Sigona	Hardware, Hawking, Housing, property agency, Laundry, Mali Mali, Manufacturing, Medical clinic & lab services, Midland (cafeteria/carwash), Milk bar & eggs, Mineral water distribution Mpesa & general shop, Mpesa/equity agent/ electronic, Phone repair \$accessories, Posho mill, Property management, Pub and Restaurant, Salon, Shoes, Shop & cereals, Supermarket, Timber yard, Unga packaging and Welding	67

S/No.	Location	Type of businesses affected	Total of PaPs
18	Uthiru	Tent hire, Coca Cola kiosk Charcoal Key-cutting lock repair Hardware, Hawking, Housing, property agency, Laundry, Mali Mali, Manufacturing, Medical clinic &lab services, Midland (cafeteria/carwash), Milk bar &eggs, Mineral water distribution Mpesa & general shop, Mpesa/equity agent, electronic, Phone repair \$accessories, Posho mill, Property management, Pub and Restaurant, Salon, Shoes, Shop &cereals, Supermarket, Timber yard, Unga packaging and Welding	189
19	Uthiru-junction	General merchandise, Shop, green grocer, cereal, Clothing Barber shop, Mpesa, Equity, KCB agent	27
<b>Total</b>			<b>712</b>

**Table 6.5: Informal Business Structures to be affected by the Road Project**

S/No.	Location	Type of business	Total number of structures
1	Kangemi at the Kangemi bridge	Metal shelter, wooden	3
2	Kerwa	Semi-permanent (Agrovet and electric shop)	2
3	Kikuyu	Iron and Masonry	1
4	Muguga	One of it is petro-station	3
5	Rironi	Mpesa Shop – semi- permanent	1
6	Sigona	Dairy structures	2
7	Uthiru Junction (Uthiru-Naivasha Road Junction)	Temporary Sheds	55
8	Gitaru	Wooden sticks with polythene sheet	9
<b>Total</b>			<b>80</b>

**Mitigation:**

- ❖ A resettlement Action Plan for the proposed project was prepared and is available under a separate volume to act as a planning tool/guide in the compensation/relocation process.
- ❖ Owners of private land to be acquired for the road expansion should be compensated fully for loss of land, any structures to be demolished on the affected land, crops and trees. This should be done at prevailing market value.
- ❖ Vendors with temporary structures will be relocated to a site near where they were carrying out their businesses to maintain their clientele base.
- ❖ Since majority of the the vendors sell perishable foodstuff (fruits and vegetables), they prefer sites with larger populations like bus stops where upcountry passengers and local commuters who form a large client base are found.
- ❖ For vendors with bigger kiosks, an appropriate site will be identified with the help of the local authority and their structures relocated.

- ❖ Timely notice (1 month prior notice) and assistance to relocate/ modalities of conducting resettlement counseling will be put in place.
- ❖ KeNHA should ensure that all affected persons are appropriately assisted to resettle and compensated in a timely manner. The identification and acquisition of space for resettlement should be done with due consideration of the wishes of the affected persons.
- ❖ The road rehabilitation will cause some form of displacement and also loss of some structures like billboards, power lines and trees. It is therefore recommended that KeNHA carries out compensation of any structures that may be demolished during project implementation.
- ❖ RAP applies to all displaced persons regardless of the total number of persons affected, the severity of the impact and whether or not they have legal title to the land.
- ❖ Since the Local Administration indicated that appropriate markets are a short distance away like in Kangemi it is less than 150m away, KeNHA should work together with the Councils to put in place appropriate incentives/mechanisms that can encourage vendors to go back to designated markets. This can be done by having good parking spaces for clients and ensuring that some vendors do not return to the roadside.

#### **6.3.1.2 Site clearance, excavation, materials acquisition/ handling and other construction activities**

##### **Impact B1: Loss of habitat and biodiversity**

Site activities such as clearance of vegetation, earthworks and other activities that involve disturbance of the natural ambience of the land will result in negative effects on flora and fauna.

This will result in irreversible loss of natural habitat for flora and fauna particular to the area. Also dealers of construction materials engaging in illegal sand harvesting, quarrying and tree logging activities contribute to the same. Singly, the effect may appear insignificant but the cumulative effect can cause serious secondary environmental impacts.

The proposed road rehabilitation and capacity enhancement will have negative effects on the composition of natural plant species .Some of them could be unique to the area. Compacting, leveling and site improvement creates new conditions that limit plant regeneration.

##### **Mitigation**

- ❖ Limit land disturbance to areas meant for construction works
- ❖ Identify rare plant species (herbs and trees) on the selected sites and seek expert advice to harvest them during site clearance and transplant them to a nursery to serve as a source of plants for replanting during landscaping

- ❖ Create a landscape schedule to be implemented for planting trees, grass cover on road side and material sites to substitute for lost vegetation
- ❖ Compact and stabilize the soil structure to allow for plant growth

### ***Impact B2: Atmospheric pollution: Dust and Exhaust emissions***

Activities resulting in gaseous emissions from vehicles and machinery operation will result in production of toxic gases such as Sox, NOx, CO, THC, particulate matter, volatile organic compounds, aldehydes, and secondary pollutants etc Smell from solid waste and wastewater produced on site is also likely if waste is not handled satisfactorily.

Dust emanating from site activities such as grinding of material such as ballast, excavation, land clearance, delivery of materials by transport vehicles and generator operation is expected especially during the dry season.

Serious road traffic accidents have been reported to happen in past roads projects due to intrusion of dust to road drivers and thus it calls for a lot of mitigation of this dust by all means possible.

The gaseous emissions and dust will settle on plants clogging their stoma and thus choking them. The plants may eventually die, or have stunted growth.

Inhalation of the dust and gaseous emissions is a health hazard to the people/animals coming into contact with them .This may result in various chest and respiratory tract infections some of which may be fatal if untreated in good time such as bronchitis.

### **Mitigation:**

#### *Dust Emissions*

- ❖ Watering of dusty excavated areas and diversions during the drier seasons to suppress dust .This should be done three to five times a day depending on the prevailing climatic factors
- ❖ Diverting vehicular traffic using the project road away from construction site with appropriate signage to avoid visual intrusion to drivers due to too much dust
- ❖ Limit excavations in extremely dry weather conditions
- ❖ Site enclosure to provide buffer against dust propagation at camp site.
- ❖ Control speed and movements of construction vehicles on site by erecting speed bumps.
- ❖ Stacked building material on-site shall be kept for shortest time possible.
- ❖ Provide all construction workers with protective equipment/wear such as overalls, protective goggles helmets and respirators to prevent them from excessive dust

- ❖ Dust collectors should be considered where plant operations will emit substantial dust such as crushers
- ❖ Creation of awareness on dust impacts on human health to construction workers so that they can take necessary precautions such as wearing protective equipment
- ❖ Carry out construction in the shortest time to minimize prolonged effects

#### *Gaseous /Exhaust emissions*

- ❖ Ensure regular and prompt maintenance of construction machinery and vehicles e.g. reconditioning of engine exhaust systems
- ❖ Vehicle drivers to be controlled to avoid unnecessary racing of vehicle engines at loading/off loading zones

#### **Impact B3: Noise pollution**

Noise from construction activities such as hooting by construction vehicles and communication from workers, delivery of materials by heavy trucks, operation of machinery/equipment including bulldozers, generators, grinders, mixers, compactors, crushers and drills and the general construction process will emanate. It is likely to cause deterioration of the acoustic environment within the project site and the surrounding areas especially at market centers, schools, churches and settlement areas. This will however be very minimal and will be restricted to the construction stage of the project.

#### **Mitigation**

- ❖ Restricting construction hours to daytime only(i.e. 8.00 am to 5.30 pm) especially close to settlement areas, hospitals , worship centers , schools and market centers
- ❖ Sensitizing workers against use of ear/head phones on site to avoid accidents
- ❖ Provide all workers operating high level noise with ear protectors
- ❖ Using machinery /vehicles with tolerable noise levels and that comply with KEBS standards by using mechanical equipment that are properly fitted with noise reduction devices such as silencers and mufflers on exhaust systems
- ❖ Control all project drivers against unnecessary hooting on site

#### **Impact B4: Contamination of water and soil resources**

Site excavation and offloading of construction materials often requires machinery and vehicles. These often result in oil, grease and other hazardous chemical spills and leakages resulting in ground water contamination through leaching of the toxic substances making it unsafe for human and animal consumption .Also, during the rainy season, the chemicals get washed away in storm water runoff to nearby surface waters leading to contamination and subsequent destabilization of aquatic life. Soil is also contaminated i.e. the acidity and hence PH distortion which makes it



unfavorable for any form of plant growth. Solid and waste water if not properly disposed off are also likely to interfere with water resources.

### **Mitigation**

- ❖ Establish inspection plan program and a response procedure for all construction equipment /machinery to entail;
  - ✓ Ensuring up to date construction equipment are hired that comply with KEBS standards to minimize spills.
- ❖ Develop a waste management strategy as detailed under subsection 4.9 and monitor standards of sanitation at construction camp sites
- ❖ Coming up with spill control procedures which will entail;
  - ✓ Provision of special containers to dispose off used oil during refill exercises.
  - ✓ Ensuring that all oils and fuels are stored in closed containers and preferably in concrete floors

### ***Impact B5: Land degradation /Soil Erosion at construction sites***

Construction would necessitate flattening, leveling and compaction to create uniform grounds for construction works. Removal of vegetative cover and the subsequent excavation activities required for infrastructure installation will impact the existing drainage patterns in the area. Loss of topsoil due to soil erosion is a cause for concern which must be addressed prior to the clearing phase. Soil erosion will remain a problem during the clearing and the construction phases of the project. Lack of proper drainage ways could result in localized pooling and flooding, providing ideal conditions for the proliferation of nuisance pests such as mosquitoes. Excessive runoff, especially during heavy rains, could also lead to elevated nutrient loading within the site.

The project will also involve borrow excavations, which can have significant impacts during construction and after exhaustion. These will involve reduction of vegetation cover during construction and defacing of physical landscape while rendering the borrow areas unusable by residents as a result of abandoned overburden and craters created from borrowing activities.

Side drains, especially outfalls/mitre drains and in areas of multiple cross culverts may increase soil erosion on cultivated fields or settlements where the runoff will drain. The concentration of flows at both inlets and outlets of culverts may cause scouring. Increases in flow volume within a narrow channel and enhanced speed may enable the flow to scour and cause soil erosion.

Cut and fill activities are likely to create bare cliffs that are vulnerable to erosion. Clearing of vegetation along the roadside during construction will cause a reduction on the vegetation cover within the Row. The soil is exposed to rain drop impact, which causes soil erosion.

**Mitigation:**

- ❖ Soil conservation structures should be included in the road design in areas prone to erosion such as drainage channels, and areas of poor soil types and eroded areas as a result of current alignment.
- ❖ Set up a land rehabilitation programme for the road reserve to entail;
  - ✓ Reclamation of open pits and depressions from construction activities so that land is restored to its initial state or improved, for example by use of agro forestry and dam construction.
  - ✓ Involve participation of land owners , local community and material site owners soil conservation measures / land rehabilitation and ensure their cooperation
- ❖ Excavation, clearing, blasting and cutting be limited to project area
- ❖ Ensure management of excavation activities especially during rainy conditions and
- ❖ Site excavation to be planned so that a section is completed and rehabilitated before another section begins

**Impact B6: Increased Waste generation**

A lot of waste will be generated during the construction phase due to activities such as earthworks, site activities, used oil from construction equipment and vehicles. If not well managed, the waste generated especially sewage and solid waste may lead to contamination of ground and surface water resources ,aesthetic degradation and contamination of soil resources .This can result in detrimental effects on human health such as contracting of water borne diseases e.g. cholera, amoebae and typhoid.

All construction waste material if not properly disposed off could lead to site accumulation of scrap metal pieces and other construction waste debris resulting in injury to site staff.

**Mitigation**

- ❖ Providing adequate number of sanitary facilities to workers and visitors to the site for their sanitary convenience
- ❖ Set up a waste management procedure to ensure;
  - ✓ Waste is segregated by separating hazardous waste from non-hazardous waste
  - ✓ Suitable disposal bins and skips are provided during the construction phase and positioned strategically within the camp site.
  - ✓ Minimize waste generated by adopting cleaner production methods such as ; source reduction, recycling, reuse, combustion and sanitary land filling
  - ✓ Containers or package for storing hazardous waste including used oil to be securely bundled and labeled as provided for by Regulation 18 under the Environmental Management and Coordination (Waste Management) Regulations, 2006

- ✓ Contracting a licensed waste transporter to collect solid waste from the site for dumping at an approved site, a licensed waste oil recycler for collecting used oil from the site for recycling (if any), a scrap metal dealer with a valid license for appropriate disposal of scrap metals
- ❖ The contractor to adhere to the project's bill of quantities to avoid wastage
- ❖ Monitor effluent quality at camp site to ensure stipulated discharge rules and standards are met.
- ❖ The contractor will prepare a Project Waste Management Plan (PWMP) that will see to it that all waste is disposed off optimally and at NEMA/council designated disposal facilities

### **Impact B7: Potential degradation at Material Borrow Sites**

Extraction of gravel, sand and hard stone for crushing in construction of the project road may cause modest adverse impacts on the environment as follows:

- ❖ Destruction of vegetation cover thus degrading vegetation cover and habitat to animals that may be relying on vegetation,
- ❖ Creation of quarry spoils which erode the aesthetic beauty of local surroundings,
- ❖ Trampling of conserved land along the access roads to material extraction sites,
- ❖ Creation of open craters that pose hazards of accidents to both people and their livestock,
- ❖ Abandoned craters often accumulate water and pose hazards of accidental drowning to people and livestock, spread of waterborne diseases and sometimes attract dangerous wild animals, etc,
- ❖ Water stagnation in craters can also be source of mosquitoes and hence escalation of malaria cases.
- ❖ Routes to which materials borrow sites will be accessed are likely to be increased.
- ❖ Routes to be accessed by heavy trucks transporting materials to site likely to wear off faster leading to deterioration and inconveniences to the road users in the locality
- ❖ Abandoned quarry spoils amount to loss of economically useful land, etc.

### **Mitigation:**

Activities in the materials borrow sites involve actions that lead to degradation of the site that these are located. Six materials borrow sites were identified and will be used for extraction of the required gravel and hard stone. When left unattended, these sites can be a hazard leading to injuries and deaths to people and animals especially young children having swimming escapades in abandoned quarries, accumulated water can also lead to water borne diseases and spread of malaria. As part of the requirements of good practices, the rehabilitation of the borrow sites is therefore a necessity.

The objectives of the materials borrow site rehabilitation plan are:

- ❖ Eliminating unacceptable health hazards and ensuring public safety;
- ❖ Limiting the production and circulation of substances that could damage the receiving environment and, in the long-term, trying to eliminate maintenance and monitoring;

- ❖ Restoring the site to a condition in which it is visually acceptable to the community;
- ❖ Reclaiming the areas where infrastructures are located to the various buildings, and to the other structures; (excluding the accumulation areas) for future use.

In view of the above objectives, the contractor shall be required to follow the following guidelines in developing a rehabilitation plan for the borrow sites.

a. *End use of the borrow site:* In liaison with the affected persons, be they community, an individual or an institution (both GoK or privately ran), and before the project commences, the contractor and the project engineer will seek to have consensus on what the end use of the borrow site will be after the construction has been done. Upon the agreement, the contractor will come up with documented plans which will be agreed with the site owners. The site plan should indicate the location of proposed rehabilitation works and the progress of rehabilitation over time. Topsoil and waste dumps, bunding, final pit faces, benches, areas of landscaping and re-vegetation, roads, drains and dams should be featured. When planning for the intended use of the rehabilitated land, the parties involved shall seek guidelines from NEMA and will take into cognizance the following:

- ❖ Any special circumstances of the land;
- ❖ The surrounding environment;
- ❖ Demand driven alternative land use, e.g.; water pans, fish ponds, etc., that will not conflict with the surrounding environment;
- ❖ Follow the guidelines provided in sections 44 to 47 on hilltops and hillsides;
- ❖ The need to stabilize the land;
- ❖ The desirability or otherwise of returning the land to a state that is as close as reasonably possible to its state before extraction of materials.

b. *Progressive rehabilitation:* Since rehabilitation is not a once off affair, the steps to be undertaken, the ensuing timeframes and responsibilities shall be assigned. The tasks to be undertaken shall be in reference to the proposed site plans. The plan should specify rehabilitation standards or "completion criteria" which will be achieved. These can cover a wide variety of matters, including:

- ❖ native re-vegetation - plant growth, plant density, species diversity
- ❖ productivity of rehabilitated agricultural land
- ❖ Final slopes of pits, waste dumps, dam walls, etc.
- ❖ chemistry and levels of suspended solids of runoff waters

c. *Landscaping and screening:* This should leave the final land form visually compatible with the surrounding natural landscape. Measures should be put in place to ensure that the land is stable and not prone to erosion and provide substrate for re-vegetation. The rehabilitation should be done in a way that will not lead to formation of pools of water and take into consideration evacuation of runoff

water. As well, the gradient of the slopes should not lead to soil erosion. Likewise, the re-vegetation should be compatible with the climatic conditions of the area.

d. *Soil removal*: For re-vegetation to be effective, the topsoil together with leaf and plant litter, should be removed and stockpiled separately from the underlying materials. The rehabilitation plan should indicate the depth and the area of soil to be stripped.

e. *Soil re-spreading*: Re-spreading should be done as soon as possible in order to maximize its fertility, seed viability and microbial activity. Care should be taken not to compact the soil in way that will inhibit later re-vegetation.

*Steps towards re-vegetation*: Once the land has been prepared, the seedbed should be prepared to encourage plant sowing and growth. Best practices should be used when re-vegetating and avoid use of chemicals that would otherwise pollute the environment.

*Roads, tracks and other compacted areas*: Some of the materials borrow sites may be away from the existing road infrastructure, meaning opening new paths to access such sites, hence leading to compaction of the paths along which trucks travel to load the materials. Final rehabilitation of tracks and roads should only be undertaken following agreement with the landowner or land manager, as to whether the road or track will be retained after operations cease. The Rehabilitation Plan should cover progressive rehabilitation, decommissioning and final rehabilitation of those tracks and roads not retained. Other highly compacted areas such as loading areas, car parks and stockpile pads may require special treatment, such as deep ripping or removal of compacted material, prior to re-spreading of topsoil. Such measures should be included in the Rehabilitation Plan.

### ***Impact B8: Increased demand /Strain on existing physical infrastructure and services***

Due to job creation in the area, there will be increased population density which may cause increased demand for the existing infrastructure and community services such as water and energy supply, recreational and other community services such as hospitals causing additional pressure on existing supply network and facilities.

#### **Mitigation**

##### *Increased water demand*

- ❖ Source for alternative and convenient water sources such as drilling boreholes
- ❖ Promote recycling and reuse of water where possible
- ❖ Harvest surface runoff during the rainy season and store into an open reservoir for reuse
- ❖ Sensitize workers at the camp site on economical use of water such as recycling and closing water taps when not in use

##### *Increased energy consumption*

- ❖ Apply to Kenya Power for electricity connection or use alternative sources like generators
- ❖ Come up with energy conservation measures such as use of energy saving fluorescent tubes at all lighting points

*Increased generation of storm water/strained drainage*

- ❖ Design and build suitably sized drainage structures that do not overly constrict water flow.
- ❖ In case of a wetland, ensure adequate size culverts to avoid concentrating flow at few outlets so as to maintain the former hydrological characteristics of a wetland.
- ❖ Frequent scour checks at correct intervals such that the run-off does not scour the land, and to lower the speed of the run-off, decreasing its erosion potential;
- ❖ The use of lined channels in severe incidences
- ❖ Use diversion channels and silt traps to minimize soil erosion materials into water ways

**6.3.1.3 Impacts on Socio-Cultural Set- up*****Impact C1: Gender Imbalance and disability discrimination in employment opportunities***

Due to nature of the work, women are likely to be locked out of employment due to the belief that the role of a woman is in the kitchen. To boost gender equity, it is important that women are considered during recruitment of both skilled and unskilled labor. Disabled persons are also likely to be discriminated against during job recruitment.

**Mitigation**

- ❖ Give equal opportunities for both men and women for skilled and unskilled work.
- ❖ Expose and involve women in construction and maintenance activities in an effort to transfer required skills to them
- ❖ Involve women groups in environmental management of the works such as construction of gabions.
- ❖ Enhance gender sensitivity and reduce gender and disabled persons discrimination in construction activities
- ❖ Give equal employment opportunity to any disabled persons
- ❖ Put up facilities for disabled persons such as special sanitary facilities and ramps on foot bridges for their convenience

***Impact C2: Increased pedestrian and road traffic accidents***

It is anticipated that with improved road condition, vehicles are likely to increase travel speed and there is likely to be more vehicular traffic using this road, this poses great danger to non motorized road users such as pedestrians, cyclists and cart riders especially in settlement areas and market centers. Traffic accidents on this road will also increase commensurate to increased speeds.

## **Mitigation**

- ❖ Factor in non motorized traffic in the design by providing cycling lanes , foot paths , zebra crossings and speed bumps at market centers and areas with learning institutions , provide road furniture warning drivers of children and animals crossing the road, provide sheds at bus termini and at market centers
- ❖ Factor in the safety of motorized traffic in the design by providing visible warning signs/ furniture of such features as sharp bend ahead, black spots , speed limit signs etc
- ❖ Provide service roads in all market centers and short access sections along the corridor
- ❖ Provide access culverts on all minor and road junctions

### **6.3.1.4 Occupational Health and Safety hazards**

It is vital that the contractor puts in place health and safety measures to ensure occupational health and safety, to guard workers against injurious occurrences and spread of diseases such as HIV/AIDS and other STDs.

#### ***Impact D1: Accidents, incidents and dangerous occurrences***

Accidents are a reality of everyday life, during construction of the proposed project, it is expected that construction workers and the public are likely to encounter occupational health and safety risks as a result of coming into contact and handling hazardous waste. Because of the intensive engineering and construction activities including operating heavy and dangerous machinery, metal cutting, concrete work, steel erection, hoisting of construction materials and welding among others, construction workers will be exposed to risks of accidents and injuries. Such injuries can result from accidental falls from high elevations, injuries from hand tools and construction equipment/machinery, cuts from sharp edges of metal sheets and being ran over by construction vehicles and machinery among other unpredictable dangerous occurrences.

## **Mitigation**

The main contractor should take the necessary measures to avoid/minimize the negative health and safety impacts by, among others doing the following:

- ❖ The contractor should maintain a regular inspection schedule to certify and conform to standards set.
- ❖ Fence off the construction camp site
- ❖ All machinery and other moving parts of machinery must be enclosed or guarded to protect injury and operated by qualified personnel.
- ❖ Warning and safety signage indicating that construction is in progress should be clearly shown and fully equipped first aid kits should be provided
- ❖ Use stable ladders and other climbing/support structures and Safe scaffolding material

- ❖ Provision must be put in place for a Health and Safety committee with representatives from workers and employers , the contractor will also designate a qualified safety officer from the committee
- ❖ All workers and visitors to the site to be provided with full protective gear
- ❖ All human traffic to be directed away from the site area to avoid unwarranted accidents
- ❖ All construction materials such as sand, cement, timber and ballast to be stored in designated areas within the site area away from human traffic
- ❖ Suitable solid waste containers shall be provided and construction staff encouraged to use them
- ❖ All workers to be trained on first aid skills in case of emergency response
- ❖ Idling by unauthorized persons within the project site area shall be discouraged through appropriate notices
- ❖ Factories act abstract to be posted at a strategic point on site
- ❖ All the people accessing the site will be informed on the preparedness of unexpected hazards e.g. BE ALERT!!
- ❖ All vehicles delivering materials to site will be controlled to avoid inconveniences to other motorists and pedestrians.

### ***Impact D2: Occupational health Hazards***

The well being of all workers is very important to a smooth running of the construction activities, once in a while construction workers are faced with health complications due to several factors which can lead to absenteeism at work causing delay in project completion. Also, due to movement of workers from different areas, there may be behavioral influences and this may lead to an increase in communicable diseases such as HIV/AIDS.

### **Mitigation**

- ❖ It shall be ensured that the contractor does not expose workers to stress inducing factors.
- ❖ Securing a workmen's compensation cover for all the workers.
- ❖ Local individuals preparing food for the workers at the site should be controlled and monitored to ensure food is hygienically prepared and must have all the necessary Public Health Licenses.
- ❖ All workers should be sensitized on social issues such as drugs, alcohol, rape, corruption, theft, education, politically related violence and diseases such as HIV/AIDS.
- ❖ Provision of Condom dispensers to the construction workers
- ❖ Medical checkup for all workers prior to and throughout the construction phase
- ❖ The contractor should provide a section within the project site with a shade and clean water where food will be served.



- ❖ Provide workers with protective wear to avoid dust related allergies and hearing impairment in workers operation high noise level machinery.

### **Impact D 3: Fire**

Electrical related activities during construction phase such as welding and electric wiring can cause serious fire accidents such as burns and scalds on workers and eventual loss of life and property in severe cases.

#### **Mitigation**

- ❖ Fire extinguishers shall be provided and strategically positioned, regularly maintained and serviced.
- ❖ Training workers on how to handle the fire extinguishers
- ❖ Provide fire hazard signs in danger zones) such as “NO SMOKING SIGNS”.
- ❖ The contractor to Provide contacts of the nearest fire brigade, Ambulance Service Provider and Police Hotline at the site office in case of emergency.

### **Impact D4: Insecurity**

Cases of theft and enhanced social crimes even among the workers will be experienced during the construction phase.

#### **Mitigation**

- ❖ Strict hiring guidelines will be adopted during the hiring of workers to lock out bad elements.
- ❖ Iron sheet fencing shall be provided and a temporary gate installed at the construction camp site
- ❖ Security lighting shall be provided within the project construction camp site for night purpose

### **6.3.1.5 Climate change impacts**

Climate change impacts are often compounded by anthropogenically driven local environmental degradation; these impacts result from cumulative degradation of the environment and may be secondary to the project. It is upon the project implementers to ensure that measures are put in place to reduce impacts of climate change. They include:

- ❖ Increased GHG (Green House Gases) emissions due to continued growth in transport industry
- ❖ Loss of biodiversity
- ❖ Loss of land, crops, coastal structures, ecosystems due to SLR
- ❖ Droughts, reduced river flows and related crop failures and human-wildlife conflicts
- ❖ Spread of diseases such as malaria, cholera
- ❖ Increasing extent of arid and semi-arid land

- ❖ Population displacement and migration from climate related disaster prone areas
- ❖ Disruption/destruction of tourist attractions
- ❖ Destruction of infrastructure by heavy rainfall
- ❖ Potential to substantially increase demand for energy due to combination of urban population growth, changing local weather conditions, urban heat-island impacts and economic growth
- ❖ Increased vulnerability of urban and rural economic assets and, subsequently, the costs of doing business due to increasing frequency and intensity of extreme climatic events and slow-onset
- ❖ Disruption of the ability of individuals and households to sustain livelihoods by destroying livelihood assets or the means of production available to individuals, households or groups
- ❖ Public health: destruction of water and sanitation systems, exposure to heat waves, etc.

**Mitigation:**

- ❖ Increase/restore lost tree cover and grass cover to restore and protect water towers by landscaping the entire road section
- ❖ Development of an extensive mass transit system in the form of bus rapid transit (BRT) corridors which will ensure reduced traffic congestion, improved local air quality and improved road safety.
- ❖ creating climate change training material and programmes for target groups of stakeholders and specific groups, i.e. women, men, children, youth, people with disabilities, religious groups
- ❖ Promotional activities and sponsorship of events with climate change themes within the project setting, e.g. a reward scheme for individuals who plant trees and maintain them.
- ❖ Conservation of water and soil to minimize adverse effects climate change
- ❖ Construction of proper and suitably sized drainage systems to control flooding as a result of increased paved areas

**6.3.2 Negative impacts during operation phase**

**6.3.2.1 Demobilisation of contractor's and RE's Camps**

***Impact E1: Potential for pollution by debris left behind***

During the demobilisation of the contractor's camp, demolitions will be done that will result in a lot of waste debris. If the waste is not disposed off properly, it could lead to environmental pollution.

**Mitigation:**

Disposal of all debris and restoration of site to original conditions.

**Impact E2: Loss of source of livelihood for site staff**

Due to demobilisation of the contractors and REs camps, it is expected that there will be loss of employment for the site staff that include the watchmen, caretakers, secretaries, cooks, etc.

**Mitigation:**

The contractor and the supervising team to re absorb the staff to other projects as required/necessary.

**6.3.2.2 Opening of the road to public use****Impact F1: Immigration of workers**

The project road will attract large number of immigrants to the community which might affect the social and cultural status of the area in terms of use of drugs, illicit brewing, increased or mushrooming of drinking dens and bars, increase in unwanted pregnancies, diseases, molestation of young boys and girls, early marriages, family disputes and conflicts

Incoming immigrants will also take up jobs that would have otherwise been given to the local community members. Increased population shall also exert pressure on existing resources including water, firewood, building materials, food sources among others.

Enhanced social interaction with the construction employees, most of whom are likely to come from other parts of the country, with the residents (considering the influence of money) is a potential avenue for transmission of HIV/AIDS and other social infections.

**Mitigation:**

Immigration of workers should be controlled through employment of locals. Locals capacity building should be conducted to prepare them for challenging assignment. Reduce sizes of labor camp by allowing locals to live at their homes if possible. To reduce vices induced by immigrating laborers, avoid setting up camp sites near trading centers as this normally increases incidence of illicit behavior.

Community members should be encouraged to report any ill vices and eye soaring behaviors to the local cultural or community development officers. Sensitize workers on HIV/AIDS and develop Information Education and Communication (IEC) programmes on the projects social impacts including HIV/AIDS and train community members to conduct awareness and training programmes in the project area with the help of the project team. Programmes should include:

- ❖ Provision of counseling and testing for HIV/AIDS to the locals.
- ❖ Strengthening of advocacy through awareness training in HIV/AIDS and other STDs; including encouraging the use of preventive measures like condoms and
- ❖ Avail condom dispensers to construction staff during routine maintenance periods

***Impact F2: Interference with Traffic Flow during routine maintenance works***

If road maintenance activities are not well planned and organized it will interfere with traffic flow leading to accidents and other negative impacts related to road development considering the high vehicular traffic volume.

**Mitigation:**

- ❖ The contractor to make use of road traffic control signs during the exercise
- ❖ Maintenance works to be limited to off peak hours when traffic flow is not heavy
- ❖ Necessary diversions to be planned in advance for alternative use

***Impact F3: Increased number of RTAs***

If appropriate speed regulating devices and signage are not used along the road, road ethics and adherence not enforced, increased accidents will be witnessed within the area due to increased speed of travel. This could lead to fatalities and injuries to road users.

**Mitigation:**

- ❖ Quality controlling design and construction works
- ❖ Installation and use of relevant road safety signs and construction of road bumps,
- ❖ Initiation of a road safety awareness program.
- ❖ Routine maintenance of the road to ensure the road remains in good condition

***Impact F4: Loss of funds***

In the recent past, there has been an alarming increase in theft of road furniture such as steel guard rails, manhole steel covers, drainage cover slabs, road safety signage etc, this was especially witnessed in the recent past on Mombasa road soon after completion of construction. It has resulted in loss of funds and increase in accidents especially for visiting drivers and users

**Mitigation:**

- ❖ Use alternative materials that will deter theft of signage
- ❖ Give heavy penalty to criminals to reduce theft cases

**6.3.3 Negative impacts during decommissioning phase*****Impact G1: increased waste generation***

Demolition of the project including the road, camps, equipments and fixtures at contractor's yard and related infrastructure will result in large quantities of solid waste. The waste will contain the materials

used in construction including concrete, metal, cement, bitumen, oil, sealants and fasteners. Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment. In addition, even the generally non-toxic chemicals such as chloride, sodium, sulphate and ammonia, which may be released as a result of leaching of demolition waste, are known to lead to degradation of groundwater quality.

Demolition of supply lines will also lead to increased waste water and interference with other community members.

**Mitigation:**

Management of solid waste will be as described under subsection 6.3.1.2 (Impact B6).

***Impact G2: Dust***

Large quantities of dust will be generated during demolition works. This will affect demolition staff as well as the neighboring residents.

**Mitigation:**

High levels of dust concentration resulting from demolition or dismantling works will be minimized as described under subsection 6.3.1.2 (Impact B2).

***Impact G3: Interference with road users***

Decommissioning will interfere with road users and even lead to destruction of natural ecosystem due to diversion and off the road drives.

***Mitigation:***

Appropriate diversions to be created and directional signage used to direct the road users.

***Impact G4: Noise and Vibration***

The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas

***Mitigation:***

Significant impacts on the acoustic environment will be mitigated as described in Section 6.3.1.2(Impact B3).

**Impact G5: Laying off of workers**

Due to closure of site workers will be laid off and there will be loss of source of income and tax revenue for the state. Site support businesses will also suffer losses due to its closure. This will result in higher unemployment rates and increased crime.

**Mitigation:**

- ❖ The Contractor to source for alternative employment for the site staff.
- ❖ Contractor to give employees prior notice on the laying off plan

## **7 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING**

### **7.1 General**

This project is geared towards enhancing social and economic benefits to the people living within the project area, Nairobi region at large and the larger Eastern Africa Community. The project should also observe environmental conservation requirements in accordance to the established laws and regulations. To realize this goal, acceptability by a majority of the stakeholders and minimal effects to the physical environment will require to be integrated in the project cycle through constant consultations, evaluations and review of the design aspects throughout the project coverage.

An Environmental and social management and monitoring plan as part of the recommendation has been devised recommending measures to be put in place for the significant negative impacts on the natural and socio-economic environment including the timeframe, the responsible party for implementing the recommended measures and a performance indicator.

The management plan complements the mitigation measures identified under sub-section 6.3 above. It provides a matrix to link key impacts to actors who will undertake action and monitor the mitigation of impacts identified. Action taken shall restore if not compensate damages and losses in the environment occasioned by the development of the project.

### **7.2 Objectives of the EMP**

The plan provides a middle corridor for the proponent in an effort to restore the loss exerted by the project. The objective of the plan is to:

- a. Provide a development framework for the project.
- b. Guide those involved in project implementation in achieving ;
  - ❖ Sound waste management
  - ❖ Enhanced health and safety of the project stakeholders
  - ❖ Tolerable noise and dust levels
  - ❖ Economic use of the available water ,energy resources and other infrastructure and services
  - ❖ Protection of bio-diversity and their habitat

### 7.3 Scope of the EMP

The scope of this EMP is to give guidelines to all parties involved during construction, maintenance and utilization of the project in fulfillment of environmental and social requirements. The management plan has a long-term objective to ensure that:

- (i) Environmental management conditions and requirements are implemented from the beginning of the project, construction and post-construction period,
- (ii) The social interests of the local community and all stakeholders are considered throughout the project cycle
- (iii) Maximum economic benefits to the immediate communities and the whole country,
- (iv) Precautions against damages to environment, biological diversity and sensitive habitats, and
- (v) Unnecessary delay of the completion date of the contract due to problems associated to delays in compensations and other hindrances arising during the course of construction.

### 7.4 Management Responsibilities

In view of the above objectives and scope, the project management system is expected to commit itself on the following aspects;

- (i) The Contractor will engage an environmentalist/social expert to monitor the implementation of the management plan on a pre-agreed schedule
- (ii) The project implementation shall uphold national policies and legal requirements on environment at all times during the project implementation,
- (iii) Ensure the proposed environmental protection measures in the ESMP and Monitoring plan are integrated in the project implementation plan to the extent possible,
- (iv) Resolve problems and complaints arising from damages and property losses within reasonable timeframes to ensure a smooth flow of construction operations and reduce social conflicts,
- (v) Implement and continuously review this Environment and Social Management and Monitoring Plan for the benefit of acceptability of the project to all stakeholders,

Precautions to ensure that damages to the environment are minimized calls for a concerted effort from the project management, the Contractor(s) and all stakeholders. Upon appointment, the Resident Engineer will be expected to discuss and convey the contents of this management plan, recommended mitigation/interventions outlined under the ESMP and Monitoring plan, instructions from NEMA as well as the wishes of the affected members of community to the Contractor and construction workers for integration in the construction process. The County Environmental Offices



in the affected county will also be involved since they have up-to-date valuable information about the environmental and social trends in the area.

Good relations, between the contractor with the local community and other stakeholders, will need to be established and sustained through timely information on the construction schedules, duration of construction works, potential interference with their daily activities and other issues arising. This will also help in resolving of problems related to construction and prevention of possible social conflicts associated with the project related activities. Communication channels should always be open to ensure proper and prompt responses to any complaints that may arise from the project.

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## **7.5 Environmental Management Guidelines**

On the basis of existing road improvement strategies, it would be necessary to establish appropriate operational guidelines on environmental conservation to enable the management identify critical environmental issues and institute appropriate actions towards minimizing associated impacts. Basically, the guidelines should cover among other areas environmental management programmes, standard operation procedures, compliance monitoring schedule and environmental audit schedules as required by law. The ESMP and Monitoring plan has been developed to provide a basis for an environmental management system (EMS: ISO 14001 principles) for the project. To allow for change in key environmental factors, provisions have been made for dynamism and flexibility of the EMP, hence its subjection to regular regime of periodic review.

This ESMP and Monitoring plan should be availed to the proponent's regional offices for reference during routine maintenance of the project road after rehabilitation;

The proposed ESMP and Monitoring plan is presented in table 7.1 below.

Table 7.1: Environmental and Social Management and Monitoring Plan

S/N	Phase	Project activities	Impacts	Recommendations	Estimated Cost	Responsibility	Time frame and monitorial indicator
1	Preconstruction	Road reserve reclamation	<ul style="list-style-type: none"> <li>Displacement of local business vendors</li> <li>Loss of a source livelihood</li> </ul>	<ul style="list-style-type: none"> <li>A resettlement Action Plan for the proposed project was prepared as a planning/guide tool in the compensation/relocation of all PAPs</li> <li>Owners of private land to be acquired for the road expansion should be compensated fully for loss of land, structures to be demolished on the affected land, crops and trees. This should be done at prevailing market value.</li> <li>Vendors with temporary structures will be relocated to a site near where they were carrying out their businesses to maintain their clientele base.</li> <li>For vendors with bigger kiosks, an appropriate site will be identified with the help of the local authority and their structures relocated.</li> <li>Timely notice (1 month prior notice) and assistance to relocate/ modalities of conducting resettlement counseling will be put in place.</li> <li>Since the Local Administration indicated that appropriate markets are a short distance away like in Kangemi it is less than 150m away, KeNHA should work together with City Council to put in place appropriate incentives/mechanism that can encourage vendors to go back to designated markets. This can be done by having good parking spaces for clients and ensuring that some vendors do not return to the roadside.</li> </ul>	Table 7.2	<p><i>Verification inspections by:</i></p> <ul style="list-style-type: none"> <li>KeNHA Planning Engineer, Sociologist and Environmentalist</li> <li>National Land commission</li> <li>RAP implementation Committee</li> <li>Contractor</li> <li>RE/Site Agent</li> </ul> <p><i>Spontaneous inspection by:</i></p> <ul style="list-style-type: none"> <li>County Environmental Officer /NEMA Officer</li> <li>County Lands Inspectorate Officer</li> </ul>	<p><i>Time frame:</i> Pre-construction phase</p> <p><i>Monitorial Indicators:</i> -Feedbacks /complaints from private land owners and local business vendors</p>
2	Construction	Vegetation clearance, excavations	<ul style="list-style-type: none"> <li>Interference / loss of habitat and biodiversity</li> </ul>	<ul style="list-style-type: none"> <li>Compact and stabilize the soil structure to allow for plant re growth</li> <li>Create a landscape schedule to be implemented for planting trees, grass cover on road side and material sites to substitute for lost vegetation</li> <li>Harvesting of rare plant species on selected sites and transfer to a nursery to serve as a source of plants for replanting during landscaping</li> </ul>		<p><i>Continuous verification and inspections by:</i></p> <ul style="list-style-type: none"> <li>RE/Site Agent</li> <li>Contractor</li> </ul> <p><i>Spontaneous inspection by:</i></p> <ul style="list-style-type: none"> <li>KeNHA- Environmentalist</li> <li>Inspectorate officer ,Ministry of Agriculture</li> <li>County Environment Officer</li> </ul>	<p><i>Time frame:</i> During site preparation</p> <p><i>Monitorial Indicators:</i> - Extent of lost vegetation cover.</p>
3		Excavations , land clearance Materials handling and acquisition	<ul style="list-style-type: none"> <li>Dust and gaseous emissions</li> </ul>	<ul style="list-style-type: none"> <li>Site enclosure to provide buffer against dust propagation at camp site</li> <li>Watering of dusty excavated areas and diversions during the drier seasons to suppress dust .This should be done three to five times a day depending on the prevailing climatic factors</li> <li>Provide all construction workers with protective equipment/wear</li> <li>Erection of speed bumps to limit vehicular speed</li> <li>Use appropriate signage/flaggers to divert vehicular traffic from construction site to avoid visual intrusion to drivers</li> <li>Limit excavation activities in extremely dry weather conditions</li> </ul>		<p><i>Continuous verification and inspections by:</i></p> <ul style="list-style-type: none"> <li>RE/Site Agent</li> <li>Contractor</li> </ul> <p><i>Spontaneous inspection by:</i></p> <ul style="list-style-type: none"> <li>KeNHA- Environmentalist</li> <li>County Environment Officer /NEMA Officer</li> </ul>	<p><i>Time frame:</i> Throughout construction period and decommissioning</p> <p><i>Monitorial Indicators:</i></p> <ul style="list-style-type: none"> <li>Visible constituents of dust</li> <li>Reported Complaints from the locals</li> <li>Increase in incidences of dust related ailments</li> </ul>

Table 7.1: Environmental and Social Management and Monitoring Plan

S/N	Phase	Project activities	Impacts	Recommendations	Estimated Cost	Responsibility	Time frame and monitorial indicator
				<ul style="list-style-type: none"> <li>Educate/create awareness to workers on dust impacts on human health</li> <li>Regular and prompt maintenance of construction machinery/vehicles</li> <li>Control drivers to avoid unnecessary racing of vehicle engines at loading/off-loading zones</li> </ul>			
4		General construction process	<ul style="list-style-type: none"> <li>Noise</li> </ul>	<ul style="list-style-type: none"> <li>Provide ear protectors for all workers undertaking high level noise activities</li> <li>Construction activities to be restricted to daytime (0800-1700hrs) near settlements, learning institutions, hospitals and other social centers</li> <li>Sensitization of workers against the use of head phones on site</li> <li>All machinery to be properly fitted with noise reduction devices</li> <li>Weekly maintenance of construction equipment</li> <li>Control all project drivers against unnecessary hooting on site</li> <li>Using mechanical equipment that are properly fitted with noise reduction devices</li> </ul>		<p><i>Continuous verification and inspections by:</i></p> <ul style="list-style-type: none"> <li>RE/Site Agent</li> <li>Contractor</li> </ul> <p><i>Spontaneous inspection by:</i></p> <ul style="list-style-type: none"> <li>KeNHA- Environmentalist</li> <li>County Environment Officer /NEMA Officer</li> </ul>	<p><i>Time frame:</i> Throughout construction period and decommissioning</p> <p><i>Monitorial Indicators:</i></p> <ul style="list-style-type: none"> <li>Noise levels in dB</li> <li>Reported Complaints from the locals</li> </ul>

Table 7.1: Environmental and Social Management and Monitoring Plan

S/N	Phase	Project activities	Impacts	Recommendations	Estimated Cost	Responsibility	Time frame and monitorial indicator
5		Land clearance, excavations Waste disposal	<ul style="list-style-type: none"> <li>Contamination of soil resources</li> <li>Contamination of water resources</li> <li>Land degradation</li> <li>Soil Erosion</li> </ul>	<ul style="list-style-type: none"> <li>Establish inspection plan program and a response procedure for all construction equipment</li> <li>Come up with spill control procedures</li> <li>Develop a waste management procedure and monitor standards of sanitation at construction camp sites</li> <li>Soil conservation structures to be constructed in areas prone to erosion such as drainage channels, areas of poor soil types and eroded areas</li> <li>Set up land rehabilitation programme for the road reserve and materials borrow sites</li> <li>Excavation, clearing, blasting and cutting to be limited to project area</li> <li>Ensure management of excavation activities especially during the rainy season</li> <li>Site excavation to be planned so that a section is completed and rehabilitated before another section begins</li> </ul>		<p><i>Continuous verification and inspections by:</i></p> <ul style="list-style-type: none"> <li>RE/Site Agent</li> <li>Contractor</li> </ul> <p><i>Spontaneous inspection by:</i></p> <ul style="list-style-type: none"> <li>KeNHA- Environmentalist</li> <li>County Environment Officer /NEMA Officer</li> <li>Inspectorate officer WARMA</li> <li>County Water Officer (MoWI)</li> </ul> <p><i>General Inspection by;</i></p> <ul style="list-style-type: none"> <li>Inspectorate and Enforcement Officers from local authorities (Nairobi&amp;Kiambu)</li> </ul> <ul style="list-style-type: none"> <li>NEMA official from the inspectorate and compliance department. Nairobi&amp;Kiambu</li> </ul>	<p><i>Time frame:</i> Throughout construction period</p> <p><i>Monitorial Indicators:</i></p> <ul style="list-style-type: none"> <li>Soil contaminants in water</li> <li>Amount of soil lost</li> <li>Levels of soil erosion</li> <li>Reported complaints/concerns from locals</li> </ul>
6		Borrow pits and material extraction	<ul style="list-style-type: none"> <li>Damage to landscape</li> <li>Hazardous open pits</li> <li>Caving in of excavations</li> <li>Noise and vibration</li> <li>Dust and air pollution</li> </ul>	<ul style="list-style-type: none"> <li>The contractor will come up with a borrow pits/ quarries rehabilitation plan to ensure: <ul style="list-style-type: none"> <li>End use of the borrow site is established</li> <li>Progressive rehabilitation is achieved</li> <li>The borrow pits are landscaped and re-vegetated</li> <li>Access roads and tracks are rehabilitated</li> </ul> </li> </ul>		<p><i>Continuous verification and inspections by:</i></p> <ul style="list-style-type: none"> <li>RE/Site Agent</li> <li>Contractor</li> </ul> <p><i>Spontaneous inspection by:</i></p> <ul style="list-style-type: none"> <li>KeNHA- Environmentalist</li> <li>County Environment Officer /NEMA Officer</li> <li>Inspectorate Officer-Ministry of Agriculture</li> </ul> <p><i>General Inspection by;</i></p> <ul style="list-style-type: none"> <li>Inspectorate and Enforcement Officers from local authorities (Nairobi&amp;Kiambu)</li> </ul>	<p><i>Time frame:</i> After completion of materials extraction</p> <p><i>Monitorial Indicators:</i></p> <ul style="list-style-type: none"> <li>Levels of soil erosion.</li> <li>Extent of vegetation cover lost</li> <li>Extent of damage to access roads and tracks</li> <li>No. of reported cases of accidental falls in open pits by locals</li> </ul>

Table 7.1: Environmental and Social Management and Monitoring Plan

S/N	Phase	Project activities	Impacts	Recommendations	Estimated Cost	Responsibility	Time frame and monitorial indicator
7		Waste generating activities	<ul style="list-style-type: none"> <li>Increased waste generation</li> </ul>	<ul style="list-style-type: none"> <li>Providing adequate number of sanitary facilities to workers and visitors to the site for their sanitary convenience</li> <li>Set up a waste management procedure</li> <li>The contractor to adhere to the project's bill of quantities (BOQ)</li> <li>Monitor effluent quality at camp site to ensure stipulated discharge rules and standards are met</li> <li>The contractor will prepare a Project Waste Management Plan (PWMP that will see to it that all waste is disposed off optimally and at NEMA/council designated disposal facilities</li> </ul>		<ul style="list-style-type: none"> <li>NEMA official from the inspectorate and compliance department. Nairobi&amp;Kiambu</li> </ul> <p><i>Verification inspections by :</i></p> <ul style="list-style-type: none"> <li>RE/Site Agent</li> <li>Contractor</li> <li>KeNHA- Environmentalist</li> <li>County Environment Officer /NEMA Officer</li> <li>Public Health Officer (PHE)Nairobi &amp;Kiambu</li> </ul>	<p><i>Time frame:</i> During construction and decommissioning</p> <p><i>Monitorial Indicators:</i></p> <ul style="list-style-type: none"> <li>Constituents of generated waste.</li> <li>Public complaints.</li> <li>Odor within camp site</li> </ul>
8		General construction process	<ul style="list-style-type: none"> <li>Increased water demand</li> <li>Increased energy consumption</li> <li>Increased storm water generation</li> </ul>	<ul style="list-style-type: none"> <li>Source for alternative and convenient water source</li> <li>Promote recycling and reuse of water where possible</li> <li>Harvest surface runoff and store into an open reservoir for reuse</li> <li>Sensitize workers on economical use of water</li> <li>-Come up with water and energy conservation measures such awareness posters-Apply to KPLC for electricity connection or use alternative sources like generators</li> <li>Come up with energy conservation awareness measures e.g. use of energy saving fluorescent tubes for lighting</li> <li>Design and build suitably sized drainage structures that do not overly constrict water flow.</li> <li>In case of a wetland, ensure adequate size culverts to avoid concentrating flow at few outlets so as to maintain the former hydrological characteristics of a wetland.</li> <li>Install scour checks and check dams at correct intervals such that the run-off does not scour the land, and to lower the speed of the run-off, decreasing its erosion potential;</li> <li>The use of lined channels in severe incidences</li> <li>Use of diversion channels and silt traps to minimize erosion of soil materials into waterways</li> </ul>		<p><i>Verification inspections by :</i></p> <ul style="list-style-type: none"> <li>RE/Site Agent</li> <li>Contractor</li> <li>KeNHA- Environmentalist</li> <li>County Environment Officer /NEMA Officer</li> </ul> <p><i>Technical Verification by:</i></p> <ul style="list-style-type: none"> <li>Design Engineer</li> <li>Project Engineer (KeNHA)</li> </ul>	<p><i>Time frame:</i> during design and during construction</p> <p><i>Monitorial Indicators:</i></p> <ul style="list-style-type: none"> <li>Complaints from staff</li> <li>Unconstrained surface water during rainy period</li> </ul>
9			<ul style="list-style-type: none"> <li>Interference with socio-cultural set up</li> </ul>	<ul style="list-style-type: none"> <li>Give equal opportunities for both men and women for skilled and unskilled work.</li> <li>Expose and involve women in construction and maintenance activities in an effort to transfer required skills to them</li> <li>Involve women groups in environmental management of the works such as construction of gabions.</li> <li>Enhance gender sensitivity and reduce gender and disabled persons discrimination in construction activities</li> </ul>		<p><i>Continuous verification and inspections by:</i></p> <ul style="list-style-type: none"> <li>RE/Site Agent</li> <li>Contractor</li> </ul> <p><i>Spontaneous inspection by:</i></p> <ul style="list-style-type: none"> <li>KeNHA- Environmentalist</li> <li>County Environment Officer</li> </ul>	<p><i>Time frame:</i> During design and During construction</p> <p><i>Monitorial Indicators:</i></p> <ul style="list-style-type: none"> <li>%of women casuals employed</li> </ul>

Table 7.1: Environmental and Social Management and Monitoring Plan

S/N	Phase	Project activities	Impacts	Recommendations	Estimated Cost	Responsibility	Time frame and monitorial indicator
				<ul style="list-style-type: none"> <li>• Give equal employment opportunity to any disabled persons</li> <li>• Put up facilities for disabled persons such as special sanitary facilities and ramps on footbridges for their convenience</li> <li>• Undertake ground survey and initiate appropriate compensation process</li> <li>• Give enough vacation notice on road reserve to allow for prior relocation plans</li> <li>• Factor in non motorized traffic in the design by providing cycling lanes , foot paths , zebra crossings and speed bumps at market centers and areas with learning institutions</li> <li>• provide road furniture warning drivers of children and animals crossing the road, provide sheds at bus termini and at market centers</li> <li>• Factor in the safety of motorized traffic in the design by providing warning signs furniture of such features as sharp bends ahead, black spots, speed limit signs etc</li> <li>• Provide service roads in all market centers and short access sections along the corridor</li> <li>• Provide access culverts on all minor and road junctions</li> <li>• Engage community in road maintenance activities</li> <li>• Sensitize the local community on optimal and wise use of the road to improve social and economic growth</li> </ul>		<p>/NEMA Officer</p> <p><i>General Inspection by;</i></p> <ul style="list-style-type: none"> <li>• Inspectorate and Enforcement Officers from local authorities (Nairobi &amp;Kiambu)</li> <li>• NEMA official from the inspectorate and compliance department. Nairobi&amp;Kiambu</li> <li>• Gender Representative(Nairobi and Kiambu)</li> </ul> <p><i>Technical inspection by:</i></p> <ul style="list-style-type: none"> <li>• Design Engineers</li> <li>• Project Engineer(KeNHA)</li> </ul>	<ul style="list-style-type: none"> <li>• No. of NMT accidents reported</li> <li>• Reported cases and concerns from the community</li> </ul>
10		Occupational Health and safety hazards	<ul style="list-style-type: none"> <li>• <i>Accidents/incidents and dangerous occurrences</i></li> </ul>	<ul style="list-style-type: none"> <li>• Put in place a Health and Safety committee with representatives from workers and employers , the contractor will also designate a qualified safety officer from the committee</li> <li>• All construction materials such as sand, cement, timber and ballast to be stored in designated areas within the site area away from human traffic</li> <li>• All workers to be trained on first aid skills in case of emergency response and fully equipped first aid kits to be provided</li> <li>• Factor act abstract to be posted at a strategic point on site</li> <li>• All machinery and other moving parts of machinery must be enclosed or guarded to protect injury and operated by qualified personnel.</li> <li>• The contractor should maintain a regular inspection schedule to certify and conform to standards set.</li> <li>• Warning and safety signage indicating that construction is in progress should be clearly shown</li> <li>• All the people accessing the site will be informed on the preparedness of unexpected hazards e.g. BE ALERT!!</li> <li>• All workers and visitors to the site to be provided with full protective gear</li> <li>• All human traffic to be directed away from the site area to avoid unwarranted accidents</li> </ul>		<p><i>Continuous verification and inspections by:</i></p> <ul style="list-style-type: none"> <li>• RE/Site Agent</li> <li>• Contractor</li> <li>• Contractor's Safety Officer</li> </ul> <p><i>Spontaneous inspection by:</i></p> <ul style="list-style-type: none"> <li>• KeNHA- Environmentalist</li> <li>• County Environment Officer /NEMA Officer</li> <li>• Public Health Officer (Nairobi &amp; Kiambu)</li> </ul> <p><i>General Inspection by;</i></p> <ul style="list-style-type: none"> <li>• Inspectorate and Enforcement Officers from local authorities (Nairobi &amp;Kiambu)</li> <li>• NEMA official from the inspectorate and compliance department. Nairobi&amp;Kiambu</li> <li>• OH&amp;S officer, Directorate of Occupational Health, Ministry</li> </ul>	<p><i>Time frame:</i> During construction</p> <p><i>Monitorial Indicators:</i></p> <ul style="list-style-type: none"> <li>• No of accidents reported</li> <li>• Employee complaints</li> </ul>

Table 7.1: Environmental and Social Management and Monitoring Plan

S/N	Phase	Project activities	Impacts	Recommendations	Estimated Cost	Responsibility	Time frame and monitorial indicator
						of labour.	
			<ul style="list-style-type: none"> <li>• <i>Fire</i></li> </ul>	<ul style="list-style-type: none"> <li>• Fire extinguishers shall be provided and strategically positioned, regularly maintained and serviced.</li> <li>• Training workers on how to handle the fire extinguishers</li> <li>• Provide fire hazard signs in danger zones) such as “NO SMOKING SIGNS”.</li> <li>• The contractor to Provide contacts of the nearest fire brigade, Ambulance Service Provider and Police Hotline at the site office in-case of emergency</li> </ul>		<p><i>Continuous verification and inspections by:</i></p> <ul style="list-style-type: none"> <li>• RE/Site Agent</li> <li>• Contractor</li> <li>• Safety Officer</li> </ul> <p><i>Spontaneous inspection by:</i></p> <ul style="list-style-type: none"> <li>• KeNHA- Environmentalist</li> <li>• County Environment Officer /NEMA Officer</li> <li>• Fire safety inspectorate section (Local Authority).</li> </ul> <p><i>General Inspection by;</i></p> <ul style="list-style-type: none"> <li>• Inspectorate and Enforcement Officers from local authorities (Nairobi &amp;Kiambu)</li> <li>• NEMA official from the inspectorate and compliance department. Nairobi&amp;Kiambu</li> </ul>	<p><i>Time frame:</i> During construction</p> <p><i>Monitorial Indicators:</i></p> <ul style="list-style-type: none"> <li>• No of fire accidents reported</li> <li>• Employee complaints</li> </ul>
			<ul style="list-style-type: none"> <li>• <i>Security</i></li> </ul>	<ul style="list-style-type: none"> <li>• Strict hiring guidelines will be adopted during the hiring of workers to lock out bad elements.</li> <li>• Iron sheet fencing shall be provided and a temporary gate installed</li> <li>• Security lighting shall be provided within the project site for night purpose</li> </ul>		<p><i>Continuous verification and inspections by:</i></p> <ul style="list-style-type: none"> <li>• RE/Site Agent</li> <li>• Contractor</li> <li>• Safety Officer</li> </ul> <p><i>Spontaneous inspection by:</i></p> <ul style="list-style-type: none"> <li>• KeNHA- Environmentalist</li> <li>• County Environment Officer /NEMA Officer</li> <li>• OH&amp;S officer, Directorate of Occupational Health, Ministry of labour.</li> </ul>	<p><i>Time frame:</i> During construction</p> <p><i>Monitorial Indicators:</i></p> <ul style="list-style-type: none"> <li>• No of theft cases reported</li> <li>• Community concerns/complaints on crime levels</li> </ul>
			<ul style="list-style-type: none"> <li>• <i>Occupational Health</i></li> </ul>	<ul style="list-style-type: none"> <li>• All workers should be sensitized on social issues such as drugs, alcohol, rape, corruption, theft, education, politically related violence and diseases such as HIV/AIDS.</li> <li>• Medical checkup for all workers prior to and throughout the construction phase</li> <li>• Persons providing food for workers at the site must have all the necessary Public Health Licenses.</li> <li>• Securing a workmen's compensation cover for all the workers.</li> <li>• Local individuals preparing food for the workers at the site</li> </ul>		<p><i>Continuous verification and inspections by:</i></p> <ul style="list-style-type: none"> <li>• RE/Site Agent</li> <li>• Contractor</li> <li>• Safety Officer</li> <li>• HIV/AIDS Community Facilitator</li> </ul> <p><i>Spontaneous inspection by:</i></p>	<p><i>Time frame:</i> During construction</p> <p><i>Monitorial Indicators:</i></p> <ul style="list-style-type: none"> <li>• Level of Absentism from work</li> <li>• Presence of condom dispensers within camp site</li> </ul>

Table 7.1: Environmental and Social Management and Monitoring Plan

S/N	Phase	Project activities	Impacts	Recommendations	Estimated Cost	Responsibility	Time frame and monitorial indicator
				<p>should be controlled and monitored to ensure food is hygienically prepared.</p> <ul style="list-style-type: none"> <li>• Provision of Condom dispensers to the construction workers</li> </ul>		<ul style="list-style-type: none"> <li>• KeNHA- Environmentalist</li> <li>• County Environment Officer /NEMA Officer</li> <li>• Public Health Officer (Nairobi &amp; Kiambu)</li> </ul> <p><i>General Inspection by:</i></p> <ul style="list-style-type: none"> <li>• Inspectorate and Enforcement Officers from local authorities (Nairobi &amp; Kiambu)</li> <li>• NEMA official from the inspectorate and compliance department. Nairobi &amp; Kiambu</li> <li>• OH&amp;S officer, Directorate of Occupational Health, Ministry of labor.</li> </ul>	
11		General construction process	Climate change impacts	<ul style="list-style-type: none"> <li>• Increase/restore lost tree cover and grass cover to restore and protect water towers by landscaping the entire road section</li> <li>• Development of an extensive mass transit system in the form of bus rapid transit (BRT) corridors which will ensure reduced traffic congestion, improved local air quality and improved road safety.</li> <li>• Creating climate change training material and programmes for target groups of stakeholders and specific groups, i.e. women, men, children, youth, people with disabilities, religious groups</li> <li>• Promotional activities and sponsorship of events with climate change themes within the project setting, e.g. a reward scheme for individuals who plant trees and maintain them.</li> <li>• Conservation of water and soil to minimize adverse effects climate changes</li> <li>• Construction of proper drainage systems to control flooding as a result of increased paved areas</li> </ul>		<p><i>Verification inspections by :</i></p> <ul style="list-style-type: none"> <li>• RE/Site Agent</li> <li>• Contractor</li> <li>• KeNHA- Environmentalist</li> <li>• County Environment Officer /NEMA Officer</li> </ul>	<p><i>Time frame:</i> during construction</p> <p><i>Monitorial Indicators:</i></p> <ul style="list-style-type: none"> <li>• Presence of trees and grass cover</li> <li>• Flooding incidences during rainy season</li> </ul>
12	Operation	Immigration	<ul style="list-style-type: none"> <li>• Population increase</li> <li>• Spread of HIV/AIDS and opportunistic infections</li> <li>• Changes in cultural set up</li> <li>• Insecurity</li> </ul>	<ul style="list-style-type: none"> <li>• Report any ill vices and eye soaring behaviors to the local cultural or community development officers.</li> <li>• Sensitize workers on HIV/AIDS and develop Information Education and Communication (IEC) programmes</li> <li>• train community members to conduct awareness and training programmes in the project area</li> <li>• Provision of counseling and testing for HIV/AIDS to incoming construction personnel;</li> <li>• Strengthening of advocacy through awareness training in</li> </ul>		<p><i>Verification inspections by :</i></p> <ul style="list-style-type: none"> <li>• RE/Site Agent</li> <li>• Contractor</li> <li>• KeNHA- Environmentalist</li> <li>• County Environment Officer /NEMA Officer</li> </ul> <p><i>Technical Verification by:</i></p> <ul style="list-style-type: none"> <li>• Design Engineer</li> </ul>	<p><i>Time frame:</i> During operation phase of project</p> <p><i>Monitorial Indicators:</i></p> <ul style="list-style-type: none"> <li>• Increase in population</li> <li>• Rate of new HIV/AIDS infections</li> <li>• Increased in no of social</li> </ul>



Table 7.1: Environmental and Social Management and Monitoring Plan

S/N	Phase	Project activities	Impacts	Recommendations	Estimated Cost	Responsibility	Time frame and monitorial indicator
				HIV/AIDS and other STDs; including encouraging the use of preventive measures like condoms and • Avail condom dispensers to construction staff		• Project Engineer (KeNHA)	crimes in the area
13		Maintenance activities	• Interference with flow of traffic	• The contractor to make use of road traffic control signs during the exercise • Maintenance works to be limited to off peak hours when traffic flow is not heavy • Necessary diversions to be planned in advance for alternative use		<i>General Inspection by:</i> • RE/Site Agent • Contractor • KeNHA- Environmentalist • County Environment Officer /NEMA Officer  <i>Spontaneous inspection by:</i> • Kenya roads Board(KRB) Audit Team	<i>Time frame:</i> During operation phase of project  <i>Monitorial Indicators:</i> • No. of complaints from road users • Accident rates
14		Road use	• Increased RTA accidents • Loss of funds due to theft	• Quality controlling design and construction works • Installation and use of relevant road safety signs, construction of road bumps, • Initiation of a road safety awareness program. • Routine maintenance of the road to ensure the road remains in good condition • Use alternative materials that will deter theft of signage • Give heavy penalty to criminals to reduce theft cases		<i>General Inspection by:</i> • RE/Site Agent • Contractor • KeNHA- Environmentalist • County Environment Officer /NEMA Officer • Traffic police	<i>Time frame:</i> During operation phase of project  <i>Monitorial Indicators:</i> • No. of complaints from road users • Accident rates • No of theft cases of road signs/furniture
15	Decommissioning	Dismantling of structures and fittings	• Dust and vibration • Increased Waste generation • Income loss for site support businesses • Interference with road users	• <i>Dust, Noise and waste to be mitigated as recommended on the measures under construction phase (rows 3,4 &amp; 7 respectively)</i>		<i>General Inspection by:</i> • RE/Site Agent • Contractor • KeNHA- Environmentalist • County Environment Officer /NEMA Officer • Traffic police	<i>Time frame:</i> During Decommissioning of the project  <i>Monitorial Indicators:</i> • Visible constituents of dust • Reported Complaints from the locals • Incidences of dust related ailments • Noise levels in dB Reported Complaints from the locals • Constituents of generated waste. • Public complaints.
16		Laying off workers	• Loss of employment hence loss of income and tax revenue for state	• Contractor to assist in sourcing for alternative source of employment for its employees e.g. reabsorb in other ongoing projects • Employees to be given prior notice on the likely laying off of staff		<i>General Inspection by:</i> • RE/Site Agent • Contractor • KeNHA- Environmentalist • Inspector from the Ministry of labor.	<i>Time frame:</i> During Decommissioning of the project  <i>Monitorial Indicators:</i> • Employee complaints.

## 7.6 EMP and Monitoring Plan Budget

A lump sum item under bill no one of the general BoQ of the project has been set aside for ESMP and Monitoring Plan implementation costs. In addition, bills on safe passage of traffic, road safety and HIV/AIDS awareness campaigns have been provided in the general BoQ under separate bills. A summary of the ESMP and Monitoring Plan associated costs is summarized in table 7.2 below.

**Table 7.2: Summary of ESMP and Monitoring Plan implementation budget**

S/No.	Recommendations	Estimated ESMP implementation Cost (Kshs)	Cost Included in other bills of BoQ (Kshs)
1	Development of a landscaping Schedule and Landscaping of entire road section	28,300,000.00	
2	Dust, gaseous emissions and noise prevention/minimization	7,300,000.00	
3	Provision of Personal Protective Equipment to workers and site visitors	12,500,000.00	
4	Development of a Project Waste management Plan and its implementation	8,640,000.00	
5	Erosion control and soil conservation(during construction)	9,620,000.00	
6	Borrow pits and material sites rehabilitation	6,000,000.00	
7	General education, drug abuse sensitization and awareness campaigns	9,800,000.00	
8	Water conservation measures	2,200,000.00	
9	Setting up a first aid box, provision of fire extinguishers and training of workers on safety issues	3,300,000.00	
10	Site security including security lighting	8,000,000.00	
11	Health and safety measures for workers and general public	6,000,000.00	
12	ESMP and Monitoring Plan implementation audit (inspection, verification, monitoring)	18,000,000.00	
13	Off road environmental mitigation measures		100,000,000.00
14	HIV/AIDS Awareness Campaign		5,000,000.00
15	Safe passage of traffic during construction including maintenance of deviations and detours		409,108,900.00
16	Landscaping and backfilling of used quarries, borrow pits and spoil areas		750,000.00
17	Road furniture		703,753,346.00
18	Land acquisition and compensation for Project Affected Properties		50,000,000.00
19	Road safety awareness campaign		10,000,000.00
20	Construction of erosion control structures(gabions and stone pitching)		86,521,890.00
	<b>TOTAL</b>	<b>119,890,000.00</b>	<b>1,364,384,136.00</b>

## **8 CONCLUSIONS AND RECOMMENDATIONS**

The integration of environmental concerns in the implementation strategy of the project will enhance environmental practices amongst all stakeholders. This will ultimately enhance sustainable development of the project. The proposed project will enhance the socio economic well-being of the local community as well as the whole country.

From an environmental point of view, the design, rehabilitation and operation of the proposed road project will not have considerable levels of negative environmental and socio-economic impacts.

During the construction period, concerns of dust, noise and waste generation from the site and socio-cultural impacts such as spread of HIV/AIDS can easily be mitigated against since they are localized to the site and of very small magnitude.

This report therefore concludes and recommends the following;

1. The proposed project has both potential positive and negative impacts which are manageably mitigatable.
2. The proponent must adhere and implement in full the proposed Environmental and Social Management Plan. Its implementation must be monitored by the representative of the engineer to ensure total compliance.
3. The proponent must observe adherence to the legislations discussed under chapter 2 of this report and in particular Occupational Safety and Health Act-2007, World Bank Policy on Involuntary Resettlement, Water quality regulations and waste management regulations.
4. The proponent must adhere to the conditions that will be attached to the EIA license. The proponent must confirm adherence in writing to the Director General-NEMA.

## REFERENCES

### Laws and Regulations

1. The Environmental Management and Co-Ordination Act, 1999 No 8 of 1999.
2. The Environmental Management and Co-Ordination Act, 1999 No 8 of 1999 Second Schedule (s.58 (1), (4)), No. 1 (major changes in land use and out of keeping with the surroundings) and 4 (water resources and water diversion).
3. Environmental Management and Coordination, (Water Quality) Regulations 2006. Legal Notice No. 120.
4. Environmental Management and Co-ordination (Waste Management) Regulations, 2006. Legal Notice No. 121.
5. Environmental Management and Coordination Act (No 8 of 1999) Environment Impact Assessment Guidelines and Administrative Procedures. November 2002.
6. The various Acts of Parliament and Treaties listed in this report.
7. World Bank Safeguard Policies
8. National Climate Change Action Plan 2013 -2017- GoK- ministry of Environment and Mineral Resources
9. National Climate Change Response Strategy April 2010

### Others

1. Nairobi West District Development Plan -2008-2012
2. Kiambu West District Development Plan – 2008-2012
3. The local community and professional bodies through public participation
4. Kenya: Climate Change Impacts, Vulnerability, Mitigation and Adaptation Strategies- Prof. Daniel O. Olago, Institute for Climate Change & Adaptation (ICCA) and Department of Geology, University of Nairobi, Nairobi.
5. Available project documentation including the preliminary and detailed design and RAP reports of the proposed project

**APPENDICES**

Appendix 1 Design Layouts and Profiles

Appendix 2 : Photo Gallery

Appendix 3 : Summary of Questionnaire respondents' Details

Appendix 4 Sample questionnaire administered during the CPP exercise

Appendix 5 : Summary of Project's Cost Estimates

Appendix 6: List of EIA Team and NEMA Registration Certificates and Practicing Licenses of Lead Expert and WMCL as Firm of Experts

Appendix 7: Minutes of Stakeholder Consultative meetings

## **1. Project Design Layouts and Profiles**

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## 2. Photo Gallery



**ESIA Field Officers engaging members of the public in interviews during the Consultations and Public Participation(CPP) exercise**



**Access to private property lacking access culverts, the home owners cited heavy flooding in their compounds during the rainy season**





One of the few foot bridges on the highway that is rarely used by pedestrians in the locality



Distant view of a pedestrian crossing at New jersey barrier, this endangers the residents' lives on a day to day basis



Conflict between Motorized traffic (MT) and Non Motorized Traffic (NMT) due to lack of NMT facilities such as cycle tracks and pedestrian walkways



Service road at Muguga in a deplorable state



A Section of A104 with new jersey barrier that hinders unrestricted crossing by residents who opt to jump over it as opposed to using the available foot bridge, the residents propose that more crossing points should be established

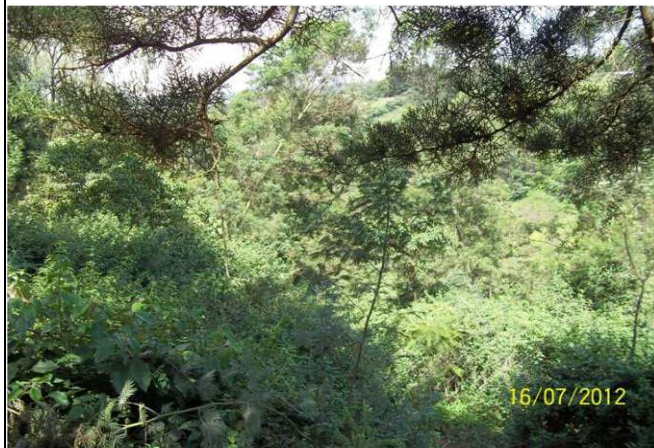




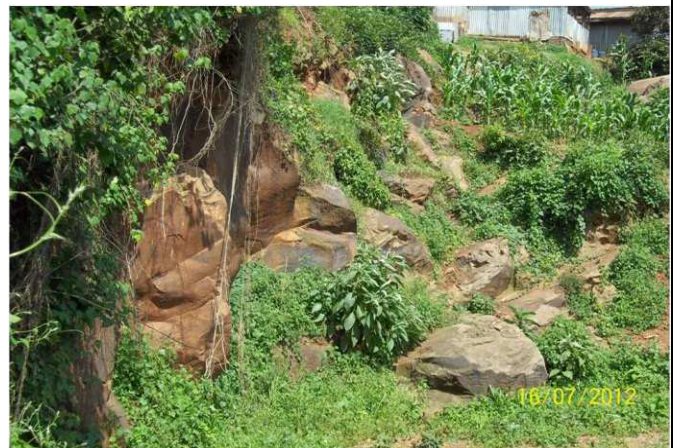
Distant background view of a possible source of construction water impounding a depth of 100m over an area of 2 acres



Access road to Kikuyu Quarry, heavy trucks access the quarry likely to impact negatively on this road if prior improvement measures are not considered



Un exploited Waiyaki quarry located 340m left of Road A104



Kamuguga quarry found to be unsuitable for material extraction due to a settlement as can be seen on the background of the quarry



Consultative meeting with project stakeholders drawn from Kitisuru Location at Kaptagat Social Hall



Consultative meeting with project stakeholders drawn from Muguga location at Kanjeru chief's office-youth empowerment center hall





**Consultative meeting with project stakeholders drawn from Rironi Location at Rironi Market**



**Consultative meeting with project stakeholders drawn from Uthiru Location at St. Stephen ACK Church**



**Consultative meeting with project stakeholders drawn from Uthiru/Ruthimitu Location at Muthua Chief's Camp**



**Consultative meeting with representatives of business traders along the project road held at KEFRI Headquarters**



**Consultative meeting with project stakeholders drawn from Gitaru Location at the Chief's Camp**





**Consultative meeting with project stakeholders drawn from Kerwa Location at the Chief's camp**



**Consultative meeting with project stakeholders drawn from Kangemi Location at Kangemi Social Hall**



**Consultative meeting with project stakeholders drawn from Kikuyu Location at KEFRI Headquarters -Nderi**



**Consultative meeting with project stakeholders drawn from Kinoo Location at the Chief's camp**

### 3. Summary of Questionnaire Respondents' Details

S/ No.	Stakeholder Name	Stakeholder ID No/Phone Number	Stakeholder Category	Occupation	Location
1	Bavesh P. Kotecha	20739971	Local community	Businessman	Kileleshwa
2	Ronald O. Nwlema	11583169	Governmental Organization	Ass. Chief - Kileleshwa	Kileleshwa
3	Evans Atonya Mahonga	0723 903 016	Governmental Organization	Chief-Parklands Location	Kileleshwa
4	Samuel Mbugua	10366687	Local Community	Businessman	Kileleshwa
5	Anthony Ndonga	11449762	Business Community	Manager-Petrol station	Kileleshwa
6	Peter Ombeva	0711 558 830	Local Community	Businessman	Kileleshwa
7	Richard	29216037	Local Community	Student	Kileleshwa
8	Hs no .5-White House	-	Local Community	Manager	Kileleshwa
9	Sri Sathya sai Centre	0718 500 476	Religious Organization	-	Kileleshwa
10	Pamesar	-	Local Community	Retired	Kileleshwa
11	Nicholas Nyabera	13191475	Business Community	Site Engineer	Kileleshwa
12	Joan Odera	0721 547 572	Learning Institution	Principal-Kianda School	Kileleshwa
13	Raphael King'ori	0721 323 589	Governmental Organization	Police Officer	Kileleshwa
14	Flora Mworja	10898106	Governmental Organization	DC-Westlands	Kileleshwa
15	Patrick Gicheru	0722 465 642	Governmental Organization	Director-KARI Kabete	Kileleshwa
16	Andrew Daga	0559780	Learning Institution	D/Principal-Nairobi School	Kileleshwa
17	Engen Waiyaki Way	0718 766 070	Business Community	Supervisor-Engen Waiyaki Way	Kileleshwa
18	Joseph K. Kamau	0721 649 247	Local Community	-	Kangemi
19	Sarah Vuhasio	0721 310 834	Local Community	-	Kangemi
20	AHITI-Kabete	4131096	Learning Institution	-	Kangemi
21	Simon Ndirangu	9127359	Local Community	Businessman	Kangemi
22	Victor Kilonzo	0753 539 343	Local/Business Community	Kinyozi	Kangemi
23	David Karanja Ndun'gu	1861544	Local Community	Businessman	Kangemi
24	Fair Mile School	0721 699 844	Learning Institution/Local Community	Director	Kangemi
25	Simon M. Karanja	0286833	Business Community	Businessman	Kangemi

<b>S/ No.</b>	<b>Stakeholder Name</b>	<b>Stakeholder ID No/Phone Number</b>	<b>Stakeholder Category</b>	<b>Occupation</b>	<b>Location</b>
26	Lucy W. Kinyua	4313095	Local Community	Civil Servant	Kangemi
27	HewtonLt/Francis Gakuru	11182466/420 6000	Local Community/Business Community	Head of Finance&Admin	Kangemi
28	Francis K. Ingara	0722 765 693	Governmental Organization	Head Eng. Dept-Kenya Sugar Board	Kangemi
29	Kabete T. T. Institue	0722 537 791	Governmental Organization/learning institution	Registrar- KTTI	Kangemi
30	Thomas K. Ng'ang'a	7246527	Business Community	Manager	Kangemi
31	Basweti Osiemo Bernard	2904411	Business Community	Salesman	Kangemi
32	Salome Wanja Muratha	0720 763 713	Local Community	Travel Consultant	Kangemi
33	Onesmus Wakaba Mukiri	11143906	Business community	Tour consultant	Uthiru
34	Mary Wanjiku Chege	9873629	Business community	Business lady-real estate	Uthiru
35	Josphine Wairimu Kimiri	-	Local Community	Secretary	Uthiru
36	Shell Station-Uthiru	0721 211 759	Business community	Secretary	Uthiru
37	Morris Kuria Kairu	0722 469 515	Business community	Business Manager	Uthiru
38	Noah Mukiri	0725 161 213	Local Community	-	Uthiru
39	Nancy Mukiri	0722 492 168	Local Community	-	Uthiru
40	Samuel Makumi	11247571	Local Community/ Business community	Businessman	Uthiru
41	Leonard Mukono	27823222	Local Community	Student	Uthiru
42	Christine Njoki	11317251	Local Community	Business lady	Uthiru
43	Joestina Mungai	0719 326 609	Local Community	Farmer	Uthiru
44	Noah Njau	0727 008 721	Local Community	-	Uthiru
45	Salome Wambui	-	Local Community	Farmer	Uthiru
46	Jane W. Muchene	6445499	Local Community	Farmer	Uthiru
47	Wahu Kamunyu	5189796	Local Community	Reverend	Uthiru
48	Daniel C. Bube	3102509	Local Community	Businessman	Uthiru
49	John N. Gitau	0725 518 209	Local Community	Pensioner	Uthiru
50	Jared Mbugua Ragoi	5182130	Local Community	Agr/Eng/Senior Citizen	Uthiru

<b>S/ No.</b>	<b>Stakeholder Name</b>	<b>Stakeholder ID No/Phone Number</b>	<b>Stakeholder Category</b>	<b>Occupation</b>	<b>Location</b>
51	Nathan Kariuki Waweru	3379314	Local Community	Farmer	Kinoo
52	Mr. S.K. Gachene	3102536	Local Community	Self-Employed	Kinoo
53	Josphat M. Mungai	20094790	Local Community/Business Community	-	Kinoo
54	Total petrol station	0723 338 848	Business Community	Businessman	Kinoo
55	Samuel Kihera	0725 719 039	Local Community/Business Community	Businessman	Kinoo
56	Angelina Njenga	0722 711 048	Learning Institution	Principal	Kinoo
57	Faith Kioko	21960814	Local Community	Banker	Kinoo
58	E. K. Karanja	0693602	Local Community	Teacher	Kinoo
59	Esther Ndegwa	0734 286 180	Business Community	Business Lady	Kikuyu
60	Jackson Wanja	23707936	Local Community	Accountant	Kikuyu
61	Irene W. George	0489503	Business Community	Medical Practitioner	Kikuyu
62	Eunic Wambui Munyua	-	Local Community	Farmer	Kikuyu
63	Joyce Kimani	23674432	Local Community	Business Woman	Kikuyu
64	Enock Esipisn	26303871	Business Community	Driver	Kikuyu
65	Hotensia Karungari	25894610	Business Community	Business Woman	Kikuyu
66	Simon Gathu Magiri	21397161	Business Community	Businessman	Kikuyu
67	Peter Mbatia Kariuki	0706 568 189	Business Community	Businessman	Kikuyu
68	Mburu Kamau	1274029	Business Community	Landlord	Kikuyu
69	Mike Macharia	0721 923 625	Local Community	Online Marketer	Kikuyu
70	Elizabeth Muthoni	0707 323 296	Business Community	M-Pesa Attendant	Kikuyu
71	Monica wanjiru M.	22400570	Local Community	Teacher	Muguga
72	John Kinuthia	0722 990 666	Local Community	Farmer	Muguga
73	John N. Makibia	5181956	Local Community	Farmer	Muguga
74	Westgate Shield School	0722 628 880	Learning Institution	-	Muguga
75	Mary Nyakeru	0706 084 740	Local Community	Farmer	Muguga
76	George Kimani	0720 701 384	Local Community	Casual Laborer	Muguga

<b>S/ No.</b>	<b>Stakeholder Name</b>	<b>Stakeholder ID No/Phone Number</b>	<b>Stakeholder Category</b>	<b>Occupation</b>	<b>Location</b>
77	Peter Kariuki	-	Business/Local Community	Motorbike Rider	Muguga
78	Pharm Chemists	32832198	Business Community	Chemist Attendant	Muguga
79	Pauline Nyokabi	21990839	Business Community	Business Woman	Muguga
80	Benson M. Njoroge	0722 413 436	-	-	Muguga
81	Chairman of BodaBoda	0723 256 927	Local Community	Transport	Muguga
82	Mary W. Kinuthia	0727 618 030	Business Community	House Agent	Muguga
83	Job Ngotho	0727 973 749	Local Community	Accountant	Muguga
84	Peter Kung'u Ngaruiya	16006478	Local/Business Community	Teacher/Business Man	Muguga
85	Magdalene W. Mburu	5209723	Local Community	Farmer	Rironi
86	Mercy	0713 678 003	Learning institution	Secretary	Rironi
87	Mago Mere	0721 942 927	Business Community	Businessman	Rironi
88	Esther	22297442	Local Community	Contractor	Rironi
89	Veronica Wanjiru Kamau	0742124	Local Community	Farmer	Rironi
90	Rachel Wambura	0716 776 754	Local Community	-	Rironi
91	Samuel M. Kimuri	1887363	Local Community	Pastor	Rironi
92	John Njung'e Mungai	6243125	Local Community	Businessman	Rironi
93	Carol Mburu	0722 937 944	Local Community	Business lady	Rironi

**4. Sample Questionnaire administered during the CPP Exercise**

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF THE PROPOSED REHABILITATION AND CAPACITY ENHANCEMENT OF ROAD A104 FROM JAMES GICHURU ROAD JUNCTION TO RIRONI (A104/ B3 JUNCTION).**

Pursuant to the provisions of EMCA 1999, the EIA&EA regulations and in pursuance of sustainability and harmony, an Environmental and Social Impact Assessment is being undertaken for the Proposed Rehabilitation and Capacity Enhancement of Road A104 from James Gichuru Road Junction to Rironi (A104/ B3 Junction). This is your opportunity to present your honest views, opinions, concerns and recommendations in regard to the project. You are requested to complete this questionnaire and submit it to Wanjohi Mutonyi Consult Ltd. Please note that your name and information will not be used for any other purpose other than for this particular project.

**Stakeholder’s Details**

1. Name.....2. Date.....  
 3. Occupation/Designation.....4. Residential Location.....  
 5. ID No. /Tel No.....6. Your Signature.....

*Relation to the Project (Tick where appropriate)*

- Local Community.....
- Business Community (Please specify).....
- Governmental Organizations (Please specify).....
- Learning Institutions (Please specify).....
- Private Sector/Non Governmental Organizations (Please specify).....
- Religious Organizations (Please specify).....
- Transporters/ Matatu/ Bus Operators/Owners (Please specify).....
- Other (Please Specify).....

1. Are you aware of this project?       YES       NO
2. Do you support/oppose the proposed project?.....
3. Please indicate how the project will be of benefit to you and its impact on the local community  
 .....  
 .....  
 .....
- For what purpose do you use this road and at what frequency?.....  
 .....  
 .....
4. What current problems/issues with the road are you facing that need to be improved and how have they affected your day to day activities?.....  
 .....  
 .....
5. What positive **ENVIRONMENTAL AND SOCIAL** impacts do you think a new project will bring to the area?.....  
 .....  
 .....



What **NEGATIVE ENVIRONMENTAL AND SOCIAL** impacts do you anticipate and how should these be minimized/mitigated during and after construction of the project?

<b>Impact</b>	<b>Proposed Mitigation (steps to be taken to minimize the impacts)</b>
.....	.....
.....	.....
.....	.....
.....	.....

6. How would you like the **LOCAL COMMUNITY** to be involved in the proposed project?.....  
.....  
.....

What other development initiatives would you like to be included during the construction/improvement of the road?.....  
.....

..

**Thank you**

## 5. Project's summary of cost estimates

BILL NO.	DESCRIPTION	AMOUNT (KSH)
1	PRELIMINARY AND GENERAL ITEMS	1,890,951,169.00
4	SITE CLEARANCE AND TOP SOIL STRIPPING	219,896,630.00
5	EARTHWORKS	1,890,805,504.00
7	EXCAVATION AND FILLING FOR STRUCTURES	86,521,890.00
8	CULVERT AND DRAINAGE WORKS	2,156,293,390.00
9	PASSAGE OF TRAFFIC	409,108,900.00
12	NATURAL GRAVEL MATERIAL	133,950,000.00
13	GRADED CRUSHED STONE	657,885,000.00
14	CEMENT AND LIME TREATED MATERIAL	1,229,809,000.00
15	BITUMINOUS SURFACE TREATMENT AND SURFACE DRESSING	510,362,000.00
16	BITUMINOUS MIXES	3,640,974,000.00
17	CONCRETE WORKS	3,969,353,380.00
20	ROAD FURNITURE	880,808,406.00
21	MISCELLANEOUS BRIDGE WORKS	426,201,482.00
22	DAY WORKS	517,231,500.00
23	CONCRETE PAVING BLOCKS AND CONCRETE PAVEMENT	1,166,848,000.00
24	STREET LIGHTING AND TRAFFIC SIGNALS	389,248,310.00
A	<b>SUB TOTAL A</b>	<b>20,176,248,561.00</b>
B	PROVISIONAL AND PRIME COST SUMS PROVIDED IN THE BILL	1,762,200,000.00
C	SUB TOTAL C( SUB TOTAL A LESS PROVISIONAL & PRIME COST SUMS	18,414,048,561.00
D	ADD 15% OF OF SUB TOTAL C FOR VARIATION OF PRICE	2,762,107,284.15
E	ADD 10% OF OF SUB TOTAL C FOR PHYSICAL CONTINGENCIES	1,841,404,856.10
F	<b>SUB TOTAL F= C+D+E</b>	<b>23,017,560,701.25</b>
	<b>GRAND TOTAL (B+F)</b>	<b>24,779,760,701.25</b>

## 6. List of EIA Team and NEMA Registration Certificates and Practicing Licenses of Lead Expert and WMCL as Firm of Experts

No	Name	Profession	Qualifications	Position
1	Eng. I. G. Wanjohi	Civil/Structural Engineer /Lead EIA/EA Lead Expert	BSC Civil Engineering	Team Leader/Lead EIA Expert
2	E. Kimani	Sociologist	Degree in Sociology and Economics	Sociologist
3	J. Muli	Civil Engineer /Environmental Expert	BSC in Civil Engineering	Assistant Environmentalist
4	B. Masika	Civil Engineer /Environmental Expert	BSC in Civil Engineering	Assistant Environmentalist
5	E. Ireri	Civil Engineer	BSC in Civil Engineering	Assistant Environmentalist

## **7. Minutes of Stakeholder Consultative meetings**

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