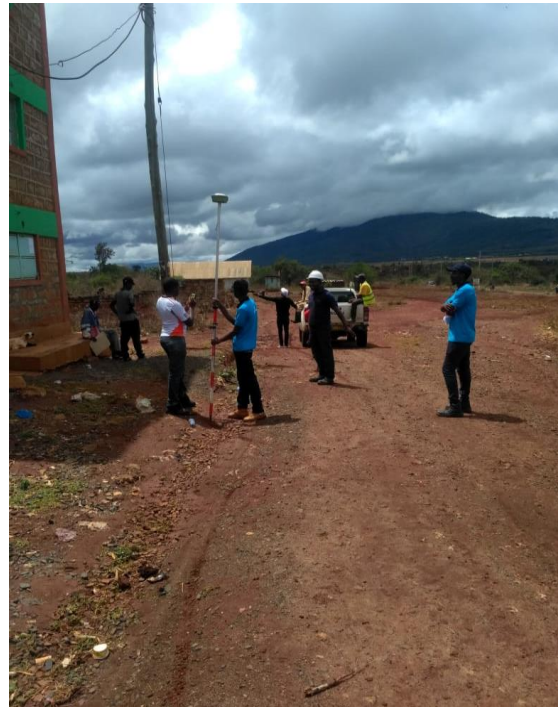


COUNTY GOVERNMENT OF KIAMBU



PROPOSED UPGRADING TO BITUMEN STANDARDS OF KILIMAMBOGO MAKUTANO TOWNSHIP ROADS IN THIKA MUNICIPALITY



<p>Proponent: County Government of Kiambu, P.O. Box 2344- 00900, Kiambu, Kenya</p>	<p>Prepared by: Mary N. Kamau Lead Expert No. 7071</p>
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April, 2020

DECLARATION

This Environmental Impact Assessment project report has been prepared by registered and licensed EIA /EA lead and Associate Experts in accordance with the Environmental Management and Coordination Act (EMCA), 1999 (amended 2015) and the Environmental (Impact Assessment) and Audit regulations 2003 which requires that every development project must have an EIA report prepared for submission to the National Environmental Management Authority (NEMA). We the undersigned, certify that the particulars in this report are correct and righteous to the best of our knowledge.

EIA TEAM

Name	Designation	Reg.No
Mary Kamau	Lead Expert	7071
Date.....		
Signature.....		
Martin Kiambati	Associate Expert	9827

PROPONENT

On Behalf Of **COUNTY GOVERNMENT OF KIAMBU:**

CHIEF OFFICER MUNICIPAL ADMINISTRATION AND URBAN DEVELOPMENT

P.O. BOX 2344- 00900, Kiambu

Name: **John M Mutie**

Authorized Signature.....

Date/ Official stamp:

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LIST OF ACRONYMS/ ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
BoQs	Bills of Quantities
CIDP	County Integrated Development Plan
CoK	Constitution of Kenya
CGK	County Government of Kiambu
EIA	Environmental Impact Assessment
THIWASCO	Thika Water sewerage and Sanitation Company Ltd
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
KUSP	Kenya Urban Support Program
NEMA	National Environment Management Authority
OP	Operational Policy
PSV	Public Service Vehicles
TOR	Terms of Reference
WB	World Bank

EXECUTIVE SUMMARY

A. Introduction:

The County Government of Kiambu has received additional financing from the World Bank for the Kenya Urban Support Program. Part of the funds will be used for Proposed Upgrading To Bitumen Standards Of Kilimambogo Makutano Township Roads In Thika Municipality.

This project report gives the findings of the Environmental Impact Assessment Study undertaken as an integral part of the design process. The Project report highlights environmental issues associated with the design, construction and operational aspects of the proposed project road reconstruction and upgrading whose total length is approximately 1km.

Environmental Impact Assessment (EIA) is a tool which has been incorporated in environmental legislation to ensure that all development activities that have a bearing on the environment have a positive and sustainable interaction with the environment. The main purpose of the EIA is to identify all possible environmental impacts that may be generated by the development and come up with workable methods of addressing those problems. The EIA process is guided by Environmental (Impact Assessment and Audit) Regulations 2002, Kenya gazette supplement No.56, legislative supplement No.31, Legal Notice No.101 of 13/6/2003 made under the Environmental Management and Coordination Act 2015 (EMCA 2015).

B. Scope of the Project Report

The Project Report has been prepared in line with the Environmental Management and Coordination Act (EMCA) of 2015 and its Legal Notice 101 of June 2003. The Study Process leading to this Project Report was further designed to address the proponent's expectations as stipulated in the Terms of References (TORs)

C. Objectives of the Project Report Study

The main objective of the study was to identify environmental and social impacts associated with the proposed Upgrading To Bitumen Standards Of Kilimambogo Makutano Township Roads In Thika Municipality in Thika town and to recommend an appropriate environmental management strategy for the project. Thus, a core outcome of the Study is an Environmental Management Plan (EMP) for the proposed project.

D. Study Approach and Methodology

The Legal Notice 101 of EMCA was adopted. The Notice stipulates the systematic investigative and reporting methodology specified for conduct of Project Report Studies. Discussions with the project proponent and review of project documentation helped in generating the baseline data. Opinions formed were revalidated through field work entailing site investigations and interviews with potentially affected people and secondary stakeholders. A range of study methods and tools were employed. They included checklists, expert opinions and observations were employed. These tools and methods helped in the identification, prediction, analysis and evaluation of potential impacts that may emanate from the project.

E. Policy, Legal and Regulatory Framework

This report was prepared to ensure that the project in Kilimambogo town conforms to the national policy aspirations towards securing sustainable development. Specifically, this Report has been developed to ensure compliance with requirements of the Environmental Management and Coordination Act (EMCA) 1999 (amended 2015) -Kenya's supreme environmental law and the National Constitution. Section 58 of EMCA requires that all development proposed in Kenya to be subjected to environmental assessment to be conducted in line with the Second Schedule (of EMCA) and the Legal Notice 101 (Regulations for Environmental Assessment and Audit) of June 2003. The entire Study process has been designed to conform to the regulatory framework stipulated by the National Environmental Management Authority (NEMA)-the body that will review this report and make decisions on grant of an environmental license to the development.

F. Description of the Project

The County Government of Kiambu (CGK) aims to upgrading to Bitumen Standards Of Kilimambogo Makutano Township Roads In Thika Municipality. The road covers a distance of approximately Km and will include tarmacking of some stretch of the road that is gravel and murrum. The road proposed for upgrade connects kilimambogo and makutano.

G. Justification of the Project

The Road currently has lots of potholes. The road also lacks adequate drainage and requires a complete overhaul. During the rains, the schools, the residential areas and churches along the road become inaccessible due to flooding and hence its improvement will definitely enhance

accessibility. The project itself justifies its need for existence as it will adequately address the concerns related to flooding and accessibility.

H. Public Participation and Consultation

Various meetings were held with the project proponent during which, comments on the content, quality and focus of the environmental reports were made. The proceedings from those discussions are incorporated and form part of this report. Various consultative forums incorporating the proponent, the Kenya Urban Support Program (KSUP) team and senior staff of Kiambu County were held with the aim of agreeing on the modalities that would inform the project design process. On their part, the County Government identified and nominated staff who would provide focal points in respective departments of the County Administration. Key Informant Interviews were also conducted with various key stakeholders. The stakeholders helped in the drafting of the checklists used to predict the impacts for this study. Questionnaires were also used to collect opinions from the residents of Kilimambogo area as well as those neighboring the project site.

I. Project Impacts

Positive Impacts Predicted

Some of the positive impacts anticipated from the proposed project include:

- ❖ Reduction in health hazards associated with dusty road surfaces
- ❖ Creation of employment during the construction process
- ❖ Reduced travel time and ease movement
- ❖ Improve security
- ❖ Most landlords expressed gratitude as the road will bring more people to the area as the estate will now be opened up
- ❖ Improved drainage along the road

Negative Impacts

The study identifies the following negative impacts that are likely to occur because of the project:

- ❖ Emission of dust and air pollution

- ❖ Increased noise and vibration during construction phase
- ❖ Exploitation of water resources
- ❖ Increased storm water/ run off
- ❖ The health and safety of workers and immediate residents and neighbours may be compromised due to accidents, pollution and disturbance
- ❖ Potential traffic accidents
- ❖ Increased waste generation (both solid and liquid) during construction
- ❖ Soil erosion during construction

J. Mitigation Measures

To minimize the occurrence and magnitude of the negative impacts, mitigation measures have been proposed against each of the anticipated impacts. Other measures have been integrated in the project designs with a view to ensuring compliance with applicable environmental laws and guidelines. To ensure project sustainability and environmental enhancement, the study recommends the following mitigation measures to be integrated into the project:

- ❖ Careful siting, planning and design of the development to ensure that it is compatible with the environment e.g. not out of scale
- ❖ Erection of warning / informative signs (bill boards) at the site during the construction phase, and traffic control along the connecting roads
- ❖ Soil compaction and watering of loose soils on all unpaved access sections, to minimize air pollution and erosion by the agents of soil erosion
- ❖ Sensitization of workers on the need to switch off engines whenever possible to reduce noise pollution
- ❖ Ensuring that the machinery is well maintained to inhibit frictional noise
- ❖ To cater for storm water drainage, well-designed concrete inverted channel drains shall be provided to harmonize management of the resulting surface water within the site. The drains will be regularly maintained to unclog them and reduce the chances of flooding
- ❖ Workers shall be provided with full protective gear to beef up their health and safety standards and they should be sensitized on health, safety and environmental conservation aspects

- ❖ During the construction phase, the contractor shall put in place effective and efficient waste disposal systems. Wastes such excavated soil and debris will be recycled or properly disposed of by backfilling or dumping in approved grounds.
- ❖ The contractor shall adapt and implement all the recommendations in the EMP during the project cycle.

K. Environmental Management Plan (EMP)

The study report incorporates an EMP whose main aim is to improve the overall net effect of the project and avoid or minimize the potential negative impacts of the project activities. This Report observes that most of the adverse impacts will manifest at the Construction stage in which case, the core effort in mitigation will be concentrated in the contract for construction. This Report therefore proposes that the EMP be integrated into the Design Report with appropriate allocation of funds in the Bills of Quantities (BQs) to mitigate against adverse environmental impacts. The contract for construction should bear clauses binding the contractor to implement impact mitigation as part of the civil works.

L. Conclusions and Recommendations

The study concludes that the positive impacts outweigh the negative impacts making the project highly positive on environmental considerations. The study established that the proponent had complied with and is within the guidelines of the existing legislative and regulatory requirements in relation to the proposed development. Subsequently, the recommendation is for this project to be granted environmental licensing to pave the way for implementation. The EIA while supporting the approval of the proposed project further recommends for the full implementation of the Environmental Management and impact mitigation plan proposed at the end of the document. The EMP outlines resolutions to guide mitigation of potential negative adverse impacts while enhancing the positive ones.

M. Project Budget and Duration

The proposed road upgrading project will cost approximately **Ksh 85,190,400.00** (*eighty Five Million, one Hundred and ninety Thousand, four Hundred Shillings*) and is expected to be implemented with a period of 12 months from the award of contract.

1.0 INTRODUCTION

1.1 Background and Rationale for the Environmental Impact Assessment

Most urban centers in the country are faced with acute infrastructural challenges either in terms of quality or quantity. The high rates of population growth and urbanization have not matched with increase in infrastructural and utilities provision. Crises have therefore resulted which includes transport and accessibility. The proposed project matches the National

Government's "Big 4 Agenda" which includes infrastructural provision, improvement or upgrade. More recently the development, spurred on by regulators in Kenya and in deed globally, has recognized the need for change in order to safeguard the environment. In relation to this, Environmental concerns have now been integrated in the planning and implementation processes of any proposed project (in Kenya). The key objective is to mitigate conflicts with the environment at the vicinity; during implementation and operational phases.

The proposed project is part of the Municipal Annual Urban Investment Plan under the Kenya Urban Support Program (KUSP) meant to elevate some of the major towns in Kenya to Municipal status. KUSP is intended to improve the services in towns which are critical in spurring economic development including transport systems, storm water management, water supply and sanitation, landscaping and beautification, security and street lighting and solid waste management among others. The project also supports the strengthening of the public sector management and accountability and is part of the ongoing public sector reform agenda towards achievement of the Sustainable Development Goals (SDGs) and Kenya Vision 2030.

Kenya's framework environmental law, entitled The Environmental Management and Coordination Act (EMCA), Cap 387 is a product of a new methodology for the development of environmental law in the history of the country. Views and aspirations of a wide range of stakeholders both at national as well as at local levels were solicited and incorporated in the Act. This is a major shift from the traditional centralized mode of policy formulation that did not involve the public. The Act is thus designed to promote greater public participation in the management of natural resources and the environment in general.

1.2 Objectives of the EIA

The purpose of this EIA process is to identify potentially negative environmental impacts, propose workable mitigation measures and to formulate an Environmental Management Plan (EMP) articulating envisaged impacts. The overall objective of the study on the other hand is to ensure that all environmental concerns are integrated in all the development activities in order to contribute to sustainable development.

Specifically, the Objectives of the EIA are: -

- i) To identify potential environmental impacts and their significance.

- ii) To propose preventive mitigating and compensative measures for the significant negative impacts of the project on the environment.
- iii) To present the results of the EIA in a format that can guide informed decision making.
- iv) Compare available alternatives for a particular project and determine the optimal mix of environmental and economic costs and benefits
- v) To prepare an EMP for the proposed project.
- vi) Involve public, proponents, private and government agencies in assessment and review of a proposed project in an open, transparent and participatory approach

1.3 Environmental Screening

Screening was conducted to determine whether an environmental impact assessment was required and what level of assessment was necessary. This was done in reference to requirements of the EMCA 1999, (amended in 2015), and specifically the second schedule. Issues considered included the physical location, sensitive receptors in close proximity to the site and the nature of anticipated impacts. It was concluded that the proposed project falls within the category of projects under the second schedule of EMCA that requires an EIA to be done before implementation.

1.4 Scope of the EIA Study and the Scoping Process

The Second Schedule of EMCA 1999 (amended in 2015) specifies projects that require to be subjected to EIA studies. In line with this Schedule, the proposed construction of the Road was screened and found to be without any concerns warranting a full cycle EIA. As such, an environmental assessment process culminating in production of a Project Report was adopted.

The EIA was conducted with physical examination, interviews with workers, neighbors, relevant consultants and government agencies. The process included a systematic examination of the proposed activities such as planning, transportation, construction, decommissioning and occupation phases.

During the preparation for this report, the screening procedure, as specified in NEMA's Legal Notice 101 of June 2003 was adopted. This project report, as required therefore incorporates the following:

- i) The nature of the project;

- ii) The Division of the project including the physical area that may be affected by the project's activities;
- iii) The activities that shall be undertaken during the project construction, operation and decommissioning phases;
- iv) The design of the project;
- v) The materials to be used, products, by-products, including waste to be generated by the project and the methods of disposal;
- vi) The potential environmental impacts of the project and the mitigation measures to be taken during and after implementation;
- vii) An action plan for the prevention and management of possible accidents during the project cycle;
- viii) A plan to ensure the health and safety of the workers and neighboring communities;
- ix) The economic and socio-cultural impacts to the local community and the nation in general;
- x) The project budget;
- a) Any other information that NEMA may require

In order to achieve all this, a systematic approach was followed by the consultants who included the general steps outlined below:

- ❖ Environmental screening;
- ❖ Environmental scoping which provided the key environmental issues;
- ❖ Desktop studies;
- ❖ Interviews with the Project Proponent;
- ❖ Physical inspection of the site and surrounding areas;
- ❖ EIA Public participation; and
- ❖ Reporting including the preparation of an Environmental Management Plan.

All these aspects were considered accordingly. This report also seeks to ensure that all the potential environmental impacts are identified and that workable mitigation measures are adopted. The report also seeks to ensure compliance with the provision of the EMCA 1999, (amended in 2015), and Environmental (Impact Assessment and Audit) Regulations 2003 as well as World Bank safeguard policies.

The report lays emphasis on the duties of the proponent and contractor during the installation phase as well as the operation phase of this project.

1.5 Study Approach and Methodology

The study adopted an investigative and reporting methodology for conduct of Project Report Studies (Legal Notice 101 of EMCA).

1.5.1 Data Collection Procedure

The study made use of both primary and secondary data. Primary data was collected through consultation with the proponent, site visits and public consultations. The Study key informant interviews, semi-structured interviews and observations. Secondary data was obtained through literature review and desk study.

Data collection involved a review of available project documents with a view to understanding the scope and focus of the proposed road and market upgrading project. Simultaneously, planning reports, baseline reports and other documents for the Kiambu County were reviewed so as to provide an insight into the socio-environmental baseline of the project area. Observations and preliminary opinions formed from such literature review were re-validated during fieldwork undertaken on the ground.

1.5.2 Data Collection Tools

During the field investigations, a survey was conducted in order to collect information on biophysical and socio-economic environment of the project development site area and its environs. The following steps were involved environment screening; environmental scoping; physical inspection of the site and its environs; Desk stop studies, consultations, questionnaires and public participation and consultation; Reporting.

Public participation was achieved through discussion and interviews with the help of tailor made questionnaires; which were evenly distributed to the area residents and neighbours to fill in their opinions and recommendations. The exercise generated primary data on the socio-economic impacts on the area; anticipated impacts and suitable solutions and recommendations. More details are given elsewhere in the report and as appendices in the annex

1.5.3 Data Analysis and Prediction of Impacts

An analysis on the data collection tools and expert opinions was conducted to predict potential environmental impacts (both positive and negative). The magnitude, significance, and acceptability of predicted impacts were evaluated with a view to determining whether observed adverse impacts are significant enough to warrant mitigation. The stakeholder consultation, predicted impacts, probable mitigation measures and an Environmental Management Plan form part of this report.

1.5.4 Public Consultations

Consultation was also undertaken as part of the EIA in order to obtain the views of members of the immediate community and interested and affected groups within the site's immediate area of influence. The consultation was done with randomly selected people in the neighborhood of the proposed site and involved use of a semi-structured interviews.

1.6 Terms of Reference (TOR)

The EIA study as stipulated under the EMCA was commissioned by the County Government of Kiambu for the upgrade to bituminous standards of Makutano –kilimambogo road and to prepare a study report for further examination by the National Environmental Management Authority (NEMA) and subsequent authorization to implement the proposed project. This EIA considered the following aspects and others that proved of significance during the study.

- ❖ Provision of background and baseline information
- ❖ The effects of the development on biodiversity diversity both within and outside the project development site i.e. effects on flora and fauna, habitat quality and issue of habitat disruption.
- ❖ Surface water run-off, containment and flood control
- ❖ Sustainable use of resources and ecosystem maintenance and enhancement
- ❖ Economic implications of the development, employment and livelihoods
- ❖ Security – threats, risks and enhancement
- ❖ Public health implications
- ❖ Social cohesion, culture, emigration and communication
- ❖ Demand and development of infrastructure and social amenities
- ❖ Assessment of the effects on scenery modification

- ❖ Analysis of the compatibility of the development with the surrounding land uses.
- ❖ Development of an environmental management plan with mechanisms for monitoring and evaluating the compliance and environmental performance.

1.7 EIA Guiding Principles

The guiding principles for Environmental Impact Assessment are:

- a) It requires that all environmental concerns must be accounted for in all development activities;
- b) It also encourages public participation in all stages of proposed project development. It increases the ownership and sustainability;
- c) It also recognizes the role of social and cultural principles traditionally used in the management of the environment and natural resources;
- d) International cooperation in the use and wise management of shared resources;
- e) Intra-generation and inter-generation equality;
- f) Polluter-pays principle; and
- g) The precautionary principle.

1.8 Justification of the Project

The rapid population growth and urbanization has put immense pressure on the road infrastructure in many urban centers and town in Kenya. This is compounded by inadequate resources and poor planning coupled with competing infrastructural needs which in most cases are always prioritized over road infrastructure. The importance of road infrastructure and utilities cannot be overemphasized. Other than improving the quality of life of the people, good roads enhance accessibility and ease connectivity while at the same time improving the ambience and alter the landscape positively.

The Road currently has lots of potholes. The design of the road was not meant to handle the huge amount of traffic going through it. The road also lacks adequate drainage and requires a complete overhaul. During the rains, the schools, hospital, the residential areas and churches along the road become inaccessible due to flooding and hence its improvement will definitely enhance accessibility. The project itself justifies its need for existence as it will adequately address the concerns related to flooding and accessibility.

1.9 EIA Criteria

The Environmental Impact Assessment was carried out in light of the environmental management; statutory and regulatory requirements in Kenya as outlined in section 3 of this report, the Environmental (Impact Assessment and Audit) Regulations 2003 and best practice guidelines on safety and health as per the Occupational Safety and Health Act of 2007.

1.10 Project Cost

The project is estimated to cost approximately Ksh **85,190,400.00**

1.11 Report Outline and Presentation

The culmination of the EIA study was this report, which is designed to ensure that the proposed development complies with the Environmental Management and Coordination Act (EMCA), 1999 (amended in 2015). The report is organized in chapters as outlined below:

Chapter 1: Details the background Information to the Study Describing the Objectives and the Terms of Reference.

Chapter 2: Gives the description of the project

Chapter 3: Gives an outline of the baseline information of the study area

Chapter 4: Gives the Policy, Legal, Regulatory and Institutional Framework

Chapter 5: Outlines the outcome of the public consultation process

Chapter 6: Discusses the potential positive and adverse impacts of the proposed project

Chapter 7: Details the mitigation measures for the potential impacts predicted

Chapter 8: Summarizes the alternatives for the project

Chapter 9: Environmental Management Plan

Chapter 10: Gives a conclusion to the findings and suggests the necessary recommendations

2.0 DESCRIPTION OF THE PROPOSED PROJECT

2.1 Introduction

The project is owned by the County Government of Kiambu (CGK) under the Municipal Board. It is part of the projects within Kiambu County meant to upgrade various towns to Municipal status. The project is funded by the World Bank under KUSP.

2.2 Nature, Design and Description of the Proposed Project

The proposed project involves the upgrading of kilimambogo - makutano road. Like many other similar projects, the proposed project is designed and expected to go through various phases (pre-construction, construction, decommissioning and operation) with various activities being conducted at every phase. The works shall include but not limited to: -

2.2.1 Description of Construction Activities

- ❖ Site clearance and top soil removal.
- ❖ Earthworks including cutting of benches, filling and compaction of the sub grade layer to receive the pavement layers as per the design and specifications.
- ❖ Construction of a 225mm thick layer of natural gravel material as sub base for the carriageway.
- ❖ Construction of a 150mm thick layer of approved hand packed stones as base for the carriageway.
- ❖ Application of a 50mm asphaltic concrete wearing course plus a single seal surface dressing of 6/10mm Chippings on the carriageway.
- ❖ Construction of cross and access pipe culverts, and other drainage works
- ❖ Improvement of junctions
- ❖ Installation of road furniture including road kerbs, traffic island and road marking
- ❖ Works auxiliary to the main works such as beatification and HIV awareness campaign.
- ❖ Maintenance of passage of traffic through and around the works.
- ❖ Maintenance of the works during construction. The defects liability period shall be 24 months.

2.2.2 Specific Project Activities

i) Site Clearance and Earth Works

- ❖ Removal of trees, hedges, bushes and uprooting of tree stumps. Site clearance of all overburden on road shoulders
- ❖ Top soil stripping along shoulders to be widened.
- ❖ Excavation for the road carriageway where widening is necessary
- ❖ Re-use of stored material, for material that cannot be reused to be cut to spoil.
- ❖ Filling in soft material including benching of shoulders and embankments and compaction

ii) Drainage Works

- ❖ Excavation for open & closed drains, backfilling and compaction
- ❖ Construction of 450mm & 600mm, diameter cross and access culverts
- ❖ De-silting and improvement of outfall
- ❖ Stone pitching of the side drains
- ❖ Construction of masonry Scour Checks to side drains

iii) Passage of Traffic

- ❖ Passage of traffic through the works for the duration of the contract

iv) Pavement Works

- ❖ Provision of 225mm thick natural gravel as sub base in two layers
- ❖ Provision of 150mm hand packed stones as base layer (including filling of voids)
- ❖ Priming the hand packed surface with MC 30 bitumen and a tack coat of K1-60
- ❖ Laying of 50mm thick Asphalt Concrete Type I overlay
- ❖ Surface dressing

v) Road Furniture and Ancillary Works

- ❖ Provision and installation of standard and non-standard road signs.
- ❖ Application of road markings as appropriate.

- ❖ Construction of kerbs along the road edge, traffic island, junctions, drainage and non-motorized transport.
- ❖ Improvement of accesses on feeder roads and business premises where applicable.
- ❖ Installation of traffic signs.
- ❖ Installation of guard rails where applicable
- ❖ Installation of marker posts
- ❖ Construction of bumps to control vehicle speed.

vi) Other Works

- ❖ Provision of NMT
- ❖ HIV/AIDS campaign

2.2.3 Project Activities during Project Decommissioning

i) Demolition works

Upon decommissioning (unlikely), the project components including pavements and drainage systems will be demolished. This will produce a lot of solid waste, which will be reused for other construction works or if not reusable, disposed of appropriately by a licensed waste disposal company.

ii) Dismantling of Equipment and Fixtures

All equipment including road surface, electrical installations, furniture partitions, pipe-work and sinks among others will be dismantled and removed from the site on decommissioning of the camp site, the road and other project components. Priority will be given to reuse of these equipment in other projects.

iii) Site restoration

Once all the waste resulting from demolition and dismantling works is removed from the site, the site will be restored through replenishment of the topsoil.

iv) Solid Waste Generation

Large amounts of solid waste will be generated during decommissioning of the project. These will include metal cuttings, rejected materials, surplus materials, surplus spoil, excavated materials, paper bags, empty cartons, empty paint and solvent containers, broken glass among others. The proponent is advised to take steps to minimize the generation of such waste and to ensure proper disposal procedures or recycling/ generated wastes.

v) Aesthetics

The proponent should ensure high hygiene standards within the premises and surrounding areas during construction and during the operation stages of the project. More so via the prescribed EMP, the proponent shall put in place several measures aimed at ensuring high standards of hygiene and housekeeping within the premises and surrounding areas.

2.3 Description of Construction Inputs (Products and by Products)

The proposed road upgrade project will utilize as much as possible materials from within the area and imported. The project inputs will include but not limited to the following:

- ❖ Construction raw materials i.e. sand, cement, stones, crushed rock gravel, murrum, steel metals and metal products, plastic and PVC pipes and materials, timber and timber products, precast and in situ concrete products, iron sheets and iron products, electric cables and conduits, painting materials among others. All these will be obtained from licensed dealers and especially those that have complied with the environmental management guidelines and policies. It is worthwhile noting that most of the construction materials are locally available.
- ❖ Construction machines including machinery such as excavators, graders, mixers, and bulldozers and other tools and equipment. These will be used for the transportation of materials, clearing of the vegetation and debris, and in the construction of the project. Such machinery will use petroleum products to provide energy.
- ❖ A construction labour force of both skilled and non-skilled workers. These will require services such as energy, water supply and sanitation facilities.
- ❖ Large volumes of water for construction purposes. It will be supplied from the area's mains water supply.

- ❖ Power from the mains grid or provided by generator.

2.4 Location of the Project

This E.I.A project report is based on information and consultations with the project proponent, the Architects, Quantity Surveyors, Engineers, valuers and financial analysis's and details contained in the drawings of the proposed project.

The works are located in Thika sub-county. Thika town is an industrial town, lying on A2 road (Garissa road) 40 kilometers North East of Nairobi, near the confluence of Thika and Chania River. The project involves upgrading and improvement to bitumen standards of Kilimambogo – Makutano road.

The GPS coordinates for the road are 37° 04' 20.72"E, 1° 02' 14.84"S and 37° 03' 49.02"E, 1° 02', 21.24"S.

The project road traverses through a relatively flat area serving a wide range of business premises, hospital, churches and other institutions as well as residential houses. The soil type is red coffee soil with some areas historically being marshy.

The project site can be accessed through the A2 (Nairobi – Thika) dual highway. The Thika Municipality is situated in Thika West District, Kiambu County, approximately 45 km North-East of Nairobi. It stretches approximately 24km in an east-west direction and tapers from a width of about 2.5km on western side to 5.0km on the Eastern edge. The total area of the municipality is 93km². The main Nairobi/Nyeri road, which runs in a north-south direction, dissects the Municipality just to the west of the commercial and administrative center of the town.

2.4 Site Ownership, Zoning and Land Use

The proposed project is owned by the County Government of Kiambu under the Department of Roads and is overseen by the Thika Municipal Board Manager. The proposed road reconstruction and upgrading project is located on public land. The area in which the project is sited is a mixed use though the predominant use is residential. The proposed plans fall in line with the CGK zoning regulations and were prepared by the CGK staff under the supervision of the County Roads Engineer.

2.6 Project Budget

The proposed road upgrading project will cost approximately **Ksh 85,190,400.00** (*eighty Five Million, one Hundred and ninety Thousand, four Hundred Shillings*) and is expected to be implemented with a period of 12 months from the award of contract.

3.0 ENVIRONMENTAL BASELINE CONDITIONS

3.1 Overview and Location

The works are located in Thika sub-county. Thika town is an industrial town, lying on A2 road (Garissa road) 40 kilometers North East of Nairobi, near the confluence of Thika and Chania River. The project involves upgrading and improvement to bitumen standards of Kilimambogo – Makutano road. Kilimambogo town is approximately 17kms from thika town.

3.2 Demographics of Thika

The table below shows the demographics for Thika for the 2009 population census and the projections for years 2020 and 2022 respectively by gender.

Table 3.1: Thika Demographics

	2009 Census			2020 Projections			2022 Projections		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Thika	68,408	68,509	136,917	96,927	97,221	194148	101425	102321	203,746

The population density (per square km) for Thika according to the 2009 population census was 760 persons. This is projected to increase to 943 persons in 2020 and further to 997 by 2022.

3.3 Settlement Patterns, Land Tenure and Land Use

Thika Municipality is one of the industrial areas in Kenya, it also supports large and small-scale agriculture. The town is also highly urbanized. Land ownership in the area resides with the State. Under the Government Lands Act, the Commissioner of Lands grants leases of town plots for terms up to 99 years and agricultural land for terms up to 999 years in duration.

3.4 Social Economic Activities in Thika

Approximately 43% of households in Thika District rely on agriculture. The sector employs an estimated 189,072 people directly or indirectly, 70% of them are women. The main cash crops are coffee, tea, pineapples and macadamia nuts; coffee and pineapples are grown on a large-scale for export. Animal husbandry is also practiced. Fish farming is also an important

activity, employing an estimated 67,700 people and producing 65.5 m tonnes of fish per year. The trade and industrial sectors also provide an important source of employment; According to the Kiambu County Development Plan, a total of 31 agro-based industries, 16 chemical and 15 engineering industries are operating, while commercial trading employs roughly 3,000 people.

3.5 Public Social Services

Infrastructure in Thika is relatively fair. Road coverage is considered fairly low, with 1,339 km of classified and 123 km of earth roads for the entire Subcounty. Poor access to road networks in the interior of Thika makes it difficult for farmers to bring products to market, and contributes to higher poverty levels. Others social infrastructure in Thika town include schools, religious places, shopping areas etc.). These are within reasonable reach and are conveniently available for all. Major urban infrastructures (water, electricity, roads, and landline telephony) are available though there is need for improving on them. All emergency facilities (fire brigade, ambulances etc.) are within easy reach from the various providers in the town.

3.6 Sensitive Ecosystems or Places of Cultural Importance

There are no sensitive ecosystems or places of cultural importance within the project site or in the environs.

3.7 Topography and Elevation

The project road traverses through a relatively flat area serving a wide range of business premises churches and other institutions as well as residential houses. The soil type is red coffee soil with some areas historically being marshy

3.8 Climate

The project area experiences moderate tropical climate with sunshine most of the year round and typical average temperatures of 25°C during the day. The area experiences hottest period in January and February leading to the long rains and the coldest is experienced in July. The long rains season lasts from March/September to May/June. The short rains season is from October to November/December. The evaporation/evapo-transpiration is estimated to be

between 1,450 and 2,200mm per annum. The annual mean evaporation is 1,452mm, with a mean monthly maximum of 182mm in March.

3.9 Hydrogeology

The northern and southern boundaries of Thika Municipality are well demarcated by rivers which flow in an easterly direction. The Karimenu- Chania-Thika Rivers form the northern boundary while the Komu Rivers forms the Southern boundary.

Kiambu County is bestowed with both surface and ground water resources and has various rivers that came from Aberdare ranges, which is the major water tower. The County is located in Upper Athi Water Catchment area, which has two main aquifers namely Nairobi Suite and Basement Athi Suite. Basement Athi Suite is the main water aquifer for Thika town and the proposed project area. The main water resource in Thika Town is surface water from various rivers such as Chania, Thika, and Karimenu. These rivers drain into Athi-river which later drains into the Indian Ocean. Thika town also has wetlands including Kiganjo and Theta. Kiganjo wetland is one of the wetlands in the proposed project area. It is worth noting that the location of the proposed project is found in sub-Catchment 3DA (Athi River)

3.10 Geology and Soils

Kiambu County has three broad kinds of soils that are characteristic of the various topographical zones in this County. These soils are High level upland soils and volcanic footbridges soils present in the highland zone and plateau soils in the midland zone. The three types of soils vary in fertility levels with the upland and volcanic soils being fertile and favorable for agriculture including livestock keeping and crop cultivation. Some of the animals reared include cattle, sheep and goats while tea, coffee, horticultural crops, maize, beans, peas, potatoes are some of the crops grown. These soils are found in the highland areas of the County such as Gatundu, Githunguri, Kiambu, and Limuru.

Thika town is characterized by two types of soils namely plateau soils and volcanic footbridges soils. Plateau soils are poor in fertility and are found in the middle and eastern areas of the County, which is relatively semi-arid. The areas with the plateau soils have low rainfall measures and are unfavorable for agricultural development. The soils in the area are either sandy or clay in nature and thus the kinds of crops grown are those that need less water including soya beans and sunflower and pastoralism (including ranching). This type of soil is

also found in areas such as Juja, Ruiru, Kabete, and some parts of Gatundu. Volcanic soils are found in most areas of the County at large. These soils are moderately fertile and include red and dark brown clay soils and suitable for cash and food crops.

3.11 Vegetation

Thika area is predominantly characterized by agricultural land, which is the main livelihood source in the area. The main vegetation thus include cultivated crops such as coffee, cabbages, irish potatoes, trees and shrubs and pineapple plantations owned by Delmonte farm. However, the specific project sites are located in peri-urban areas where the major vegetation is grass, weeds and other short plants.

4.0 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 National Policy Framework

4.1.1 The Constitution of Kenya (2010)

The Constitution of Kenya (CoK) (2010) is the supreme law of the Republic and binds all persons and all State organs at all levels of government. The CoK, 2010 provides the broad framework regulating all existence and development aspects of interest to the people of Kenya, and along which all national and sectoral legislative documents are drawn. There are further provisions on enforcement of environmental rights as well as establishment of legislation relating to the environment in accordance to the guidelines provided in this chapter.

In compliance with the CoK, 2010, every undertaking or project within the country must align with the state's vision for the natural environment as well as adhering to the rights of every individual to a clean and healthy environment.

The proposed project is a key development activity that touches on sensitive components of the physical and natural environment and therefore the need for a clear stipulated environmental management plan (EMP) to mitigate potential adverse effects towards the environment.

4.1.2 The Kenya Vision 2030

Sessional Paper Number 10 of 2012 on Kenya Vision 2030 is the National Policy Economic Blueprint that entrenches Kenya Vision 2030 as the long term development strategy for Kenya towards achieving a “globally competitive and prosperous country with a high quality of life by 2030. Specifically, Vision 2030 aims at transforming Kenya into “a newly industrializing, middle income country providing a high quality of life to all its citizens in a clean and secure environment as anticipated in the Millennium Development Goals and is anchored on 3 pillars1:

- ❖ The Economic Pillar aims to achieve a sustained annual growth rate of 10% to 2030,
- ❖ The Social Pillar seeks to create a just, cohesive and equitable social development, and;

- ❖ The Political Pillar envisions a democratic system that is issue based, people centered, results oriented and is accountable to the public.

The Kenya Vision 2030 is being implemented in five year successive Medium Term Plans (MTP). The first plan covered the period 2008-2012. The Medium Term Plan (MTP 2013-17) is the second in a series of successive 5-year plans. The second MTP 2013-2017 draws on lessons learnt in implementing the first MTP. It seeks to implement the flagship projects identified under Vision 2030 over the five year period together with incomplete flagship and other projects and programs in the previous Medium Term plan. It will also take due cognizance of the devolved structure of government following promulgation of the Constitution of Kenya 2010 and recent discovery of oil and mineral resources.

Relevance

This project touches on the main pillars that form the Kenya Vision 2030 and thus very relevant for this study.

4.1.3 The National Poverty Eradication Plan (NPEP)

The NPEP has the objective of reducing the incidence of poverty in both rural and urban areas by 50 percent by the year 2015; as well as strengthening 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 the Social Development (WSSD) of 1995. The plan focuses on the four WSSD themes of the poverty eradication; reduction of unemployment; social integration of the disadvantaged people and the creation of an enabling economic, political, and cultural environment. This plan is to be implemented by the Poverty Eradication Commission (PEC) formed in collaboration with Government Ministries, community based organizations and private sector.

Relevance

The project aims at creating a conducive economic environment for the residents of kilimambogo town and creates employment either directly or indirectly. This improves the quality of life of the residents and thus relevant or applicable for this study.

4.1.4 The Poverty Reduction Strategy Paper (1999)

This strategy paper was published by the Government in 2001. The two key goals of the strategy is poverty reduction and economic growth. The document outlines the priorities and measure necessary for poverty reduction and economic growth. The objectives of economic growth and poverty reduction are borne out of realization that economic growth is not a sufficient condition to ensure poverty reduction. In this regard, measures geared towards improved economic performance and priority actions that must be implemented to reduce the incidence of poverty among Kenyans have been identified. With respect to the environment the paper proposes that adequate awareness be created among stakeholders regarding environmental costs and benefits. It further calls for community involvement and participation in environmental management and conservation.

Relevance

The project aims at creating a conducive economic environment for the residents of Thika town and creates employment both directly or indirectly and in the process eradicating poverty and improving the quality of life of the residents thus relevant or applicable for this study.

4.2 Legal Framework

4.2.1 Environmental Management and Coordination Act (EMCA) of 2015

This project report will be undertaken in accordance with the Environment (Impact Assessment and Audit) regulation 2003, which operationalize the EMCA, 1999 (amended in 2015). The report is prepared in conformity with the requirements stipulated in the environmental management and coordination act no 8 of 2015 (EMCA) and the Environmental Impact Assessment and audit regulations 2003 regulation⁷ (1) and the second schedule. Part II of the said act states that every person is entitled to a clean and healthy environment and has the duty to safeguard the same. In order to achieve the goal of a clean environment for all, new projects listed under the second schedule of Section 58 of EMCA

No 8 Of 2015 shall undergo an EIA. This includes development activities such as this new project.

EMCA stipulates several regulations for managing the environment which include the following:

a) The Environmental (Impact Assessment and Audit) Regulations, 2003

This is a supplementary legislation to the EMCA. It gives additional “punch” by providing guidelines for conducting Environmental Impact Assessments and Audits. It offers guidance on the fundamental aspects on which emphasis must be laid during field study and outlines the nature and structure of Environmental Impact Assessments and Audit reports. The legislation further explains the legal consequences of partial or non-compliance to the provisions of the Act.

Relevance

Road construction is an activity is listed in the second schedule of EMCA as among projects that require an Environmental Impact Assessments before commencement. Implementation of the project cannot commence before the license is granted, upon conducting the EIA. This report therefore provides the legal requirements for the project approval.

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

Regulations guiding waste management are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69 of September 2006. They offer legal provisions on handling of a variety of wastes emanating from various projects and activities. The waste categories covered by the regulations include:

- ❖ Industrial wastes;
- ❖ Hazardous and toxic wastes;
- ❖ Pesticides and toxic substances;
- ❖ Biomedical wastes; and
- ❖ Radio-active substances.

These Regulations outline requirements for handling, storing, transporting, and treatment /disposal of all waste categories as provided therein.

Relevance

The proposed project may involve use of materials that release hazardous waste during construction including bitumen/ tar, cement, oil spillage from vehicles. It is therefore quite important for the proponent to adhere to the provisions of this regulation.

c) Environmental Management and Coordination (Fossil Fuel Emission Control) Regulations 2006

These regulations are described in Legal Notice No. 131 of the Kenya Gazette Supplement No. 74 of October 2006 and will apply to all internal combustion engine emission standards, emission inspections, the power of emission inspectors, fuel catalysts, licensing to treat fuel, cost of clearing pollution and partnerships to control fossil fuel emissions.

Relevance

The project will involve the use of fossil fuels such as petrol, engine oil and diesel. This will be applicable for the equipment, machinery and trucks used during pre-construction and construction phases of the project.

d) Environmental Management and Coordination (Noise and Excessive Vibration Pollution) Control Regulations, 2009

These Regulations prohibit making or causing any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

Relevance

This regulation prohibits the contractor from producing excessive noise and vibrations which might annoy, disturb, injure or endanger the comfort, repose, health and safety of others and the environment or excessive vibrations which exceed 0.5 centimeters per second beyond any source property boundary or 30 meters from any moving source.

4.2.2 The County Governments Act 2012

The local government act was repealed after the final announcement of all the results of the first elections held under the Constitution as per the County Governments Act of 2012. Under section 134 subsection (1), The Local Government Act is repealed upon the final announcement of all the results of the first elections held under the Constitution. It further

states in section 134, subsection (2) reads “All issues that may arise as a consequence of the repeal under subsection (1) shall be dealt with and discharged by the body responsible for matters relating to transition”.

The project will according to the County Government act of 2012 ensure that the project activities conform to the regulation that shall be passed.(section 135 (1) The Cabinet Secretary may make regulations for the better carrying out of the purposes and provisions of this Act and such Regulations may be made in respect of all county governments and further units of decentralization generally or for any class of county governments and further units of decentralization) comply to the set regulations and by laws.

4.2.3 The Urban Areas and Cities Act 2011

This law passed in 2011 provides legal basis for classification of urban areas (City when the population exceeds 500,000; a municipality when it exceeds 250,000; and a town when it exceeds 10,000) and requires the city and municipality to formulate County Integrated Development Plan (Article 36 of the Act). Under Article 36, the integrated development plan so developed is required to be the central pillar in public administration of the city or municipality this forming the basis for: i) the preparation of environmental management; ii) preparation of valuation rolls for property taxation plans; iii) provision of physical and social infrastructure and transportation; iv) preparation of annual strategic plans for a city or municipality; v) disaster preparedness and response; vi) overall delivery of service including provision of water, electricity, health, telecommunications and solid waste management; and vii) the preparation of a geographic information system for a city or municipality. The strategy plan as stated in 4) above denotes an annual plan to be adopted in the county assembly following the integrated development plan, and the Act requires the board of town committee to formulate the strategy plan soon after the adoption of the integrated development plan (Article 39). The integrated development plan as stipulated in the Act has to reflect;- i) vision for the long term development of the city or urban area; ii) an assessment of the existing level of development; iii) any affirmative action measures to be applied; iv) development priorities and objectives; v) development strategies which shall be aligned with any national or county sectoral plans and planning requirements; vi) a spatial development framework; vii) operational strategies; and viii) applicable disaster management plans; ix) a regulated city and municipal agricultural plan; x) a financial plan; and xi) the key performance indicators and

performance targets (Article 40). The integrated development plan thus formulated has to be submitted to the county executive committee, and the committee has to submit the plan to the county assembly with an opinion within 30 days (Article 41). The Urban Areas and Cities Act is thus a powerful strategic tool designed to inject order into the planning and management of urban areas. The Kiambu CIDP identifies infrastructural / road development and upgrading as a high priority investment towards unlocking the County's economic potential.

Relevance

The projects are geared towards maintaining the Municipal status of the town and therefore the stipulations in the Act are quite important.

4.2.4 The Physical Planning Act (Cap 286)

Cap 286 provides for the preparation and implementation of physical development plans for connected purposes. It establishes the responsibility for the physical planning at various levels of government mainly the District Level. The Act provides for a hierarchy of plans in which guidelines are laid down for the future physical development of areas referred to in the specific plan. The intention is that the three-tier order plans, the national development plan, regional development plan, and the local physical development plan should concentrate on broad policy issues.

Relevance

The Act promotes public participation in the preparation of plans and requires that in preparation of plans proper consideration be given to the potential for economic and social development.

4.2.5 Occupational Health and Safety Act (OSHA), 2007

OSHA provides for the safety, health and welfare of workers and all persons lawfully present at work place, as well as the establishment of the National Council for Occupational Safety and Health and for connected purposes.

Sections 3(1) and (2) of the Act stipulate that it applies in all workplaces where any person is at work, either temporarily or permanently. It expounds on the purpose, which is to secure the safety, health and welfare of persons at work as well as protecting persons other than persons at work against risks resulting from, or connected to, activities at workplace. In addition,

sections 43 and 44 of part V give regulations on registration of work places. Other relevant stipulations in this Act include:

i) Subsection 17 - Drainage of floors.

Where any process is carried on which renders the floor liable to be wet to such an extent that the wet is capable of being removed by drainage, effective means shall be provided and maintained for draining off the wet.

ii) Subsection 18 - Sanitary conveniences.

Sufficient and suitable sanitary conveniences for persons employed in the factory/ work places shall be provided, maintained and kept clean, and effective provision shall be made for lighting the conveniences and where persons of both sexes are, such conveniences shall afford proper separate accommodation for persons of each sex.

iii) Subsection 21 – Prime movers

Every flywheel directly connected to any prime mover and every moving part of any prime mover, shall be securely fenced, whether the flywheel or prime mover is to be situated in an engine –house or not. Head and tailrace of every water wheel and of every water turbine shall be securely fenced. Every part of electric generators, motors and rotary converters and every flywheel directly connected thereto shall be securely fenced unless it is in such a position or of such construction as to be safe to every person employed or working in the premises as it would be if securely fenced.

iv) Subsection 22 -Transmission Machinery

This sub-section requires that; (1) Every part of transmission machinery shall be securely fenced unless it is in such a position or of such construction as to be safe to every person employed or working in the premises, as it would be if securely fenced. Efficient devices or appliances shall be provided and maintained in every room or place where work is carried on by which the power can promptly be cut-off from transmission machinery in that room or place. (3) Every machine intended to be driven by mechanical power shall be provided with an efficient starting and stopping appliance, the control of which shall be in such a position as to be readily and conveniently operated by the person operating the machine.

v) Subsection 25 - Construction and maintenance of fencing

All fencing or other safeguards provided in pursuance of the a foregoing provisions shall be of substantial construction, constantly maintained, and kept in position while the parts required to be fenced or safe guarded are in motion or in use except when any such parts are necessarily exposed for examination and for any lubrication or adjustments shown by such examination to be immediately necessary.

vi) Subsection 13 – Cleanliness

Every factory/work place shall be kept in a clean state and free from effluent arising from any drain, sanitary convenience or nuisance.

vii) Subsection 14 – Overcrowding

A factory/ work place shall not while work is carried on be so overcrowded as to cause risk of injury to the health of the persons employed therein. Standard cubic space allowed for every person in a workroom should not be less than three hundred and fifty cubic feet.

viii) Section 51 Air pollution

Preventive measures shall be put in place during operation of the project to prevent fumes and exhaust gases from entering into the atmosphere.

Relevance

The project will require a significant amount of manpower during construction resulting in quite a number of people being employed either permanently or as casual workers. The security and the welfare of the workers on site and other people near the project site from related risks is thus of essence and will be protected under this Act.

4.2.6 Sessional paper No. 6 (1999)

Policy guidelines on environment and development – the key policy objectives of this paper includes:

- a) Ensuring that all development projects at the inception stage and programs, as well as policies consider environmental considerations.
- b) Ensuring that an EIA report is prepared for any undertaking or development project before implementation.
- c) Coming up with effluent treatment standards that will conform with acceptable health guidelines.

4.2.7 The Factory and Other Places of Work (Medical Examination) Rules, 2005

This supplementary legislation covers workers who are exposed to specific occupational hazards for the purpose of preventing or controlling occurrence of occupational diseases. In the first schedule of the legislation, works involving risks to healthcare are listed and recommended examinations and their respective intervals are indicated for adherence by employers or company directors. Sample requisite certifications are also provided for employers.

4.2.8 The Factory and Other Places of Work (Noise Prevention and Control) Rules, 2005

Sections 1-4 of the legislation detail the permissible levels of noise in a workplace. Sections 5 and 6 elaborate on the recommended noise prevention program as well as measurement and records to be undertaken by the contracted company during construction and even operational phases of the project.

4.2.9 Public Health Act Cap 242

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 that local authorities take all lawful necessary and reasonable practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to injuries or dangerous to human health. This will have to be provided for this project.

Relevance

During road construction, there are usually issues ranging from sanitation, housing, disease outbreaks and resource sharing. This Act provides the necessary legal guidelines and regulatory measures aimed at effectively controlling and managing these issues.

4.2.10 The Kenya Roads Board Act, 1999

This is the one of the legal instruments used in the governance and management of the road network in the country.

Relevance

This Act is important as it offers a platform for consultation and cooperation with the roads authorities.

4.2.11 Land Planning Act Cap 303

Sub Section 9 of the subsidiary legislation (the development and use of land Regulations 1961) under which it requires that before the local authority submits any plans to the minister for approval, steps should be taken as may be necessary to acquire the owners of any land affected by such plans.

Relevance

Particulars of comments and objections made by the landowners should be submitted, which intends to reduce conflict of interest with other socio economic activities. This Act provides the requisite redress mechanisms.

4.2.12 The 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 vapour is emitted there from. Pollution of the atmosphere occurs on the highway either by use of adulterated petroleum products or non-road-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.

Relevance

The road upgrading project is meant for traffic use. All the stipulations regarding motor vehicle traffic have therefore to be put into consideration.

4.2.13 The Lands Act No. 6 of 2012

The Land Act was enacted by Parliament to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land based resources, and for connected purposes. The Act applies

to all land declared as (a) public land under Article 62 of the Constitution; (b) private land under Article 64 of the Constitution; and (c) community land under Article 63 of the Constitution and any other written law relating to community land. The Land Act guarantees security of tenure for land under (a) freehold; (b) leasehold; (c) such forms of partial interest as may be defined under the Act and other law, including but not limited to easements; and (d) customary land rights, where consistent with the Constitution and guarantees equal recognition and enforcement of land rights arising under all tenure systems and non-discrimination in ownership of, and access to land under all tenure systems. Under the Lands Act 2012, The Way leaves Act, Cap 292 and The Land Acquisition Act, Cap. 295 have been revoked but Sections 8 and 9 allow for Compulsory Acquisition as an option in acquiring land for public utility.

Relevance

This Act gives the necessary legal and regulatory framework on land acquisition, ownership and tenure issues and as such important for this project.

4.3 International Policy Framework

Kenya is a signatory as well as a party to various international conventions, treaties and protocols relating to the environment which aims at achieving sustainable development. According to the Registrar of International Treaties and other Agreements in Environment (UNEP 1999), there are 216 treaties, 29 of which are of interest to Kenya. The country is a signatory to 16 such agreements, which range from use of oil, protection of natural resources and protection of the atmosphere. The agreements are both regional and international and became legally binding on Kenya upon ratification thereof by the rightfully designated Kenyan Authority. The agreements of interest to Kenya can be categorized as those for protecting natural resources, atmosphere and social wellbeing of man.

4.4 World Bank Policies

4.4.1 Operational Policy (OP) 4.01: Environmental Assessment, 2001

According to the World Bank (WB), Environmental Assessment is used identify, avoid, and mitigate the potential negative environmental associated with Bank lending operations. The purpose of Environmental Assessment is to improve decision making, to ensure that project

options under consideration are sound and sustainable and that potentially affected people have been properly consulted.

The WB has well-established environmental assessment procedures, which apply to its lending activities and to the projects undertaken by borrowing countries, in order to ensure that development projects are sustainable and environmentally sound. Although its operational policies and requirements vary in certain respects, the World Bank follows a relatively standard procedure for the preparation and approval of an environmental assessment study, which:

- a) Identifies and assesses potential risks and benefits based on proposed activities, relevant site features, consideration of natural/human environment, social and transboundary issues;
- b) Compares environmental pros and cons of feasible alternatives;
- c) Recommends measures to eliminate, offset, or reduce adverse environmental impacts to acceptable levels (siting, design, technology offsets);
- d) Proposes monitoring indicators to implement mitigation measures; and
- e) Describes institutional framework for environmental management and proposes relevant capacity building needs.

4.4.2 OP 4.12: Involuntary Resettlement

The WB 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 project involves upgrading of existing infrastructure and doesn't involve involuntary resettlement of people.

4.4.3 OP 4.04: Natural Habitats

The policy aims at promoting environmentally sustainable development by supporting the protection, conservation, maintenance and rehabilitation of natural habitats and their functions. The policy seeks to ensure that World Bank-supported infrastructure and other development projects take into account the conservation of biodiversity, as well as the

numerous environmental services and products that natural habitats provide to human society. The policy strictly limits the circumstances under which any Bank-supported project can damage natural habitats (land and water area where most of the native plant and animal species are still present). This project has no significant interaction with natural habitats. The project doesn't fall within areas considered as natural habitats and therefore this policy is not activated.

4.4.4 OP 4.11: Physical Cultural Resources

This policy serves to assist in preserving physical cultural resources including the movable or immovable (above or below ground, or under water) objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance including sites and unique natural values. 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 aim of this policy is to avoid or mitigate adverse impacts on physical cultural resources for development projects. No cultural sites or resources fall within the project area that are likely to be interfered with during the construction process and therefore this policy will not be triggered.

4.4.5 OP 4.36: Forests

The policy on forest safeguards seeks to realize the potential of forests to reduce poverty in sustainable manner, integrate forests effectively into sustainable economic development and protect the vital local and global environmental services and values of forests. Among the principles is to screen as early as possible for potential impacts on forest health and quality and on the rights and welfare of the people who depend on them. The project area is fully habited with intensive social and economic activities and therefore no forest resources are likely to be interfered with.

4.5 Institutional Framework

4.5.1 County Government of Kiambu

The County of Kiambu is the principle lead agency on all matters pertaining to planning within the proposed site. The County Governments' Act (Cap 265) clearly defines the functions of

this key institution. Section 166 empowers the count to be responsible for local planning and development control in the region. The Physical Planning Act (Cap 286) also confers upon local authorities the powers to control development in their areas of legal jurisdiction.

4.5.2 Ministry of Environment and Forestry

Kenya's Ministry of Environment and Forestry is mandated to monitor, protect, conserve and manage environment and natural resources of the country. The Ministry is to achieve this monumental task through sustainable exploitation of natural resources for socio-economic development geared towards eradication of poverty, improving living standards and maintaining a clean environment for present and future generations.

5.0 PUBLIC CONSULTATION AND PARTICIPATION

5.1 Introduction

The Legal Notice 101 of EMCA 1999 (revised 2015) (The Environmental Regulations, 2003) requires that all environmental assessment process in Kenya to incorporate Public Consultation. The essence of public consultation is to ensure that all stakeholder interests are identified and incorporated in project development, implementation and operation. Of necessity, stakeholder consultations should take place alongside project design and implementation to ensure that the project puts in place measures to cater for stakeholder concerns in all project phases.

5.2 Objectives of the Public Consultation

Public consultation is crucial in any development agenda. EMCA, 2015 treats the environment as one entity as opposed to the previous situation where each segment of the environment had its own laws. This section has been based upon the principle that local communities have a right to participate in making decisions on matters that have significant effect on the environment. The information obtained from both field visits and public consultations formed the basis for incorporation of public views into this report.

5.2.1 Outcome of the Public Consultation Process

Some of the issues raised during the public consultation process include:

- a) How long the project would take to be completed
- b) If the road reconstruction and upgrade will include pedestrian and NMT facilities
- c) If there would be diversions or alternatives to access the area during the construction
- d) If the road upgrade would cause resettlement of the people
- e) Stakeholders were optimistic that the project would create numerous employment opportunities for both the skilled and the unskilled from the construction phase to the operational phase

The proposed project doesn't involve any relocation or displacement of the people and if any cases of encroachment are identified, the County Government of Kiambu will use the available legal channels to address them. The study observes that the stakeholders are in support of the

project. The questionnaires and interview schedules used during the public consultation process are attached in the annex section of this report.

6.0 POTENTIAL IMPACTS AND MITIGATION MEASURES

6.1 Introduction

This chapter provides an analysis of the potential impacts likely to emanate from the implementation of the project activities. In predicting the likely impacts, a checklist of environmental impacts developed by diverse authorities was employed. The impacts are related to the activities to be carried out during construction and operation phases of the project respectively. Furthermore, the likely impact during the closure and decommissioning phases of the project are highlighted. The impacts are categorized as either positive or negative and are further grouped in accordance with the project cycle stages (construction, operation and decommissioning). The impacts are also categorized into: impacts on the biophysical environment; health and safety impacts and the socio- economic impacts).

6.2 Negative Impacts during the Construction Phase

Extraction and Use of Construction Materials

The project will consume materials such as rough stone, ballast and bitumen. These materials will be obtained from quarries and bitumen dealers respectively. The availability and sustainability of such materials or resources will thus be negatively affected, as they are not renewable in the short term. The sites from which these materials are extracted may be significantly affected in various ways including dereliction, landscape changes, destruction of vegetation, poor visual quality and opening of depressions on the surface leading to human and animal health impacts.

Dust Emissions

Activities such as excavation, leveling or transportation of materials during construction will generate a substantial amount of dust both at the construction sites and the surrounding areas respectively. Such dust emissions especially in large quantities may cause significant health problems on the construction workers and the local residents and this might be accentuated during the dry season.

Exhaust Emissions

There will be increase in emissions of CO₂, NO₂ and other fine particulate matter from the trucks used to transport materials to the project sites as a result of diesel combustion. Such

emissions compound other problems such as global warming and health impacts. Large quantities of materials of materials are used during road upgrades and in this case they will have to be sourced a distance away from Kiambu Town and as such the impacts may affect a wider geographical area. The impacts of emissions are more in areas where the materials are sourced and at the construction sites as a result of frequent running of vehicle engines, frequent turning of vehicles and slow movement of vehicles at the loading and offloading points.

Noise and Vibrations

Noise levels generated by some equipment may be high and if the workers are not provided with relevant ear protection, then there is a risk that such workers would in the long run start suffering noise induced deafness which is medically irreversible. Vibration resulting from heavy earth moving equipment is expected to impact on human settlements, educational institutions, health facilities and commercial centres. This effect will however be localized and temporary in duration.

Possible Pollution from Waste Oils and Spares Parts

Heavy trucks and equipment require maintenance from time to time. This leads to discharge of waste oils and containers. The oils if not properly handled may contaminate land and water. Scrap is also generated as broken and worn out parts are replaced. If safe disposal measures are not in place, then the project area may be found to be a dumping ground for the waste. Used up spare parts and scrap from plant and equipment generate solid waste that is also contaminated with mineral oils.

Soil Erosion

Excavation works associated with this project may lead to increased soil erosion at the project site and release of sediments into the drainage systems. Uncontrolled soil erosion can have adverse effects on any local water bodies.

Solid Waste Generation

Large quantities of solid waste will be generated at the site during construction of the road and related infrastructure. Such waste will consist of excavated materials, vegetation, metal drums, rejected materials, surplus materials, surplus spoils, paper bags, empty cartons, waste oil, and waste bitumen, among others. This may be accentuated by the fact that some of the waste materials contain hazardous substances such as waste oil, solvents, while some of the waste

materials including metal cuttings and plastic containers are not biodegradable and can have long-term and cumulative effects on the environment. Stored materials may also generate waste in form of oil spills from storage tanks, filling platforms and transfer tanks.

Increased Water Use

The construction activities will require large quantities of water mainly be used for concrete mixing, dust suppression and sanitary and washing purposes. Excessive water use may negatively impact on the water source and its sustainability.

Increased Energy Consumption

The market and road upgrade project will consume fossil fuels (mainly diesel) to run transport vehicles and construction machinery. Fossil energy is non-renewable and its excessive use may have serious environmental implications on its availability, price and sustainability.

The project may also use electricity supplied by Kenya Power & Lighting Company (KPLC) Ltd. Electricity in Kenya is generated mainly through natural resources, namely, water and geothermal resources. In this regard, there will be need to use electricity sparingly since high consumption of electricity negatively impacts on these natural resources and their sustainability.

Increased Traffic

Construction activities will lead to increased vehicular traffic especially at the site where the road is to be upgraded to bituminous standards. This may cause inconveniences to road users who are not used to such a high amount of traffic.

6.3 Negative Socio- Economic Impacts during Construction Phase

Temporary Economic Displacement

The bus park construction project will obviously lead to temporary relocation of the public service vehicle operators to pave way for construction works. This will in turn lead to inconveniences which might have economic implications on their businesses.

Antagonism from Local Populace if Locals are not Recruited

The road upgrade project will require large numbers of casual labour. However, if the locals feel that the contractor has not considered them for these jobs, they might antagonize the project leading to delays in completion.

OHS Hazards e.g. Injury/Fatalities from Plant, Equipment and Working Tools

Given the intensive engineering and construction activities including concrete work, construction workers will be exposed to risks of accidents and injuries. Such injuries can result from accidental falls, injuries from hand tools and construction equipment and risk of vehicular accidents.

Interference to road use activities due to diversions and closures

During construction, there will be instances where diversions/ closures/ barriers will have to be put in place to allow construction work continue with minimum interference by other road users. The closures/ barricades may obstruct access routes to people's homes, businesses etc.

HIV-AIDS Infections

There is risk of infections to workers and other persons to sexually transmitted diseases and HIV/AIDS during project implementation following increased incomes of workers as well as some of the contractor workers being away from their homes.

6.4 Positive Impacts during the Construction Phase

Creation of Employment Opportunities

The project will require a substantial amount of manpower. This will lead to creation of employment and income generating activities during the construction phase of the project. This is a significant impact given that the rate of unemployment in Kiambu and the surrounding areas is quite high.

Market Opportunities in Procurement and Supply of Materials

The project will require supply of large quantities of construction materials most of which will be sourced locally in Kiambu County and the surrounding areas. This provides ready market for construction material suppliers such as quarrying companies, hardware shops and individuals with such materials.

Increased Business Opportunities

The large number of project staff required will provide ready market for various goods and services, leading to several business opportunities for small-scale traders such as food vendors around the construction site.

6.5 Negative Impacts of Operational Phase

Increased Storm Water Flow

The paved areas will likely lead to an increase in volume and velocity of storm water or run-off flowing across the area covered by the roads. This will lead to increased amounts of storm water entering the drainage systems, resulting in overflow and damage to such systems in addition to increased erosion or water logging in the neighboring areas if not adequately mitigated.

Increased Population and Congestion

The upgrade of the road to bituminous standard is likely to attract more people into the area either as tenants or business people. This is likely to cause congestion and increase demand for resources such as water, sewerage and drainage facilities.

6.6 Positive Impacts of Operational Phase

Increased Revenue for the County and National Government

An upgrade of the market will help raise the revenue for the County Government of Kiambu through payment of the relevant taxes, rates and fees. The road upgrading project will contribute towards the national and local revenue earnings from those using the upgraded facilities.

Reduction in Dust Emissions

The upgrade of the road will help reduce dust emissions especially during the dry weather conditions. In its current status, any time the wind blows or vehicles move with speed, it raises lots of dust that raises health concerns for the bus park users and those living close to the road that is to be upgraded.

Increased Ease of Mobility and Connectivity within the Area

The road is usually too muddy and unstable during the rainy weather conditions. Cars using the route opt to use the main road since the road is usually impassable during such conditions.

Hence its upgrade will help eliminate congestion on the main road and enhance connectivity to the surrounding areas.

Other positive social impacts during the operational phase include:

- ❖ Improved drainage will likely reduce the flood damage and increase accessibility for pedestrians and residents
- ❖ Improvement of the road will help spur physical development in the area leading to increased jobs for Kilimambogo residents
- ❖ Clean and orderly environment
- ❖ Improved safety and security for users
- ❖ Increase in land and property value for land owners
- ❖ Reduced human- vehicle conflicts due to provision of Non-Motorized Transport (NMT) Facilities
- ❖ Increased ride quality due to improved road surface
- ❖ Reduced travel time
- ❖ Reduced vehicle operational costs

6.7 Negative Impacts during Decommissioning Phase

Solid Waste

Waste generated during this phase includes materials used during construction including concrete, metal, kerbs, bitumen, stones and ballast. Decommissioning may also involve demolition works which generates large amounts of solid waste.

Dust Emissions

Demolition works normally involve generation of large amounts of dust which may negatively affect the project personnel and the neighboring residents.

Noise and Vibration Emissions

Demolition works may cause deterioration of the acoustic environment within the project sites in significant proportions.

6.8 Positive Impacts during Decommissioning Phase

Rehabilitation

Decommissioning of the proposed road project will pave way for restoration of the site to its original status. Replacements will be done to enhance the visual quality of the area.

Creation of Temporary Employment

Various employment opportunities will be created for decommissioning personnel including those hired to aid in demolition activities.

7.0 MITIGATION MEASURES

7.1 Introduction

This chapter highlights the requisite mitigation measures that should be adopted to prevent or minimize significant negative environmental, health and safety impacts associated with the activities of the project during its construction, operation and decommissioning phases.

Allocation of responsibilities, the timeframes and an estimated budget for these mitigation measures are presented in the Environmental Management Plan (EMP)

7.2 Mitigation Measures for Impacts during Construction Phase

Efficiency in the Acquisition and Use of Raw Materials

The contractor or the implementer of the project should source construction materials such as sand, ballast and hard core from registered quarry and sand mining firms, whose projects have undergone satisfactory environmental impact assessment/audit and received NEMA approval. Since such firms are expected to apply acceptable environmental performance standards, the negative impacts of their activities at the extraction sites are considerably well mitigated.

To minimize the negative impacts on availability and sustainability of the materials, the contractor should only order for what will be required through accurate budgeting and estimation of actual construction requirements. This will ensure that materials are not extracted or purchased in excessive quantities. Moreover, the proponent should ensure that wastage, damage or loss (through run-off, wind, etc.) of materials at the construction site is kept minimal, as these would lead to additional demand for and extraction or purchase materials.

Additionally, the contractor shall consider reuse of construction materials and use of recyclable materials. This will lead to reduction in the amount of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.

Excavations

Any excavated materials shall be taken to licensed sites or reused. This includes mounds of soil that will be excavated to create room for drainage lines or the soil that will be removed during the grading of the road.

Minimization of Runoff and Soil Erosion

The contractor shall institute measures aimed at minimizing soil erosion and associated sediments from the project during construction. The measures include silt traps, barriers, planting of vegetation, terracing and leveling of the project site to reduce the velocity of runoff and increase infiltration of rain water into the soil. Construction vehicles will also be restricted to designated areas to avoid soil compaction within the project site, while any compacted areas will be ripped to reduce run-off.

Reduction in Construction Waste

All demolition work shall be properly collected, stored, recycled or reused to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses. In this regard, the proponent is committed to ensuring that construction materials left over at the end of construction will be used in other projects rather than being disposed of. The proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal.

It is also recommended that the proponent institutes the following measures to minimize solid waste generation:

- ❖ Use durable, long- lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time.
- ❖ Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to weather elements
- ❖ Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials
- ❖ Use building materials that have minimal packaging to avoid the generation of excessive packaging waste
- ❖ Use of construction materials containing recycled content when possible and in accordance with accepted standards

Minimization of Dust Generation and Emission

The contractor shall strict ensure and enforce speed limits within the project site as well as limit unnecessary traffic within the project site. Traffic routes Traffic routes on site have to be

sprinkled with water regularly to reduce amount of dust generated by the construction trucks and activities.

Minimization of Exhaust Fumes

Construction vehicles and machinery have to be well serviced and maintained to manufacturers' specifications. The contractor and the proponent shall also ensure proper planning of transportation of materials to ensure that vehicle loads are increased in order to reduce the number of trips done or the number of vehicles on the road. In addition truck drivers will be sensitized to avoid unnecessary racing of vehicle engines at loading/offloading areas, and to switch off vehicle engines at these points.

Minimization of Noise and Vibration

Noise and vibration will be minimized in the project site and surrounding areas with strict adherence to designated working hours; and through sensitization of construction truck drivers to switch off vehicle engines while offloading materials. In addition, they will be instructed to avoid running of vehicle engines or hooting especially when passing through sensitive areas such as residential areas and schools. In addition, construction machinery shall be kept in good condition to reduce noise generation and maintained in accordance with manufacturers' specifications. It is recommended that all generators and heavy duty equipment be insulated or placed in enclosures to minimize ambient noise levels. They should also be located in areas of the site where they cause minimum nuisance.

Reduction of the Risk of Accidents and Injuries to Workers

The Contractor shall comply with all standard and legally required health and safety regulations as promulgated by Occupational Health and Safety Act and the Factories and Other Places of Work Regulations. In this regard, the contractor is committed to provision of appropriate personal protective equipment, as well as ensuring a safe and healthy environment for construction workers. This will also include use of a traffic management plan.

Reduction in Energy Consumption

The contractor and the proponent shall ensure that there is proper planning of transportation of materials will ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts. Complementary to these measures, the proponent shall monitor energy use during construction and set targets for reduction of energy use.

Minimization in the Amount of Water Used

The contractor shall ensure that any recyclable water is recycled. The contractor shall ensure that water is used efficiently at the site by sensitizing construction staff to avoid irresponsible water usage.

Minimization of Conflicts with the Local Community

All issues raised shall be attended to. The contractor and the proponent shall ensure that there is adequate public participation and stakeholder engagement. Additionally, a grievance redress mechanism will be instituted to ensure that any complaints and grievances are registered and adequately addressed during project implementation.

7.3 Mitigation of Social Impacts

Temporary Economic Displacement

The proponent shall ensure that the bus park users are temporarily relocated to an alternative site that is as close as possible to the bus park to minimize inconveniences and consequent loss of revenue. Additionally, the timelines for which the project implementation is scheduled to take should be strictly adhered to.

HIV-AIDS Management

It is recommended that there is sensitization and awareness creation to safeguard workers and other persons against infections from sexually transmitted diseases including HIV-AIDS.

Grievance Redress Mechanisms

Grievance redress mechanisms will be employed for this project to handle and manage any complaints or grievances received from concerned persons. It is expected that a standard form is applied to receive complaints/ grievances and a grievance log is kept on site by the Resident Engineer.

7.4 Mitigation of Impacts for the Operation Phase

Storm Water and Runoff Management

The proponent will ensure that proper drainage is provided and regularly maintained for storm water runoff management. The maintenance and repairs fall under the jurisdiction of the county government.

7.5 Mitigation of Impacts for the Decommissioning Phase

Efficiency in Solid Waste Management

Solid waste resulting from demolition or dismantling works will be managed as described above.

Reduction of Dust Emission and Concentration

High levels of dust concentration resulting from demolition or dismantling works will be minimized as described earlier.

Minimization of Noise and Vibration

Significant impacts on the acoustic environment will be mitigated as described above.

8.0 ANALYSIS OF PROJECT ALTERNATIVES

8.1 Introduction

This section analyses the project alternatives in terms of site and technology scale options.

8.2 Relocation Option

Relocation option to a different site is not an option available for the project implementation as this project is to upgrade & improvement to bitumen standards of Kilimambogo – makutano road. The road to be upgraded is already existent and as such the cost of relocating would be quite exorbitant and would require lots of planning which may take lots of time to implement.

8.3 Alternative Location

The location for the project is the best suited as it only involves an upgrade. Relocating the project to another area would require lots of planning; a lot of resources to compensate those that might be relocated and a lot of time might be spent in the planning and acquisition of alternative land. The proposed location is thus the best suited for the project

8.4 The No Project Alternative

The **No Project Alternative** with respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will however, involve several losses both to the county and the community as a whole. Transport, access and connectivity will continue to be hampered. The **No Project Option** is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- ❖ Service provision to the residents of Kilimambogo town will continue to be inefficient
- ❖ Access and connectivity to the areas will continue to be a challenge due to the poor nature of the connection roads
- ❖ The economic status of the users and the local people would remain unchanged.
- ❖ The Estate will continue to be unattractive
- ❖ There will be no employment opportunities created for thousands of Kenyans who will work in the project area on the road and the market

- ❖ Increased urban poverty and crime in Kenya.
- ❖ Discouragement for investors and loaners
- ❖ Development of infrastructural facilities will not be undertaken.

8.5 Analysis of Alternative Construction Materials and Technology

The proposed project 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 factors. The road will be upgraded using locally sourced stones, cement and bitumen that meets the requirements of the Kenya Bureau of Standards (KeBS). The alternative technologies available include the conventional concrete, prefabricated concrete panels, or even temporary structures. These may not be desirable from a cost and durability perspective. The technology to be adopted will be the most economical and one sensitive to the environment.

9.0 ENVIRONMENTAL MANAGEMENT AND MANAGEMENT PLAN

9.1 Introduction

An Environmental Management and Monitoring Plan (EMMP) for proposed projects is used to provide a logical framework within which identified negative environmental impacts can be avoided, mitigated and monitored. In addition the EMMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done. The EMMP is a crucial output of an Environmental Impact Assessment as it provides a checklist for project monitoring and evaluation. The EMMP outlined below will address the identified potential negative impacts and mitigation measures of the Project based on the chapters on Environmental Impacts and Mitigation Measures of the Negative Impacts.

9.2 Responsibilities of the Proponent

It will be the duty of the proponent to ensure that all legal requirements as pertaining to the development are met as specified by the law, including World Bank Safeguards and specifically OP4.01 (Environmental Assessment).

- a) The proponent shall hand over the site to the Contractor for implementation of the project
- b) The proponent will fund the project
- c) The Proponent will acquire the NEMA license
- d) The proponent will supervise the project and will also ensure its satisfactory implementation
- e) The proponent shall ensure that there is a functional stakeholder engagement plan and grievance redress mechanism.
- f) The proponent shall define the area of the site, which may be occupied by the contractor for use as storage, on the site
- g) The proponent shall include all recommendations from EIA into the contract.

9.3 Responsibilities of the Contractor

- a) Prepare and maintain an approved time and progress work-plan, indicating clearly the period allowed for each section of the work.

- b) The contractor shall comply with all regulations and by-laws of the local authority including serving of notices and paying of the fees.
- c) The contractor shall make good at his own expense any damage he may cause to the public and private roads, drainages and pavements in the course of carrying out the road works.
- d) The contractor shall provide at his own risk, and cost all water required for use in connection with the works including the work of subcontractors
- e) The contractor shall take all possible precautions to prevent nuisance, inconvenience or injury to the neighboring properties and to the public generally, and shall use proper precaution to ensure the safety of wheeled traffic and pedestrian
- f) All work operations which may generate noise, dust, vibrations, or any other discomfort to the workers and/or guests of the client and the neighbors must be undertaken with care, with all necessary safety precautions taken.
- g) The contractor shall upon completion of working, remove and clear away all plant, rubbish and unused materials and shall leave the whole site in a clean and tidy state to the satisfaction of the Proponent. He shall also remove from the site all rubbish and dirt as it is produced to maintain the tidiness of the premises and its immediate environs.
- h) The standard of workmanship shall not be inferior to the Kenya Bureau of Standards and/or codes of practice where existing.
- i) The contractor shall maintain good working relationship with the community and implement the stakeholder engagement plan and the grievance redress mechanism.
- j) All these responsibilities shall be reviewed carefully against the contract documentation to ensure that they are included in the contract documentation.

EMMP FOR THE UPGRADING OF UPGRADING AND IMPROVEMENT TO BITUMEN STANDARDS OF KILIMAMBOGO MAKUTANO ROAD

<i>Potential Impacts</i>	<i>Mitigation Measures</i>	<i>Monitoring frequency</i>	<i>Responsibility</i>	<i>Monitoring Indicators</i>	<i>Budget</i>
Construction Phase					
Increased exploitation of raw materials	<p><i>Only source materials from suppliers with relevant permits and consents as required by the National Construction Authority</i></p> <p><i>Source materials from environmentally sound/ friendly suppliers</i></p> <p><i>Ensure accuracy in budgets and estimates for construction materials to minimize wastage</i></p> <p><i>Ensure proper storage of materials to avoid loss and wastage</i></p>	<i>Throughout Construction Period</i>	<i>Contractor</i>	<p><i>List of suppliers</i></p> <p><i>Absence of waste on site</i></p> <p><i>Presence of a site/ project store on site</i></p>	As per the BQs
Soil Erosion and Run Off	<p><i>Put into place soil erosion control measures such as leveling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil, e.g. silt traps, barriers, tree planting.</i></p>	<i>Throughout the construction period</i>	<p><i>Contractor</i></p> <p><i>Proponent</i></p>	<p><i>Presence of soil control measures/ infrastructure</i></p> <p><i>Absence of soil erosion on the project site</i></p>	As per the BQs

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	<p><i>Restrict construction vehicles to existing graded roads to avoid compaction within the project site</i></p> <p><i>To reduce runoff, ensure that any compacted areas are ripped off</i></p>			<p><i>Routes/ roads used by delivery vehicles</i></p> <p><i>Absence of flooding after construction</i></p>	
<p>Solid waste generation</p>	<p><i>Purchases for perishable construction materials such as paints or oil should be done incrementally to avoid spillage</i></p> <p><i>Accurately estimate the sizes and quantities of materials required. Only order materials in required sizes and quantities to avoid cutting them to small sizes or accumulation of large quantities of residual materials</i></p> <p><i>Ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed off</i></p> <p><i>Ensure that damaged or wasted construction materials will be recovered for refurbishing and use in other projects</i></p> <p><i>Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time</i></p>	<p><i>Contractor</i></p>	<p><i>Throughout the construction period</i></p>	<p><i>Purchase and supply schedule/ plan</i></p> <p><i>Absence of waste on site</i></p> <p><i>Amount of supplies remaining and reused after decommissioning</i></p> <p><i>Amount of supplies recovered after damage</i></p> <p><i>Type of supplies used by the contractor</i></p>	<p><i>As per the BQs</i></p>

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	<p><i>Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements</i></p> <p><i>Ensure only use of materials with minimal or no packaging to avoid generation of excessive packaging waste</i></p> <p><i>Use construction materials containing recycled content when possible and in accordance with accepted standards</i></p> <p><i>Enhance the reuse of packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at the site</i></p> <p><i>Ensure disposal of waste more responsibly or engage the use of a registered waste disposal company or CGK</i></p>			<p><i>Presence of waste management infrastructure such as waste bins on site</i></p> <p><i>Amount of waste generated by packaging materials</i></p> <p><i>Amount of waste recovered and recycled</i></p> <p><i>Absence of waste on site</i></p> <p><i>Final destination of waste generated from the project site</i></p>	
Dust pollution	<p><i>Sprinkle water on graded access routes as necessary to reduce dust generation by construction vehicles</i></p> <p><i>Drivers should be sensitized to avoid unnecessary racing of vehicle engines at loading/offloading points and parking</i></p>	<i>Contractor</i>	<i>Throughout the construction period</i>	<p><i>Absence of dust during construction</i></p> <p><i>Vehicles engines switched off when not in use</i></p>	As per the BQs

Environmental impact assessment project report for the proposed upgrading to bitumen standards of kilimambogo makutano township roads in thika municipality

	<i>areas. Switch off or keep vehicle engines at these points</i>				
Exhaust Emissions	<i>Ensure that delivery/ project vehicles are serviced regularly Switch off project vehicles when not in use Drivers should be cautioned against revving their vehicles unnecessarily</i>	<i>Contractor</i>	<i>Continuous</i>	<i>Presence of vehicle service records/schedules Vehicle engines switched off when not in use Presence of caution/ notice signs for drivers conduct on the site</i>	<i>As per the BQs</i>
Air Pollution	<i>Ensure proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips done per vehicle or the number of vehicles on the road Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.</i>	<i>Contractor</i>	<i>Throughout the construction period</i>	<i>Number of delivery trips Switched off vehicle engines when not in use</i>	<i>As per the BQs</i>
Noise Pollution	<i>Construction drivers should be sensitized to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as residential areas and schools</i>	<i>Contractor</i>	<i>Throughout the construction period</i>	<i>Absence/ reduced amount of noise on the site Absence of hooting/ gunning from vehicles on site</i>	<i>As per the BQs</i>

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	<p><i>Construction equipment should be kept in good condition to reduce noise generation and serviced in accordance with manufacturers requirements</i></p> <p><i>All generators and heavy duty equipment should be insulated or placed in enclosures to minimize ambient noise levels and located in areas that cause minimum nuisance</i></p>			<p><i>Servicing of equipment</i></p> <p><i>Machines/ equipment with silencers</i></p>	
<i>Exploitation of water resources</i>	<p><i>Enhance Recycling and reuse of water as much as possible</i></p> <p><i>Ensure that water is used only when necessary</i></p>	<i>Contractor</i>	<i>Throughout the construction period</i>	<p><i>Amount of water reused or recycled</i></p> <p><i>Absence of water wastage incidences</i></p>	As per the BQs
<i>Depletion of energy resources</i>	<p><i>Ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts through meticulous planning of transportation of materials</i></p> <p><i>Set targets for reduced energy use and monitor energy consumption during construction</i></p>	<i>Contractor</i>	<i>Throughout the construction period</i>	<i>Energy audits</i>	As per the BQs
<i>Work related Accidents</i>	<p><i>Ensure that Ensure that provisions for reporting incidents, accidents and dangerous occurrences during</i></p>	<i>Contractor</i>	<i>Continuous</i>	<i>Incidents/ accidents recorded</i>	As per the BQs

Environmental impact assessment project report for the proposed upgrading to bitumen standards of kilimambogo makutano township roads in thika municipality

	<p><i>construction using prescribed forms obtainable from the local Occupational Health and Safety Office (OHSO) are in place.</i></p> <p><i>Develop, document and display prominently an appropriate SHE policy for construction works</i></p> <p><i>Provide for the formation of a Health and Safety Committee, in which the employer and the workers are represented</i></p>		<p><i>One off</i></p> <p><i>One off</i></p>	<p><i>Presence of proper records</i></p> <p><i>Presence of Safety, Health and Environment policy properly displayed on site</i></p> <p><i>Presence of Health and Safety committee on site</i></p> <p><i>Presence of well-equipped First Aid Kits on site</i></p>	
Safety of machinery	<p><i>Ensure that machinery, equipment, personal protective equipment, appliances and hand tools used in construction do comply with the prescribed safety and health standards and be appropriately installed maintained and safeguarded</i></p>	<i>Contractor</i>	<i>One off</i>	<p><i>Workers with proper protective clothing and PPEs</i></p> <p><i>Implementation of OHSA</i></p> <p><i>Presence of well-equipped First Aid Kits on Site</i></p>	As per the BQs

Environmental impact assessment project report for the proposed upgrading to bitumen standards of kilimambogo makutano township roads in thika municipality

	<p><i>Ensure that adequate provisions are in place to immediately stop any operations where there is an imminent and serious danger to health and safety and to evacuate workers</i></p> <p><i>Provide measures to deal with emergencies and accidents including adequate first aid arrangements</i></p> <p><i>Educate the public on potential emergency situations</i></p> <p><i>Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body</i></p> <p><i>Regular inspection and servicing of the equipment must be undertaken by a reputable service provider and records of such inspections maintained</i></p> <p><i>Enough space must be provided within the premises to allow for adequate natural ventilation through circulation of fresh air</i></p>	<p><i>Contractor</i></p> <p><i>Contractor</i></p> <p><i>Contractor</i></p> <p><i>Contractor</i></p> <p><i>Contractor</i></p>	<p><i>Continuous</i></p> <p><i>Throughout the project period</i></p>	<p><i>Presence of well-equipped First Aid Kit(s)</i></p> <p><i>Presence of well documented and displayed emergency preparedness plan</i></p> <p><i>Regular inspections of equipment</i></p> <p><i>Presence of well documented and displayed emergency preparedness plan</i></p> <p><i>Presence of workers trained and certified on First Aid Provision skills</i></p> <p><i>Size of the project site</i></p>	
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Environmental impact assessment project report for the proposed upgrading to bitumen standards of kilimambogo makutano township roads in thika municipality

Sanitation	<i>All work places must be kept in a clean state, and free from effluvia arising from any drain, sanitary convenience or nuisance</i>	<i>Contractor</i>	<i>Continuous</i>	<i>Presence of toilets for both men and women on site</i>	As per the BQs
	<i>Accumulations of dirt and refuse should be cleaned daily from the floors, benches, staircases and passages</i>	<i>Contractor</i>	<i>Daily</i>		
Insecurity	<i>Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the Construction site.</i>	<i>Contractor</i>	<i>Continuous</i>	<i>Presence of a record book for all the workers and visitors on site</i>	As per the BQs
	<i>Conduct sensitization campaign for the public on risks related to construction sites.</i>	<i>Contractor</i>	<i>Twice (before construction) and then monthly</i>	<i>Presence of security guards on site</i>	
Road closure and diversions	<i>Provide the necessary alternative routes for residents to access their residences</i>	<i>Contractor</i>	<i>Continuous</i>	<i>Presence of alternative routes during road closures</i>	As per the BQs
	<i>Make the all the diversions or alternative routes Motor able</i>	<i>Contractor</i>	<i>Continuous</i>	<i>Absence of complaints from the public as a result of road closures/diversions</i>	
	<i>Ensure that the project doesn't go beyond the stipulated project period</i>	<i>Contractor and the Proponent</i>	<i>Continuous</i>	<i>The work plan or work schedule</i>	

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Storm water/ Runoff Management	<i>Provide proper storm water drainage from the paved roads Provide regular inspection and maintenance of the drains.</i>	<i>Contractor Proponent</i>	<i>One off Continuous</i>	<i>Absence of floods on the project site Regular inspections Presence of unclogged drains</i>	<i>As per the BQs</i>
Health and Safety Risks	<i>Implement all necessary measures to ensure health and safety of workers and the general public during operation of the project as stipulated in OSHA 2007</i>	<i>Proponent</i>	<i>Continuous</i>	<i>OSHA rules</i>	<i>As per the BQs</i>
Solid Waste Management	<i>Implement measures to ensure adequate solid waste management in along the including putting wastes bins</i>	<i>Proponent</i>	<i>Continuous</i>	<i>Absence of solid waste in the drains Presence of waste bins along the road</i>	<i>As per the BQs</i>
HIV-AIDS Management	<i>Awareness creation Sensitization to workers and other persons post- project to reduce or eliminate chances of infections of HIVAIDS and other sexually transmitted diseases</i>	<i>Proponent</i>	<i>Continuous</i>	<i>Presence of HIV/AIDs awareness campaigns</i>	<i>As per the BQs</i>
DECOMMISSIONING PHASE					
Solid Waste Generation	<i>All removed materials that will not be used for other purposes must be</i>	<i>Contractor</i>	<i>One Off</i>	<i>Absence of solid waste on the site</i>	<i>As per the BQs</i>

Continuous observations and assessment is essential so that if unforeseen safety dangers are noticed, alternatives must be sought for. Risk assessment of accidents, and other adverse impacts should not be ignored in the construction plan. Waste management in the construction should be strictly followed. Mitigation measures of storm water management are essential. Safety standards should constantly be maintained, with indicators like condition of equipment, contractor compliance with the set regulations, and tracking of accidents on-site logged regularly.

There should be constant reporting by the site contractor to the proponent to ensure the project is executed as per the plans and drawings. The safety officer should always remain on site to report any safety concerns for urgent mitigation. The officer should also at all times enforce safety requirements as per the relevant legislation. The contractor must consult the proponent to maintain a clear understanding of all the aspects of the project.

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

In the preparation of this report for the development of the proposed development, it is observed and established that most of the negative environmental and social impacts on the environment can be mitigated and have potentially short term low significant effects. The positive impacts are highly rated and will benefit all stakeholders and Kilimambogo residents at large. The project proponents have proposed to adhere to prudent implementation of the EMP. The contractor is committed to obtaining all necessary permits and licenses from the relevant authorities and have qualified and adequate personnel to do the project as proposed. The proponent has proposed adequate safety and health mitigation measures as part of the relevant statutory requirements. As such, the project in itself is already an activity in mitigation of an existing concern and this is the prime justification of the proposed investment.

NEMA is mandated to consider licensing the project subject to annual environmental audits once it has been commissioned. This will be in compliance with the Environmental Management and Coordination Act, EMCA of 2015 and the Environmental Impact Assessment and Audit Regulations, Legal Notice No. 101 of 2003. The World Bank also is to clear the project consistent with the Bank's safeguards requirements.

10.2 Recommendations

The County Government of Kiambu - the proponent – through this project report wishes to disclose that the proposed targeted road upgrading project has adverse environmental impacts as already identified. However, the majority of adverse impacts identified is of a short-term nature and will cease once the civil works phase is completed. Further, other impacts can be managed through available means of mitigation. By such disclosure, the prayer of the proponent to NEMA is for an Environmental License for this project to be issued in line with Section 10(2) of Part II of Legal Notice 101.

REFERENCES

1. Kenya gazette supplement, Environmental Management and Coordination Act Number 8 of 2015.
Government printer, Nairobi
2. Kenya gazette supplement Acts *Building Code 2000* by government printer, Nairobi
3. Kenya gazette supplement Acts *Land Planning Act (Cap. 303)* government printer, Nairobi
4. Kenya gazette supplement Acts *Local Authority Act (Cap. 265)* government printer, Nairobi
5. Kenya gazette supplement Acts Penal Code Act (Cap.63) government printer, Nairobi
6. Kenya gazette supplement Acts *Physical Planning Act, 1999* government printer, Nairobi
7. Kenya gazette supplement Acts *Public Health Act (Cap. 242)* government printer, Nairobi
8. Kenya gazette supplement number 56. Environmental Impact Assessment & Audit Regulations
2003. *Government Printer, Nairobi*
9. World Bank Safeguards Documents (Environmental Assessment (OP 4.01) Safeguard

LIST OF ANNEXURES

ANNEX 1: NEMA LICENSES

FORM 7 (r.15(2))



NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)
THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE
License No : NEMA/EIA/ERPL/9148
Application Reference No: NEMA/EIA/EL/12732

M/S MARY NYOKABI KAMAU
(individual or firm) of address
P.O Box 12035 - 00400,Nairobi.

is licensed to practice in the
capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**
registration number **7071**
in accordance with the provision of the Environmental Management and Coordination Act Cap
387.

Issued Date: 1/24/2019 Expiry Date: 12/31/2019

Signature..... 

 (Seal)
Director General
The National Environment Management
Authority

P.T.O. 

ANNEX 3: LOCATION OF KILIMAMBOGO MAKUTANO ROAD



ANNEX 4: BILLS OF QUANTITIES

SUMMARY PAGE(KILIMAMBOGO)		
Bill No	Description	Tender Amount
1	General	8,221,000.00
4	Site clearance	520,000.00
5	Earthworks	2,510,000.00
7	Excavation and filling for structures	1,720,000.00
8	Culvert and drainage works	8,137,000.00
9	Passage of traffic	1,300,000.00
11	Footpath to carriageway	240,000.00
12	Natural Material Base and Sub-base	3,135,000.00
15	Bituminous surface treatment	1,320,000.00
16	Bituminous mix bases, binder courses and wearing courses	12,575,000.00
20	Road furniture	4,062,500.00
24	Electrical Works	27,761,500.00
25	HIV/AIDS	498,000.00
A	Sub Total 1	72,000,000.00
B	Add 1% Contingencies	720,000.00
C	Add 1% Variations	720,000.00
D	Sub Total 2	73,440,000.00
E	Add 16% V.A.T	11,750,400.00
	TOTAL	85,190,400.00

ANNEX 5: PLATES OF THE PROJECT SITE



ANNEX 6: QUESTIONNAIRES AND INTERVIEW SCHEDULES