# COUNTY GOVERNMENT OF MACHAKOS

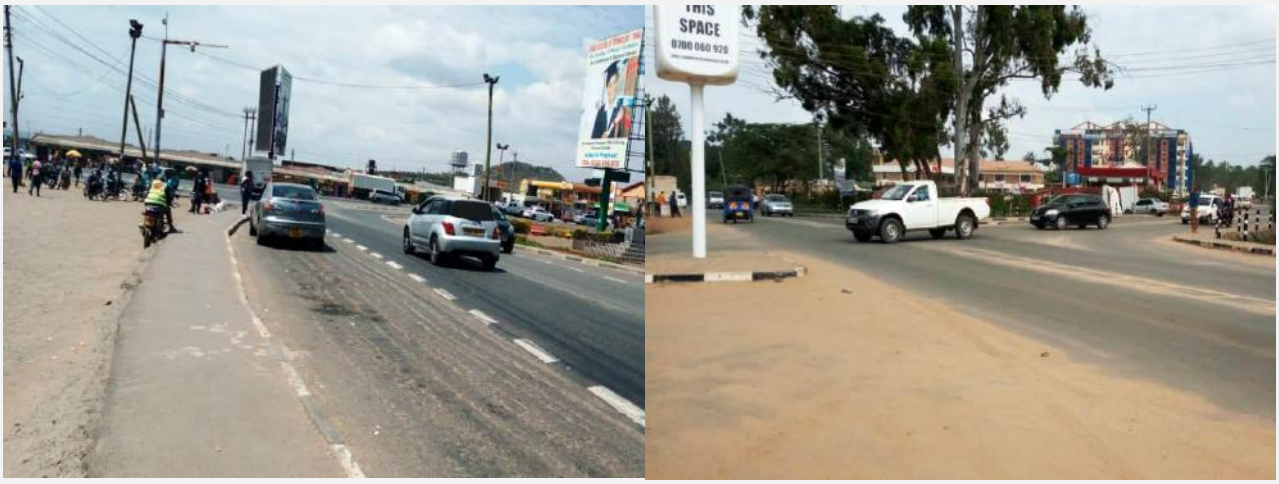
## DEPARTMENT OF ROADS, TRANSPORT AND PUBLIC WORKS

**P.O BOX 1996-90100**

**MACHAKOS**

**NEMA/TOR/R/2/298**

# ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED DUALLING OF 16KM KYUMVI (A109 JUNCTION) TO MACHAKOS SECTION OF (B62) ROAD, MACHAKOS COUNTY.




**EXPERTS**

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**DECLARATION PAGE**

The undersigned Experts confirm that the contents of this report is true representation of the Environmental and Social Impact Assessment for the proposed dualling of carriageway of 16km Kyumvi (A109 junction)-Machakos section of (B62) road and associated activities.

**DETAILS OF THE CONSULTING EIA/EA FIRM**

| **Authorized for submission by :**<br>_____<br>**Winnie Menge** | | | |
|---|---|---|---|
| **NAME OF EIA/EA LEAD EXPERT** | **NEMA REGISTRATION NUMBER** | **SIGNATURE** | **STAMP/ DATE** |
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**THIS ESIA REPORT IS PREPARED FOR AND ON BEHALF OF:**

**COUNTY GOVERNMENT OF MACHAKOS**

**DEPARTMENT OF ROADS, TRANSPORT AND PUBLIC WORKS**

**P.O BOX 1996-90100**

**MACHAKOS**

**CHIEF OFFICER**

**Sign……Date…….**

## EXECUTIVE SUMMARY

The County Government of Machakos through, through the Ministry of Transport, Roads and Public Works intends to use part of its development budget towards improvement of Kyumvi Machakos Road. The County Government of Machakos, through Department of Roads, Transport and Public Works has in this regard commissioned an ESIA for this proposed activity to cater for the dualling of the carriage way in an environmentally and socially friendly manner. The Experts carried out the Environmental and Social Impact Assessment (E.S.I.A) using a combination of methods including literature review, ground survey and interviews with neighbours. Roads can have both positive and negative influences on people and the environment. On the positive side the dualling of the motor carriage way will provide the opportunity of mobility and transport for people and goods. From the assessment three alignment alternatives and so called no action (Zero alternative) alternative were considered. For detailed evaluation alternative having least impact on environment and community was chosen. Positive and negative sides of alternatives were described. It was mentioned, that prior to commencement of construction, the project must undergo evaluation process and obtain approvals and permits from decision makers, including the lender for sub projects such as borrow pits, asphalt and batching plant. On the negative side roads occupy land resources and form barriers to animals. They can also cause adverse impacts on natural water resources and discharge areas. The three most damaging effects of road construction and management are noise, dust and vibrations. Noise mainly occurs during road construction phases but it can also occur to a lesser degree during maintenance operations. Dust is created during the dualling of the road and unbound aggregate layers. Excess dust production can be treated by a range of means such as watering, the use of alternative materials, and by using dust binders near houses. Vibration can be caused by uneven road surfaces and can pose significant impacts and problems to houses close to the source. Key negative impacts related to impacts caused by deterioration of air quality and noise related nuisances and their mitigation measures have been discussed. Attitude of local residents towards the project is dual both positive and negative opinions have been voiced.

**Summary of conclusion**

1. The proposed dualling of 16km Kyumvi (A109 junction) to Machakos section of (B62) Road **within an existing right of way (RoW).** The location or Right of Way is 16km Kyumvi (A109 junction)-Machakos section of (B62) road, Machakos county. The road passes through, Kathome market, Kithini Shopping Centre, Kimangu, Kenya Israel and ends at the Kitui Machakos road intersection. It contains nine activities: ditch excavation, culvert, concrete removal, peat excavation and swamp backfill, embankment, utility work, subbase, gravel, and paving.

2. **Construction standards and memoranda of understanding with KENHA**: The MOU between the County Government of Machakos and KENHA should be expedited with the aim of streamlining the standards and respective activities related to road expansion. The Road development and maintenance is under KENHA's mandate.
3. **Sensitive Ecosystem**: Within the existing RoW, there are no sensitive such as protected areas, wetlands, forests, and other areas of conservation concern or legal protection. However, County Government of Machakos through relevant department shall take all necessary measures to protect and/or minimize impacts on environment resources, to prevent and/or minimizing pollution, and to protect any biodiversity and ecosystem integrity, including, where some impacts are unavoidable, through implementing biodiversity offsets to achieve "not net loss but net gain" of biodiversity. County Government of Machakos shall collaborate with other Government agencies and stakeholders to identify, design, and implement activities to enhance environment and social conditions as part of its projects and will require contractor participation in these activities as appropriate.
4. **Land Acquisition and Involuntary Resettlement:** There is no land acquisition**,** displacement or resettlement as the proposed project is within the RoW. The dualling space is clear from Kyumvi to Machakos Town. However, there are those who are likely to be affected mainly traders with makeshift structures along the shopping centers along the RoW through secondary impacts associate with the project. Genuine consultation with project affected persons should continuously take place. This is to ensure that their rights and interests of traders along the RoW are taken care of. For this to take place, their voices will be made clear via the formation of shopping centers consultation forums throughout the project phase. Compensation for traders along the markets have been proposed subject to an outcome of mini-RAP.
5. **Cultural Resources:** The scoping report indicate that there are aren't any tangible and intangible cultural heritage that may be affected by the proposed road dualling and construction activities.
6. **Occupational Health and Safety (OHS):** Project activities may present risks to health and safety of workers, communities, and the general public. Therefore, County Government of Machakos, its consultants and contractors shall ensure that all activities are conducted in a manner that protects the health and safety of workers, communities, and the general public. The contractors will be required to adopt policies and to provide safe tools, materials, equipment, and processes for work and rest that meet National and International requirements, as well as best practices, for occupational and community health and safety. The contractors will submit the code of conduct shared with NEMA that will apply to the consultant's and contractor's staff to ensure compliance

with best Occupational Health and Safety (OHS) practices and how the Code of Conduct will be enforced.

7. **Project Specific Stakeholders' Engagement Plans**: The consultative public participation was undertaken but limited by the inhibition of in person meeting. The County Government of Machakos developed stakeholders' analysis plan so that public meetings are held (in observance of Covid 19 protocols) with affected and interested parties to explain to them the project, its social, economic and environmental impacts, and to receive oral or written comments and objections to any proposed project. The Experts proposes that that County Government of Machakos to work in co-operative partnerships with road users, transport providers, relevant county governments, contractors, and local communities. County Government of Machakos through director of PP should engage with and listen to project affected persons and organizations throughout all its activities and will be responsive to their concerns. The contractor should develop and implement community engagement programs to complement the County own mechanisms. The goal is to foster dialogue among different stakeholders, in order that stakeholder views can be understood, considered, incorporated where possible in the road projects, and clear feedback provided regarding the action taken. The Project supervising consultant on behalf of the County Government will be responsible in managing the plan at the project site.
8. **Grievance Redress Mechanism (GRM**): County Government of Machakos must establish an effective communication channel among the stakeholders for providing a timely and efficient two-way feedback mechanism to address any complaints made about the project, including those from members of the communities, local businesses and other stakeholders, as well as raising public awareness on the projects and on the availability of a GRM mechanism. GRM should be open, transparent and fair process by which project staff, project affected persons, and other stakeholders can express concerns and grievances and be sure they will be considered and resolved in a timely manner.
9. **Climate change**: Climate change, including the increased frequency and severity of extreme events, can affect road infrastructure, extreme weather events, such as heavy rains, flooding, high temperatures, and changes in the water table causing pavement deterioration, slope stability and landslides, and flooding and damage of drainage systems and at watercourse crossings. Through its contractors, County Government of Machakos must promote a robust and innovative designs, undertake risk assessments, and appropriate measures to promote resilience to adverse effects caused by climate change and attendant weather stresses. In addition, County Government of

Machakos will require the contractors' plant and equipment are well serviced so as to control GHG emissions.

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# 1 SECTION ONE: BACKGROUND INFORMATION

## 1.1 Project definition

The County Government of Machakos through, through the Ministry of Transport, Roads and Public Works intends to use part of its development budget towards improvement of Kyumvi Machakos Road. The County Government of Machakos, through Department of Transport, Roads and Public Works, Machakos has in this regard commissioned an ESIA for this proposed activity to cater for the dualling of the carriage way in an environmentally and socially friendly manner. Dualling will be done for **16km** Kyumvi (A109 junction)-Machakos section of (B62) road. Compilation of this Report was carried out within the requirements of the Environmental Management and Coordination Act (EMCA) of 2015 and the Environmental (Impact Assessment and Audit) Regulations of June 2003 revised in 2019.

## 1.2 Need for ESIA

Road construction belongs to the types of activities capable to have significant environmental and/or social impact and requires full-fledged environmental impact assessment according to EMCA CAP 370.

The purpose of the ESIA was to:

- Examine the project's potential negative and positive environmental and social impacts and recommend any measures needed to prevent, minimize, mitigate, or compensate adverse impacts and to improve environmental and social performance;
- Analyze project alternatives;
- Provide technical information and recommendations for selection and designing of the best option out of several alternatives;
- Ensure that affected communities are appropriately engaged on issues that could potentially affect them; and
- Develop an Environmental Management Plan, which will include a mitigation programme, a monitoring plan and assessment of institutional capacity for its implementation.

In the course of assessment the issues related to labour, health and safety need for compliance with labour standards, occupational and community health and safety, population movement was paid attention to. The process was carried out with active involvement of the stakeholders.

## 1.3 The ESIA Process

In carrying out this ESIA Project Report, various activities were undertaken including detailed field surveys for acquisition of biophysical socio-economic data. Other sources of information included desktop exercise, professional judgment, interviewing of neighbours through use of questionnaire.

## 1.4 Terms of Reference

The TOR for this ESIA covered the following: -

- Brief project background;
- Review of relevant legislations
- Project definition and project objectives;
- Identification of anticipated environmental and social impacts;
- Development of appropriate mitigation measures;
- Development of an Environmental Management and decommissioning Plan.

# 2 SECTION TWO: EIA PROCESS FOLLOWED

## 2.1 Background

This Environmental and Social Impact Assessment (ESIA) Exercise refers to a critical examination of the effects of the operation of a proposed dualling of 16 Km Makutano/Kyumvi-Machakos road on the environment before its implementation. The process included the following:

- Identifying the anticipated environmental and social impacts of the operations of the proposed road dualling and associated activities the scale of the impacts;
- Identifying and analyzing alternative methods or technologies for implementing the proposed road construction.
- Proposing mitigation measures to be undertaken during the implementation of the project;
- Developing an Environmental and Social Management Plan (ESMP), with mechanisms for monitoring and evaluating the compliance and environmental performance, cost for mitigation and time frame of implementing the measures.

## 2.2 ESIA Research team

The EIA research team comprised of registered Environmental Impact Assessment/Environmental Audit Lead and Associate Experts. The Lead Experts led the team in collecting data and information and prepared this ESIA Report as provided for in the Environmental (Impact Assessment and Audit) Regulations of 2019.

**Appendix 2** gives certificates of registration and practicing license of the EIA/EA Experts.

## 2.3 Preparation of the ESIA Report

This ESIA Report prepared for the project contains detailed information on the project, including on the following;

- Location of the road proposed for dualling;
- Baseline information such as descriptions of the natural, social and operational environments, the current policy and legal framework and the administrative arrangement under which the project will operate.
- The technology, procedures and processes used in implementation of the project;
- Alternative technologies and processes available and reasons for preferring the chosen technology and processes;
- The wastes to be generated by the project and ways of handling;
- A description of potentially affected environments;

- The environmental effects of the project: including the social and cultural effects and the direct, indirect, cumulative, irreversible, short term and long term effects anticipated;
- An EMP proposing measures for eliminating, minimizing or mitigating adverse impacts on the environment, while enhancing the positive effects; including the cost, time frame, and responsibility to implement the measures;
- Provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities;
- Measures to prevent health hazards and to ensure security in the working environment for the employees and users of the facility, the local community and for management of emergencies;
- An economic and social analysis of the project;
- An identification of gaps in knowledge and uncertainties which were encountered in compiling the information; and
- A non-technical summary outlining the key findings, conclusions and recommendations of the study.

# 3 SECTION THREE: ENVIRONMENTAL LEGISLATIVE AND REGULATORY FRAMEWORK

## 3.1 Introduction

There are many environmental problems and challenges in Kenya today. Among the critical Environmental problems include: loss of biodiversity and habitat, land degradation, land use conflicts, human-animal conflicts, water management and environmental pollution. This has been aggravated by lack of awareness and inadequate information amongst the public on the consequences of their interaction with the environment. There is a growing concern in Kenya and at global level that many forms of development activities do cause adverse effects to the environment. This section identifies the most pertinent legislation, regulations and standards governing the environmental quality, solid and liquid waste management, health and safety, protection of sensitive areas, land use control, ecological and socio-economic issues through, institutional, policy and legal frameworks relevant to this project.

## 3.2 Social Issues

There is no legal instrument in the country that addresses social issues in development interventions. However, over the years, the Kenya Government has recognized the importance of entrenching social dimensions of development in its development agenda. Notably, development initiatives are required to deliberately ensure that the marginalized and more vulnerable people in society are actively involved in development processes. Thus the new constitution has emphasized on the need for public participation and awareness on any development initiatives. The social issues that may be related to the proposed road construction and associated activities were sought and captured.

## 3.3 Environmental Issues

Kenya's constitution which came into effect in August 2010 takes an important step in elevating the importance environmental protection to the highest levels, with a number of articles dedicated specifically to the rights of the people and responsibilities of the state on environmental matters. In Part 2, on "Rights and fundamental freedoms", section 42 states: “Every person has the right to a clean and healthy environment, which includes the right, a) to have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69, and b) to have obligations relating to the environment fulfilled under Article 70”.

In return, every person has responsibility to protect and manage the environment. In this regard, the Government enacted the EMCA (2015) and the Environmental Impact Assessment and Audit Regulations (2009) to provide a framework law for the coordinated management of environment.

Both the EMCA and the EIA regulations require that EIA to be undertaken for developments that are out of context with the surroundings. The umbrella body administering this requirement is NEMA. The Authority has designated Environmental Committees to oversee the implementation of the EMCA at the Regional, County and Sub-county levels. With the observance of international laws, it is now possible to factor in social impacts of any proposed development in an assessment.

## 3.4 Institutional Framework

### 3.4.1 National Environment Management Authority (NEMA)

The objective and purpose for which NEMA is established is to exercise general supervision and coordinate over all matters relating to the environment and to be the principal instrument of the government in the operation of all policies relating to the environment. However, NEMA's mandate is designated to the following committees discussed in the subsections:

### 3.4.2 Public Complaints Committee

The Committee performs the following functions:

- Investigate any allegations or complaints against any person or against the authority in relation to the condition of the environment in Kenya and on its own motion, any suspected case of environmental degradation and to make a report of its findings together with its recommendations thereon to the Council.
- Prepare and submit to the Council periodic reports of its activities which shall form part of the annual report on the state of the environment under section 9 (3) and
- To perform such other functions and excise such powers as may be assigned to it by the Council.

***Relevance to the project***: County Government of Machakos must be aware that the local community have the right to lodge complaints on any environmental related impacts of the proposed road construction contrary to the agreement with the proponent.

### 3.4.3 National Environment Tribunal

This tribunal guides the handling of cases related to environmental offences in the Republic of Kenya.

### 3.4.4 National Environment Council (NEC)

EMCA, 2015 No. 8 part III section 4 outlines the establishment of the National Environment Council (NEC). NEC is responsible for policy formulation and directions for purposes of EMCA; set national goals and objectives and determines policies and priorities for the protection of the environment and promote co-operation among public departments, local authorities, private sector,

non-governmental organizations and such other organizations engaged in environmental protection programmes.

## 3.5 Relevant National Policies

### 3.5.1 The National Environment Action Plan (NEAP)

Established in 1990, the NEAP's objective was to integrate environmental considerations into the country's economic and social development. The government recognized the negative impacts on ecosystems emanating from development programmes that disregarded environmental sustainability. Interaction of man and biological environment has been taken into consideration during the design of the proposed road B62 dualling and associated activities.

## 3.6 Applicable Laws and Regulatory Frameworks

### 3.6.1 Constitution of Kenya

In the Constitution of Kenya, 2010 Part II (Environment and Natural Resources), (I) the State clearly undertakes to carry out the following:

- Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
- Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;
- Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;
- Encourage public participation in the management, protection and conservation of the environment;
- Protect genetic resources and biological diversity;
- Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;
- Eliminate processes and activities that are likely to endanger the environment; and
- Utilize the environment and natural resources for the benefit of the people of Kenya.

(II) "Every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

Chapter 5 on land and environment emphasizes on the following:

- Land use and management shall by law benefit local communities;
- Community land is protected from encroachment by state;
- Rivers, forests and water bodies shall be protected by law;

- Equitable access to land; and
- County Governments will manage land in trust of the people in accordance with the constitution.

**Relevance**

**County Government of Machakos should observe the above stated conditions in as far as environmental protection is concerned. For instance, in the protection of the rights of every Kenya to a clean environment and the right of Project Affected Persons (PAPs) in its operations. Article 20 (5) (b) In allocating resources, the State will give priority to ensuring widest possible enjoyment of The right of fundamental freedom having regard to prevailing circumstance, including the vulnerability of particular groups or individuals. Article 21 Duty of the State and State organs to provide for and take measures for progressive realization of rights Article 43, including addressing the needs of vulnerable groups within society and the international obligations regarding those rights.**

### 3.6.2 Kenya Roads Act 2007 No. 2

An Act of Parliament to provide for the establishment of the Kenya National Highways Authority, the Kenya Urban Roads Authority and the Kenya Rural Roads Authority, to provide for the powers and functions of the authorities and for connected purposes. The Act establishes various Authorities with regard to management of various categories of roads in the Country.

### 3.6.3 Environment Management and Coordination (Amendment) Act, 2015 and subsidiary Regulations

The requirement of an EIA license is prescribed in Section 58 of EMCA. It provides that any person, being a proponent of a project shall, before financing, commencing, proceeding with, carrying out, executing or conducting any undertaking specified in the Second Schedule of the Act, submit a project report to the Authority in the prescribed form. Lone Tree Limited is undertaking a comprehensive EIA study at his own expense as required by EMCA 2015 (Amendment Act) since the ongoing structure is an ***activity out of character with its surrounding, with a structure of a scale not in keeping with its surrounding. Reference: Section 1 of the Second Schedule sets out projects which require ESIA.***

The impact of a proposed dualling of 16km Kyumvi (A109 junction)-Machakos section of (B62) road and associated activities on the environment and communities along the road is critical and the regulatory body charged with approving the environmental aspects of projects and issuing the relevant environmental licenses is the National Environment Management Authority (NEMA). The

requirements of EMCA with respect to development projects reflect a worldwide appreciation of the adverse effects of unbridled development that now find a Constitutional anchor in the right to a clean and healthy environment and public participation as well as the obligations of the Courts under Article 70 of the Constitution. These concerns are aptly captured by the phrases sustainable development and the pre-cautionary principle. With such enhanced rights and greater awareness, developers increasingly experience spirited resistance from residents and environmental activists. The relevant matters County Government of Machakos has taken into account in screening the project for the necessity of an EIA include but are not limited to: -

1. The characteristics of the intended development;
2. The location of the intended development and characteristics of potential impact;
3. The size of the development as well as comparison with other neighboring developments;
4. The probability of any environmental impact; and
5. The duration and reversibility of such

### 3.6.4 Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2003, Legal notice No. 101 amended in 2019

These Regulations stipulate how an ESIA will be undertaken and what the EIA study report should contain. It also provides regulations on Environmental Audits (EA), which the proponent will be required to undertake.

**NB: It is important to note that the ESIA Experts has complied with section 17 part 1 of EMCA regulation which states that "During the process of conducting an environmental impact assessment study under these Regulations, the proponent shall in consultation with the Authority, seek the views of persons who may be affected by the project"**

Environment Management and Coordination (Amendment) Act, 2015 provides the main legal and institutional framework under which the environment in general is to be managed. EMCA is implemented by the guiding principle that every person has a right to a clean and healthy environment and can seek redress through the High court if this right has been, is likely to be or is being contravened.

EMCA 2015, being the principle Act, Section 58 having been amended as section 43 of the amended Act, makes it a mandatory requirement for an EIA study to be carried out by proponents intending to implement projects specified in the Second Schedule of the Act. Such projects have a potential of causing significant impacts on the environment. Similarly, section 68 of the same Act requires

operators of existing projects or undertakings to carry out Environmental Audits (EA) in order to determine the level of conformance with statements made during the EIA study. Part III Rule 16, takes into account environmental, social, cultural, economic, and legal considerations, and shall:

- Identify the anticipated environmental impacts of the project and the scale of the impacts;
- Identify and analyze alternatives to the existing project;
- Mitigation measures to be taken during and after the operation of the project; and develop an environmental management plan with mechanisms for monitoring and evaluating.
- The compliance and environmental performance which shall include the cost of mitigation measures and the time frame of implementing the measures.

**Relevance**

**The EIA and Audit Regulations state in Regulation 3 that "the regulations should apply to all policies, plans, programmes, projects and activities specified in Part IV, Part V and the Second Schedule of the Environment Management and Coordination (Amended) Act, 2015.**

### 3.6.5 Environmental Management and Coordination (Water Quality) Regulation 2006

The Water Quality Regulations provide for the protection of lakes, rivers, streams, springs, wells, and other water sources. The regulations also stipulate that all actors industries should refrain from any actions, which may directly or indirectly cause water pollution and are therefore required to refrain from discharging effluent into water bodies. This regulation gives a minimum distance from a water body for which any development may be undertaken and as such affect the proposed development with regards to the choice of line route. The regulation also applies to drinking water, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife and water used for any other purposes. This includes the following:

- Protection of sources of water for domestic use;
- Water for industrial use and effluent discharge;
- Water for agricultural use.

The regulations outline:

- Quality standards for various sources of domestic water;
- Quality monitoring for sources of domestic water;
- Standards for effluent discharge into the environment;
- Monitoring guide for discharge into the environment;
- Standards for effluent discharge into public sewers;
- Monitoring for discharge of treated effluent into the environment.

**Relevance**

**There are seasonal streams along the road. County Government of Machakos through its contractors must adhere to these regulations so as not to carry out any activity or operations that will cause pollution to the above-mentioned natural water course.**

### 3.6.6 The Environment management and co-ordination (air quality) regulations, Legal Notice No.34 of 2014.

This Regulation provides for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. It provides for the establishment of emission standards for various sources such as mobile sources (e.g. motor vehicles) and stationary sources (e.g. industries) as outlined in the EMCA 1999. It also covers any other air pollution source as may be determined by the Minister in consultation with the Authority. Emission limits for various equipment and facilities have been set. The regulations also establish the procedures for the issuance of emissions licenses, measurement of emissions, inspection and monitoring programs, and reporting requirements.

**Relevance to the proposed project**

i. County Government of Machakos environment requires special attention to ensure a healthy outdoor air quality (OAQ) to protect workers and visitors against work place respiratory infections and occupational diseases. Poor air quality may cause outbreaks of work related illness such as headaches, fatigue, eye, and skin irritations, and other symptoms and have the potential of polluting the immediate atmospheric environment. Thus, need for strict adherence to these regulations and standards.

ii. County Government of Machakos through its contractors will obtain Emission Licenses for the asphalt and other plants used in road construction.

iii. County Government of Machakos through its contractors will ensure Emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying Kenya legislated standards, or in their absence, the current WHO Air Quality Guidelines, or other internationally recognized sources. Emissions from point sources will be avoided and controlled using air pollution control devices (Electronic precipitators, bag filters, scrubbers) according to good international industry practice, depending on ambient conditions, through the combined application of process modifications and emissions controls. County Government of Machakos through its contractors must also undertake ambient quality assessment prior to licensing/operation for future monitoring practices. Baseline air quality

monitoring at and in the vicinity of the site will be undertaken to assess background levels of key pollutants, in order to differentiate between existing ambient conditions and project-related impacts.

iv. County Government of Machakos through its contractors will ensure that measurements of pollutants are carried out by a laboratory designated by the Authority in order to determine compliance with the prevailing allowed levels of exposure; County Government of Machakos will also ensure that record of measurements carried out under paragraph (c) are reported to the Authority on a quarterly basis; and take exposure reduction measures recommended under Part IX of the Fifth Schedule. [S.32 (c) (d) (e) AQR, 2014].

v. Measuring and/or estimating environmental parameters and potential environmental impacts (e.g. during combustion), such as: emissions to air (e.g. CO, CO2, NOx, SOx, CH4, NMVOCs, PM, ozone, particulates, odour) by calculation and/or direct measurement and process equipment (e.g. from acid gas removal unit etc.); fugitive emissions (e.g. from valves); vented emissions (e.g. from storage and loading facilities); and other process emissions will be undertaken.

### 3.6.7 Environmental Management and Coordination (Waste Management) Regulation 2006

The Waste Management Regulations sets out standards for handling, transportation and disposal of various types of wastes. The regulations stipulate the need for facilities to undertake, in order of preference, waste minimization or cleaner production, waste segregation, recycling or composting. These regulations provide guidelines on how to store, transport and dispose any wastes generated during the construction and maintenance phases of the project. These regulations are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69, September 2006. These Regulations apply to all categories of waste as provided in the regulations. These include:

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

Relevant parts of this regulation that are pertinent to the proposed road dualling include;

- Prohibition of any waste disposal on a public highway, street, road, recreation area or in any public place except in designated waste receptacle;

- All waste generator to collect, segregate and dispose such waste in a manner provided for under these regulations;
- All waste generators to minimize waste generated by adopting cleaner production methods;
- All waste transporters to be licensed according to the act;
- Collection and transportation of the waste to be done in such a manner not to cause scattering of the waste;

### 3.6.8 Environmental Management and Coordination (Conservation of Biological Diversity) Regulations 2006

These regulations are described in Legal Notice No. 160 of the Kenya Gazette Supplement No. 84, December 2006. These regulations apply to conservation of biodiversity which includes conservation of threatened species, inventory and monitoring of BD and protection of environmentally significant areas, access to genetic resources, benefit sharing and offences and penalties. Additionally, these links provide for the local enforcement of the International Convention on Biological Diversity (CBD).

**NB: Though there are no known rare or endangered species along the Kyumvi-Machakos Town Road, or rare habitats and species of birds seen in the locality of the RoW whose preservation would be key.**

### 3.6.9 Environmental Management and Coordination, (Noise and Excessive Vibration Pollution) Regulations 2010

These regulations are described in Legal Notice No. 31 of the Kenya Gazette Supplement No. 21, May 2010. These regulations prohibit any person from making or causing to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. It also prohibits excessive vibration which annoys, disturb, injure or endanger the comfort, repose, health or safety of others and the environment or excessive vibrations which exceed 70 decibels. Part 11 section 6(1) provides that no person shall cause noise from any source which exceeds any sound level as set out in the First Schedule of the regulations.

**Relevance to the project: As evident in other case studies road construction has the potential produce noise and vibration during operation. The proponent must observe policy and regulatory requirements and implement the measures proposed in this document in an effort to comply with the provisions of these regulations**.

### 3.6.10 Public Health Act (Cap. 242)

This is an Act of Parliament to make provisions for securing and maintaining health. Sections include those dealing with notification of infectious diseases; inspection of infected premises and examination of persons suspected to be suffering from infectious diseases; rules for prevention of diseases; venereal diseases and infection by employees, among others. The proposed project will encourage the movement of people in search of jobs and opportunities, and with this, the risk associated with spread of diseases. Part IX, section 115, of the Act states that no person/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 reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 and include nuisances caused by accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbor rats or other vermin. The environmental management plan (EMP) advices the proponent on safety and health aspects, potential impacts, personnel responsible for operation and monitoring, frequency of monitoring, and estimated cost.

**Relevance**

Road construction gives rise to substantial quantity of fine fugitive dust emissions which create health hazards to the workers as well as surrounding population by way of causing respiratory diseases. The dust also adversely affects visibility, reduces growth of vegetation and hampers aesthetics of the area.

This Act is applicable to proponent and its contractors as they required to provide toilets for use by workers and visitors at the construction campsite. County Government of Machakos will also be required to ensure that waste from the site is properly managed so as not to cause nuisance to public health.

### 3.6.11 Water Act, 2016

The Water Act 2016 provides for the management, conservation, use and control of water resources and for acquisition and regulation of rights to use water; to provide for the regulation and management of water supply and sewerage services.

Section 143 of the Act makes it an offence to obstruct, interfere with, divert or obstruct water from any watercourse or any water resource, or negligently allow any such obstruction, interference, diversion or abstraction. It also prohibits anyone to throw or convey or cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive or

unwholesome matter or thing into or near to water resource in such a manner as to cause, or be likely to cause, pollution of the water resource.

**Relevance**

County Government of Machakos through its contractors will have to adhere to these regulations so as not to carry out any activity or operations that will cause pollution to all natural water courses. Continuous monitoring of dust from road construction is crucial to avert any damage to the water sources and therefore need for implementation of the right mitigation measures.

### 3.6.12 Penal Code Act, Cap. 63

Section 191 of the penal code states that if any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same Act says a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons /institution, dwelling or business premises in the neighborhood or those passing along public way commit an offence. County Government of Machakos shall observe the guidelines as set out in the environmental management and monitoring plan laid out in this report as well as the recommendation provided for mitigation of adverse impacts arising from the project activities.

### 3.6.13 Occupational Safety and Health Act, 2007

This is an Act of parliament that provide for the safety, health and welfare of all workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. It applies to all workplaces where any person is at work, whether temporarily or permanently. The purpose of the Act is to:

- Secure the safety, health and welfare of persons at work;
- Protect persons other than persons at work against safety and health arising out of, or in connection with the activities of persons at work.

The Act provides that before any premises are occupied, or used as a workplace, a certificate of registration must be obtained from the Director of Occupational Safety and Health Services. The Act provides for the health, safety and welfare for employees at workplaces. This shall be considered at the operation and decommissioning phases of the project. The following are other provisions of the Act.

#### 3.6.13.1 Health Act

The quarry and crushing area must be kept clean and not overcrowded. Food and drinks should not be partaken in dangerous places. Provision of suitable protective clothing and appliances

including where necessary, suitable gloves, footwear, goggles, gas masks, and head covering, and maintained for the use of workers in any process involving expose to wet or to any injurious or offensive substances.

#### 3.6.13.2 Safety

Fencing of campsite premises and dangerous parts of other machinery is mandatory. Training and supervision of inexperienced workers, protection of eyes with goggles or effective screens must be provided in certain specified processes. Special precaution against gassing is laid down for work in confined spaces where persons are liable to overcome by dangerous fumes. Air receivers and fittings must be of sound operation and properly maintained. Adequate and suitable means for extinguishing fire must be provided in addition to adequate means of escape in case of fire must be provided.

#### 3.6.13.3 Welfare

An adequate supply of both quantity and quality of wholesome drinking water must be provided. Maintenance of suitable washing facilities, accommodation for clothing not worn during working hours must be provided. Sitting facilities for all female workers whose work is done while standing should be provided to enable them take advantage of any opportunity for resting. Regular individual examination or surveys of health conditions of industrial medicine and hygiene must be performed and the cost will be met by the employer. This will ensure that the examination can take place without any loss of earning for the employees and if possible within normal working hours. The OSHA, 2007 provides for development and maintenance of an effective programme of collection, compilation and analysis of occupational safety. This will ensure that health statistics, which shall cover injuries and illness including disabling during working hours, are adhered. The Environmental Management Plan (EMP) advices the Proponent on safety and health aspects, potential impacts, personnel responsible operation and monitoring, frequency of monitoring, and estimated cost.

#### 3.6.13.4 Work Injury and Benefits Act, 2007

This Act provides for compensation to employees for work related injuries and disease contracted in the course of their employment and for connected purposes. Key sections of the Act include the obligations of employers; right to compensation; reporting of accidents; compensation; occupational diseases; medical aid etc. In case of any accidents or incidents during the project cycle, this Act will guide the course of action to be taken. The Proponent will adhere to the provisions

of this Act during operation phase while the proponent will adhere to these provisions during occupation phase.

### 3.6.14 The Physical and Land Use Planning Act, 2019

The Physical and Land Use Planning Act, 2019 (the 2019 Planning Act) came into force on 5 August 2019, repealing the Physical Planning Act of 1996 (the 1996 Act). The 2019 Planning Act governs matters relating to planning, use, regulation and development of land in Kenya. The government, at both national and county level, is tasked with the preparation of physical and land use plans. The national, county, inter-county and local plans are required to be integrated, and these plans shall collectively form the basis of how land is to be used in Kenya. County governments have retained their role of development control in their respective counties. All applications for development permission shall therefore continue to be made in the relevant county. Development permission must be sought prior to undertaking any development. A developer who does not obtain such prior permission risks criminal sanctions and demolition of the unapproved works. The following is outlined in the new Act:

- **Increased public participation:** Members of the public will now be given the opportunity to give their views and raise objections to various matters e.g. the suitability of the national and county plans.
- **Classification of developments:** Developments are no longer classified as either Class "A" or Class "B" but rather the 2019 Planning Act lists developments that require development permission. In this regard, developments such as subdivision, amalgamation, change of user, extension of user, extension of lease and approval of building plans will still require development permission to be issued by the relevant county government.
- **Additional developments requiring approvals:** Processing of easements and wayleaves will now require express development permission, as will siting of educational institutions, base transmission stations, petrol stations, eco lodges, campsites, power generation plants and factories.
- **Definition of commercial and industrial use:** There is also more clarity as to what constitutes a commercial use versus an industrial use. This will guide applicants in selecting the correct land use, depending on the nature of the project they wish to undertake.

- **Pre-requisite for other licenses:** Development permission in respect of commercial and industrial use is a pre-requisite for other licensing authorities granting a license for a commercial or industrial use, or occupation of land.

The 2019 Planning Act has also set timelines in relation to various matters, significantly:

- **6 years:** The maximum time a person shall serve as Director General of Physical and Land Use Planning.
- **Years:** Period within which to commence a project before the development permission lapses.
- **2 years:** Period within which the national plan should be completed.
- **90 days:** Time allowed for land to be restored by the developer where development permission was not sought in advance, failing which the county shall restore the land at the cost of such developer.
- **60 days:** If an applicant does not receive a response to their application for development permission after this period, such application will be deemed to have been approved.
- **Every 10 years:** Counties are required to prepare their respective county plans.

According to Section 7, of the Act, "a person applying for development permission shall also notify the public of the development project being proposed to be undertaken in a certain area in such a manner as the Cabinet Secretary shall prescribe."

The law has also created a new institution, Director General of Physical and Land Use Planning and the office of the county Director of Physical Planning

**Relevance**

The proposed road construction must have all the prerequisite approvals and experts observe that have no conflict with the Physical Planning Regulations. However, the proponent must comply with KENHA codes, National Environment Management Authority, and National Construction Authority etc. Section 36 states that, if in connection with a development application, the local authority is of the opinion that the proposed development activity will have injurious impact on the environment, the applicant shall be required to submit, together with the application, an EIA report. EMCA, 2015 echoes the same by requiring that such an EIA is approved by NEMA.

### 3.6.15 Way Leaves Act (Cap. 292) Revised Edition 2010

The Act provides for certain undertakings to be constructed e.g. transmission lines, pipelines, canals, pathways etc., over or under any lands. This project is under the provision of the Act. Section 3 of the Act states that the Government may carry any works through, over or under any land whatsoever provided it shall not interfere with any existing building or structures of an ongoing activity. Where the line touches buildings or interferes with people's livelihoods, the Act requires written consent of affected parties and compensation thereof.

### 3.6.16 Climate Change Act No. 11 of 2016 and related polices and Plans

The Climate Change Act (Republic of Kenya, (2016a) provides a regulatory framework for an enhanced response to climate change and proposes measures to achieve low-carbon climate development. The act requires that both national, County governments and private sectors mainstream climate change responses into development planning, decision making and implementation in all sectors of the economy. It also puts in place the climate change governance structure in Kenya, with the coordinating body being the Climate Change Directorate and establishes a National Climate Change Council responsible for overseeing climate change actions. The act also calls for the development of the NCCAPs every five years. The National Climate Change Framework Policy (Ministry of Environment and Natural Resources, 2016), approved by Cabinet in 2018, aims to ensure the integration of climate change considerations into planning, budgeting, implementation and decision making at the national and county levels and across all sectors.

**Relevance**

**County Government of Machakos through their contractors is required to mainstream climate change in their operation of the batching and asphalt plants and associated activities. County Government of Machakos must have internal Climate Change Policy to manage the impacts of climate change and many identified actions to address these impacts. Mitigation actions especially for Green House gases management should be a priority for the Government.**

# 4 SECTION FOUR: ENVIRONMENTAL SETTING

## 4.1 Location

The location or Right of Way is 16km Kyumvi (A109 junction)-Machakos section of (B62) road, Machakos county. The County Government of Machakos through, through the Ministry of Transport, Roads and Public Works intends to use part of its development budget towards improvement of Kyumvi Machakos Road. The County Government of Machakos, through department of Transport, Roads and Public Works, Machakos has in this regard commissioned an ESIA for this proposed activity to cater for the implementation of the expansion in an environmentally and socially friendly manner.


## 4.2 Water supply

There are no permanent surface waters in the RoW road proposed for dualling. Surface water-supply in the area is strictly related to the geology and rivers in the eastern part of the area that do not receive a supply of water from the volcanic areas soon dry up after the completion of the rains. There are no permanent rivers. Rivers deriving their supply of water from Basement System rocks show intermittent flow, periods of flood being separated by periods of dryness.

## 4.3 Summary of geology of the location

The eastern half of the area is formed by rocks of the Basement System, while to the west lavas, pyroclastics and sediments of Tertiary age are exposed. In general, the rocks in the area can be divided into four main age groups; Recent soils and alluvial deposits; Pleistocene sediments; Tertiary volcanics and sediments and Archaean Basement System. Preservation of the plateau is due to a capping of Kapiti Phonolite, which at its edge is about 50 to 75 feet thick. Along its length there is a gentle slope to the south-east of the Phonolite-Basement contact. The location as observed has stones which

generally are pale bluish in colour and resemble mudstones or fine-grained limestone more than volcanic rocks. An important economic factor of the building-stones is their importance as high-grade building material and extensive quarrying of the building-stones that resembles those in the Thika valley. The distinctive feature of the building-stones is their fine-grained character and their uniform pale coloring, which varies in tints of blue, purple, green and brown. The lower claystone is usually capped by about six inches of brown flinty claystone (specimen 52/526). As with most of the tuffs and agglomerates in this region, the building-stones consist mainly of glass fragments with occasional crystals of orthoclase.

### 4.4 State of biodiversity on Site

Though there are no known rare or endangered species in the locality of carriage way proposed for dualling.

### 4.5 Physical and Topographic Features

The road section has unique physical and topographical features. These include undulating slopes to the South East. In the plains, the soils are well-drained, shallow, dark and red clay soils.

### 4.6 Climatic Conditions and Agro-ecological Zones

The area receives bimodal rainfall with short rains in October and December while the long rains from March to May. The rainfall range is between 500mm and 1250mm, which is unevenly distributed and unreliable. The altitude mainly influences rainfall distribution in the county. The high areas receive an average rainfall of 1000mm while the lowland areas receive about 500mm. Temperatures vary between 18°C and 29°C throughout the year. The dry spells mainly occur from January to March and August to October. The area can be classified under agro-ecological zone 5 (Lower midland).

### 4.7 Utilities along the RoW corridor

There are key utilities along the RoW corridor located within the project limits such as power and lighting installations. Utility adjustments may not be necessary, but it is still necessary to show the utility on the plans and notify the utility owner of proposed work even if no adjustment is anticipated. Early coordination is crucial between the utility, the project designers, and Design Services - Utilities Section. The Utility Coordinator, in coordination with the project designers, will evaluate utility impacts and identify the extent of the work needed by the the utility. It is preferred to avoid impacts to utilities if possible.

# 5 SECTION FIVE: PROPOSED ROAD DUALLING AND ASSOCIATED ACTIVITIES

## 5.1 Introduction

The location or Right of Way is 16km Kyumvi (A109 junction)-Machakos section of (B62) road, Machakos county. The road passes through, Kathome market, Kithini Shopping Centre, Kimangu, Kenya Israel and ends at the Kitui Machakos road intersection. It contains nine activities: ditch excavation, culvert, concrete removal, peat excavation and swamp backfill, embankment, utility work, subbase, gravel, and paving.

## 5.2 Site Planning and Preparation

The project started with site planning and preparation. Much of the planning and preparation of the road dualling was done by land survey teams from the County and national Government. These professionals mapped and set control lines running the entire length of the road. They will then create reference points along the shoulders, and plant markers to guide the construction crew. In order to ensure ease of site access, the contractor has to clear any vegetation and remove any other obstructions occurring within or near the allocated road allowance.

## 5.3 Installation of Utilities

The next step is the installation of underground utilities like storm drains. This is a very intensive phase in the project because it involves the fitting of valves. The new piping systems are then connected to the existing drainage then redirected to the affected premises. The concrete supports of security or street lights are also planted before the actual road construction begins.

## 5.4 Mobilization and construction phase

### 5.4.1 Mobilization

Works will be carried out by the contractor selected through local tendering. Prior to the commencement of works, the contractor will specify location of the camp, equipment stationing area, material stockpiling sites and agree on/receive a permit for its use. After selection of Construction Company through tendering, preconstruction activities connected with the highway construction works to be implemented by the latter include the following:

- Preparation of temporary camp sites in the vicinity of the road bed in accordance with environmental requirements;
- Selection of temporary disposal sites for construction debris of the highway and materials;
- Selection of temporary sites for separate stockpiling of topsoil and subsoil, obtaining approval from local administration and environmental authorities;

- Land acquisition/compensation;
- Obtaining permits (Environmental impact permit issued by the NEMA ) for the operation of asphalt plants (in case contractor plans to run his own plants);
- Approval of quality characteristics (allowable limits of discharge) of waste water by NEMA (part of Environmental impact permit) – if discharge into any water body is planned;
- Obtaining mining licenses by contractor or concluding sub-contracts for the supply of aggregate materials (use of licensed suppliers rather than development of new quarries is advisable);
- Developing waste management plan;
- Developing traffic management plan;
- Developing work camp or construction yard site map;
- Relocation/protection of existing infrastructure.

### 5.4.2 Construction stage

After all the utilities are installed and tested to ensure proper functioning, the actual road construction exercise begins. The road-building phase kicks off with the placement and installation of concrete curbs, gutters, sidewalks, and even new driveways to residences. After these accessories are installed, all vehicles are barred from driving on the curbs for three days until the concrete is fully cured. In the meantime, electrical conduits for the streetlights are installed behind the new curb. After the concrete curb is totally dry, a base layer of asphalt is laid down for the main road or pathway. The closed driveways are then restored and connected to the new road. The final layer of pavement is then placed and the paved sections marked or painted. When it comes to road painting, any certified Greenwood asphalt striping contractor will know the most appropriate styles and colors for marking the driveways, access roads, bumps, and in some cases the pavements.

The construction process involves a variety of activities, such as

- Stripping and stockpiling of topsoil until reuse during reinstatement of temporarily disturbed sites (Note: a) the height of the stockpile must not exceed 2m, b) all sites temporarily disturbed/used for the needs of the project must be reinstated);
- Removal and stockpiling of subsoil to agreed location until reuse;
- Grading of the area and laying of cross-drain pipes/culverts. In fill areas, the grading is brought up in layers and compacted. In cuts, the excavation is carried on until the subgrade elevation is reached, and then the earth is compacted;
- Reinforcement of soil with gravel columns and/or Prefabricated Vertical Drains (PDV);

- Base course forming on the subgrade. Soil rolling with machinery. Import of inert materials with trucks, roll (around 500-800 mm) for bed formation;
- Surface course forming over the base. This material may be sand, asphalt, blacktop, concrete, or similar materials;
- Concrete works, arrangement of foundations and bridge structures, including arrangement of sheet piles for construction of the piers in the riverbed;
- Providing of road furniture and marking in accordance with international standards;
- Landscape harmonization and tree planting/grass seeding of temporarily disturbed areas according to the reinstatement plan. Landscaping efforts should start just after the first base layer of asphalt is placed; that is before the final layer of pavement is installed. Placement of top soils and of other decorative retaining bulwarks is all part of landscaping. These and other aesthetic endeavors will continue even after the site cleanup exercise is over.

Volume of earthworks is calculated in accordance with the design cross-sections

#### 5.4.2.1 Mounting

The road takes shape as diggers, excavation plant machinery and bulldozers mount dirt and soil over the area where the future pathway will run. The surface is then leveled and smoothed by graders. Culverts and drains, consisting of large concrete pipes, are laid to prevent the road from flooding by leading away groundwater, sewage or storm water.

#### 5.4.2.2 Fine Grading

Fine grading requires construction workers to prepare the surface by leveling it according to plans provided by structural engineers. Fine grading requires manual labour and digging as well as grading plant machinery, also called graders. To make the grading last, it is stabilized with limestone or concrete.

#### 5.4.2.3 Aggregate Base

After another grading of the surface, the aggregate base course is laid. Aggregate base is made of crushed stone or gravel, and it is placed evenly on the road surface. If the road is in a town or city, a curb for the pavement and the gutter will be constructed straight after the gravel is placed on the surface. The road is then fine graded again.

#### 5.4.2.4 Asphalt Paving

Once the gravel has been distributed evenly, the asphalt can be poured. Asphalt is a mixture of a petroleum byproduct, an aggregate base material and bitumen. Depending on the expected traffic

on the road, up to four layers of asphalt can be placed on top of each other. The asphalt usually is produced and mixed in large plants after the engineer's specifications. The hot asphalt is filled into trucks that transport the material to the construction site where it will be poured immediately. Before the last layer of asphalt is poured, the sidewalks and gutters have to be finished.

### 5.5 Road furniture

The construction work is concluded by placing the appropriate road signs at the places specified by planners and the application of road markings. Examples of road furniture are road signs, crash barriers, sign-posts and lamp-posts. Usually these are made of galvanized steel but they are still subject to corrosion. Zinc can be released into the environment through the use of de-icing salts and in addition the older types of paints may contain heavy metals. However, compared to heavily trafficked roads, the environmental impacts of road furniture is expected to be minor.

### 5.6 Types of Construction Vehicles to be used onsite

To prepare land and build a structure at a construction site, the contractor will use a variety of vehicles. Each vehicle has its own assignments at the site based on its capabilities, and its operator is responsible for using the vehicle to complete any work needed.

#### 5.6.1 Bulldozers

Bulldozers are often the first vehicles on a construction site as they will clear the ground by pushing away debris. The heavy metal blade attached to the front makes it easy for them to push debris of all types including concrete, tree branches and large rocks. Once the debris has been cleared, dirt is moved around to make the site level.

#### 5.6.2 Front Loaders

As bulldozers push debris and excess dirt to the side of the construction site, front loaders load it on to dump trucks for it to be hauled away. With a shovel/scoop attached to the front of the vehicle, they easily scoop, lift and dump dirt until the site has been cleared. Front loaders do have a limitation, though, since they are unable to dig or scoop dirt lower than ground level.

#### 5.6.3 Dump Trucks

Hauling debris and dirt away from the construction site is the responsibility of the dump truck. They also can bring in additional rocks, gravel or dirt if needed to stabilize or level the land at a site. There are a variety of types of dump truck vehicles in construction. Some of these include the standard double and triple trailer vehicles, which allow one truck to haul multiple trailers of dirt and debris. In addition, there are off-road dump trucks that are used in rough terrains and mining.

### 5.6.4 Backhoes/Excavators

When digging is needed at a construction site, a backhoe or excavator is used. Backhoes can be used for shallow digging projects such as small trenches for water or sewer pipes. They are also used to bury pipes after they've been laid by covering them with excess dirt. For larger digging projects, such as a basement or tunnel, excavators are used. The depth to which they can dig is based on the length and height of their boom or arm. The longer and taller it is, the farther down they can dig.

### 5.6.5 Cranes

Work can begin on an actual structure once the ground has been prepared. Cranes are often brought in for large structures or commercial buildings where there is a need to lift heavy objects such as metal beams and other materials. In addition, this type of construction vehicle may be used for large buildings where a need to reach high exists. Cranes vary in size and abilities as there are a number of different types. Truck-mounted cranes, tower cranes and rough terrain cranes are just a few of the cranes available for use in the construction industry.

## 5.7 Auxiliary facilities

If licensed to operate, the contractor will need to have the following facilities;

- **Campsite**: The project contractor will need a campsite. The contractors will put several material here as well as a batching plant, asphalt plant etc.
- **Workshop/ Garage** complete with a parking area, for day-to-day quick and light repairs and servicing of the vehicles used for road construction;
- **Site office** for keeping records of the operations and enabling smooth day-to-day functions.
- **Sanitation block within campsite** with changing rooms, washing rooms and toilets;
- **Water supply** to provide water for use by staff; there a proposal for borehole at the site.
- **Electricity supply** for receipt of electrical power from the KP supply line and supply to various components of the asphalt, batching plant including campsite.
- **Security post** at the entrance of the site for security staff.

**Note: Ensure separate EIAs are conducted for campsites, borrow pits, asphalt and batching plant.**

## 5.8 Utilities

### 5.8.1 Power supply

Kenya Power supplies one phase electricity to the site. The supply is connected to the site from a nearby line.

### 5.8.2 Water supply

The project will draw water from the borehole at the site that the County Government has planned to drill.

## 5.9 Permit and licenses for off-site works during construction

Off-site works will include extraction of construction materials or purchase of material from already existing licensed quarries. (The latter option is preferable.). According to the law, the license is granted to the proponent presenting the best proposal that shall meet the criteria stipulated for resources and environmental protection, and recognized as the most economical acceptable. The validity of the license for abstraction of construction materials may be up to 30 years, while short term licenses may vary from 2 to 5 years. A license holder is obliged to ensure sustainable use of the resources with due regard of environmental and resource protection rules; guarantee safety of works with consideration of ambient air, water, soil, forest, protected areas, protection norms for historical and cultural monuments and buildings. A license holder is obliged to stop operation if any rare plant or object of aesthetic value is found. The fact must be immediately communicated to NEMA and relevant governmental authorities. The license holder is responsible for restoration and reinstatement of the used plot. The license can be terminated in case of non-compliance with license conditions, including environmental requirements. Liquidation or conservation costs are covered by the resource user. In case of license termination the owner automatically loses right to the land plot.

If the contractor decides to use own borrow pit/quarry the following requirements must be met:

- Sufficient resource in the proposed quarry must be insured to make a site financially viable; including rehabilitation expenses.
- Topsoil must be removed and stockpiled until reintroduction. The topsoil should not be buried, driven on, excessively handled, contaminated or stockpiled so as to hinder final land-use.
- If required, erosion protection must be provided.
- To ensure safe operation the access tracks must be of adequate width: the track should be twice the width of the widest vehicle in the case of one-way traffic and three times the width of the widest vehicle in the case of two-way traffic.
- Gates and fences should be designed, regularly inspected and repaired to prevent unauthorized entry; signs at any insecure locations on a site indicating the risk must be provided.

- Operation and decommissioning of the quarry/borrow pit must be performed in compliance with the conditions of the quarrying license and with due regard to environmental standards.
- Upon completion of the license term, the quarry/borrow pit area affected by the development should be re-cultivated: the topsoil reinstated, the status of the site restored to the state close to the initial state (for instance, the site may be planted with vegetation).

# 6 SECTION SIX: POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

## 6.1 Introduction

Environmental impacts of the 16KM- Kyumvi (A109 junction)-Machakos section of (B62) road section expansion of the design highway have been identified and evaluated for pre-construction, construction and operation stages of the project. On each stage both negative and positive impact on environment along the new alignment and next to it will occur. The environmental baseline information collected and the project description discussed form the basis for impact identification and evaluation. The impacts that are expected to arise from the project could both be termed as positive or negative, direct or indirect, short-term or long-term, temporary or permanent depending on their nature, area of coverage and their duration in the environment and have been identified in all the phases of the project cycle namely operational and decommissioning. The list of expected impact by the stage of the project is given in the table below.

| Planned operation | Environmental Impact |
|---|---|
| Preconstruction<br>▪ **Obtaining all clearance and permits related to the project;**<br>▪ **Development and approval of plans (such as waste management, traffic management, erosion management);**<br>▪ **Identification of sources /suppliers of materials identified;**<br>▪ **Selection of sites for temporary camps, material, topsoil, spoil and waste with consideration of environmental and safety requirements.** | **Nil** |
| ▪ **Preparation of worksites, sites for vehicles and construction machinery, arrangement of temporary facilities and camp site (in case arrangement of construction camp is considered by contractor advisable) – this includes removal of vegetation (whether absolutely necessary), stripping and removal of topsoil to temporary storage, grading of the work areas;**<br>▪ **Clearing the RoW strip - removal of vegetation, stripping and removal of topsoil to temporary storage area;**<br>▪ **Onsite and offsite works.** | ▪ Air emission of inorganic dust and combustion products;<br>▪ Propagation of noise and vibration;<br>▪ Generation of waste, littering;<br>▪ Accidental oil spills - risk of soil and water pollution;<br>▪ Soil erosion, ramming;<br>▪ Impact on flora and fauna;<br>▪ Visual impact;<br>▪ Increase of traffic;<br>▪ Impact on infrastructure – potential temporary disruption of services provided to local population and travelers;<br>▪ Resettlement/land acquisition of permanent use agreement needs;<br>▪ Safety-community, workforce;<br>▪ Temporary employment (Note: positive impact). |
| Construction works:<br>▪ **Importation of inert material for arrangement of embankment;**<br>▪ **Storage of material in specially allocated area (if deemed advisable);**<br>▪ **Arrangement of embankment-forming embankment, ramming;**<br>▪ **Arranging drainage system;**<br>▪ **Installation of sheet piles in water crossing bridge construction area**<br>▪ **Bridge construction-arrangement of foundation; pile cap; bridge column, bearing, bridge deck-works include excavation, concrete works, assembling pre-cast elements on the site;**<br>▪ **Paving of the deck and the carriageway, including shoulders;**<br>▪ **Road marking and installation of road signs;**<br>▪ **Onsite and offsite traffic** | ▪ Air emission – dust, exhaust emissions and welding aerosols;<br>▪ Propagation of noise and vibration;<br>▪ Deterioration of water quality – pollution with oil products and increased turbidity during works close/in the stream bed<br>▪ Risk of flow blockage;<br>▪ Accidental oil spills – soil pollution;<br>▪ Soil erosion, ramming;<br>▪ Waste generation, littering;<br>▪ Impact on terrestrial fauna;<br>▪ Impact on aquatic fauna (in river crossings);<br>▪ Risk of impact on vegetation;<br>▪ Increase of traffic;<br>▪ Impact on road infrastructure; |

| | |
|---|---|
| | ▪ Risk of accidental undeliberate impact on private properties;<br>▪ Temporary employment in construction (Note: positive impact);<br>▪ Safety-community, workforce; |
| Demobilization<br>▪ **Dismounting of temporary structures;**<br>▪ **Removal of machinery and waste from the area;**<br>▪ **Landscaping of site disturbed during construction (based on landscaping plan, tailored to the site).** | ▪ Air emission – dust, exhaust emissions;<br>▪ Propagation of noise and vibration;<br>▪ Waste generation, littering;<br>▪ Risk of soil and water pollution;<br>▪ Impact on baseline traffic;<br>▪ Safety – community, workforce. |
| Operation:<br>▪ **Traffic along the new alignment;**<br>▪ **Maintenance of roads and bridges** | ▪ Air emissions (dust, combustion emissions);<br>▪ Noise and vibration;<br>▪ Safety risks;<br>▪ Impacts during maintenance - similar to those expected during construction, but with lower magnitude, local |
| **Decommissioning; Must be considered separately (whether required).** | Will depend on planned works. |

**Table 6-1: Mitigation Plan for the Design Phase**

| Issue | Measures taken or to be taken | Implementing Organization | Responsible Organization - supervisor |
|---|---|---|---|
| **Dust/air pollution** | Location of soil borrowing sites, waste disposal sites and concrete mixing sites will be identified with consideration of environmental issues (to avoid negative impacts on humans and wildlife). | Contractor, contractor Contractor | County Government of Machakos |
| **Noise** | Planning of auxiliary and haulage routes will be done with maximum use of existing roads and/or away from densely populated areas to reduce nuisance related to noise. | | County Government of Machakos |
| **Surface water pollution** | Need for installation of drainage system will be identified. Surface water protection measures for facilities/works near or in the riverbed will be identified | | County Government of Machakos |
| **Loss of source of income/for roadside business** | -Damages/loss will be compensated according to the RAP if any | | County Government of Machakos |
| **Landscape visual change** | Design, colour and shape will be identified with consideration of peculiarities of the landscape | | County Government of Machakos |
| **Impact on surface water** | Seasonal River crossing are designed allowing minimum interference with active riverbed | | County Government of Machakos |

**Table 6-2: Mitigation Plan for Construction Phase**

| AIR QUALITY | | | |
|---|---|---|---|
| **Potential impact** | Mitigation/Enhancement Measure | Responsibility | Control |
| **Exhaust emissions from the engines of construction vehicles and machinery** | -All vehicles, equipment and machinery used for construction will be regularly maintained and inspected/certificated to ensure that the pollution emission levels conform to the standards prescribed.<br>-Idling of engines will be prohibited.<br>-Use of poorly maintained machinery or equipment that cause excessive pollution (e.g., visible smoke, fuel/oil leaks) will be banned.<br>-Staff will be trained in best practice | Contractor | County Government of Machakos<br><br>Construction supervisor |
| **Dust generated during loading/unloading and hauling of friable materials** | -Construction materials (gravel, sand, etc.) will be transported in covered (for example, by tarpaulins) vehicles.<br>-Unpaved roads and significant areas of uncovered soil will be sprayed with water every four hours on working days, during dry and windy weather;<br>-Optimum speed will be kept to while moving through the residential area to reduce dust emissions;<br>-Dumping of material from high will be prohibited to avoid dust related nuisance;<br>-Staff will be trained in best practice. | | |
| **Dust generated during the movement of vehicles** | -Water truck bowser with spray bar will be used to spray water on unsealed road surfaces, asphalt mixing sites and temporary service areas, for dust suppression.<br>-Optimum speed will be kept to while moving through the residential area to reduce dust emissions. | | |
| **NOISE AND VIBRATION** | | | |
| **Construction-related noise from vehicles, asphalt plants, crushing and batch plants (If any), equipment** | All vehicles, equipment and machinery used for construction will be regularly maintained and inspected/certificated to ensure that the noise levels conform to the standards prescribed. | Contractor | County Government of Machakos and MoT Construction supervisor |

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| **Noise Impact – Disturbance to residents** | -Work hours will be restricted between 06:00 to 21:00 hours within 500 m of the settlements along the dualled section.<br>-Noise on construction site will be limited. Idling with switched gear will be prohibited, shields used, if required. Other measures include design and construction of noise barrier - a wall, an earthen berm, or a combination of wall and berm, use of green barrier (tree planting);<br>-Dialogue will be maintained, grievance mechanism used to allow residents to contact Project staff and ask for additional measures;<br>-Traffic schedule will be developed and kept to;<br>-Optimum travel speed during offsite travel will be set<br>-Distance to the nearest residence building or inhabited area will be kept to;<br>-Proper state of maintenance of machinery and vehicles will be maintained;<br>-Vegetation will be preserved as far as feasible to act as a natural noise barrier;<br>-Train staff will be trained in construction best practice. | Contractor | County Government of Machakos and MoT Construction supervisor |
| **Noise impact on workers** | Noise standards will be strictly enforced to protect construction workers from noise impacts, in accordance with international Health, Safety and Environment (HSE) standards and procedures.<br>-Personal Protection Equipment (PPE) (e. g., ear defenders) will be provided and used.<br>-Noise exposure will be limited to 85 dB (A). | Contractor | County Government of Machakos and MoT Construction supervisor |
| **SOIL AND WATER** | | | |
| **Pollution of soil and water (Seasonal streams and tributary)** | -Contractor will be requested to provide<br>-Information about location and floor space of the area required and layout of the work camp;<br>-Description and layout of equipment maintenance areas and lubricant /fuel storage facilities including distance from water<br>sources and irrigation facilities;<br>-Storage facilities for fuels and chemicals will be located away from watercourses.<br>-The storage will be bounded and provided with impermeable lining to contain spillage and prevent soil and water contamination Prior to the commencement of works the site installations will be inspected for approval; | Contractor | County Government of Machakos and MoT Construction supervisor, |

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|---|---|---|---|
| | -Each parking, service, or cleaning and washing site will be equipped with waste water treatment facilities (temporary);<br>-Sewage management plan and proper sewage collection and disposal system will be available to prevent pollution of watercourses (if discharge in surface water is planned);<br>-Use of offsite fueling and maintenance facilities will be encouraged. However, in planned to have onsite – storage and handling of fuels, oils and other hydrocarbons will be a controlled process, involving measures to prevent soil and water contamination. Designs will include storage on sealed surfaces and within secondary containment and refueling of all plant, vehicles and machinery will not be allowed within 50 m of any watercourse, drain or channel leading to a water course.<br>-Waste management plan will be prepared;<br>-Storing and disposal of waste/used oil will comply with environmental regulations and standards;<br>-Contaminated or hazardous waste such as bitumen waste will be disposed only in areas approved by the NEMA. All waste disposal will comply with a Waste Management Plan, to be developed at the start of construction;<br>-After completion of construction works the contractor will execute all works necessary to restore the sites to their original state (removal and proper disposal of all materials, wastes, installations, surface modelling if necessary, spreading and levelling of stored top soil);<br>-Location of temporary disposal of soil material will be selected in the area with consideration of general environmental safeguards and potential risks. | | |
| **Siltation of surface waters during construction near seasonal streams tributary and/or impact on soils due to improper disposal of excess materials** | -Sheet piles will be used to avoid pollution of the water;<br>-Bank protection measures will be used to avoid erosion;<br>-Monitoring of bank stability will be implemented. | Contractor | County Government of Machakos and MoT Construction supervisor |

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| **Soil compaction due to operation of heavy equipment** | Operation of heavy equipment will be confined within the corridor to avoid soil compaction and damage to land. | Contractor | County Government of Machakos and MoT Construction supervisor |
| **Loss of top soil** | -All of the removed top soil within the corridor will be stored for reuse. Long-term stockpiles of topsoil will immediately be protected to prevent erosion or loss of fertility.<br>-Topsoil will be stripped and reused during land scaping of disturbed sites;<br>-Soil management plan will be provided. The plan will describe measures to be undertaken to minimize effects of wind and water erosion on stockpiles, measures to minimize loss of fertility of top soil, timeframes, haul routes and disposal sites;<br>-Prior to operation of borrow pits, the contractor will develop and submit reinstatement plan – indicating location of the borrow pits, rehabilitation measures, implementation schedule (Rehabilitation measures may not be necessary for borrow areas still in operation after road works have finished). | | |
| **Wastewater collection and disposal/treatment** | Camps (if any) will be furnished with sanitary and wastewater collection and disposal/treatment facilities and should operate fully compliant waste systems, involving storage of waste by waste category. | Contractor | County Government of Machakos and MoT Construction supervisor |
| **Sand and gravel borrow pit-disturbance of river bed, water quality, ecosystem disturbance** | -Preference will be given to use of existing borrow pits or buying material at licensed facilities;<br>-Borrowing from the stream will be prohibited. | Contractor | County Government of Machakos and MoT Construction supervisor |
| **ECOLOGY AND NATURAL ENVIRONMENT** | | | |
| **Potential damage of vegetation/flora during excavation/ construction and** | Boundaries of RoW and operation area will be strictly kept to -to avoid impact on the adjacent vegetation;<br>-Any damage to the existing trees during construction activities will be avoided; temporary vegetation protection fence – established; Dust, water, soil impact mitigation measures will be implemented; | Contractor | County Government of Machakos and MoT Construction supervisor |

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| **transportation activities** | -Clearing up and removal of vegetation will be minimized to the extent necessary for the execution of works.<br>-Vegetation will be preserved as much as feasible;<br>-In case taxation reveals any protected plant species in the area, the latter will be removed from the environment in accordance with forest Act 2005<br>-Re-vegetation will be performed. "Replacing' lost vegetation by triple amount of the same species replanted in the area (whether deemed advisable), maintenance of vegetation for 2 years minimum; | | |
| **Maintaining animal mobility through culverts and bridges** | Designed culverts and underpasses will be used as animal crossing points. | Contractor | County Government of Machakos and MoT Construction supervisor |
| **Domestic and wild animals straying onto the road and being killed.** | Protective fence along the road, and fencing of excavated sites as a measure to prevent domestic and wild animals straying onto the road and being killed or falling into the excavations will be Installed. Protective fences will be of various density. For small animals boards or corrugated metal shields will be used. For larger animals colour ribbons will be used as a generally accepted practice. | Contractor | County Government of Machakos and MoT Construction supervisor |
| **Disturbance of wild life** | -Adherence to no horn policy will be enforced;<br>-Dust, noise, water, soil impact mitigation measures will be Implemented;<br>-Strict keeping to traffic routes during the construction will be ensured to avoid impact on vegetation;<br>-Vegetation will be preserved as much as feasible;<br>-Works will be scheduled to the season less sensitive for fauna.<br>Tree cutting in the season most sensitive for birds (nesting/hatching) will be avoided;<br>-Poaching will be prohibited | | |
| **Damage to aquatic ecosystems, habitats and fish** | -Movement of machines inside seasonal rivers, streams, or on their banks will be prevented except when it is unavoidable due to the construction of a structure or construction;<br>-Vegetation on the slopes will be preserved to reduce the risk of siltation.<br>-All the works to be performed in water or near watercourses will follow statement or plan for the execution of particular works. | Contractor | County Government of Machakos and MoT Construction supervisor |

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| | -Erosion protection measures set in Soil and erosion management plan will be implemented, including measures that will be undertaken to address adverse environmental impacts such as erosion of river embankment and siltation of watercourses that may result from such activities.<br>-Poaching will be prohibited;<br>-"Dropping structures" into rivers/streams will be avoided. This will be done by "sawing" appropriate sections of the structure and using cranes to lift these sections or alternatively construct a platform onto which the structure could be dropped.<br>-Discharge of sediment-laden construction water (e.g., from areas containing dredged soil) directly into surface watercourses will be forbidden. Sediment laden construction water will be discharged into settling lagoons or tanks prior to final discharge.<br>-Staff will be trained in construction best practice. | | |
| **Damage to river morphology** | Digging and making the foundations for bridge piers, retaining walls, and structures located at, or near, surface water bodies, will take place in low water period to minimize negative impacts on rivers and their banks | Contractor | County Government of Machakos and MoT Construction supervisor. |
| **LANDSCAPE, VISUAL AND AGRICULTURE** | | | |
| **Potential deterioration of aesthetic value of the landscape and vegetation losses** | Landscape planting will be developed and implemented;<br>-Vegetation will be protected from non-deliberate damage – achievable by keeping to the boundaries of the work areas and travel routes.<br>-Erosion prevention measures (straw bales, fibre rolls, other) in sensitive locations will be provided;<br>-Stability of the slope of deep excavations for bridge piers will be ensured. For this purpose boarding can be used. | Contractor | County Government of Machakos and MoT Construction supervisor |
| **Damage to agricultural lands, including impacts of drainage and irrigation infrastructure** | -Grievance procedure will be developed before start of construction;<br>-Machinery and vehicle access will be strictly limited;<br>-All the affected areas will be restored. | Contractor | County Government of Machakos and MoT Construction supervisor |

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| **Livestock resources damaged by machinery and vehicles** | -Grievance procedure will be developed before start of construction;<br>-Machinery and vehicle access will be strictly limited;<br>-All the affected areas will be restored. | Contractor | County Government of Machakos and MoT Construction supervisor |
| **Arrangement of new borrow pits or stone quarries, possibly damaging agricultural or archaeological** | -Contractor will be encouraged to use the Borrow pits on specific locations which are predefined within the detailed design.<br>-Advantage will be given to already licensed sourcing areas, Existing quarries will be used or license to run own quarry will be obtain (if deemed advisable). | Contractor | County Government of Machakos and MoT Construction supervisor. |
| **CULTURAL HERITAGE AND ARCHAEOLOGY** | | | |
| **Possible loss or damage to cultural resources** | In case of chance finds, the Contractor will immediately, without delay, halt works and inform the authorized Institution for Protection of Cultural Monuments and undertake measures to ensure the findings are not destroyed or damaged and to protect the area and position in which they are discovered. | Contractor | County Government of Machakos and MoT Construction supervisor |
| **HEALTH AND SAFETY** | | | |
| **Health and safety risks to workers** | -The following will be provided: Adequate health care facilities (including first aid facilities) within construction sites;<br>-All construction workers will be trained in basic sanitation, general health and safety matters, and on the specific hazards of their work;<br>-Personal protection equipment (PPE) for workers, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection required in accordance with OSHA 2007 legislation will be provided and used;<br>-Clean drinking water will be made available to all workers;<br>-Drainage throughout the camps (in case available) will be arranged to avoid puddling;<br>-Periodic cleaning of latrines (if available) and waste container will be implemented to prevent outbreak of diseases;<br>-Where feasible contractor will arrange temporary integration of waste collection from work sites into existing waste collection systems and disposal facilities of nearby communities. | Contractor | County Government of Machakos and MoT Construction supervisor |

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| | -Training/briefing about safety – prior to commencement of works in rules for the handling and storage of hazardous substances (fuel, oil, lubricants, bitumen, paint) and cleaning of machinery/equipment will be provided;<br>-International HSE standards will be implemented in all contracts.<br>-Working on height and other safety requirements relevant to the task will be enforced.<br>-Proper maintenance of vehicles and machinery will be ensured - machinery examined prior to use to ensure it is in safe condition;<br>-Machine perimeter will be checked before moving to exclude any possibility of collision with people/objects;<br>-Seat-belts while operating machine will be used;<br>-Leaving machinery unattended with engine running will be prohibited;<br>-Safe speed will be preserved;<br>-Designated spotter will be assigned, if backing is required, to guide the move. (Note: The spotters must wear high-viz vests and stay in sight of the driver. The driver must stop if he loses sight of the spotter.);<br>-Compliance with work on height safety measures will be ensured;<br>-PPE and safety gear during works on height and elsewhere as appropriate will be provided, use - enforced. This includes use of hearing protective devices capable of reducing sound levels at the ear to at least 85 dBA; -Adequate on site First Aid Boxes and treatment facilities will be provided;<br>-Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits will be controlled through the choice of equipment, installation of vibration dampening pads or devices, and/or limiting the duration of exposure (OSHA Guidelines, 2007); -Alcohol use will be prohibited;<br>-Use of mobile phone while driving will be prohibited;<br>-Drivers and other personnel will be trained; -Measures suggested for noise, air quality reduction will be kept to;<br>-Traffic Management, Waste Management plans will be developed and implemented;<br>-Warning signs and barriers will be installed wherever appropriate. | | |

| | | | |
|---|---|---|---|
| **Health and safety risks to adjacent communities.** | -Barriers and warning signs at all hazardous areas will be installed to protect general public;<br>-Measures suggested for noise, air quality reduction will be kept to;<br>-Community will be informed about the possible restriction of services (power supply) and duration of disruption;<br>-Alternative access roads will be provided – if exiting ones are temporarily not available for pedestrian and traffic (including non-motorized);<br>-Traffic Management, Waste Management plans will be developed and implemented;<br>-Safety awareness campaigns, focusing on schools and children will be implemented. | Contractor | County Government of Machakos and MoT Construction supervisor |
| **Community tension and disruption** | -Locations for camps (if any) will be designed by contractor. Project. Contractor will prepare Camp Management Plan.<br>-Grievance mechanism will be in place;<br>-Priority will be given to employment of local population (under condition that required qualification/skills are available) | Contractor | County Government of Machakos and MoT Construction supervisor |
| **TRAFFIC AND MACHINERY** | | | |
| **Asphalt plants** | Existing asphalt plants will be used, in case decision is made to use own asphalt plant - permit from NEMA will be obtained. | Contractor | County Government of Machakos and MoT Construction supervisor |
| **Traffic disruption** | -Traffic Management Plan will be developed in conjunction with road authorities to manage all temporary accesses, delivery of material and machinery;<br>-Traffic management plan will be submitted to local traffic authorities prior to mobilization;<br>-Information about the scope and schedule of construction activities and expected disruptions and access restrictions will be provided to the public;<br>-Adequate traffic flow around construction areas will be allowed for;<br>-Adequate lighting, well-designed traffic safety signs, barriers and flag persons for traffic control will be provided | Contractor | County Government of Machakos and MoT Construction supervisor |

**Table 6-3: Mitigation Plan for Operation phase**

| Activity | Location | Issue | Mitigation measure | Responsible authority (implementation) | Responsible agency (monitoring) |
|---|---|---|---|---|---|
| **Accidental fuel/oil spill and/or roadside litter washed off/blown off into the river** | Surface water | Water pollution | Maintenance works will be planned so to prevent runoff contamination; Surface sweeping and development of better cleaning methods – are considered as mitigation;<br>Culverts will be cleaned routinely, and repaired as far as required;<br>-Water from bridge will be collected and retained prior to discharge. | Road Maintenance Contractor | County Government of Machakos and MoT, Traffic Police |
| **Road resurfacing** | Road/bridge | Water bodies pollution by heavy metals, hydrocarbons and debris | -Maintenance paving will be performed only in dry weather to prevent runoff contamination; -Proper staging techniques will be used to reduce the spread of paving materials during the repair of potholes and worn pavement. These can include covering storm drain inlets and manholes during paving operations, using erosion and sediment controls to decrease runoff from repair sites, and using drip pans, absorbent materials and other pollution prevention materials to limit leaks of paving materials and fluids from paving machines. | Road maintenance contractor | County Government of Machakos and MoT |
| **Noise** | Residential area | Disturbance of local residents by traffic related noise | In those locations where the nighttime noise is expected to slightly exceed allowable limit green barriers and speed reduction are recommended. In other areas noise barriers are assumed to be an option. Dimensions of the walls are calculated with consideration of the distance and topography of the area. In Black Sea Arena section the modelled noise value is in allowable limit, however, keeping in mind that this is a concert hall, arrangement of green barriers is deemed to be necessary. Additional measures may be required later during operation in case monitoring reveals expedience of the limit or complaints from the resident received. | n/a | n/a |
| **Littering** | Along the dualled road | Possible negative impact on wildlife, Water pollution, Aesthetic impact | -Community will be informed of the level of fines that littering incurs;<br>-Awareness raising in proper waste disposal (no littering, no fly tipping);<br>-Installation of signage as a part of a roadside litter prevention program, educating the community that littering is illegal, fines apply and behaviours are monitored. The signs may be suitable | Road maintenance contractor | County Government of Machakos and MoT |

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|---|---|---|---|---|---|
| | | | for placement in a series of two to four signs at 10 km intervals to repeat the message in different ways;<br>-Cleaning up will be provided. | | |
| **Status of biodiversity** | Along the new road | Impact on vegetation, Road kills of animals | -Faded plants will be removed, replaced with new saplings;<br>-Records of accidents will be kept;<br>-If accident hot spots with large mammals are identified, appropriate protective measures will be elaborated (e.g. reflectors /local fencing, warning signs, speed reduction). | Road maintenance contractor | County Government of Machakos and MoT |
| **Traffic** | Along the road sections | Accidents due to winter typical hazards (snow, ice, fog) | Warning signs will be installed | Road maintenance contractor | County Government of Machakos and MoT |
| **Presence of the road structure, traffic redirection** | Along all road section | Restricted access because of the highway acting as a barrier, Safety issues, impact on non-motorized transport | Smooth operation of underpasses, overpasses, road junctions, and secondary roads within the highway area will be ensured. | Contractor, supervision by County Government of Machakos and MoT | County Government of Machakos and MoT |

# 7 SECTION EIGHT: CONSULTATIONS AND PUBLIC PARTICIPATION

## 7.1 Opportunities for Consultative Public Participation

The aim of consultation was to ensure that all stakeholders' interests are identified during the EIA study and that stakeholder views, and in particular those of interested and affected persons are taken into account at the project planning stage. Stakeholders' views are also important in shaping the development of the ESMP. Members of the public are supposed to participate and get involved because the project being carried out will affect them. Reference is made to Section 17 of the Environmental (Impact Assessment and Audit) Regulations, 2009, which states that the proponent shall in consultation with the authority, seek the views of persons who may be affected by the projects. The role of public consultation and involvement in ESIA process is to assure the quality, comprehensiveness and effectiveness of the assessment and ensure that the public views are adequately taken into consideration in decision making process. Public consultations were undertaken as far as the proposed instream works through stream training as prescribed in the EIA/EA Regulation. Public participation means different things to different people and may take several forms, ranging from information supply to consultation, discussions with the public, co-decision making to a situation in which the public is in charge of parts of natural resources management, for example, through water users 'associations. Public participation should improve the quality of decision making by opening up the decision-making process and making better use of the information and creativity that is available in society. Moreover, it would improve public understanding of the management issues at stake, make decision making more transparent, and might stimulate the different government bodies involved to coordinate their actions more in order to provide serious follow-up to the inputs received. Management itself would become less controversial, less litigation would take place, and implementation of decisions would be much smoother. Consultations with various stakeholders and public participation was considered throughout the EIA process. This is in line with the requirements of Legal Notice No. 101, Kenya Gazette Supplement No. 56 of June 13th 2003, the Environmental (Impact assessment and Audit) Regulations, 2003 revised in 2019. Consultations and public participation was encompassing, interactive and intensive, so as to ensure that all potentially affected people were reached. Special attention was paid to general public, especially those drawn from the market centres along Machakos-Kyumvi Road.

The consultation was vital as it served to: -

- Inform all IAP of the proposed project within their locality and explain to the community members the nature of the project.

- Give IAP an opportunity to present their views, concerns and issues regarding the project
- Incorporate the information collected in the ESIA report
- Obtain suggestion from IAP on possible ways that they feel potential negative impacts can be effectively mitigated.

## 7.2 Stakeholder analysis and stakeholder engagement plan

It is important to note that the proponent fully complied with section 17 part 1 of EMCA regulation which states that "During the process of conducting an environmental impact assessment study under these Regulations, the proponent shall in consultation with the Authority, seek the views of persons who may be affected by the project". During the ESIA study, the extensive consultations was done to ensure that all stakeholders are informed of the proposed project and are involved in it. The consultations was in form of: -Community consultative meetings at various locations site, lead Agencies consultations, wider public reach through the mass media and site visits, interviews and discussions. A Stakeholder Engagement Plan (SEP) was developed. A stakeholder is defined as any individual, organization or group which is potentially affected by the Project or which has an interest in the Project and its impacts. The objective of stakeholder identification is to establish which stakeholders may be directly or indirectly affected either positively or negatively ("affected parties"), or have an interest in the Project ("other interested parties"). It is important that particular effort will be made to identify any disadvantaged and vulnerable stakeholders who may be differentially or disproportionately affected by the proposed project or who may have difficulty participating in the engagement and development processes.

**Table 7-1: SEP for the proposed road dualling**

| Stakeholder group | Stakeholder type | | Connections to the Project | Timeframe and mode |
|---|---|---|---|---|
| | Potentially Affected party | Other interested party | | |
| **Local Communities** | | | | |
| ▪ **Wider Machakos community**<br>▪ **Users of local public amenities**<br>▪ **Traders at the markets/shopping centres along the road** | ✓ | | Households and communities that will receive impacts (positive or negative) as a result of the Project e.g. positive employment opportunities, provision of infrastructure services or negative Impacts associated with road construction | Week 1 |
| **National, County Government and political offices** | | | | |
| ▪ **Development control office-Machakos County**<br>▪ **Ward Administration**<br>▪ **Area MCA**<br>▪ **NEMA Office, Machakos County**<br>▪ **Opinion Leaders**<br>▪ **KENHA** | | ✓ | Oversee the procedures to contain conflict and ensure the ESIA process is coordinated smoothly for decision making. | Week 2 |
| **Ministry of Interior and Coordination of National Government** | | | | |
| ▪ **Sub County Commissioner**<br>▪ **Chief** | | ✓ | Ministry of Interior and Coordination of national Government has primary importance to the Project with permitting meeting requirements that must be met by the Project and responsibilities for calling for public meetings at the project venue or any suitable venue. | Throughout the ESIA process |

## 7.3 Methodology used in Public Consultation

The exercise was conducted by a team of experienced registered environmental and social safeguard experts. Stakeholders' participation forms were distributed to the project neighbors as key stakeholders.

### i. Questionnaire survey

A questionnaire survey was carried out targeting stakeholders and neighbours of the proposed project site. The stakeholders responded to the questionnaire and none had objection to the establishment.

### ii. Detailed Public Consultation

Consultation meetings were held with project neighbours and local stakeholders in order to gauge their perception regarding the proposed project. Meetings were held at Kithini Market, Katoloni market and Showground. Detailed outcomes of each meeting is appended in the report.

## 7.4 Resettlement Action Plan

The full scope of the environmental and social impacts of the proposed dualling of the road has been addressed in a detailed environmental and social impact assessment (ESIA) conducted for the project and for which a separate ESIA summary has been prepared. Of direct relevance to this summary is the requirement under the World Bank Operational Safeguard on involuntary resettlement: Land acquisition, population displacement and compensation which requires that whenever a project involves displacement of more than 200 people, a full RAP should be prepared. **It is in this regard, this project will not displace number of people**. **However, there exists small businesses and enterprises within the RoW though they will not be adversely affected by the project. They are temporary displaced persons with no recognizable legal right or claim to the land they are occupying but will be entitled to compensation for resettlement assistance. In this regard of traders along the road, a mini RAP is needed. Overall, most of the affected assets identified were non-residential structures.** Efforts have been made to align government owned land, road reserve, power way leave and public utility reserve land so as to avoid or minimize relocation and therefore resettlement and disturbances arising from land acquisition in line with the Kenyan Laws on Involuntary Resettlement. Similarly, the land identified for the project is a Row publicly owned land under KENHA hence no efforts will be made to acquire the land for this proposed project. Additional measures taken or steps to be taken to reduce impacts include:

i. The camps for Earth moving equipment will be established along the existing tracks to limit social disturbances and destruction of the environment.

ii. All those small scale traders that shall be affected by the project will be fully compensated before project commencement.

iii. All PAPs shall be meaningfully consulted before commencement of construction activities.

iv. Public consultations be held with the PAPs (traders) and the community in general, stakeholders and members of the civil society be consulted through assistance of the local administration especially the chiefs. Interviews should also be conducted within the proposed project areas with the identified asset owners.

v. Provisions of the Kenyan legal framework relevant to compensation as well as the relevant international policies be incorporated in the RAP process to ensure harmony in resettlement planning.

# 8 SECTION EIGHT: ANALYSIS OF PROJECT ALTERNATIVES

The project alternatives have been assessed using a methodology that transforms qualitative assessments in quantitative numbers, which are then summed up in a final score that expresses the overall impact of each alternative and allows their comparison. In order to encompass potential impacts different components have been selected and analyzed. Rank was assigned to each component:

| | **Ranking components** | **Ranking value** |
|---|---|---|
| **1.** | Landscape visual impact | 10 |
| **2.** | Local air-quality | 25 |
| **3.** | Noise | 10 |
| **4.** | Impact on biodiversity & ecological integrity | 15 |
| **5.** | Impact on surface water | 10 |
| **6.** | Geotechnical risks | 10 |
| **7.** | Impact on soil | 15 |
| **8.** | Socio-economical | 5 |
| **9.** | Resettlement | 0 |
| | | 100 |

These ranking criteria have been differentiated in order to reflect the peculiarity of the areas interested by the project. The criteria are key questions, to which closed answers and scores are associated. A score is ascribed to each answer:

No or negligible impact 0

Very low (VL) 0.3

Low impact (L) 0.5

Medium impact (M) 1

High impact (H) 1.5

For each criterion, a score is obtained by multiplying the component rank (based on potential impact) by the score of the criterion (criterion score). The final score value for alternative is obtained as a sum of the component scores. Alternative that shows the lowest score a value is assumed to have the best environmental and social performance.

# 9 SECTION NINE: ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (ESMMP)

## 9.1 Introduction

Information included in the EMP is based on the main findings outlined in every chapter of the ESIA report, i.e., all proposed mitigation and monitoring actions set to a timeline, specific responsibility assigned and follow up actions defined. The EMP is presented in a table format and divided into three main parts, dealing with the physical environment, with the biological environment, and with the socioeconomic and cultural environment. Each part is organized by development stages, i.e. pre-construction, construction and road operation. The overall objective of the EMP is to bring the project into compliance with national environmental and social requirements and environmental and social policies of the World Bank. EMP will be included into the bidding documents so that bidders can consider and incorporate their environmental responsibilities into their bid proposals. Later EMP becomes an integral part of a contract for the provision of works and is binding for implementation. Once works provider is contracted, the provider should develop and submit to County Government of Machakos and MoT for subsequent approval the following thematic management plans:

- Waste Management Plan;
- Traffic Management Plan;
- Health and Safety plan; and
- Emergency Response plan.

These plans should be prepared and cleared prior to commencement of works. Compensatory tree planting (and other greening/reinstatement as required) plan may be produced at a later stage, once progress of works allows initiation of reinstatement within the project area.

## 9.2 Institutional framework

The County Government of Machakos and Ministry of Transport is responsible for general oversight of environmental compliance of works through ensuring quality performance of the technical supervisor and of the contractor. County Government of Machakos and MoT will perform these functions through its staff members with relevant education and professional skills, as well as the safeguards consultants with international experience hired for the technical supervision of operations. This in-house capacity will be supported by external individual consultants upon demand. The

supervisor of works commissioned by the County Government of Machakos and MoT will be charged with the responsibility to establish strong field presence in the project area and supervise the works. Along with ensuring consistency with the design and quality of works, the supervisor is mandated to track the implementation of the EMP by the contractor, reveal any deviations from the prescribed actions, and identify any environmental / social issues should they emerge at any stage of the works. Monitoring shall include visual observation and measurements as appropriate. Field testers and hand-held equipment shall be used to monitor short- term impact. Calibrated equipment and approved methods of monitoring must be used. Calibration must be done regularly, all calibration records and monitoring results, along with the copies of the site records, certificates, permits and documents shall be submitted and kept by the Roads Department. The list of records include

- Work program and schedule;
- Environmental permits and licenses;
- List of equipment;
- List of mitigation measures;
- Route/program of construction material transportation;
- Inspection records – noise, water quality monitoring data;
- Copies of correspondence related to environmental issues;
- Site drainage plan;
- Records of maintenance and cleaning schedules for sediment and oil/grease traps;
- Records of sewage disposal (if relevant);
- Records of quantity of discharged wastewater and concentration of pollutants;
- Waste disposal records
- Written designation of waste disposal sites and instructions for waste transportation from local authorities;
- Log of material inventories and consumption;
- Chance find records (if any);
- Complaints register;
- Incidence register (environmental limits expedience forms, injuries records, etc.);
- Records on remedial actions taken;
- Equipment control and maintenance log;

- Corrective and preventive action request records;
- Training records.

Works supervisor will be responsible for reporting to the County Government of Machakos and MoT on the environmental and social performance on monthly basis through including safeguard compliance section into the general reporting. Supporting photo material shall also be attached. County Government of Machakos and MoT will make monthly reports from the works supervisor. Also, County Government of Machakos and MoT will include analytical sections on the EMP implementation and overall safeguard performance into the regular project progress reporting to the lender. This reporting will be based on the information received from the works supervisor, but should also reflect results of County Government of Machakos and MoT's own due diligence (quality control over the supervisor's work) and County Government of Machakos and MoT's assessment of supervisor's performance.

**Table 9-1: ESMP for construction phase of the Machakos Town-Kyumvi Road (B62)**

| Objective/Plan | Recommended Mitigation Measures | Responsible Party | Monitoring Mechanism | Approximate Cost (Ksh) |
|---|---|---|---|---|
| **1) Increased exploitation of raw materials** | ▪ Maximize sourcing of construction materials – sand and aggregates from registered quarry and sand mining firms whose activities are approved by NEMA and have acceptable environmental and social performance standards. | Contractor | Throughout construction period | - |
| | ▪ Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered | Contractor | Throughout construction period | - |
| | ▪ Ensure that damage or loss of materials at the construction site are kept minimal through proper storage | Contractor | Throughout construction period | - |
| **2) Run off and soil erosion** | ▪ Apply 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 and other barriers. | Contractor | Throughout construction period | - |
| | ▪ Ensure that construction vehicles are restricted to existing graded roads to avoid soil compaction within the project site. The trucks should not be driven off the existing roads and trucks to avoid damaging the surrounding land. | Contractor | Throughout construction period | - |
| | ▪ Ensure that any compacted areas are filled in to reduce run-off or accumulation of water during rains. | Contractor | 6 months | - |
| **3) Solid waste generation** | ▪ Ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed of. | Contractor | One-off | - |
| | ▪ Ensure that damaged or wasted construction materials will be recovered for refurbishing and use in other projects | Contractor | One-off | - |

| Objective/Plan | Recommended Mitigation Measures | Responsible Party | Monitoring Mechanism | Approximate Cost (Ksh) |
|---|---|---|---|---|
| | ▪ Utilize opportunities for donating recyclable/reusable or residual materials to local community groups, institutions and individual local residents or home owners. | Contractor | One-off | - |
| | ▪ 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 | Contractor | Throughout construction period | _ |
| | ▪ Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements | Contractor | One-off | 20,000 |
| | ▪ Purchase of perishable construction materials such as paints should be done incrementally to ensure reduced spoilage of unused materials | Contractor | Throughout construction period | - |
| | ▪ Use construction materials that have minimal or no packaging to avoid the generation of excessive packaging waste | Contractor | Throughout construction period | - |
| | ▪ Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at the site | Contractor | Throughout construction period | - |
| | ▪ All wastes will be segregated, collected and stored in appropriate containers, and removed from site at least once per week. The wastes shall be segregated into those for recycling, hazardous waste, and wastes for disposal with general household waste. Only register carriers will be used to remove wastes from the site, and the removed wastes shall be taken to the nearest appropriate facility that is registered to receive that type of waste | Contractor | Throughout construction period | 50,000/month |
| **4) Air/ Dust pollution** | ▪ Sprinkle water on graded RoW as necessary to reduce dust generation by construction vehicles | Contractor | Throughout construction period | 50,000/month |

| Objective/Plan | Recommended Mitigation Measures | Responsible Party | Monitoring Mechanism | Approximate Cost (Ksh) |
|---|---|---|---|---|
| | ▪ Sensitize truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas. Switch off or keep vehicle engines at these points. Ensure vehicles are maintained in accordance with manufacturers' requirements. | Contractor | Throughout construction period | - |
| **5) Air pollution** | ▪ 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 | Contractor | Throughout construction period | |
| | ▪ Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used. Ensure vehicles are maintained in accordance with manufacturers' requirements. | Contractor | Throughout construction period | - |
| **6) Noise Pollution** | ▪ Sensitize construction drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as residential areas and schools | Contractor | Throughout construction period | - |
| | ▪ Ensure that construction machinery are kept in good condition to reduce noise generation. This machinery should be maintained in accordance with manufacturers' requirements. | Contractor | Throughout construction period | - |
| | ▪ Ensure that all generators and heavy duty equipment are insulated or placed in enclosures to minimize ambient noise levels and maintained in accordance with manufacturers' requirements. | Contractor | Throughout construction period | - |
| **7) Depletion of energy resources** | ▪ Ensure planning of transportation of materials to ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts | Contractor | Throughout construction period | - |
| | ▪ Monitor energy use during construction and set targets for reduction of energy use. | Contractor | Throughout construction period | - |

| Objective/Plan | Recommended Mitigation Measures | Responsible Party | Monitoring Mechanism | Approximate Cost (Ksh) |
|---|---|---|---|---|
| **8) Exploitation of water resources** | ▪ Promote recycling and reuse of water as much as possible.<br>▪ Organize collection of rainwater on site. Water will be tankered to site to reduce pressure on local resources. | Contractor | Throughout construction period | - |
| **9) Accidents** | ▪ Ensure that provisions for reporting incidents, accidents and dangerous occurrences during construction using prescribed forms obtainable from the local Occupational Health and Safety Office (OHSO) are in place as required by OSHA 2007. | Contractor | Continuous | - |
| | ▪ Ensure that the premises are insured as per statutory requirements (third party and workman's compensation) | Proponent | Annually | _ |
| | ▪ Develop, document and display prominently an appropriate SHE policy for construction works | Contractor | One-off | - |
| | ▪ Provisions must be put in place for the formation of a Health and Safety Committee, in which the employer and the workers are represented | Contractor | One-off | - |
| **10) Hygiene** | ▪ Suitable, efficient, clean, well-lit and adequate gender specific sanitary conveniences should be provided for construction workers | Contractor | One-off | - |
| **11) Medical Examinations** | ▪ Arrangements must be in place for the medical examination of all construction employees before, during and after termination of employment. | Contractor | Continuous | - |
| **12) Machinery Safety** | ▪ 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 | Contractor | One-off | _ |
| **13) Injuries caused by machineries and equipment.** | ▪ Ensure that equipment and work tasks are adapted to fit workers and their ability including protection against mental strain | Contractor | Continuous | _ |
| | ▪ All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury | Contractor | One-off | _ |

| Objective/Plan | Recommended Mitigation Measures | Responsible Party | Monitoring Mechanism | Approximate Cost (Ksh) |
|---|---|---|---|---|
| | ▪ Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/operations | Contractor | Continuous | 5,000 per training |
| | ▪ Equipment such as fire extinguishers must be examined by a government authorized person. The equipment may only be used if a certificate of examination has been issued | Contractor | Continuous | - |
| | ▪ Reports of such examinations must be presented in prescribed forms, signed by the examiner and attached to the general register | Contractor | Continuous | - |
| | ▪ Ensure that materials (cement bags, aggregates, bitumen drums) are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse | Contractor | Continuous | - |
| | ▪ Conduct sensitization campaign for the public on risks related to construction sites. A safe system will be established encompassing use of warning signs, barricading the working areas and sensitizing the workers on occupational health and safety. | Contractor | Twice (before construction begins) and a repeated after 1 month. | - |
| **14) Poor storage of materials** | ▪ Ensure that items are not stored/stacked against weak walls and partitions | Contractor | Continuous | _ |
| | ▪ All floors, steps, stairs and passages of the premises must be of sound construction and properly maintained | Contractor | Continuous | _ |
| **15) Emergencies.** | ▪ Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency. Such procedures must be tested at regular intervals | Contractor | Every 3 months | - |
| | ▪ Ensure that adequate provisions are in place to immediately stop any operations where there in an imminent and serious danger to health and safety and to evacuate workers | Contractor | One-off | - |
| | ▪ Ensure that the most current emergency telephone numbers posters are prominently and strategically displayed within the construction site | Contractor | One-off | - |

| Objective/Plan | Recommended Mitigation Measures | Responsible Party | Monitoring Mechanism | Approximate Cost (Ksh) |
|---|---|---|---|---|
| | ▪ Provide measures to deal with emergencies and accidents including adequate first aid arrangements | Contractor | Continuous | - |
| | ▪ Sensitize the public on potential emergency situations | Contractor | Twice (before road construction begins) and a repeated after 1 month. | |
| | ▪ Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body. | Contractor | One-off | - |
| | ▪ Fire-fighting equipment such as fire extinguishers should be provided at strategic locations such as stores and construction areas. | Contractor | One-off | 50,000 |
| | ▪ Regular inspection and servicing of the equipment must be undertaken by a reputable service provider and records of such inspections maintained | Contractor | Every 3 months | 5,000 |
| | ▪ Signs such as "NO SMOKING" must be prominently displayed within the premises, especially in parts where inflammable materials are stored | Contractor | One-off | - |
| | ▪ Enough space must be provided within the premises to allow for adequate natural ventilation through circulation of fresh air | Contractor | One-off | _ |
| | ▪ Well stocked first aid box which is easily available and accessible should be provided within the premises | Contractor | One-off | - |
| **16) Food and toxins.** | ▪ Ensure that all chemicals used in construction are appropriately labeled or marked and that material safety data sheets containing essential information regarding their identity, suppliers classification of hazards, safety precautions and emergency procedures are provided and are made available to employees and their representatives | Contractor | One-off | _ |
| | ▪ Keep a record of all hazardous chemicals used at the premises, cross-referenced to the appropriate chemical safety data sheets | Contractor | Continuous | _ |

| Objective/Plan | Recommended Mitigation Measures | Responsible Party | Monitoring Mechanism | Approximate Cost (Ksh) |
|---|---|---|---|---|
| | ▪ There should be no eating or drinking in areas where chemicals are stored or used. Eating and drinking will only be in defined areas. | Contractor | Continuous | _ |
| | ▪ Ensure that workers at the excavation sites and other dusty sites are adequately protected from inhalation of substantial quantities of dust through provision of suitable protective gear (e.g. nose masks) | Contractor | One-off | - |
| **17) Provisions of PPE to Workers.** | ▪ Provide workers in areas with elevated noise and vibration levels, with suitable ear protection equipment such as ear muffs | Contractor | One-off | - |
| | ▪ Suitable overalls, safety footwear, dust masks, gas masks, respirators, gloves, ear protection equipment etc. should be made available and construction personnel must be trained to use the equipment | Contractor | Once off | - |
| | ▪ Ensure that construction workers are provided with an adequate supply of wholesome drinking water which should be maintained at suitable and accessible points. | Contractor | One-off | 5,000/month |
| | ▪ Provide and maintain adequate and suitable accommodation for clothing not worn during working hours for construction employees | Contractor | One-off | - |
| | ▪ Provide and maintain, for the use of all workers whose work is done standing, suitable facilities for sitting sufficient to enable them to take advantage of any opportunities for resting which may occur in the course of their employment | Contractor | One-off | - |
| | ▪ Ensure that conveniently accessible, clean, orderly, adequate and suitable washing facilities are provided and maintained in within the site | Contractor | One-off | - |
| **18) Sanitary** | ▪ All work places must be kept in a clean state, and free from effluvia arising from any drain, sanitary convenience or nuisance | Contractor | Continuous | - |
| | ▪ Accumulations of dirt and refuse should be cleaned daily from the floors, benches, staircases and passages | Contractor | Daily | - |
| **19) Insecurity** | ▪ 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. | Contractor | Continuous | - |

| Objective/Plan | Recommended Mitigation Measures | Responsible Party | Monitoring Mechanism | Approximate Cost (Ksh) |
|---|---|---|---|---|
| | ▪ Conduct sensitization campaign for the public on risks related to construction sites. | Contractor | Twice (before construction begins) and a repeated after 1 month. | - |
| **20) HIV-AIDS Management** | ▪ Awareness creation and sensitization to workers and other persons engaged in the project to reduce or eliminate chances of infections of HIV-AIDS and other sexually transmitted diseases | Contractor | Continuous | Ksh. 2,500,000 |
| **21) Management of complaints and/or grievances** | ▪ Employ a grievance redress mechanism incorporating a negotiation and/or mediation team or party | Grievance Chairman / Committee (Stewarded by Resident Engineer) | Continuous | - |

**NB**:

For items with no budget assigned, the budget is coming from the construction budget and has been allowed for in the Bill of Quantities.
The key responsibilities regarding compliance to the above ESMMP rest on the Contractor. However, it is important that the project proponent ensures adequate monitoring and evaluation for the Contractor for no non-conformances.

## 9.3 Operational Phase ESMMP

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the operational phase the project are outlined below.

**Table 9-2: Operational phase EMP**

| Objective/Plan | Recommended Mitigation Measures | Responsible Party | Monitoring Mechanism | Cost (Ksh) |
|---|---|---|---|---|
| **1) Storm Water Run-off Management** | ▪ Provide proper storm water drainage from the paved roads. | Contractor | One-off | Part of project costs |
| | ▪ Provide regular inspection and maintenance of the drains. | County | Continuous | - |
| **2) Health and Safety Risks.** | ▪ 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 | County | Continuous | - |
| **3) Solid waste management** | ▪ Implement measures to ensure adequate solid waste management in the park including putting wastes receptacles and disposal | County | Continuous | - |
| **4) Road management** | ▪ Implement a sustainable road management plan after hand-over with clear structure of management | County | Continuous | - |
| **5) HIV-AIDS Management** | ▪ Awareness creation and sensitization to workers and other persons post- project to reduce or eliminate chances of infections of HIV-AIDS and other sexually transmitted diseases | County | Continuous | - |

**Table 9-3: Occupational hazards Management Plans**

| Activity | Impacts | Mitigation measures | Monitoring | Actors | Time frame | Cost estimates (Ksh) |
|---|---|---|---|---|---|---|
| Exposure of employees to occupational hazards | - Injuries & fatalities at the work places.<br>- Occupational diseases | - Adhering to the provision of the Occupational Health & safety Act 2007 as well as the Labour Act<br>- -Provision of adequate & appropriate personal protective clothing<br>- Provision of appropriate & certified tools for each task | Regular site inspections to ensure that required site working conditions are followed to the letter | CGM and MoT, occupational health & safety officer, County environmental officer | Throughout companies operations life | 100,000 for personal protective equipment annually<br>80,000 for OSHA audits annually |
| High noise levels | - Noise induced hearing loss;<br>- -Hearing effects to employees on site, neighbours and the general public | - Carry out site noise survey<br>- Provide employees with ear protectors | Reports of noise survey, feedback from employees, neighbours and general public | Project CGM and MoT, Occupational Health and Safety Officer and County Environmental Officer | | 40,000 for noise survey |
| - Collapse of the machinery used for road construction | - Injury and death to employees<br>- Injury and death to neighbours and general public | - Constant checking of adherence to required specification and verifications.<br>- Adherence to time and material specifications strictly. | Constant inspection by Health and safety specialists. | Project Engineer, CGM and MoT, Occupational Health and Safety Officer and County Environmental Officer | | Insurance cover charges |

**Table 9-4: Solid Waste Management Action Plan**

| Activity | Impacts | Mitigation measures | Monitoring | Actors | Time frame | Cost estimates (Ksh) |
|---|---|---|---|---|---|---|
| - Solid waste handling & disposal | - Littering of the environment<br>- Blockage of drains<br>- breeding ground for mosquitoes | - Solid waste to be disposed off in accordance with the Waste management regulations 2006<br>- Licensed waste collector to be contracted for final disposal of solid waste.<br>- Keeping of records of solid waste generated on site<br>- Producer extended user responsibly and recycling scrap metal on site | Records of waste collection and disposal by licensed company. | CGM and MoT Limited, Public health officer and County environmental officer | From project period and throughout operational life | 20,000 for collection of waste. |

**Table 9-5: Covid 19 Pandemic administrative and Contingency Management Plan**

| Activity/concern | Impacts | Mitigation measures | Monitoring | Actors | Time frame | Cost estimates (Ksh) |
|---|---|---|---|---|---|---|
| - Community transmission of Covid 19 Pandemic at work place | - Possible Death of employees and relatives<br>- Incapacitation of affected employees<br>- Suspension of the operations | - Develop and post a statement of management's commitment and responsibilities to reduce the risk of exposure to the virus and transmission of COVID-19 at the workplace in consultation with worker representatives.<br>- Establish a workplace system for providing up to-date reliable information to workers on the emerging situation on COVID-19, with reference to information released by national or local health authorities.<br>- Develop a preparedness and response plan for COVID-19 prevention at workplace, considering all work areas and tasks performed by workers and potential sources of exposure.<br>- Integrate safety and health into your contingency and business continuity plan and consider other labour related requirements including where operations must be done with a reduced workforce.<br>- Promote teleworking for non-critical workers to minimize the spreading of COVID-19 in your workplace.<br>- Provide staff, customers and visitors with ample and easily accessible places where they can wash their hands with soap and water, disinfect hands with sanitizers, and in addition, promote a culture of hand washing.<br>- Organize work in a way to allow for physical distancing of at least 2 meters (6 feet) from other people or another distance as prescribed by the MoH. | Compliance with ILO 2001 ILO Guidelines on occupational safety and health systems (3.10.3.) arrangements for emergency prevention, preparedness and response be made according to the size and nature of activity of the Company. | CGM and MoT Limited, MOH Kwale, Public health officer and County environmental officer | Throughout operational life | To be determined |

## 9.4 General EMP for the management of the campsite

**Table 9-6: General EMP for the operation phase of the project**

| Area of concern | Recommended measures | Responsible party | Priority level | Approximate cost (Ksh.) |
|---|---|---|---|---|
| **Collected production wastes and other Solid wastes** | | | | |
| ▪ Pollution and nuisance<br>▪ Creation of breeding grounds for vectors, rodents and other disease causing and/or transmitting organisms | Use of an integrated solid waste management system (recycling and re-use) | CGM and MoT | High | To be determined |
| | Collect and recycle metal wastes and mill scales to the processing site within a week | CGM and MoT | High | |
| | Cover the collection area to minimize invasion by pests and rodents or other animals | CGM and MoT | High | |
| | Use of NEMA approved waste collection/ transportation companies | | | |
| **Dust and exhaust emissions** | | | | |
| ▪ Health hazard<br>▪ Visual obscurity<br>▪ Degradation of air quality | Water all dust-active areas by sprinkling with water to suppress dust | CGM and MoT | High | 500 per day |
| | Minimize vehicle idling time | All vehicle users | Low | – |
| | Provide adequate ventilation in all working and accommodation areas by opening windows | CGM and MoT | High | – |
| | Ensure taps are not running when not in use | All users | High | – |
| **Wastewater and sewerage** | | | | |
| ▪ Health hazard<br>▪ Degradation of water resources<br>▪ Pollution | Put in place measures to ensure proper use and daily cleaning of the sanitary facilities | CGM and MoT | High | - |
| | Conduct regular checks to detect and correct sewage pipe blockages, damages and leakages | CGM and MoT | High | 2,000 per maintenance |
| **Energy consumption** | | | | |
| ▪ Increased demand on energy resources | Voltage optimization for the construction campsite facilities.<br>Use energy-saving lights such as LED tubes and bulbs | CGM and MoT | High | 10,000 per bulb |
| | Switch off electrical appliances when they are not in use | All users | High | – |
| **Fires** | | | | |
| ▪ Injuries and deaths<br>▪ Destruction of property | Prominently display 'NO SMOKING' FIRE ASSEMBLY and EXIT signs at respective places. | CGM and MoT | High | 1,000 |
| | Maintain first aid kits in the | CGM and MoT | Medium | 1,500 per kit |
| | Conduct regular inspection of the firefighting equipment (every three months) | CGM and MoT | Medium | 5,000 per service |
| **Record keeping and documentation** | | | | |
| Environmental degradation | Develop procedures for documentation of records keeping of all environmental and health concerns | CGM and MoT | High | 500 per month |

**Table 9-7: Proposed occupational safety and health EMP for the dualling of 16km Kyumvi (A109 junction)-Machakos section of (B62) carriage way**

| Area of concern | Management | Responsibility | Time frame | Approximate cost (Ksh.) |
|---|---|---|---|---|
| General register | Keep a general register within the facility as stipulated in Section 62 (1) of OSHA, 2007 | CGM and MoT | Continuous | 500 per month |
| Incidents and accidents | Report any incidents and accidents using prescribed forms obtainable from the Occupational Health and Safety Office | | Continuous | 500/month |
| | Conduct regular safety education and training | | Quarterly | 5,000 per trainee |
| | Prepare a contingency plan for emergency response | | -off | 10,000 |
| Insurance | Insure the premises as per statutory requirements (third party and workman's compensation) | | Annually | 5,000 per year |
| Safety healthy environment (SHE) policy | Develop, document and display prominently an appropriate Safety and Healthy Environment policy | | -off | 1,000 |
| Sanitary conveniences | Provide suitable, efficient, clean, well-lit and adequate sanitary amenities at the site taking care of gender division | | -off | 50,000 |
| Storage of construction materials | Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse | | Continuous | _ |
| First aid | Have on site a stocked first aid box which is easily available and accessible | | -off | 1,500 per kit |
| | Have on-site persons trained in first aid and issued with a certificate by a recognized body | | -off | 5,000 per trainee |
| Emergency preparedness and evacuation | Design suitable documented emergency preparedness and evacuation procedures for emergencies | | -off | 1,000 |
| Fire protection | Regularly inspect and service fire-fighting equipment by a reputable service provider and maintain inspection records | | Every 3 months | 5,000 |
| | Prominently display signs such as "NO SMOKING" at the campsite site | | -off | 500 |
| Disease incidences and spread | Provide sanitizers, masks, handwashing station and ensure a complete refuse collection and handling service | | Continuous | 5,000 |

## 9.5 Decommissioning Phase

In addition to the mitigation measures provided above, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the project have ceased. The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project are outlined below.

**Table 9-8: ESMMP for the Decommissioning Phase**

| Potential Impact/Aspect | Proposed Mitigation | County Government of Machakos | Monitoring Means | Responsibility for Monitoring | Time Frame | Cost (Ksh) |
|---|---|---|---|---|---|---|
| Waste management, sanitation and | Ensure safe disposal of the waste generated during the decommissioning processes, | County Government of Machakos | Regular inspection | Proponent | Number of reported cases, | 20,000 |
| Noise from dismantling of construction Machinery and campsite | Provision of hearing protection devices | County Government of Machakos | Regular inspection | Proponent | Number of Public complaints | 20,000 |
| Soil erosion | Compact loose soil and apply binding materials | County Government of Machakos | Regular inspection | County Government of Machakos | Retention of top soil | 50,000 |
| Terrestrial Habitat Alteration | Landscape all altered places upon completion of road construction | County Government of Machakos | Regular inspection | County Government of Machakos | Retention of top soil | 50,000 |

# 10 SECTION TEN: ENVIRONMENTAL MONITORING PLAN

## 10.1 Introduction

Environmental Management is nothing but resource management and environmental planning is just the same as development planning. They are just the other side of the same coin. The resource management and development planning look at the issue from narrow micro-economical point of view while environmental management views the issue from the broader prospective of long term sustained development option, which ensures that the environment is not desecrated for the effective and consistent functioning of the project, proper environmental monitoring programme shall be continued to be carried out at the proposed road dualling.

The programme includes the following:

- Environmental Monitoring
- Personnel Training
- Regular Environmental audits and Correction measures
- Documentation–standards operation procedures Environmental Management Plan and other records.

## 10.2 The environmental monitoring

The environmental monitoring is an important part in terms of assessing the implementation of pollution control equipment used during road construction to abate and reduce the pollution level at site. The sampling and analysis of the environmental attributes will be as per the guidelines framed by NEMA.

Work of monitoring shall be carried out at the locations to assess the environmental health in the post period. A post study monitoring programme is important as it provides useful information on the following aspects.

- It helps to verify the predictions on environmental impacts presented in this study.
- It helps to indicate warnings of the development of any alarming environmental situations, and thus, provides opportunities for adopting appropriate control measures in advance.

The monitoring programmes in different areas of environment, outlined in the next sections, have been based on the findings of the impact assessment and analysis described in chapter six.

**Table 10-1: Environmental Monitoring during construction of the road**

| Sr. No. | Potential Impact | Action to be Followed | Parameters for Monitoring | Frequency of Monitoring |
|---|---|---|---|---|
| **1** | Air Emissions | All equipment's (asphalt and batching plants) are operated within specified design parameters | Random checks of equipment logs/manuals | Periodic |
| | | Vehicle trips to be optimized to the extent possible | Vehicle logs | Periodic during site clearance & installation activities |
| | | Maintenance of furnace emissions to meet stipulated standards | Particulate and Gaseous emissions (SO2, HC, CO, NOx) | Periodic emission monitoring |
| | | Ambient air quality within the premises of the proposed unit to be monitored. | The ambient air quality shall conform to the standards for PM10, PM2.5, SO2,NOx, and CO | As per NEMA requirement or on monthly basis whichever is earlier. |
| **2** | Noise | List of all noise generating machinery onsite along with age to be prepared. Equipment to be maintained in good working order | Equipment logs, noise reading | Regular during civil works and installation activities. |
| | | Generation of vehicular noise. | Maintenance of records of vehicles | Daily records |
| **3** | Wastewater Discharge | No discharge to be made to surface water, groundwater or soil. | No discharge hoses shall be in vicinity of watercourses | Periodic check during installation activities |
| **4** | Soil erosion | Protect topsoil stockpile where possible at edge of site. | Effective cover in place. | |
| **5** | Drainage and wastewater Management | Ensure drainage system and specific design measures are working effectively. The design to incorporate existing drainage pattern and avoid disturbing same. | Visual inspection of drainage and records thereof | |
| **6** | Waste management | Implement waste management plan that identifies and characterizes every waste arising associated with proposed activities and which identifies the procedures for collection, handling & disposal of each waste arising. | Comprehensive Waste Management Plan should be in place and available for inspection on-site. Compliance with MSW Rules, 2006 and Hazardous Wastes (Management, Handling and Trans boundary Movement). | |
| **7** | Health | Employees and migrant labour health check ups | All relevant parameters including HIV | Regular check ups |

**Table 10-2: Key Monitoring During road construction Stage**

| Monitoring elements | Monitoring points (sections) | indicators | Monitoring frequency | Implement duties |
|---|---|---|---|---|
| The water quality | Camp, construction site, construction yard | The SS and oil | Once a quarter | Environmental quality consultants |
| Air quality | Equipment operation site there is a lot of homework, sensitive areas or sensitive environment near the shop or clearing roads, | $PM_{10}$ | In the construction peak of random sampling | Environmental quality consultants |
| noise | Equipment operation site there is a lot of homework, sensitive areas or sensitive environment near the shop or clearing roads. | The equivalent continuous sound level ( $L_{Aeq}$ ) | In the construction peak of random sampling | Environmental quality consultants |

## 10.3 Environmental Risk Assessment

The safety and protection of people, equipment and the environment is a serious concern in engineering industries. Road construction industry have recognized the significance of Safe Working Environment and are progressively trying to prevent hazardous events, avoid production & manpower losses and other fallouts associated with industrial accidents by conducting risk assessment, onsite & off site management plan and adopting the safety measures as proposed. This also assists industries to enhance employee knowledge of operations, improve technical procedures, maintain accurate process safety information and increase overall facility productivity. This subsection, accordingly, gives an outline of the associated environmental and other risk prone hazards, their assessment and remedial measures. It also describes an approach to emergency planning to be adopted by the Plant management.

### 10.3.1 Objectives

The objectives of environmental risk assessment are governed by the following, which excludes natural calamities:

a) Identifying the potential hazardous areas so that adequate design safety measures can be adopted to reduce the likelihood of accidental events.
b) Identifying the stakeholders and evaluating their risk along with proposing adequate control techniques.
c) Identifying the probable areas of environmental disaster which can be prevented by proper design of the installations and its controlled operation.
d) Managing the emergency situation or a disastrous event, if any, during the plant operation.

Environmental risk assessment is a systematic approach for identification, evaluation, mitigation and control of hazards that could occur as a result of failures in process, procedures, or equipment. Increasing industrial accidents, loss of life & property, public scrutiny, statutory requirements and intense industrial processes, all contribute to a growing need to ensure that risk management is conducted and implemented. Managing a disastrous event would require prompt action by the operators and plant emergency staff using all their existing resources like deployment of fire-fighting equipment, operation of emergency shut off valves, water sprays etc. Minimizing the immediate consequences of a hazardous event include cordoning

off, evacuation, medical assistance and providing correct information to the families of the affected persons and local public to avoid rumours and panic. Lastly, an expert committee is required to probe the cause of such an event, even if it is a "near miss" situation, note the loss incurred/would have been incurred, and suggest remedial measures for implementation so that in future such events or similar events do not recur.

### 10.3.2 Definition of Environmental Risks

The following terms related to environmental risks are defined before reviewing the environmental risks:

| | |
|---|---|
| **Hazard** | **Situation that poses a level of threat to life, health, property, or environment. A hazardous situation that has come to pass is called an incident. Hazard and possibility interact together to create risk. An environmental hazard is thus going to be a set of circumstances, which leads to direct or indirect degradation of environment and damage to the life and property.** |
| **Risk** | The probability of harm or likelihood of harmful occurrence and its severity. Environmental risk is a measure of the potential threats to the environment, life and property |
| **Consequence** | Effect due to occurrence of the event, which may endanger the environment permanently or temporarily and, or, loss of life and property. |
| **Environmental Disaster** | The consequence can extensively damage any one or all the four components of the environment, namely, (i) physico-chemical, (ii) biological, (iii) human and (iv) aesthetics. |

**Table 10-3: Monitoring Plan**

| Issue | What parameter is to be monitored? | Where is the parameter to be monitored? | How Is the parameter to be monitored? | When is the parameter to be monitored? (Frequency) | Institutional responsibility |
|---|---|---|---|---|---|
| **CONSTRUCTION PHASE** | | | | | |
| **Waste water (if applicable)** | Quality parameters of waste water from construction camps and portable sites, according to relevant standards | At construction camps (if available) and portable facilities at work sites | Inspection of wastewater units, latrines and septic tanks | Frequency defined by Georgian Environmental standards | County Government of Machakos and MoT, Construction Supervision |
| **Community tension and disruption** | Satisfaction/disturbance level of the residents | Camp (if available), Construction sites | Observation, surveys | Regular frequency or when changing operations | County Government of Machakos and MoT, Construction Supervision |
| **Impact on topsoil** | Striping of the topsoil Stockpiling, Protection from erosion and washing away Reintroduction | Worksite | Inspections; observation | During removal of the topsoil layer and preparation of the sites, After stockpiling, After completion of works – during reintroduction | County Government of Machakos and MoT Construction Supervision |
| **Oil/fuel spill** | Oil/fuel spills | Worksite, car maintenance, servicing area (if available) | Inspections; observations | Unannounced inspections during construction | County Government of Machakos and MoT, Construction Supervision |
| | Are the truck loads covered or wetted; Compliance with the Contractor's Method Statement (restricted working hours; haul routes) | Worksite/haul routes | Supervision | Unannounced inspections during work | County Government of Machakos and MoT, Construction Supervision |

| | | | | | |
|---|---|---|---|---|---|
| | dust suppression methods where required. | | | | |
| **Impacts on trees near the working area** | Are the trees located close to the project area protected by fence. | At sites where trees and forests are located along the construction site. | Supervision | After begin of construction works at the respective site | County Government of Machakos and MoT, Construction Supervision |
| **Impact on fauna** | Injury cases | Along alignment | Visual inspection | After begin of construction works | County Government of Machakos and MoT Construction Supervision |
| **Air pollution from improper maintenance of equipment/ machinery (general)** | Exhaust emissions, dust | At site | Visual inspection, measurements of exhaust emissions | Unannounced inspections during construction works | County Government of Machakos and MoT, Construction Supervision, NEMA |
| **Dustiness** | Visual presence of dust | At construction sites | Visual monitoring | Regularly during construction | County Government of Machakos and MoT, Construction Supervision |
| **Contamination of surface water during construction – seasonal streams and, tributaries** | Suspended solids, organic compounds, lubricants, fuel, solvents, heavy metals, pH value, mineral oils | Sampling downstream the worksite | Water quality analysis | During construction works near in the water Unannounced inspections during works near watercourses | County Government of Machakos and MoT, Construction Supervision |
| **Contamination of soil during construction** | Heavy metals and greases and oils | Agricultural land | Soil quality analysis | One month before the commencement of works. During construction - quarterly | County Government of Machakos and MoT, , Construction Supervision |

| | | | | | |
|---|---|---|---|---|---|
| **Material supply Concrete production** | Obtaining valid operation license or purchasing from licensed provider | Asphalt /concrete plant (if available) | Inspection | Before work begins | County Government of Machakos and MoT, Construction Supervision |
| **Material supply Borrow areas** | Obtain a license for material extraction | Sand and gravel borrow pit | Inspection | Before work begins | County Government of Machakos and MoT, Construction Supervision |
| **Damage to irrigation and other infrastructure** | Visual damages | Agricultural land | Visual observations | Weekly | County Government of Machakos and MoT, Construction Supervision |
| **Material production/ extraction** | Asphalt/concrete plant - possession of official approval or valid operating license | Asphalt /concrete plants (if available) | Supervision inspection | before work begins | County Government of Machakos and MoT, NEMA |
| **Material production/ extraction** | Stone quarry – availability of license. | Quarry | Supervision inspection | before work begins | County Government of Machakos and MoT, NEMA |
| **Material production/ extraction** | Sand and gravel borrow pit - possession of a license | Sand and gravel borrow pit | Supervision inspection | before work begins | County Government of Machakos and MoT, NEMA |
| **Transportation** | Traffic management - hours and alignments selected | Job site | Supervision inspection | Regular inspections during work | County Government of Machakos and MoT, Construction Supervision |
| **Possible loss or damage to cultural resources in** | Presence of chance finds | Construction site, during excavation works | Permanent archaeological supervision during earth works | During earth works | Construction Contractor Archaeologist Supervisor |

| | | | | | |
|---|---|---|---|---|---|
| **case of Chance Finds** | | | | | |
| **Vibration (whether appropriate)** | Vibration levels | Job site | Supervision, observations | Regular inspections during work and on complain | County Government of Machakos and MoT, Construction Supervision |
| **Noise disturbance to population and wildlife** | Noise levels | Worksite, nearest residential areas, natural habitats | Mobile noise meter | Once per week and on any complaint | County Government of Machakos and MoT, Construction Supervision |
| **Traffic disruption** | Existence of traffic management plan | At job site | inspection; observation | Before works start; once per week at peak periods | County Government of Machakos and MoT, Construction Supervision |
| **Workers safety** | Protective equipment; organization of bypassing traffic | Work site | Inspection | Regular inspections during work | County Government of Machakos and MoT, Construction Supervision |
| **Slope stability** | Status of slopes | Sensitive areas | Stability , identification of visual traces of possible erosion | Seasonally after adverse weather events(storm, gale) | County Government of Machakos and MoT, Construction Supervision |
| **Impact on planted areas** | Status of vegetation | Planted vegetation areas | Visual control | Seasonally | County Government of Machakos and MoT, Construction Supervision |
| **OHS** | Use of personal protective equipment (PPE) relevant to the task; Training records; Organization of traffic on the construction site Keeping to the safety rules while working on height | Worksite | Inspection; interviews; comparisons with the Contractor's method statement. | Unannounced inspections during construction and upon complaint | County Government of Machakos and MoT, Construction Supervision |

| | | | | | |
|---|---|---|---|---|---|
| **OPERATION PHASE** | | | | | |
| **Road safety** | Proper signage and traffic control arrangements in place | Entire length of constructed section | Inspection | Recurrent | County Government of Machakos and MoT |
| **Adequate operation and maintenance of drainage and retention systems** | Drainage/retention infrastructure in good technical condition and cleaned regularly | Entire length of constructed | Inspection | Recurrent | County Government of Machakos and MoT |
| **Environmental performance during maintenance works** | Temporary on-site storage of construction materials and waste organized to prevent environment pollution; Final disposal of construction waste and excess material into designated locations; Conduct of maintenance works in adequate seasonal and weather conditions; Appropriate installation of traffic regulation and warning signs. | Maintenance sites | Inspection | During conduct of maintenance works | County Government of Machakos and MoT |
| **Regular maintenance and periodic replacement of** | Trees planed for compensation of removed plants and grass seeded for slope stabilization properly | Greened areas within the RoW | Inspection | Recurrent | County Government of Machakos and MoT |

| | | | | | |
|---|---|---|---|---|---|
| **greenery within the alignment corridor** | safeguarded, watered as needed, and replaced to substitute dead plants. | | | | |
| **Livelihood restoration of project-affected households and communities** | Project-affected individuals, households and communities re-gained streams of income and quality of life no worse than prior to the project implementation | Settlements of the project-affected towns along the dualled road | Inspection interviews, Review of statistical data | Medium-term post-project | Administrations of project-affected municipalities |

# 11 SECTION ELEVEN: CONCLUSION AND RECOMMENDATIONS

## 11.1 Conclusion

From the assessment three alignment alternatives and so called no action (Zero alternative) alternative were considered. For detailed evaluation alternative having least impact on environment and community was chosen. Positive and negative sides of alternatives were described. It was mentioned, that prior to commencement construction the project must undergo evaluation process and obtain approvals and permits from decision makers, including the lender for sub projects such as borrow pits, asphalt and batching plant. In case of positive conclusion construction will be implemented by company identified via bidding procedure. There are no particular interest related to resettlement and compensation issues as the right of way is already cleared and demarcated. The dualling and construction of the road will result in appreciation of the cost of the land. On the negative side roads occupy land resources and form barriers to animals. They can also cause adverse impacts on natural water resources and discharge areas. The three most damaging effects of road construction and management are noise, dust and vibrations. Noise mainly occurs during road construction phases but it can also occur to a lesser degree during maintenance operations. Dust is created during the dualling of the road and unbound aggregate layers. Excess dust production can be treated by a range of means such as watering, the use of alternative materials, and by using dust binders near houses. Vibration can be caused by uneven road surfaces and can pose significant impacts and problems to houses close to the source. Key negative impacts related to impacts caused by deterioration of air quality and noise related nuisances and their mitigation measures have been discussed. Attitude of local residents towards the project is dual both positive and negative opinions have been voiced.

## 11.2 Summary of conclusion

i. The proposed dualling of 16km Kyumvi (A109 junction) to Machakos section of (B62) Road **within an existing right of way (RoW).** The location or Right of Way is 16km Kyumvi (A109 junction)-Machakos section of (B62) road, Machakos county. The road passes through, Kathome market, Kithini Shopping Centre, Kimangu, Kenya Israel and ends at the Kitui Machakos road intersection. It contains nine activities: ditch excavation, culvert, concrete removal, peat excavation and swamp backfill, embankment, utility work, subbase, gravel, and paving.

ii. **Construction standards and memoranda of understanding with KENHA**: The MOU between the County Government of Machakos and KENHA should be expedited with the

aim of streamlining the standards and respective activities related to road expansion. The Road development and maintenance is under KENHA's mandate.

iii. **Sensitive Ecosystem**: Within the existing RoW, there are no sensitive such as protected areas, wetlands, forests, and other areas of conservation concern or legal protection. However, County Government of Machakos through relevant department shall take all necessary measures to protect and/or minimize impacts on environment resources, to prevent and/or minimizing pollution, and to protect any biodiversity and ecosystem integrity, including, where some impacts are unavoidable, through implementing biodiversity offsets to achieve "not net loss but net gain" of biodiversity. County Government of Machakos shall collaborate with other Government agencies and stakeholders to identify, design, and implement activities to enhance environment and social conditions as part of its projects and will require contractor participation in these activities as appropriate.

iv. **Land Acquisition and Involuntary Resettlement:** There is no land acquisition**,** displacement or resettlement as the proposed project is within the RoW. The dualling space is clear from Kyumvi to Machakos Town. Those who are likely to be affected are traders within the shopping centers along the RoW through secondary impacts associate with the project. Genuine consultation with project affected persons will continuously take place. This is to ensure that their rights and interests of traders along the RoW are taken care of. For this to take place, their voices will be made clear via the formation of shopping centers consultation forums throughout the project phase. Compensation for traders along the markets have been proposed subject to an outcome of mini-RAP.

v. **Cultural Resources:** The scoping report indicate that there are aren't any tangible and intangible cultural heritage that may be affected by the proposed road dualling and construction activities.

vi. **Occupational Health and Safety (OHS):** Project activities may present risks to health and safety of workers, communities, and the general public. Therefore, County Government of Machakos, its consultants and contractors shall ensure that all activities are conducted in a manner that protects the health and safety of workers, communities, and the general public. The contractors will be required to adopt policies and to provide safe tools, materials, equipment, and processes for work and rest that meet National and International requirements, as well as best practices, for occupational and community health and safety. The contractors will submit the code of conduct shared with NEMA that will apply to the

consultant's and contractor's staff to ensure compliance with best Occupational Health and Safety (OHS) practices and how the Code of Conduct will be enforced.

vii. **Project Specific Stakeholders' Engagement Plans**: The consultative public participation was undertaken but limited by the inhibition of in person meeting. The County Government of Machakos developed stakeholders' analysis plan so that public meetings are held (in observance of Covid 19 protocols) with affected and interested parties to explain to them the project, its social, economic and environmental impacts, and to receive oral or written comments and objections to any proposed project. The Experts proposes that that County Government of Machakos to work in co-operative partnerships with road users, transport providers, relevant county governments, contractors, and local communities. County Government of Machakos through director of PP should engage with and listen to project affected persons and organizations throughout all its activities and will be responsive to their concerns. The contractor should develop and implement community engagement programs to complement the County own mechanisms. The goal is to foster dialogue among different stakeholders, in order that stakeholder views can be understood, considered, incorporated where possible in the road projects, and clear feedback provided regarding the action taken. The Project supervising consultant on behalf of the County Government will be responsible in managing the plan at the project site.

viii. **Grievance Redress Mechanism (GRM**): County Government of Machakos must establish an effective communication channel among the stakeholders for providing a timely and efficient two-way feedback mechanism to address any complaints made about the project, including those from members of the communities, local businesses and other stakeholders, as well as raising public awareness on the projects and on the availability of a GRM mechanism. GRM should be open, transparent and fair process by which project staff, project affected persons, and other stakeholders can express concerns and grievances and be sure they will be considered and resolved in a timely manner.

ix. **Climate change**: Climate change, including the increased frequency and severity of extreme events, can affect road infrastructure, extreme weather events, such as heavy rains, flooding, high temperatures, and changes in the water table causing pavement deterioration, slope stability and landslides, and flooding and damage of drainage systems and at watercourse crossings. Through its contractors, County Government of Machakos must promote a robust and innovative designs, undertake risk assessments, and appropriate measures to promote resilience to adverse effects caused by climate change and attendant weather

stresses. In addition, County Government of Machakos will require the contractors' plant and equipment are well serviced so as to control GHG emissions.

## 11.3 Recommendations

- Hydrological studies shall be carried out on all drainage structures by use of available maps and field investigation.
- The catchment area, run-off coefficient, hydraulic slope and design flood discharge for the appropriate return period shall be determined for each drainage structure, and the corresponding water level established.
- Cross-sections and gradients of water courses shall be surveyed to determine the design of proper drainage and erosion control of the roadway and the protection of slopes.
- Auditing implementation of the Stakeholder Engagement Plan;
- Monitoring consultation activities conducted with government authorities and nongovernmental stakeholders;
- Monitoring the effectiveness of the engagement processes in managing impacts and expectations by tracking feedback received from engagement activities and recording and tracking commitments made to stakeholders;
- Monitoring any grievances received and their resolution.

## APPENDICES

1. **Appendix**: Copy of approved Terms of reference.
2. **Appendix:** Engineering layout for the road.
3. **Appendix**: Copies of registration Certificates and renewal of practicing license for the NEMA Experts.
4. **Appendix**: Copies of responses from CPP (questionnaire survey, letters)
5. **Appendix**: Copies RAP guidelines adopted

# RESETTLEMENT ACTION PLAN GUIDELINE

## ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED DUALLING OF 16KM KYUMVI (A109 JUNCTION) TO MACHAKOS SECTION OF (B62) ROAD, MACHAKOS COUNTY

A Resettlement Action Plan (RAP) details the **procedures** to be followed and the **actions** to be taken in order to properly resettle and compensate affected people and communities. This plan must be developed after it has been determined. A RAP can respond to cases of economic displacement as well. However, if only economic displacement is foreseen, a Livelihood Action Plan is required. The RAP reflects the commitment made by the Implementing Partners (County Government of Machakos and other actors) to affected people and communities to meet obligations arising from resettlement. The RAP provides mitigations and rehabilitation measures to ensure that the livelihood of the affected persons and families will not be lowered as a result of the project. The entitlement matrix provides different measures to address these losses. The RAP also provides for mitigating measures for temporary impacts resulting from civil work. Such measures include the following:

- Provision of temporary access/crossings for pedestrians, livestock and vehicles during the construction activities.
- Measures for traffic safety and accident prevention.
- Rehabilitation of affected local roads, pedestrian sidewalks, etc.
- Relocation of public utilities (electricity lines, water lines, etc.).

Addressing these temporary impacts will be the primary responsibility of the Civil Work Contractor and will be ensured through the inclusion of such provisions in the Civil Work Contract and compliance by the Contractor to these provisions will be duly monitored as part of Environmental Monitoring Plan (EMP).

The RAP covers the following elements:

1. Introduction
   - Briefly describe the Road dualling project and associated facilities (if any)
   - Describing project components requiring resettlement; give overall estimates of and resettlement
   - Providing explanation of how displacement is necessary to achieve the project objectives, how the project is in the 'public interest' and how displacement is proportional to project outcomes. Experts will also discuss alternative project designs, including the "no project" scenario and if they may have avoided or reduced the resettlement.
2. Minimizing Resettlement
   - Describing the justification for the resettlement
   - Describing efforts and measures to minimize displacement, and expected outcomes of these efforts and measures
3. Census and Socioeconomic Surveys/Social Baseline
   - Providing results of the census, assets inventories, natural resource assessments, and socioeconomic surveys and briefly describe how these were performed, i.e., techniques used, individuals interviewed, etc.
   - Identify all people and communities potentially affected by displacement activities and potential impacts to each. Conduct a vulnerability assessment and outline what determines vulnerability (i.e. which criteria need to be met to consider someone vulnerable)
4. Legal Framework

   The RAP Experts will
   - Describe all relevant international, national, local, and community laws and customs that apply to displacement and resettlement activities, with particular attention to laws and customs relating to tenure rights; highlight any potential conflicts e.g. between County Government of Machakos and national or regional law.
   - Describe how free, prior, informed consent was obtained for resettlement of indigenous peoples and tribal communities, if applicable

- Describe project-specific mechanisms to address conflicts
- Describe entitlement/compensation policies for each type of impact
- Describe method of valuation used for affected structures, land, trees, and other assets
- Prepare entitlement matrix, which includes budget and timeframe for payment of entitlements

5. Resettlement Sites and Housing
    - If the project requires relocation, the RAP Experts will describe how affected people have been involved in a participatory process to identify sites, assess advantages and disadvantages of each site, and select preferred sites. Site selection to be risk-informed (e.g. ensure not subject to higher levels of risks from floods, landslides, earthquakes). Describing the options.
    - If housing must be replaced, RAP Experts will describe how affected people have been involved in developing an acceptable strategy for housing replacement and how alternative housing meets adequate housing criteria (including legal security of tenure; availability of services, materials, facilities and infrastructure; affordability; habitability; accessibility; location; cultural adequacy). Describe the specific process of involving affected populations in identifying potential housing sites, assessing advantages and disadvantages, and selecting sites.
    - If the project involves allocation of agricultural land or pasture/rangeland, RAP Experts will describe how individual households that will be allocated lands have been involved in identifying potential new sites, and how they have explicitly accepted the selected sites
    - RAP Experts will describe the feasibility studies conducted to determine the suitability of the proposed relocation sites and housing, including where relevant natural resource assessments (soils and land use capability, vegetation and livestock carrying capacity, water resource surveys) and environmental and social impact assessments of the sites. Include a description of potential access of affected people to necessary services, shelter, food, water, energy, and sanitation
    - RAP Experts will demonstrate where relevant that the land quality and area are adequate for allocation to all of the people eligible for allocation of agricultural land. Provide data on land quality and capability, productive potential, and quantity
    - Give calculations relating to site requirements and availability
    - RAP Experts will describe mechanisms for: (1) procuring, (2) developing and (3) allotting resettlement sites including use rights to allotted lands. Indicate to whom titles and use rights will be allocated, including by gender
    - Provide detailed description of the arrangements where relevant for site development for agriculture, including funding of development costs.
    - Indicate whether temporary resettlement will be necessary and how the communities' social capital will be preserved.
6. Income Enhancement/Restoration (if RAP is also addressing economic displacement
    - Are compensation entitlements sufficient to enhance and restore livelihoods and income streams for each category of impact? Attach independent review of opportunities to enhance incomes/livelihoods. What additional economic rehabilitation measures are necessary?
    - Briefly spell out the enhancement and restoration strategies for each category of impact and describe their institutional, financial, and technical aspects
    - Describe the process of consultation with affected populations and their participation in finalizing strategies for income enhancement/restoration
    - How do these strategies vary with the area of impact?
    - Does income enhancement/restoration require change in livelihoods, development of alternative farmlands or some other activities that require a substantial amount of training, time for preparation, and implementation?
    - How are the risks of impoverishment to be addressed?
    - What are the main institutional and other risks for the smooth implementation of the resettlement programs?
    - RAP Experts will describe the process for monitoring the effectiveness of the income restoration measures
    - RAP Experts will describe any social or community development programs currently operating in or around the project area. If programs exist, do they meet the development priorities of their target communities? Are there opportunities to support new programs or expand existing programs to meet the development priorities of communities in the project area?

7. Institutional Arrangements
    - RAP Experts will describe the institution(s) responsible for delivery of each item/activity in the entitlement policy; implementation of income restoration programs; and coordination of the activities associated with and described in the resettlement action plan
    - RAP Experts will state how coordination issues will be addressed where resettlement is spread over a number of jurisdictions or where resettlement will be implemented in stages over a long period of time
    - RAP Experts will identify the agency that will coordinate all implementing agencies. Does it have the necessary mandate and resources?
    - RAP Experts will describe the external (non-project) institutions involved in the process of income restoration (land development, land allocation, credit, training) and the mechanisms to ensure adequate performance of these institutions
    - RAP Experts will discuss institutional capacity for and commitment to resettlement
    - RAP Experts will describe mechanisms for ensuring independent monitoring, evaluation, and financial audit of the RAP and for ensuring that corrective measures are carried out in a timely fashion
8. Implementation Schedule

    RAP Experts will
    - List the chronological steps in implementation of the RAP, including identification of agencies responsible for each activity and with a brief explanation of each activity
    - Prepare a month-by-month implementation schedule of activities to be undertaken as part of resettlement implementation
    - Describe the linkage between resettlement implementation and initiation of civil works for each of the project components
9. Participation and Consultation

    RAP Experts will
    - Describe the various stakeholders
    - Describe the process of promoting consultation/participation of affected populations and stakeholders in resettlement preparation and planning
    - Describe the process of involving affected populations and other stakeholders in implementation and monitoring. Add evidence of the various past consultation events, such as attendance lists, photos etc.
    - Describe the plan for disseminating RAP information to affected populations and stakeholders, including information about compensation for lost assets, eligibility for compensation, resettlement assistance, and grievance redress
10. Grievance Redress

    RAP Experts will
    - Describe the step-by-step process for registering and addressing grievances and provide specific details regarding a cost-free process for registering complaints, response time, and communication modes
    - Describe the mechanism for appeal
    - Describe how the mechanism ensured unrestricted access, transparency, accountability, how it documents cases and keeps the complainants informed and the institutional setup
    - Describe the provisions for approaching civil courts if other options fail
11. Monitoring and Evaluation

    RAP Experts will
    - Describe the internal/performance monitoring process. Ensure monitoring program seeks to measure whether displaced enjoy at least a standard of living and access to livelihoods equal to what they enjoyed before displacement
    - Define key monitoring indicators derived from baseline survey. Provide a list of monitoring indicators that will be used for internal monitoring, including number and location of displaced/resettled persons
    - Describe institutional (including financial) arrangements
    - Describe frequency of reporting and content for internal monitoring

- Describe process for integrating feedback from internal monitoring into implementation
- Define methodology for external monitoring
- Define key indicators for external monitoring
- Describe frequency of reporting and content for external monitoring. Ensure monitoring program is regular and ongoing following project completion until durable solutions are reached
- Describe process for integrating feedback from external monitoring into implementation
- Describe arrangements for final external evaluation
- Describe need for updates to census, assets inventories, resource assessments, and socioeconomic surveys, if necessary, as part of RAP monitoring and evaluation

12. Costs and Budgets

RAP Experts will

- Provide a clear statement of financial responsibility and authority
- List the sources of funds for resettlement and describe the flow of funds
- Ensure that the budget for resettlement is sufficient and included in the overall project budget. Include provisions for non-anticipated adverse impacts.
- Identify resettlement costs, if any, to be funded by the government and the mechanisms that will be established to ensure coordination of disbursements with the RAP and the project schedule. Prepare estimated budget, by cost and by item, for all resettlement costs including planning and implementation, management and administration, monitoring and evaluation, and contingencies
- Describe the specific mechanisms to adjust cost estimates and compensation payments for inflation and currency fluctuations
- Describe the provisions to account for physical and price contingencies
- Describe the financial arrangements for external monitoring and evaluation including the process for awarding and maintenance of contracts for the entire duration of resettlement

Annexes

- Copies of census and survey instruments, interview formats, and any other research tools
- Information on all public consultation including announcements and schedules of public meetings, meeting minutes, and lists of attendees
- Examples of formats to be used in monitoring and reporting on RAP implementation
- Entitlement matrix
- Evidence of prior informed consent for indigenous peoples and tribal communities

## Resettlement Action Plan Implementation Schedule

| # | Activities | Weeks | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1. | Preparation/Finalization of the RAP | | | | | | | | | | | | |
| 1.1 | Consultation/Disclosure Activities on the draft RAP | | | | | | | | | | | | |
| 1.2 | Revision and Submission of Final RAP | | | | | | | | | | | | |
| 1.2 | Pursuing RAP approval | | | | | | | | | | | | |
| 1.3 | Organization of mechanism for compensation payment and transfer of fund | | | | | | | | | | | | |
| 1.4 | Preparing RAP Implementation mechanism | | | | | | | | | | | | |
| (i) | Mobilization of Resettlement Working Team | | | | | | | | | | | | |
| (ii) | Review of the DMS results and cadastral maps | | | | | | | | | | | | |
| (iii) | Establishment of Compensation Payment Mechanism | | | | | | | | | | | | |
| 2. | RAP Implementation | | | | | | | | | | | | |
| 2.1 | Hiring of monitoring consultant | | | | | | | | | | | | |
| 2.2 | Information Dissemination on construction schedule | | | | | | | | | | | | |
| 2.3 | Conduct of field assessment/verification/audit of ownership | | | | | | | | | | | | |
| 2.4 | Preparation of land documents for registration with the Public Register | | | | | | | | | | | | |
| 2.5 | Verification of preference between cash compensation versus swap | | | | | | | | | | | | |
| 2.6.1 | Cash Compensation | | | | | | | | | | | | |
| (i) | Negotiation/agreement on compensation between the Working Team and the PAP | | | | | | | | | | | | |
| (ii) | Opening of bank account by PAP. | | | | | | | | | | | | |
| (iii) | Demarcation of ROW area and documentation in a cadastre | | | | | | | | | | | | |
| (Iv) | Payment of compensation | | | | | | | | | | | | |
| 2.7 | In case of negotiation failure on cash compensation ARS pursues the expropriation proceedings. | | | | | | | | | | | | |
| 3 | Construction Phase | | | | | | | | | | | | |
| 3.1 | Sending of notification to vacate ROW | | | | | | | | | | | | |
| 3.2 | Dismantling/takeover of ROW structures by Contractor | | | | | | | | | | | | |
| 3.3 | Start of Construction | | | | | | | | | | | | |
| 3.4 | Grievance Redress Action and Monitoring Activities | | | | | | | | | | | | |

# NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

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**NEMA/TOR/5/2/298** **13th July 2021**

The Chief Officer
Department of Roads, Transport and Public Works
P O Box 1996-90100
**MACHAKOS**

**RE: ACKNOWLEDGEMENT AND APPROVAL OF TERMS OF REFERENCE (TOR) FOR ENVIROMENTAL IMPACT ASSESSMENT**

We acknowledge the receipt of TOR for the above subject.

Pursuant to the Environmental Management and Coordination Act, 1999 the second schedule and the Environmental (Impact Assessment and Audit) Regulations 31 and 35, your terms of reference for the Environmental Impact Assessment (EIA) for the proposed **DUALLING OF 16KM KYUMVI (A109 JUNCTION) TO MACHAKOS SECTION OF (B62) ROAD IN MACHAKOS COUNTY** has been approved.

You shall submit ten (10) copies, a soft copy summarised version of the ESMP in **WORD** form and one electronic copy of your report prepared by a registered expert to the Authority.

**MARRIAN KIOKO**
**HEAD OF EIA SECTION**