



MINISTRY OF TRANSPORT, INFRASTRUCTURE,  
HOUSING AND URBAN DEVELOPMENT

**CONSULTANCY SERVICES FOR ENVIRONMENTAL AND SOCIAL  
IMPACT ASSESSMENT AND DETAILED ENGINEERING DESIGN  
OF ISIOLO - NGINYANG' (ISIOLO - LOKICHAR)**



**Draft Preliminary Environmental and Social Impact  
Assessment (ESIA) Study Report**

**18. 12. 2019**

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I the undersigned confirm that the contents of this report are a true representation of the Environmental and Social Impact Assessment project report of the proposed [project title].

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## **1 EXECUTIVE SUMMARY**

### **1.1 Background of the Project**

Isiolo - Lokichar road project forms part of the infrastructure component of Lamu Port, South Sudan, Ethiopia Transport Corridor (LAPSSET), an interregional highway, - from Lamu port, traversing through Isiolo, Lerata, Wamba, Barsaloi, Baragoi, Lokori to Lokichar, terminating in Juba, South Sudan. Other section will terminate in Addis Ababa, through Moyale and Isiolo.

LAPSSET is an Infrastructure Corridor Project conceived to improve access and connectivity between Kenya, Southern Sudan and Ethiopia and eventually forming a land bridge across the entire Great Lakes region. The other infrastructure components for LAPSSET will include an inter-regional crude oil pipeline and a railway line. The hereby report covers ESIA for the interregional highway, - the Isiolo to Lokichar road section.

The route for this road section will mostly follows the existing road and hence it will pose less implementation challenges. However, there are sections of the road with deep escarpments, e.g. towards Suguta valley, where design challenges will be expected. Detailed engineering designs for this section of the road are currently being completed.

### **1.2 Project Description**

The project is located in Isiolo, Samburu and Turkana Counties. The road starts from the proposed Isiolo Bypass- on approximately 14 km, to join the existing Isiolo – Marsabit road. It then follows the existing and constructed A2 (Isiolo – Marsabit road) for 49km up to Lerata, from where it runs north westward direction towards Wamba, a distance of 47km. The road then traverses North West through Wamba to Baragoi on a stretch of 132 km along E473 road.

From Baragoi, the road will pass through Nachola, Naturkan, Kamuge to Lokori, a section of approximately 130km.

The proposed road alignment will traverse areas where design work and/or construction have been done or it is undergoing. These sections are:

- Isiolo-Lerata (49 km). This section of the road is already constructed to bitumen standard and it is operational, the A2 road.
- Lerata-Wamba (47 km): This was recently designed and an ESIA license issued. The design team will however check if existing design was done to the standard of LAPSSET road design requirements.
- Lokori-Lokichar (67 km): This section was recently designed and to this effect an ESIA done. The design team will however check if existing design was done to the standard of LAPSSET road design requirements.

### **1.3 Project's Unique Features**

- The road will traverse through arid and semi-arid counties of Isiolo, Samburu and Turkana. It will also pass through Meru County, though not arid as the former three counties.
- In Isiolo, Samburu and Turkana, grazing and pastoralism are common. There are various wildlife conservancies within these counties. To this effect, the project areas have one unique issue of concern, mainly wildlife and possible effect during the project cycle. Impacts and mitigation measures for the wildlife have been explained in details in this report.

- Landscape related challenges will be expected during construction phase. This will mainly be within Suguta valley. Erosion related impacts have been identified and the mitigation measures to be applied during the project cycle.

#### **1.4 Purpose and Objectives of the Project**

The project's objectives in LAPSET program are:

- To open up inaccessible and interior/inland parts of Kenya and Africa at large.
- To unlock potentials and create new opportunities and markets of economies of greater scale to nationals and investors,
- To create and operate an integrated socio-economic corridor with the objective of providing multiple East African nations access to a large scale economic trade system.
- To provide an integrated infrastructure network linking the East African countries to each other and the rest of the world,
- To be the largest game changer infrastructure flagship project to be initiated and prepared under the Kenya Vision 2030 Strategy Framework.

The ground breaking for the LAPSET Corridor Program at Lamu Port site was undertaken in March 2012.

#### **1.5 Policy, Legal and Administrative Framework**

The Environmental Management and Coordination Act (EMCA), 1999, revised in 2015, and Cap. 387 provides for the establishment of a legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. Under EMCA, there are several subsidiary legislations and guidelines which govern environmental management and are relevant to the project implementation.

On social issues related to the project, relevant legislations to the project includes the Kenya National Aids Strategic Plan, Sexual offence Act on prevention and the protection of all persons from harm from unlawful sexual acts, especially youth and the vulnerable persons in close proximity to the project sites.

#### **1.6 Environmental and Socio-Economic Baseline Conditions of the Project Area**

##### **Physical Environment**

Most of the land in Isiolo, from where the project starts, is flat low lying plain resulting from weathering and sedimentation. The plains rise gradually from an altitude of about 200asl. The area has combination of metamorphic rocks and superficial rock deposits. The road traverses through Samburu County, characterized by several highlands, plateaus and lowlands including Suguta valley. Fault escarpments of the valley bound its sides while red clays, boulders and gravel fans cover the floor. The valley is characterized by beach terraces which give evidence that it was once part of Lake Turkana. High-level plateaus built by repeated floods of lava from the Rift Valley dominate the eastern part of the valley.

The physical environment within the Eastern part of Turkana County through Kamuge to Lokichar is characterised by low lying open plains, mountain ranges and river drainage patterns. There are also water catchment sources. There are open plains, which form part of the arid area in the County and receive the lowest amount of rainfall of around 180 mm per annum. These plains are dominated by dwarf shrub and grassland, which provide forage for livestock during and shortly after the rainy season.

Soils in Turkana County are not well developed due to aridity and constant erosion by water and wind. Alluvial soils range from coarse sands to flash flood silts, while black or brown clays occur locally in areas of impended drainage

#### Biological Environment

In Turkana County, the biodiversity in the area is rich for both plants and animals distributed in many parts of this wilderness. The higher concentrations are however found in the South Turkana National Reserve which among others boasts of lions, cheetahs, zebras, hyenas, elephants, gazelles, dik diks. The wetlands have aquatic life.

Samburu County is endowed with a wealth of wildlife concentrated both within and outside protected parks and conservancies. Some of the protected wildlife areas include the expansive Namanyak Wildlife Conservancy and Trust, Sera Conservancy Trust, Westgate Community Conservancy and Kalama Community Conservancy. These are rich in wildlife like lions, elephants, giraffes, buffalo, leopards, ostriches and many more. These make the county an important tourism and conservation area, factors which can be exploited to boost its economic status.

The proposed road alignment has however kept off the sensitive conservancy habitats – mainly Nyabene National Reserve in Isiolo/Meru Counties, Mitigation measures have been suggested where the road traverses through Westgate, Kalama and Namunyak conservancies in Samburu.

#### Social and Cultural Environment

Isiolo County: Around 80% of land is communally owned and is under the trusteeship of the county government. The land constitutes 10 % of total land and includes land for schools, administration, army barracks, and health facilities. The remaining 10% of the land is under private ownership. Over 80 percent of the land cannot support crop farming and is used as grazing land by the pastoralists.

Samburu County, land ownership is either under Trust, communal, Government or private ownership. Communal land is managed by the communities while private land encompasses group ranches. The land is not registered and there are no Title Deeds.

The primary land use practices are pastoralism and wildlife conservation. These practices account for over 90 % of the total land holding in the county. Farming close to the project road is only within Baragoi area. Gazzetted forests occupy 15% of land area. These forests provide habitat and foliage for both wildlife and livestock.

Business activities are within trading areas at Lerata, Lengusaka, Wamba, Swari, Barsaloi, Nachola and Naturkan.

Turkana County, land is held in trust for the community by the County Government of Turkana. There is no land under title deeds apart from certificates of title for the land they have acquired and owned. Since land in the county is owned communally, people are free to graze and settle in any area of their choice. However, in urban and market centres, the local authority charges a fee and allocates land. These sections of land within the road project are Lomerlo, Kamuge, Lokori, Kochodin and Lokichar in Turkana East.

Within all the Counties where the road will traverse, gender Inequality Indices (GII), - which reflects gender-based disadvantage in reproductive health, empowerment and the labour market - shows inequality between female and male achievements. The vulnerable groups, which include children living in poor households, the disabled and the youth, are all noted to be disadvantaged in labour and empowerment. This is

mainly to the cultural believes where women are disadvantaged in labour and empowerment.

The proposed road project will directly benefit road users particularly the communities conducting economic activities and living along the route and thus improving equity in gender issues and reducing gender disparities will benefit all sectors. It will contribute to sustainable economic growth, poverty reduction to the so called marginalized communities in the three counties where the road will traverse.

### 1.7 Summary of the Environmental and Socio-economic Impacts and Mitigation Measures

Project Activities	Anticipated Social Economic Impacts	Proposed Mitigation Measures
<b>Pre-construction Phase</b>		
Surveying and road alignment	Loss of land, livelihood and property through road alignment.	<ul style="list-style-type: none"> <li>• Carry out a comprehensive RAP to address PAPs issues of concern in land acquisition and road alignment process.</li> <li>• Hold consultative meetings with key stakeholders to seek project acceptance</li> <li>• Review existing EA audit report for existing material sites within the site and note all the contentious issues.</li> </ul>
<b>Construction Phase</b>		
Air quality	Plumes of dust will be expected during construction phase, through excavation and haulage of materials to and from construction sites and material sites at quarry sites. Lerata, Lengusaka, Swari, Basaloi and Nachola trading centres which are close to project road will be affected.	<ul style="list-style-type: none"> <li>• Control the speed of material haulage vehicles within the trading centres by creating temporary speed bumps to reduce plumes of dust originating from haulage vehicles</li> <li>• Drivers to be involved in Toolbox Talks with the management / Contractor and participate in identifying air quality receptors / pollutants and the related impacts.</li> <li>• Provide speed warning signs when approaching the dust receptors.</li> </ul>
Soil pollution	It will possibly be caused by inappropriate disposal of waste, e.g. used oils from the Contractor's camp, workshops or from spills. Pollutants will end up being soaked into the soil and will lead to soil contamination	<ul style="list-style-type: none"> <li>• Waste oil to be collected by a NEMA licensed waste dealer.</li> <li>• Workers to be provided with safety gear while handling waste oil.</li> <li>• Provide competent professionals in running machinery, workshop.</li> <li>• Provide waste container for collecting waste, including bunding areas susceptible to spillages.</li> </ul>
Surface and ground water resources Water quality	Rivers Ngare Mara (Km 3+00), Ngare Nitinga (Km4+800) and Maji ya Chumvi (km 7+00) along the proposed Isiolo Bypass will be impacted upon. Further main rivers are Seiya, Naliyo, Suguta and Kerio and which traverse the project road. Possible pollutants to	<ul style="list-style-type: none"> <li>• Drainage structures that will be constructed –cross culverts, at the river courses for the proposed Isiolo bypass to be constructed as per designed in the shop drawings.</li> <li>• Stone pitching to be done as per the specifications in the shop drawings.</li> </ul>

	<p>the watercourses will include diesel, oils, cement. Some of the runoff water may infiltrate in the subsurface reaching the groundwater.</p> <p>Road construction within the various watercourses can lead to modifications to the water flow, while constructing bridges and their support structures.</p> <p>This could cause flooding, soil erosion, channel modification or silting, especially along. This will be mainly at the main rivers named above. Further, pollution of surface water will both originate from construction camps and traffic after construction.</p>	<ul style="list-style-type: none"> <li>• Timing of the construction of proposed bridges at Seiya, Naliyo, Suguta and Kerio to coincide with dry periods to minimize possible water pollution.</li> <li>• Contractor not to infringe upon the riparian zones/ within the watercourses.</li> <li>• Bitumen trucks should be washed at designated areas only, fitted with interceptors or separators.</li> </ul>
Terrestrial Environment (Habitats, flora and fauna)	<p>Direct encroachments on the landscape during earthworks, -fill and cut sections, removal of trees, borrow pits. Road can cause interference, barrier of the wildlife crossing /migratory points</p> <p>Opening up new areas to human utilization, for example when a new road and new bore holes enable people and cattle to be moved into new areas</p>	<ul style="list-style-type: none"> <li>• Provide underpass within the wildlife crossing points.</li> <li>• Designs of the proposed bridges at major river crossings along the road to be designed as specified and in the approved contractors shop drawings.</li> <li>• Hydrogyological surveys and NEMA's ESIA to be carried out within the proposed sites for sinking the boreholes, which should include public participation with community and County administrators to enable project acceptance and compliance with authorities, NEMA and WRMA.</li> </ul>
Material Sites	<p>Created pits can end up being death traps for wildlife</p> <p>Conflict or rejection from the community/wildlife conservancy for the selected material site</p>	<ul style="list-style-type: none"> <li>• Identified material and borrow pit sites to carry out ESIA.</li> <li>• Borrow pits and quarries to be rehabilitated to the satisfaction of the RE, the Client and NEMA.</li> <li>• Proposed material sites to be agreed upon with the community/local elders or opinion leaders. This will include excavation methods, site safety and rehabilitation methods.</li> </ul>
Land Resources and Wildlife Conservation Areas	<p>Road will attract new settlements within the current community lands in the three counties - Samburu, Turkana and Isiolo.</p> <p>Possible wildlife kills and illegal commercial trade in wildlife products will represent a major threat to wildlife in Westgate, Maebei and Kalama Wildlife Conservancies, which are close to the project road.</p>	<ul style="list-style-type: none"> <li>• The key identified high priority areas (Level 1) for wildlife migration corridor and the suggested mitigation to be implemented within 4 critical crossing points where wildlife traverse Namunyak, Westgate and Maibae. Mitigations will include cut and cover, elevations and realignment of the road where possible.</li> <li>• Contractor to consult the management of existing wildlife conservancies and community before starting any activities, - quarrying, sinking borehole etc.</li> </ul>

		<ul style="list-style-type: none"> <li>• Contractor's camps to be located away from migratory corridors which have identified by the conservationist and agreed upon by the Client</li> <li>• Contractor's camps to be located away from migratory corridors</li> <li>• State security, Kenya police, KPR and community policing to be strengthened to avert illegal poaching.</li> <li>• Provide signage and or underpass at the identified wildlife and livestock crossing points</li> </ul>
Archaeological, historical and cultural sites.	Direct encroachments upon the sites, e.g. by setting up borrow pits or quarries within or near the identified sites, including their access paths.	<ul style="list-style-type: none"> <li>• There are no cultural sites identified during the planning stage.</li> </ul>
Visual Aesthetics	Direct encroachments on the scenic landscapes along the project road during cut and fill, cut sections, borrow pits etc will impact negatively on the visual aesthetics.	<ul style="list-style-type: none"> <li>• Road alignment to minimize visual intrusion on scenic sites.</li> <li>• Adjustments to slopes and borrow pits, to be away from picturesque sites</li> <li>• Timely decommissioning of the borrow pits and quarries to be done to eliminate traces of visual intrusion on the landscape.</li> </ul>
Noise and Vibrations	<p>This will impact on existing trading centers which are Lerata, Lengusaka, Swari, Barsaloi, Nachola and Lokori during construction period.</p> <p>Blasting activities at the quarry sites which the Contractor will select which the contractor will</p>	<ul style="list-style-type: none"> <li>• All machinery should be in good condition.</li> <li>• Provide temporary speed bumps within the trade centres which will be traversed by the road.</li> <li>• No construction activities at night and especially within trading centres or near homesteads</li> <li>• Measures should be taken to control dust from the construction site.</li> <li>• Road alignment has bypasses Isiolo and Baragoi towns where noise-sensitive institutions are found, - schools, health facilities and places of worship.</li> </ul>
Solid and liquid waste	Waste from the construction camp, - garage, storage facilities, workshops can be health hazard within the construction sites and nearby environment.	<ul style="list-style-type: none"> <li>• Liquid waste, e.g. oils, should be disposed by a NEMA registered dealer.</li> <li>• Reduce, Reused, Recycle waste during the construction period.</li> <li>• Waste disposal sites should be identified and which should be registered with NEMA and the relevant County Government.</li> <li>• Design provisional waste material storage for the sorted out waste at the site (e.g. spoil area)</li> <li>• Dispose all unwanted structures, wastes and unused materials in accordance to NEMA Waste Management Regulations.</li> <li>• Undertake an inventory of the type of waste and quantities.</li> </ul>



Social characteristics	<ul style="list-style-type: none"> <li>• The final road alignment will affect land (Isiolo bypass, Baragoi) and the established trading centres at Lerata, Lengusaka, Nachola, Barsaloi and Lokori.</li> <li>• Effects of both increased and faster traffic on access to the named trading centres</li> <li>• Possible increase of crime within the trading centres and beyond.</li> <li>• Improved or reduced accessibility for pedestrians and cyclists within the settlements</li> <li>• Increased or reduced feeling of insecurity.</li> <li>• Better access to markets, health care, schools etc. outside settlements</li> <li>• Reduced cost of living</li> <li>• Disturbance of everyday life, increased spread of diseases.</li> <li>• Possible negative effects of ribbon development along the new road if a settlement is bypassed or of other indirect impacts on the development of settlements</li> </ul>	<ul style="list-style-type: none"> <li>• Design /road alignment work and RAP process to incorporate the views of the community in the final design. Construction to be done as per the approved contractor's shop drawings and geometrics details</li> <li>• Speed bumps to be erected while approaching the trading centres</li> <li>• During construction, the Contractor with the assistance of local administration officers (police, chief, police reservists etc) to agree on a code of conduct for the construction workers.</li> <li>• KeNHA to make arrangements with the ministry of Integral Security in providing security within the crime prone areas close to the project road.</li> <li>• HIV/IDS and STD Training, Awareness and prevention programme to be included during the construction period, focusing on road construction workers and the nearby communities.</li> </ul>
Economic characteristics	<p>The expected economic growth will attract specific impacts which includes: predicable impacts (improved accessibility), permanent impacts (increase business along the trading centres) and long term impacts (increased formal/informal employment business and employment)</p>	<ul style="list-style-type: none"> <li>• County government to restrict unauthorized development along the project road.</li> </ul>
Occupational health and Safety	<p>Ill human behaviours can lead to indirect impacts of the project on health and safety. This includes social ills which can lead to family breakups, crime, use of substance with the comfort of working away from home and being potential for transmission of HIV-AIDS and other STIs</p>	<ul style="list-style-type: none"> <li>• A Code of Conduct should be distributed to all workers, and health personnel should reinforce their efforts to combat diseases during the construction period.</li> <li>• Workers to be sensitized on the consequences of social ills and promiscuous behaviours (over consumption of alcohol, STDs, HIV /AIDS etc).</li> <li>• Contractor to establish mobile clinic within the construction sites</li> </ul>
Security and public safety	<p>Construction work will be associated with risky exposures to the workers. Occupational health and safety will be work related injuries, near missies, fatalities and diseases. They arise due to lack of good systems of work, lack of trainings, lack of management support and inappropriate tools and equipment for work.</p>	<ul style="list-style-type: none"> <li>• Contractor to provide toolbox talks with the workers emphasizing on specific work safety measures</li> <li>• Adhered to high standards of safety</li> <li>• Construction vehicles should drive carefully,</li> <li>• Gravel should be watered at construction sites/built up areas to avoid plumes of dust, which can lead to impaired vision to drivers and possible accidents.</li> </ul>

		<ul style="list-style-type: none"> <li>• Use secure storage facilities for toxics</li> <li>• Employees to be provided PPE.</li> </ul>
Resettlement and Compensation	Various sections of the road will require land acquisition to allow for re-alignments.	<ul style="list-style-type: none"> <li>• A Resettlement Action Plan has been undertaken to address land related issues.</li> </ul>

## **Project Alternatives and Parameters considered in choosing the best Alternative**

### **Construction of the Road Alternative**

One of the most important of all public assets in Turkana, Samburu and Isiolo Counties is the road infrastructure. However, it is not sufficiently developed. Well-developed road infrastructure provides access to the crucial contribution to economic development and brings important social benefits. Road is of vital importance in order to make a region grow and develop. In addition, the road provides access to employment, social, health and education services, crucial in fighting against poverty. All these benefits are poorly developed within the counties where the road will traverse. The road will therefore open up new developments in the Northern and Eastern regions which are hitherto considered to be “remote”.

The proposed government investment projects is expected to improve the economic and social welfare of the people in the in the Counties it traverse and the country as a whole. Some of the economic benefits that will come along with the project are quantifiable in financial terms while others are not, although their benefits are quite substantial. These exogenous non-quantifiable benefits are:

*International Benefits:* The road project will lead to increased trade between Kenya and Ethiopia, South Sudan and Sudan.

*Access to health services:* Improved transportation as a result of the project road will improve access to health services which will in turn improve people’s health, increase their productivity in their social economic activities.

*Access to education:* The improved road will help to ease and provide greater access to education which will translate into increased productivity. Increased access to education will also reduce cattle rustling which has been attributed, among other factors, lack of youth education.

*Growth of market centres:* The Growth of market centres along the road corridor will lead to increased job opportunities and economic activities of the people which will not only contribute to economic growth in these three counties but will also reduce insecurity, as young people will engage in those productive activities rather than criminal activities, like cattle rustling.

*Tourism:* The three counties of Isiolo, Samburu and Turkana have a great potential for tourism development, especially alternative tourism. Samburu County for instance - is endowed with a wealth of wildlife concentrated both within and outside protected parks and conservancies. The protected wildlife areas include the expansive Namanyak Wildlife Conservancy and Trust, Sera Conservancy Trust, Westgate Community Conservancy and Kalama Community Conservancy. These are rich in wildlife like lions, elephants, giraffes, buffalo, leopards, ostriches and many more.

The completion of the road project will help the three counties realize their tourism potential which is largely unexploited due to insecurity and lack of infrastructure.

*Other affected economic activities:* The construction of the road project will also lead to increased production and marketing of agriculture, livestock rearing, fishing, forestry, mining and economic activities in all of the three counties.

### **The No-Construct/Without Project Option**

The second option, no construct/no project alternative will not achieve the objective of the project since opening up of the marginalized and the so called 'remote areas' of the counties, which will be traversed by the road will not be achieved. Failure to construct and operate the road will lead to the failure of achieving one of the Kenya's national long-term development policies that aims to transform Kenya – especially Isiolo, Samburu and Turkana - into a newly industrializing, middle-income country, by providing a high quality of life to all its citizens by 2030 in a clean and secure environment. Socio-economic development will be hampered by poor accessibility to the counties where the road passes; waste of economic time while travelling - among other negative impacts - will be experienced. This is not a desirable alternative.

Further, a review of Economic Indicators for the project will show that it will be incorrect not to implement the project. The economic survey done for the project in 2018 indicated that:

- The Net Present Value (NPV), measured as the difference between the discounted benefits and costs over the analysis period is positive. A positive NPV indicates that the investment is justified economically.
- Economic Internal Rate of Return (EIRR), measured at discount rate at which the NPV = 0. The EIRR was greater than the discount rate, showing that the investment is economically justified.

Traffic analysis done for annual average daily traffic (AADT) for ten to twenty years has projected a continuous trend in traffic increase along the project road, from Isilo bypass, Isiolo to Lerata, Lerata to Wamba, Wamba to Barago, Baragoi to Lokori and Lokori to Lokichar.

The No-Construct/Without Project Option will be undesirable. Regional economic growth through trade facilitation, integration, interconnectivity between the counties and Kenya, Ethiopia and South Sudan, socio-economic development along the Corridor among other benefits will not be achieved.

### **Outcomes of Public Participation**

A total of eight meetings were held along the trading centres within the project road which was adequately attended by over 800 stakeholders.

Issues of Concern during design, construction and operation phases were recurrently raised by the consulted stakeholders. The participants requested that mitigation measures should be implemented for the noted impacts during all the stages in the project cycle. They included:

#### **Design Phase**

- Identification of the wildlife critical crossing points
- Identification of livestock road crossing points to salt licking areas, water points, dams or to Manyatta
- Sources of raw materials for road construction, whereby an EIA will be required
- Sources of water for construction, sinking boreholes – EIA will be required.
- Areas of social and cultural significance, - sacred trees or sites, grave sites.

#### **Construction Phase**

- Employment, - youth (men and women) during construction phase
- Location of workmen's camps and related impacts.

- Haulage of raw materials from quarries and borrow pits and final alignment and the affected property
- Livestock or wildlife kills by speeding vehicles during operation phase
- Poaching and increase of trade in bush meat.
- Possible increase in wildlife kills / poaching along migratory corridors (crossing points) at Namunyak (Wamba hills in North to Wamba in North).
- Insecurity for road users or tourists driving along the project road.
- Increase of road and related accidents.

### **Environmental and Social Monitoring Program**

A monitoring program has been prepared with the aims to ensure that the suggested mitigation and enhancement measures are implemented, that they generate intended results and that they are modified, ceased or replaced when inappropriate. Moreover, it allows assessing compliance with national environmental and social policies and standards as well as with the AfDB's Bank's policies and guidelines. The monitoring program includes surveillance and monitoring activities.

The surveillance activities aim to ensure that the proposed mitigation and enhancement measures are effectively implemented during the construction phase.

Monitoring activities will involve measuring and evaluating the project impacts on some environmental and social components of concern and to implement remedial measures, if necessary.

The program shall define as clearly as possible the indicators to be used to monitor the mitigation and enhancement measures that need to be assessed during project implementation and/or operation. The monitoring program shall also provide technical details on monitoring activities such as methods to be used.

## 1.8 Conclusions and Recommendations

Positive socio-economic impacts will be experienced during the operation stage of the road. Negative impacts during construction phase can be mitigated. The alignment of the proposed road has taken into account the developing Isiolo town, and therefore the need of the 14km bypass away and north of Isiolo town. Possible land acquisition issues have therefore been avoided. Social impacts on livelihoods, loss of property has been addressed by the proposed bypass. The road further bypasses Wamba and Barsaloi trading centres to minimize possible interference with existing land, property, loss of livelihood associated with land acquisition process.

Road safety related mitigation measures have been suggested which includes the use of road furniture, speed bumps within built up areas, - (Lengusaka at km 33+300, Barsaloi at 75+000), signage, and road marking, guardrails among others. The road alignment has avoided traversing through the main trading centres which include Isiolo, Wamba, Baragoi and Lokori.

Rest areas have been recommended as the apt roadside social amenities for the project road, at a spacing of 50kms from Lerata – Wamba junction. The most scenic roadside amenities will be at km 150+ 600, 164+ 400, the sections from Naturkan towards the scenic Suguta valley and from Kamuge towards the valley. The access road to the recommended rest area will be tarmacked, with entry and exit points from the project road. The rest areas will be having the following specifications:

- Vehicles parking area,
- Restaurant with eco-toilet.
- Security lighting.

Suggested construction site for the sample rest area will be at km 164+400, a scenic area facing Suguta valley. It will be expected that during the road's operation phase, commercial filling stations with rest areas, - vehicle parking, restaurants and toilets will be built. Their locations and designs will be regulated by government mandated authorities, among them KeNHA.

Road's impact to the biophysical environment will be significant. The impacts will mainly be during construction and operation phase of the road. Critical wildlife habitat areas which the road will traverse include community wildlife conservancies, - Kalama, West Gate, Namunyak Wildlife Trust and Wildlife research areas Barsalinga, Ngaroni.

It has been noted that the alignment passes across animal settlements and breeding areas mainly between Wamba and Baragoi.

The principle potential impact on the community wildlife conservancy, migratory and breeding areas will be disturbance due to construction activities. Once constructed, the permanent and operational effects relate to collision risk is considered to be minimal, and to a lesser extent the loss of habitat. Residual effects on wildlife migratory and breeding grounds during the construction have a high sensitivity value, with negative impacts and minor residual impacts.

The critical wildlife crossing points have been identified with the assistance of the project's interested parties, mainly Grévy's Zebra Trust and Ewaso Lions. Impacts mitigation measures to minimize as far as possible wildlife vehicle collision and related risks to drivers have been suggested for specific critical crossing points. One of the main mitigation methods that has been suggested will be physically separating the wildlife from the project road, and thus avoiding the wildlife-vehicle collisions.

Although there are around forty (40) crossing points that were identified along the project road and the related mitigation measure, implementation of the suggested

mitigation measures will first be done to the four (4) critical crossing points identified, classified as Level 1. The four areas have been included in the final road design. There are other levels, 2 and 3. Some of the Level 1 Critical Crossing Points that will be considered to be included in the final road design will include:

- Kalama Community Wildlife Conservancy and Sera Wildlife Conservancy crossing points Km 18 + 400 where animals cross within a valley, km 21+ 400 26+460 crossing area. Suggested mitigation measures include cut and fill, cut and cover the road section.
- Ndikiv Enasunayi and Sabsab Ndikire to Lekat, Dam Area (km 15+000 to km 21+000) where wildlife crosses from Namunyak to Westgate wildlife conservancies. Within these areas, road elevation (ecopassage) for wildlife crossing has been recommended. There are further elevations detailed in this report.
- At Archers Post (km 00+000) after the A2 Isiolo-Marsabit junction. An elevation of the road has been suggested. Further consultations will be necessary, especially on the viability of the suggested mitigation measure.
- Lpus pass (km 26+460) and Lamparnai km 37+480, - the elephant crossing points, from Namunyak Wildlife Conservancy area to and from Maebai Conservancy.
- The wildlife breeding areas, - mainly Grévy's Zebra at Km 22+500. An underpass will be considered.

In view of socio-economics, the proposed project will have residual significant positive impact on business, retail and tourism, by improving the accessibility of the existing trading centres, tourist sites - wildlife conservancies and cultural tourism sites. Population increase within these areas will be expected. Ribbon developments and growth of the existing trading centres will be expected during the road's operation stage, leading to significant cumulative impacts. The trading centres include Lerata, Lengusaka, Swari, Barsaloi, Naturkan and Lokori are all likely to develop during its operation stage.

Significant cumulative impacts during construction phase will be expected, especially from the selected material sites. Further, noise from vehicles will create further cumulative impacts during this stage.

There is evidence of the effects of climate change, from temperature and rainfall trends within the counties traversed by the project road. Observed and projected precipitation change in Isiolo and Samburu has been noted to be gradual after reviewing the trend in 50 years period, with gradual decline to <-150mm and <-100mm respectfully. Turkana has a minimal decline of precipitation, recorded as <-50mm within the observed years. Temperatures' trends within the observation period has been rising gradually; Isiolo <+0.7°C, +/-1.1°C and Turkana +/-1.1°C.

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**ABBREVIATIONS**

EMCA	Environmental Management and Coordination Act
EMMP	Environmental Management and Monitoring Plan
EPA	Environmental Protection Agency (USA)
ESIA	Environmental and Social Impact Assessment
ESIA	Environmental and Social Impact Assessment
GDP	Gross Domestic Product
GOK	Government of Kenya
KENHA	Kenya National Highway Authority
KNASP	Kenya National Aids Strategic Plan
LAPSSET	Lamu Port-South Sudan-Ethiopia-Transport Corridor
NRT	Northern Rangeland Trust
PWDs	People with Disabilities
ToR	Terms of Reference
LCDA	Lapsset Corridor Development Authority

## **2 INTRODUCTION**

### **2.1 THE ESIA AND THE LEGAL REQUIREMENT**

The hereby ESIA for the proposed project road was prepared by the Environmental NORKEN INTERNATIONAL LTD, in association with UMAR MUNSHI ASSOCIATES, Nairobi. The ESIA study was carried out pursuant to the Legal Notice No. 101 of the Kenya's Environmental (Impact Assessment and Audit) Regulations. The regulation states that the activities that shall be undertaken during the project design, construction, commissioning and decommissioning phases shall be included in ESIA Report, describing the nature of the project and its location. The construction activities will entail upgrading the current earth road to bitumen standard.

### **2.2 DEVELOPER IDENTIFICATION**

The project Clients are the Kenya National Highway Authority (KeNHA). The state corporation was established under the Kenya Roads Act 2007 with the responsibility for the management, development, rehabilitation and maintenance of trunk roads.

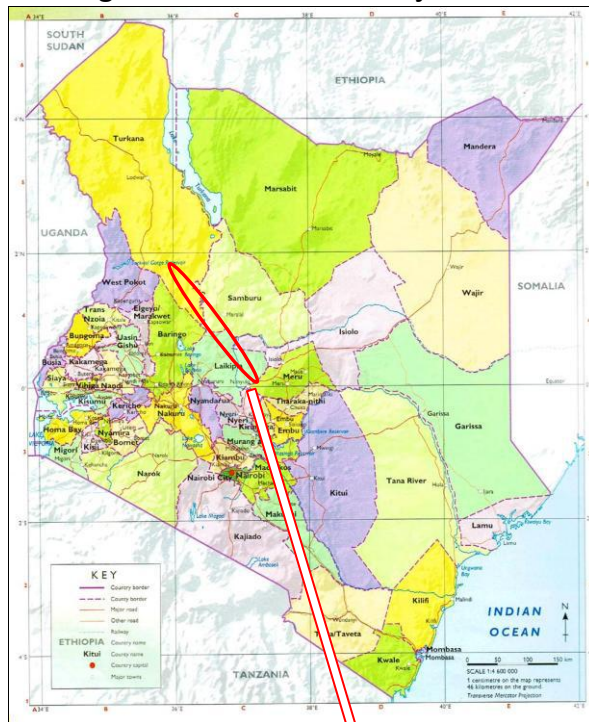
#### **2.1: The Developer and the Consultants**

<b>KeNHA</b>	<b>Consultant</b>
DIRECTOR GENERAL KENYA NATIONAL HIGHWAYS AUTHORITY P.O. BOX 49712-00100 NAIROBI	NORKEN INTERNATIONAL LTD. ENGINEERING MANAGEMENT CONSULTANTS. P. O. BOX 9882- 00100 NAIROBI <i>IN ASSOCIATION WITH</i> UMAR MUNSHI ASSOCIATES

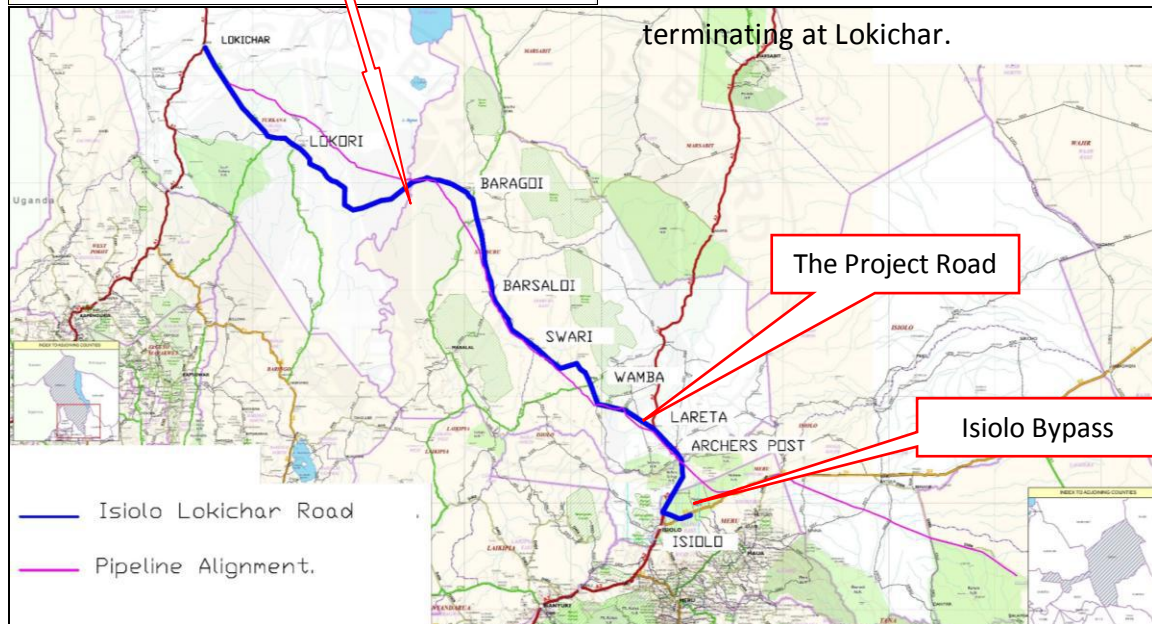


## 2.3 REGIONAL DESCRIPTION OF THE PROJECT SITE

### 2.1: Regional Details of the Project Site



The road will be within Isiolo, Samburu and Turkana Counties. It will start from the proposed Isiolo Bypass for a distance of 14km along the Isiolo-Moda Gashi road (B9) road. The road will then join existing road A2, to Lerata, a distance of 49km. It will then join the Lerata-Wamba (C78/C79) road for a distance of 41km. Then from Wamba-Baragoi (E473), 132km and eventually pass through Lokori to Lokichar (C46) for a distance of 46km, terminating at Lokichar.



The road corridor was defined broadly following the pipeline but at the same time incorporating as much of the existing road network as possible in order to maintain connectivity to major centers. This alignment would follow Isiolo by pass, Road A2 Isiolo to Lareta, Lareta-Wamba – Kisima, Kisima-Maralal- Baragoi, Baragoi –Lokori and Lokori-Lokichar, a distance of 483km.

- The Isiolo bypass will be a new route which will be constructed, to avoid passing through the developing Isiolo town.
- From Lareta to Wamba (C78/C79)- 47km, there exists an earth gravel road designed in 2014 for upgrading to bitumen, as part of Lerata-Wamba-Kisima road (C78/C79).
- From Baragoi – Lokori (E667), currently there is undefined route.

- From Lokori to Lokichar, there exists an earth / gravel road. A design was carried out in 2013 for upgrading to bitumen as part of Nginyang'-Lokori-Lokichar road (C113/C46).

## **2.4 PROJECT BACKGROUND, OVERVIEW, JUSTIFICATION AND OBJECTIVES**

### **2.4.1 Project Background**

Isiolo - Lokichar road project forms part of the infrastructure component of Lamu Port, South Sudan, Ethiopia Transport Corridor (LAPSSET), an interregional highway, - from Lamu port, traversing through Isiolo, Lerata, Wamba, Barsaloi, Baragoi, Lokori to Lokichar, terminating in Juba, South Sudan. Other section will terminate in Addis Ababa, through Moyale and Isiolo.

LAPSSET is an Infrastructure Corridor Project conceived to improve access and connectivity between Kenya, Southern Sudan and Ethiopia and eventually forming a land bridge across the entire Great Lakes region. The other infrastructure components for LAPSSET will include an inter-regional crude oil pipeline and a railway line. The hereby report covers ESIA for the interregional highway, - the Isiolo to Lokichar road section.

The route for this road section will mostly follow the existing road and hence it will pose less implementation challenges. However, there are sections of the road with deep escarpments, e.g. towards Suguta valley, where design challenges will be expected. Detailed engineering designs for this section of the road are currently being completed.

The project's objectives in LAPSSET program are:

- To open up inaccessible and interior/inland parts of Kenya and Africa at large.
- To unlock potentials and create new opportunities and markets of economies of greater scale to nationals and investors,
- To create and operate an integrated socio-economic corridor with the objective of providing multiple East African nations access to a large scale economic trade system.
- To provide an integrated infrastructure network linking the East African countries to each other and the rest of the world,
- To be the largest game changer infrastructure flagship project to be initiated and prepared under the Kenya Vision 2030 Strategy Framework.

The ground breaking for the LAPSSET Corridor Program at Lamu Port site was undertaken in March 2012.

### **2.4.2 Overview of the Project**

The project's purpose is to form part of the LAPSSET corridor, one of Kenya's Vision 2030's flagship projects. It is part of a major infrastructure development project that involves the development of a new transport corridor from the new port at Lamu through Garissa, Isiolo, Wamba, Baragoi, Kamuge and Lokori and terminates at Lokichar after joining the A2 Road, Kapenguria-Lodwar Road. It then moves further to Ethiopia and Southern Sudan through a different Contractor.

Details of the project are summarized in Table 2.2 below.

## 2.2: Details of the Project Scope and Extent

No.	Name of Road	Length (km)	Current Status	Scope of Services				
				Design Review	Aerial Mapping	Full Design	Full materials Investigation & Pavement Design	ESIA & RAP
1	Isiolo Bypass	14	New route	x	x		✓	✓
2	Isiolo – Lerata (A2) – 49km	49	Existing A2 paved highway		x	x	Review compliance with LAPSET requirements & Confirmatory Materials testing	x
3	Lerata – Wamba (C78/C79)- 47km	41.5	Earth / gravel road designed in 2014.for upgrading to bitumen as part of Lerata-Wamba-Kisima road (C78/C79)	✓	x	x	Review compliance with LAPSET requirements & Confirmatory Materials testing	Review ESIA Report
4	Wamba – Baragoi (E473) - 132km	132	Earth / gravel road	x	✓	✓	✓	✓
5	Baragoi – Lokori (E667)	114	Undefined route	x	✓	✓	✓	✓
6	Lokori – Lokichar (C46)	67	Earth / gravel road designed in 2013 for upgrading to bitumen as part of Nginyang'-Lokori- Lokichar road (C113/C46)	✓	✓	x	Review compliance with LAPSET requirements & Confirmatory Materials testing	Review ESIA Report
<b>Total</b>		<b>417.5</b>						
					<b>Key</b>		<b>x</b>	<b>Not to be Done</b>
							✓	<b>To be Done</b>

**Source:** Consultancy Team, Feb. 2019

### 2.4.3 Project Justification/Rationale

Given the strategic importance of the project road on the local, regional, national and levels, a large number of sectors and economic activities will benefit from implementation of the project. The main beneficiaries will be:

- The transporters and vehicle owners operating on the road, whereby it will be more efficient and less expensive to ply along the road.
- The local population (consumers, producers, traders, especially livestock etc)

- Improvement of services and economic activities within the three Counties traversed by the project road. (Commerce, industry and tourism sectors etc).
- Improve the three counties administration.
- Inter-county integration activities
- Management of security sector within the Counties will become easier through road development.
- Enhance faster integration and understanding between the dominant ethnic communities – Borana, Samburu and Turkana - and new comers from other parts of Kenya and elsewhere.
- Enhance deliverance of social services.
- The improvement of socioeconomic activities at regional level will create ripple effects at national level whereby fast development in various sectors will be achieved.

The proposed project road addresses the aspirations of the Vision 2030. The Vision aspires for a country firmly interconnected through a network of roads, railways, ports, airports, and water ways, and telecommunications. By 2030, it is envisaged that it will become impossible to refer to any region of our country as “remote”. To this effect and as stated in the Vision 20130, to ensure that the main projects under the economic pillar are implemented, investment in the nation’s infrastructure will be given the highest priority<sup>1</sup>.

The proposed infrastructure will therefore foster security within the traversed counties, travel, trade, skills empowerment, and ultimately economic development.

## **2.5 PURPOSE OF ESIA**

Pursuant to Environmental Management and Co-ordination Act (EMCA) of 1999, road projects in Kenya must carry out an ESIA study before construction work commences. The main objective of this Act is to provide for the establishment of an appropriate legal and institutional framework of the management of the environment in Kenya, including the establishment of a National Environment Management Authority (NEMA). The proposed initiative has therefore carried out the ESIA which will be reviewed by, among others, NEMA before issuance of an approval and license to start construction work.

The purpose of this study and its overall objective is to ensure that all the environmental concerns are integrated in the implementation of the project cycle in order to contribute to sustainable development of the general project area and areas in close proximity to it. There is the need to assess the potential environmental impacts and socioeconomic conditions which will be associated with the activities for the proposed road project.

Secondly, the study is intended to propose workable mitigation measures and thirdly to formulate an environmental management and monitoring plan articulating the mitigation measures, responsible persons, frequency of monitoring, required resources, time frame for its implementation and possible costs.

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<sup>1</sup> Refer to Vision 2030, page viii

### 2.3: Technical Expertise Involved in the ESIA Process

Name	Role	Qualifications	Experience (years)
Dickens Odeny	Biologist/Ecologist	Bsc, Msc, PhD.	Over 10 years
Isaiah Kegora	Environmentalism	Bsc, Msc	Over 10 years
Joseph Ndungu	Environmentalism	BA, MA	Over 10 years
Samson Abaya	RAP/Gender Specialist	Bsc, Msc	Over 10 years

### 2.6 OBJECTIVES OF ESIA

Key objectives of the ESIA during the design stage of the proposed project are:

- Identify possible impacts related to the proposed road design and modify and/or improve the design before construction work commences. The impacts can be on physical, biological, social and cultural environments.
- Ensure efficient resource use
- Enhance social aspects
- Identify key impacts and measures for mitigating them
- Inform decision-making and condition-setting
- Minimise as far as possible serious and irreversible damage to the environment
- Protect human health and safety

### 2.7 TERMS OF REFERENCE

The ESIA was carried out in compliance with the Government of Kenya's Environmental Management and Co-ordination Act (EMCA) of 1999 and the Environmental (Impact Assessment and Audit) Regulations, June 2003, among other relevant laws, regulations and guidelines standards, as well as the Banks Environmental and Social Assessment procedures.

The scope of services that were undertaken by the consultant included but not limited to the following:

**Task 1. Description of the baseline environment:** To collect, collate and present baseline information on the environmental and social characteristics of the existing situation in the proposed route. This involved:

- a) Physical Environment* (topography, landforms, geology, soils climate and meteorology, air quality, hydrology etc.).
- b) Biological Environments* (i.e. flora and fauna types of diversity, endangered species, sensitive habitats etc.).
- c) Social and cultural environment*, including present and projected, where appropriate(i.e. population, land use, planned development activities, community structure, gender employment and labour market, sources and distribution of income, cultural properties etc.). This shall also include identification of any resettlement and compensation needs that could trigger the need to prepare a Resettlement Action Plan (RAP).

**Task 2: Detailed Description of the Proposed Project:** The consultant is to concisely describe the proposed project, its geographic location, ecological, general layout of facilities including maps at appropriate scale where necessary.

**Task3: Legislative and Regulatory Framework:** The consultant shall identify and describe all pertinent regulations and standards of governing the environment quality, solid and liquid waste management, health and safety, protection of sensitive areas,

land use control at the national and local levels and ecological and socio-economic issues. Compliance issues to be stated.

**Task 4: Identify Potential Environmental and Social Impacts that could Result from the Project:**

The consultant shall analyze and describe all significant environmental and social impacts expected due to the proposed project. These would encompass environmental, ecological and social impacts, both positive and negative, as the result of interaction between the proposed project and the environment that are likely to bring about changes in the baseline environmental and social conditions discussed in Task 1. The consultant shall differentiate between short, medium and long term impacts. During the analysis, the consultant shall consider both biophysical and socioeconomic factors that will include the impacts of: population change and migration; socio-economic characteristics of the different target groups along the proposed routes; forms of social organization and co-operation; physical and social infrastructure, change in economic activities; development resources, vegetation clearance; mechanical disturbance; removal of structure/sites; effects on flora and fauna; air quality; improved access; accident rates and visual/aesthetic change.

**Task 5: Occupational Safety and Health Concerns:** The consultant shall analyse and describe all occupational and healthy concerns likely to arise as a result of construction and operations of the proposed facility. The consultant shall make recommendations on corrective and remedial measures to be implemented under the environment and social management plan. The consultant will include emergency /disaster preparedness plans for the project.

**Task 6: Carry out public participation and consultations on the positive and negative impacts of the project:** The consultant shall carry out a social due diligence which will involve a description of the social, economic and cultural status of the project area. The consultant shall organize public forums for participation to enable interested and affected parties, including Civil Society Organizations/NGOs, to present their concerns and opinions regarding the proposed project. Deliberate efforts will also be made to ensure inclusion of women in the public consultation. The views of the public will be solicited and incorporated in the main actual report.

**Task 7: Propose mitigation measures to the identified environment and social impacts.** The consultant shall come up with the feasible mitigation measures for the negative impacts that could result from the proposed project.

**Task 8: Development of Environmental and Social Management plan to mitigate negative impacts.** The Consultant shall develop a comprehensive Environmental and Social Management Plan (ESMP). The plan should recommend a set of mitigation, monitoring and institutional measures to eliminate, minimize or reduce to acceptable levels of adverse environmental impacts and/or maximize socio-economic benefits. The Consultant shall provide cost outlays for the proposed measures as well as their institutional and financial support.

**Task 9. Developmen of Environmental and Social Monitoring Plan:** The consultant is required to give specific descriptions, and technical details of monitoring measures, including the parameters to be used ,methods to be used, sampling locations, frequency of measurements, and definition of thresholds that will signal the need for corrective actions as well as deliver monitoring and reporting procedures .The consultant will provide time frames and implementation mechanisms ,staffing requirements and cost outlays.

## **2.8 STRUCTURE OF REPORT**

The ESIA study report constitutes descriptions of possible environmental and socioeconomic impacts likely to occur during the design, preparation, construction and operation phases of the proposed road project. The report has been divided into 9 chapters covering non-technical executive summary, project description, environmental and social impact methodology, policy, legal framework and regulatory framework, baseline environmental and social parameters, analysis of project alternatives, environmental and social impact assessment, environmental and social management plan, conclusions and, recommendations and references

### **3 PROJECT DESCRIPTION**

#### **3.1 INTRODUCTION**

The project's activities will include, - apart from the hereby ESIA Study Report - design related works which entails:

- Road design review from Isiolo - Lerata (49km) whereby there is an existing highway. A design review will also be done from Lokori to Lokichar, whereby there is an earth / gravel road which was designed in 2013 for upgrading to bitumen as part of Nginyang'- Lokori- Lokichar road (C113/C46).
- Aerial mapping will be done from the proposed Isiolo bypass, through Lerata, Wamba and from Lokori to Lokichar.
- Preliminary and detailed engineering design, including the bid documents for the 417.5 km road project.
- A full material investigation and pavement design.
- Review whether the existing paved highway - A2 Isiolo to Lareta - is in compliance with LAPSET requirements and confirmatory material testing, including the ESIA which was earlier done and license issued.

The contract period is 15 months, with the completion date set to be 15th April 2019.

#### **3.2 PROJECT LOCATION**

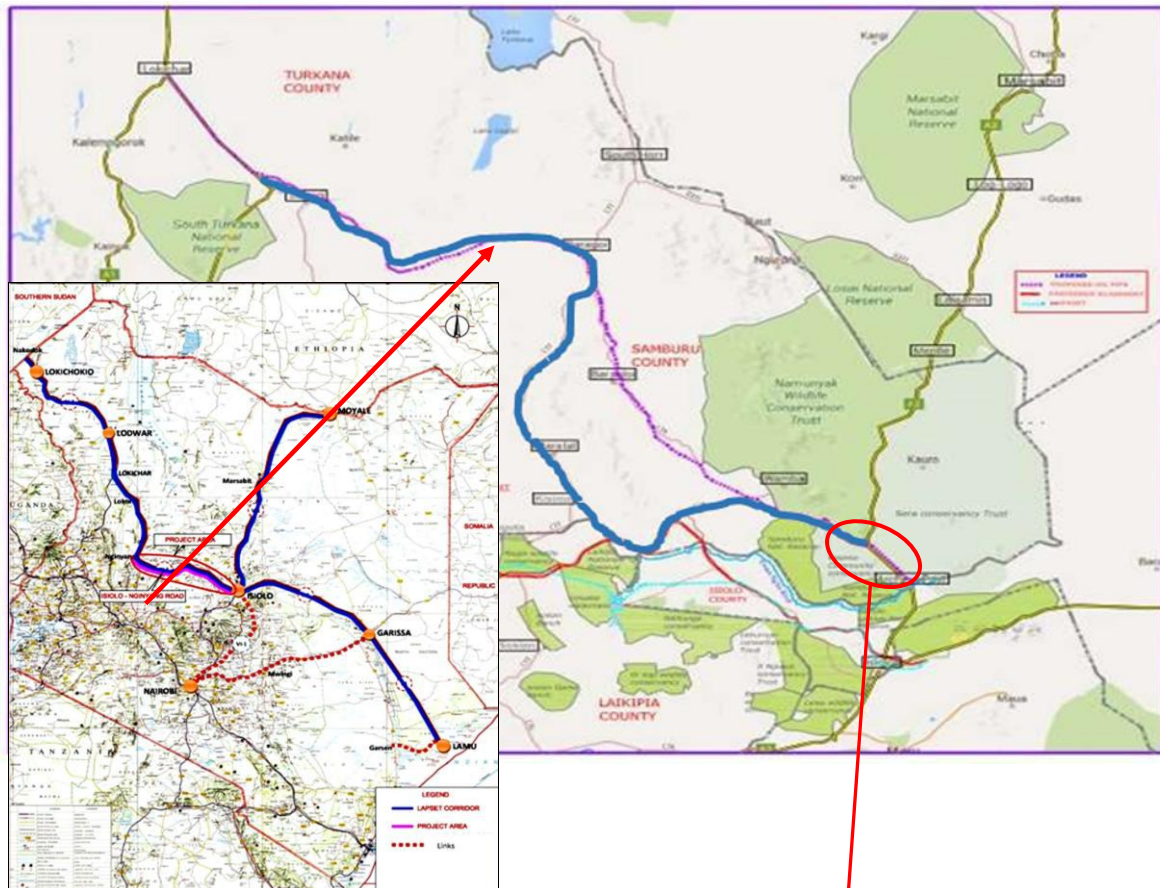
The proposed road will traverse through Meru, Isiolo, Samburu and Turkana Counties. The proposed final road alignment has incorporated the existing road network much as possible in order to maintain connectivity to major trading centers.

This alignment will follow Isiolo by pass, Road A2 Isiolo to Lareta, Lareta-Wamba – Kisima, Kisima-Maralal- Baragoi, Baragoi –Lokori and Lokori-Lokichar. The road covers 483km of which 282km will be designed.

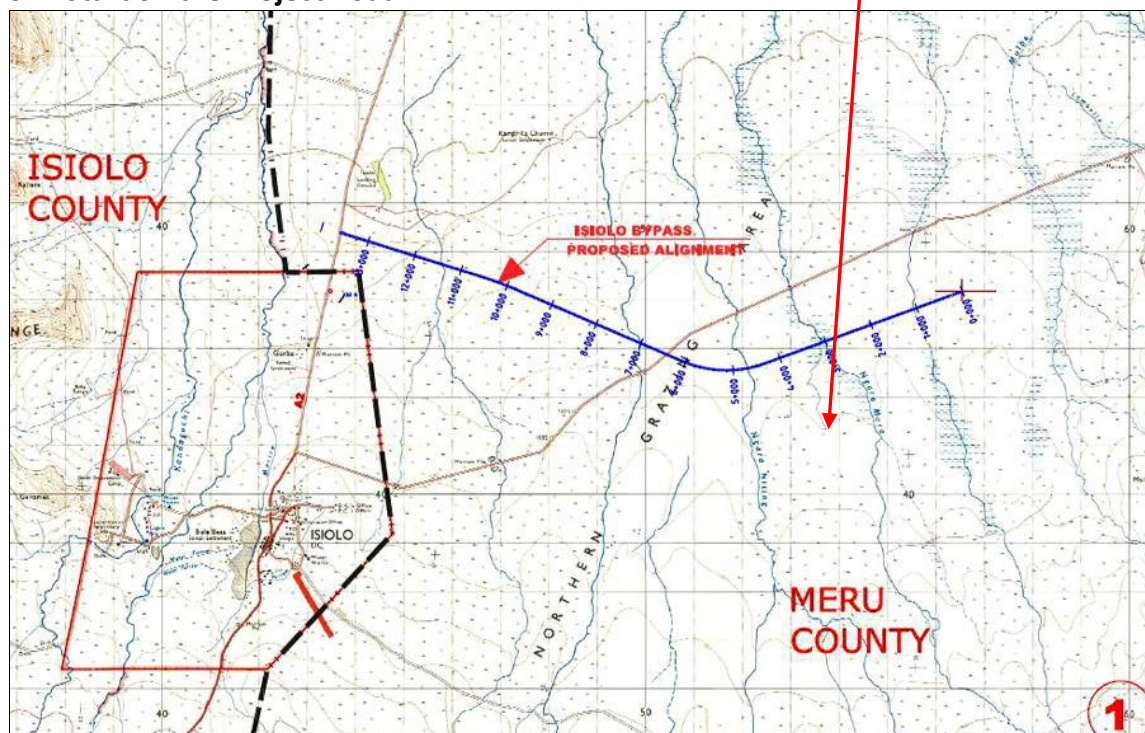
The alignment of the road follows a northwest direction to avoid the migratory corridor of the existing conservancy areas of Laikipia Plateau and a proposed dam (crocodile Jaws) on the Ewaso Ngiro River.



### 3.1: Location of the Project Road

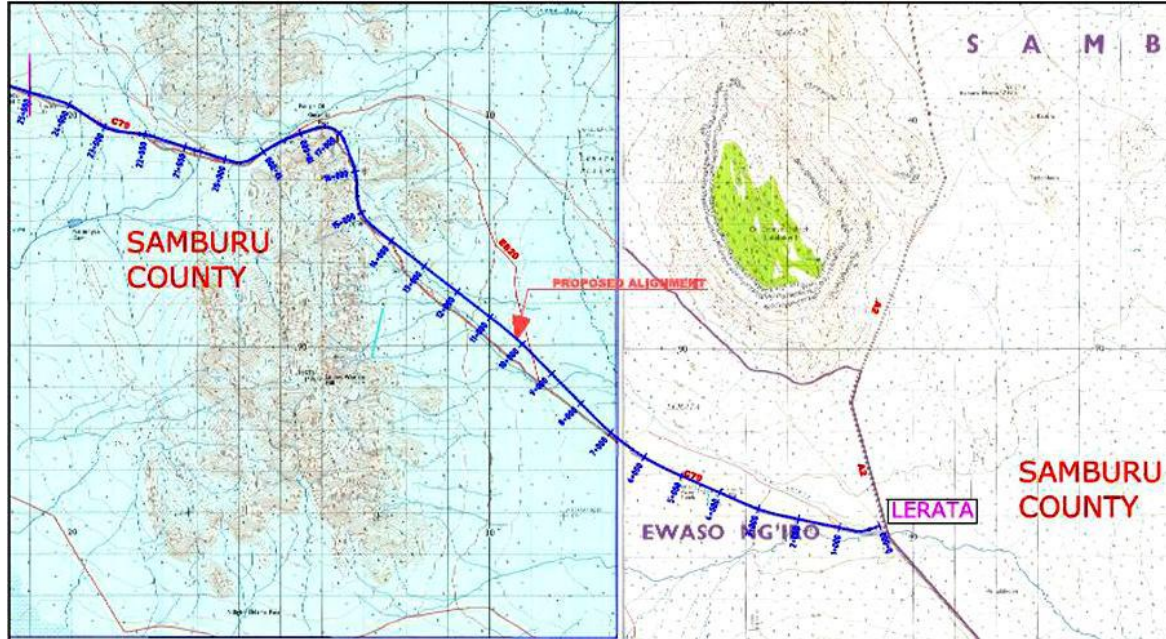


### 3.2: Start of the Project Road

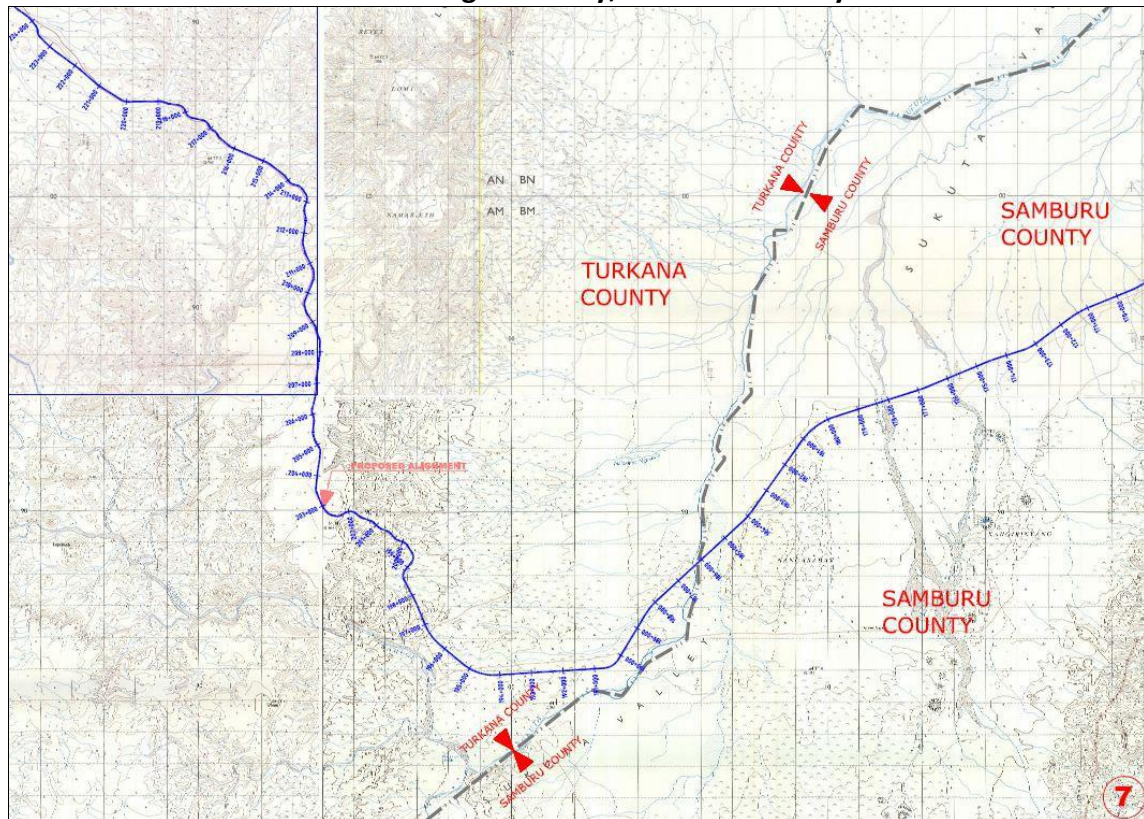




### 3.3: Section of the Road in Samburu County



### 3.4: Section of the Road within Suguta Valley, Samburu County



### 3.3 OVERVIEW OF ROAD CONSTRUCTION

#### 3.3.1 Techniques to be Used, Cross Section and Alignment<sup>2</sup>

General considerations for the road pavement design will be guided by the selection of the most economical combinations of pavement materials and layer thickness that will provide sufficient strength and durability to last over the design life of the pavement with only routine maintenance. Main factors considered in the design include:

The volume and axle load distribution of traffic that will use the road over the 20 year design life.

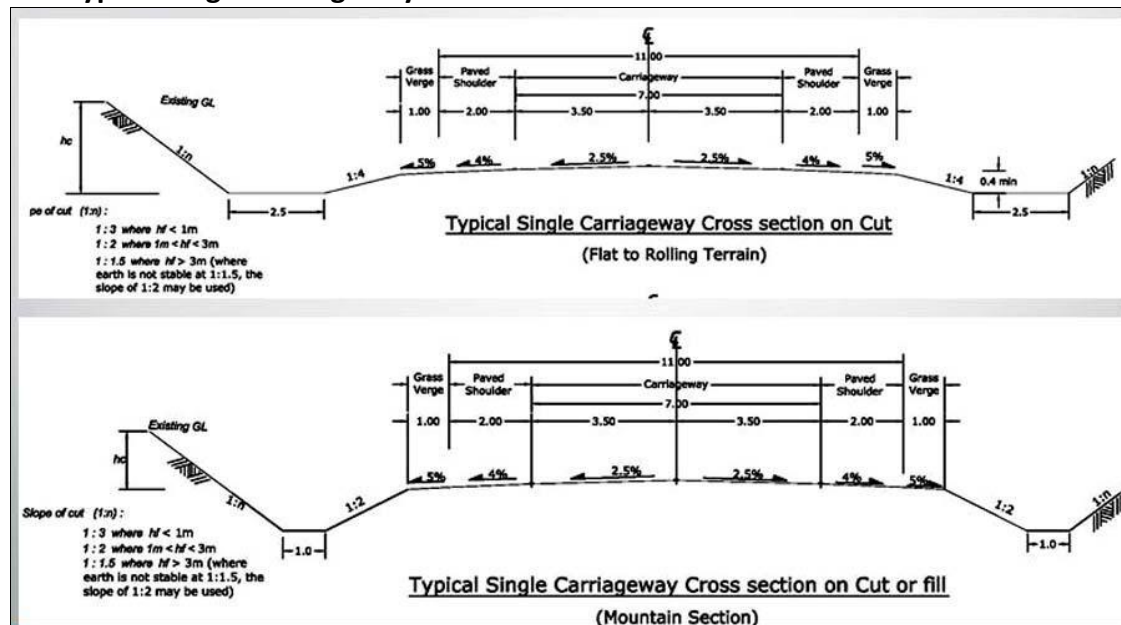
- The strength of the sub-grade underlying the pavement
- Locally available construction materials and their strength characteristics.
- Environmental conditions.

The construction technique to be used for the proposed road will be the use of bitumen. The method is the most preferred due to its flexibility. It will consist of four layers of bitumen, with the bottom layer being the thickest and the subsequent three layers will keep on thinning as they get to the top.

Major advantages of bitumen is due to its elasticity as it tends to acquire the shape of load above it, it can hold heavy traffic and it is water proof.

Specifically and from the Road Design Manual part III, the type of pavement are suitable for T1 traffic loading as is applicable to all sections of the project road will be type 11 and 12 (AC surfacing (type1) + Dense Bitumen Macadam base + Base quality GCS or cement / lime improved Material sub-base)<sup>3</sup>.

#### 3.5: Typical Single Carriageway Cross Section



Source: hydrology, structures and road drainage design Team, Feb. 2019.

#### 3.3.2 Structures to be Constructed

There are quite a number of seasonal streams which traverse the proposed project road. There are however major rivers which are River Seiya (Km 36+590), River Naliyo (Km 175+790, River Suguta (185 +010/186+260) and River Kerio. Major structures to be

<sup>2</sup> Refer to the hydrology, structures and road drainage design report for this project.

<sup>3</sup> Refer to the Materials and Pavement Design Report, Feb. 2019.

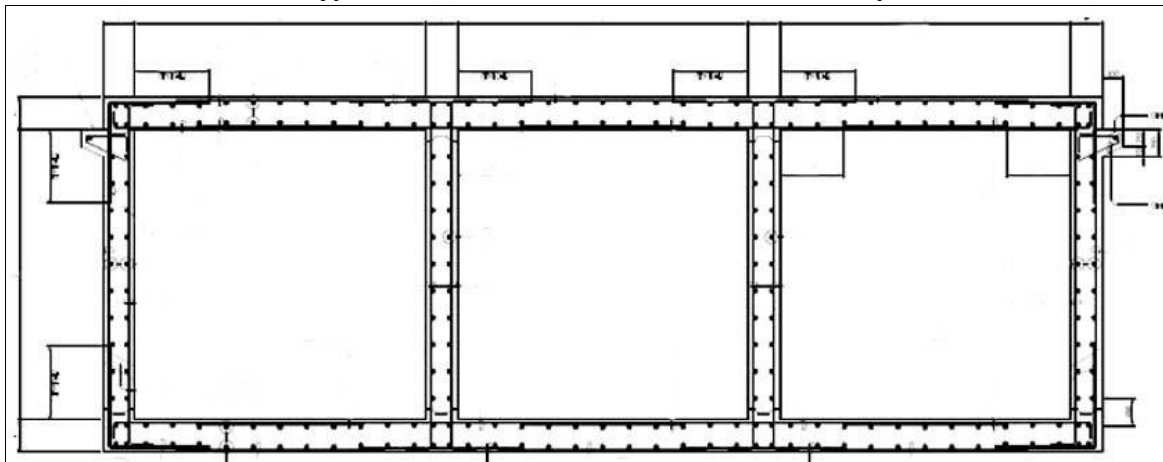
constructed will be bridges and reinforced concrete box culverts along various sections of the project road (Details in the table below).

### 3.1: Details of Drainage Structures to be Constructed

N0	Chainage (Km)	Recommended Type of Structure and Size
1	7+830	Bridge Prestressed Concrete (PCI) Triple Span 20X4M
2	8+270	Single Cell Reinforced Concrete Box Culvert (RCBC) 2MX1.5M
3	39+570	Bridge PCI Triple Span 40X3.55M
4	128+590	Twin Cell RCBC 5MX2M
5	138+380	Four Span Bridge PCI 30X3M
6	189+450	Single Barrel 900MM DIA RCPC
7	210+090	Twin Cell RCBC 4MX2M
8	211+555	Twin Cell RCBC 3MX2M
9	212+130	Twin Cell RCBC 2MX2M
10	213+310	Triple Barrel 900MM DIA RCPC

**Source:** Consultancy Team. Jan. 2019.

### 3.6: Cross Section of a Typical Reinforced Concrete Box Culvert Triple Barrel



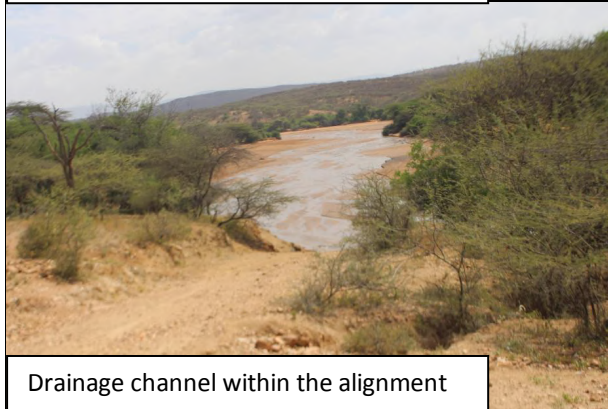
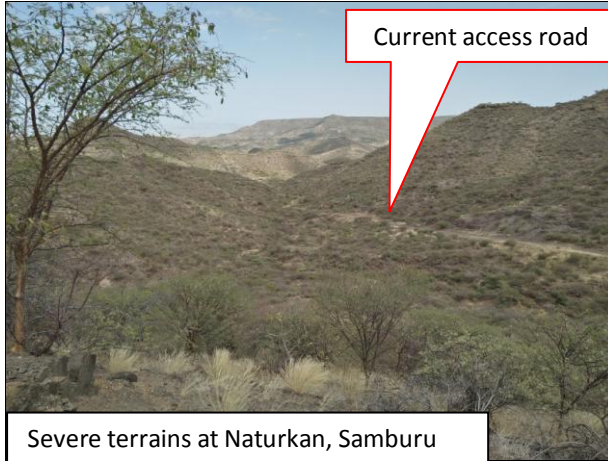
**Source:** Consultancy Team. Jan. 2019.

### 3.3.3 Alignment and Existing Terrain

The sections of road to be designed as far as possible will follow the proposed crude oil pipeline alignment from Lokichar (Ngamia 4 oil wells) located 30km from Lokichar to Lokori-Baragoi-Archers Post- Kula Mawe – Garissa - Lamu. This concept has proved difficult to implement because the alignment traverses severe terrain with mountains, escarpment and rivers. Short of providing extensive long tunnels and viaducts, each service would have vastly different geometric requirements and are best left independent.



### 3-1: Existing Alignment with Severe Terrain and Drainage Channels



The sections of road to be designed as far as possible will follow the proposed crude oil pipeline alignment from Lokichar (Ngamia 4 oil wells) located 30km from Lokichar to Lokori-Baragoi-Archers Post- Kula Mawe-Garissa- Lamu. This concept has proved difficult to implement because the alignment traverses severe terrain with mountains, escarpment and rivers. Short of providing extensive long tunnels and viaducts, each service would have vastly different geometric requirements and are best left independent.

The road will pass through Suguta valley (above).

## 4 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT METHODOLOGY

### 4.1 COLLECTION OF BASELINE DATA AND OVERVIEW OF METHODS

#### 4.1.1 Primary Data

Primary data was collected from information gathered directly from the respondents. It included interviews and focused group discussions. In focus group discussion forum, key stakeholders had the opportunity to interact with one another and discuss about their key concerns on the proposed road. Questionnaires were avoided due to impracticability of their effectiveness.

Secondary data was collected from the documented information from the project SEA report, published materials, books, pamphlets, journals as well as internet research from reliable websites were reviewed and project relevant information deduced.

#### 4.1: Data Collection Techniques

	PRIMARY DATA COLLECTION TECHNIQUE	AREAS APPLIED/ PARTICIPANTS	REMARKS
1	Interviews (Experts interviews, focused group discussion).	<ul style="list-style-type: none"><li>Stakeholders' forum.</li></ul>	Interviews held.
2	Questionnaires	<ul style="list-style-type: none"><li>Applied in Socioeconomic Survey</li></ul>	Successful in identifying socioeconomic features
3	Public consultative meetings/forums.	<ul style="list-style-type: none"><li>Community members living in close proximity to the project road.</li><li>Consultative forums with key stakeholders.</li><li>Consultation with project interested parties (NGOs)</li></ul>	Meaningful primary data was collected.
4	Observations (direct observations)	During consultative meetings, within impact areas	Observations successfully done.
5	Digital photographic documentation (Photolog)	Along the project road and during consultative meetings.	Digital photographic documentation.

**Source:** Consultants' Team, Dec. 2018.

In order to gain public views, concern and value with regard to the proposed road, public living in close proximity to the project road were consulted.

Consultative meetings were held Lerata, Wamba, Lengusaka, Barsaloi, Lolkuniyani, Baragoi, Nachola, Lokori and Kamuge.

Field work was done in the months of October, November and December 2018, January, February 2019 and the preparation of the ESIA study report was done in April, and May 2019.

#### 4.1.2 Physiography and Geology

Baseline information for the physiography and geology within the proposed project site was done through reviewing the existing secondary data. Field visits from Isiolo to Lokichar<sup>4</sup> were done whereby relevant information was gathered. The materials and pavement design team visited the project area in October, November and December 2018, and carried detailed materials investigation on the geology.

<sup>4</sup> Reference to the geological reports

#### **4.1.3 Soils**

The alignment soils were investigated through excavation of trial pits at 0.5 km intervals. Each trial pit was accurately logged and samples retrieved for lab testing. To determine the types of soils, Standard laboratory tests conducted. Results of the tests are given in detail in the soils and pavement report. Qualitative and quantitative research methods were used to provide insights into the possible impacts and generating baseline data for reviewing the possible impacts.

#### **4.1.4 Climate**

Climate data for the three counties to be traversed by the project road were collected from the Kenya Meteorological Department, Nairobi as well as the available secondary data. (See references in the appendix).

#### **4.1.5 Air Quality, Noise and Vibrations**

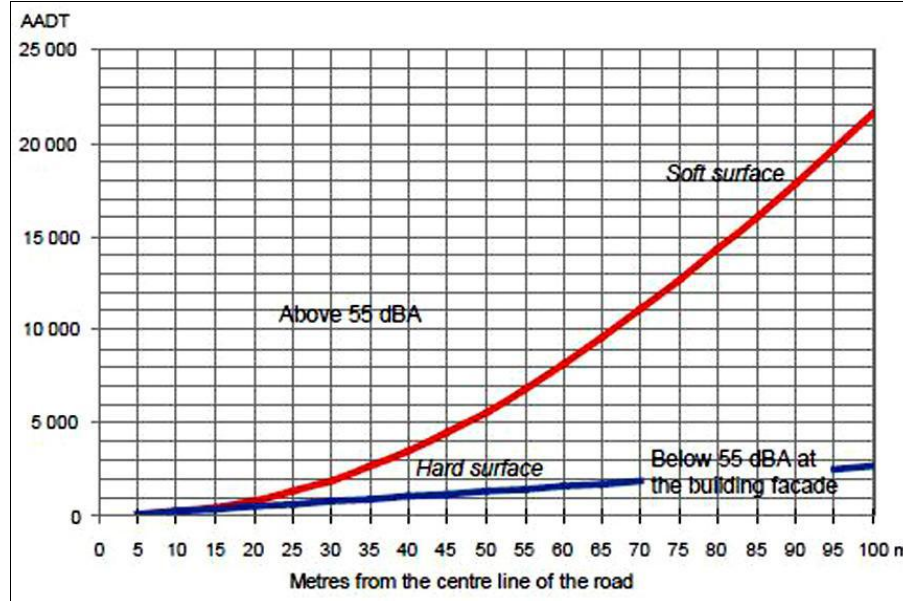
The value of air within the surrounding project environment was done. Desk studies and mapping, through field visits was done to establish the location of the trading centres, households and institutions close to the project road, at approx. 200 meters on both sides. The numbers of establishments which can be exposed to air quality impacts during the project cycle were mapped and air quality noted.

The same methodology was used to establish locations which will be vulnerable to noise and vibration. The acquired data will be used during construction phase, in accessing the trends of air quality and noise at selected sites. Through this, the magnitude and trend of air pollution and noise will be known and plotted. Indicators of large value were noted and they are:

- Density of population along the road. These areas are will be more vulnerable to air pollution and noise than less densely populated ones
- Vulnerability of the settlements. Children and the elderly will be more sensitive to noise than the rest of the population.
- Health centres, schools and kindergartens were therefore noted to vulnerable to noise and local air pollution.

*Table 3.1* can be used during the construction period in forming a basis for noise assessment within the identified receptors along the project road, based on Average Annual Daily Traffic (AADT). The variation of the graph will form basis for implementing specific mitigation measures to curb noise pollution within the identified receptors.

#### 4.1: Basis for Assessment for Noise Exposure within Selected Receptors<sup>5</sup>



**Source:** Adopted from Guideline No. 5, Planning EIA of Road Infrastructure, Botswana.

##### 4.1.6 Surface and Groundwater Resources/ Water Quality

Various locations for assessing water quality were selected. They were mainly laggas along the project sites (Suiyan, Barsaloi, Seiya, Silanga-Nanyukie and Ngaroni. Kerio and Suguta Rivers were also assessed. From the named locations, the following were noted: Water feature type (flowing, borehole or water pool, temperature, conductivity, TDS (ppm), pH and TSS<sup>6</sup>.

##### 4.1.7 Terrestrial/ Aquatic Environment

Study design involved field surveys to sample the different biodiversity groups in the different study sites and was supported by desktop survey of literature. The field observations were improved by interview on the locals as not all present species could be encountered during the field survey. This information was then verified by comparing it with the literature distribution of the concerned species. Sampling sites were located along the proposed Lokichar – Isiolo Road Project was situated in areas with potential concentration of animals and trees in the dry lands such as lugga, earthpan, oasis (springs), rivers (permanent and seasonal), and wetlands (swamps – permanent and seasonal). Sampling that was carried out included:

- Plant Sampling: The plot-less method will be employed in assessment of wetland and riparian (or riverine) plant species. This method was used to study the vegetation types and the plant diversity within the project site and adjacent riverine areas. Random walks were made into various habitat types that are likely to be affected by change of river regimes
- Aquatic macro invertebrate survey: This group includes invertebrate species that can be retained by a 500 – 600 micron mesh screen. Species that are likely candidates for sampling include aquatic insects such mayfly, dragonfly and caddis fly larvae), aquatic worms, amphipods (scuds), leeches, clams and snails. Kick-sampling was used for three minutes kicking/sweeping water media using a

<sup>5</sup> The graph will change based on the site situation during the start of the project. AADT = Annual average daily traffic

<sup>6</sup> Refer to chapter 5.4, page 64



standard 1 mm mesh pond (hand) net. Loose pebbles were turned to observe invertebrates hiding under stones.

- IUCN Red list of threatened species: Only species that were sighted within the project spatial scope were scrutinized against the IUCN Red list of threatened species. The search engine for the IUCN Red list of threatened species<sup>7</sup>.

#### **4.1.8 Land Resources**

Existing literature from the County Governments was reviewed, which details on land resources within the areas where the road will traverse. This included integrated development plans from the Counties, geology and mineral resources and maps

#### **4.1.9 Visual Aesthetics**

Available source of information on landscape was reviewed. This included consulting maps, literature, photo-maps, flora, geology; rivers and streams; trees, shrubs; built-up areas landscape features of symbolic or historical value; landmarks and land forms.

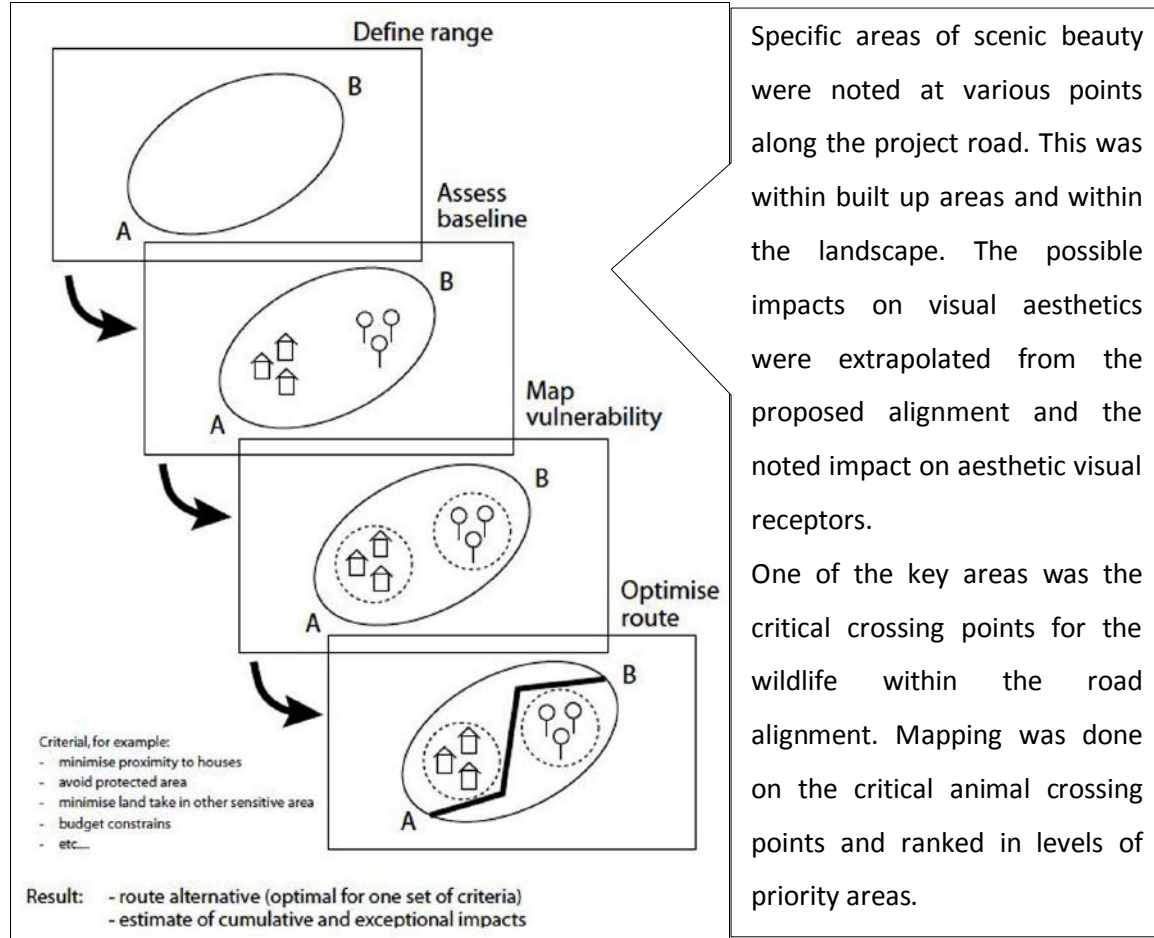
The people living within the areas that will be affected by the proposed initiative were consulted in order to check whether there are areas considered to be of aesthetic importance. Further:

- The areas influenced with visual aesthetics were accessed through the consultant's judgments of the visibility of the road corridor. The visibility was based on the viewpoint of drivers using the road, the inhabitants of the area and local informants.
- A vulnerability mapping (see figure 3.2) was carried out during the reconnaissance survey within the project sites. This involved gathering the relevant baseline information based on the current road alignment. This included the locations of conservation areas close to the project site, scenic landscapes, watercourses and plains. The information will be reviewed along with the final alignment to access whether the alignment will not impact on the areas of aesthetic beauty.

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<sup>7</sup> Refer to a detailed Ecological Impact Assessment report for this project, submitted as a standalone document, along with this report.

## 4.2: Vulnerability Mapping for the Road Alignment



**Source:** Adopted and modified from Guideline No. 5, Planning EIA of Road Infrastructure, Botswana.

To this effect, levels of mitigation measures were suggested. They included elevation of the road, cut and cover and road realignment, as well as traffic calming measures, - speed bumps and signage. The locations which were identified with critical crossing points Level 1 have been considered in the design<sup>8</sup>.

### 4.1.10 Noise and Vibrations

#### Receptors and Method to be used in Noise Sampling

Noise survey methodology will involve the measurement of noise levels, to be taken at identified noise receptors within the proposed road corridor and as per the ISO 1996 Parts 1, 2, 3 standards, which entails the following:

- Inspection of the monitoring locations and the implicated activities
- Compiling photographic reports of the monitoring locations and surroundings.
- Calibration of the sound level meter before and after each measurement.
- At all positions the spot check was mounted on a tripod approximately 1.5m above ground level.
- Noise levels to be expressed in decibels, A-weighted sound pressure level (dBA).
- The noise level for each point was measured and the following were recorded:
- Measurement time and durations (15-minute measurements).

<sup>8</sup> Refer to chapter 8.2.8, with issues of concern raised by wildlife interested parties.

- The equivalent noise level ( $L_{Aeq}$ ), maximum sound pressure level ( $L_{Amax}$ ), minimum sound pressure level ( $L_{Amin}$ ) and  $L_{APEAK(MAX)}$
- Statement of on-site calibration verification before and after each series of measurements.
- Sources of Noise.

#### **4.1.11 Solid and Liquid Wastes**

Observations on current status of waste management with built up areas- especially trading centres; - Lengusaka, Swari, Barsaloi and Lokori were noted. Waste management guidelines from NEMA were reviewed. The noted guidelines will be applied by the contractor during construction period. This will be pursuant to Environmental Management and Co-ordination Act, (Waste Management Regulations) 2006, Part II, Solid Waste, which has provisions on disposal methods.

#### **4.1.12 Public Consultations and Socio-Economics**

In order to gain public views, concern and value with regard to the proposed project road, public living in close proximity to the project road were consulted. Through this, it is anticipated that transparency and accountability in the final project report would be achieved. Possible conflicts between the key stakeholders, PAPs, community members living in close proximity to the project road, interested parties, mandated government agencies, among others, would be addressed and solved at an earlier stage. Possible delays in project implementation and extra costs will be addressed.

A range of formal and informal consultative methods were used by the consultants' team who carried out EIA and RAP study, but not limited to: focus group discussions (FGDs), public meetings, community discussions, and in-depth and key informant interviews (KII). In addition to the censuses and sample socio-economic surveys were undertaken. The consultants' team undertook consultation with special and vulnerable groups to put into consideration of their views. The consultants' team encouraged public participation in their consultations by informing members of public the meeting venues beforehand. The participants had the opportunity to express their opinion on priorities which the project should address. The key stakeholders identified for the proposed project included:

- Communities/families/ individuals who are affected by the Project;
- Mandated government agencies (KWS and Kenya Forestry Service) at the county, regional and national levels;
- PAPs
- NGOs and CBOs
- Private and Charitable Organizations
- Group Ranches and Community Conservancy Groups
- Grévy's Zebra Trust and Ewaso Lions (Interested parties in wildlife conservancy)
- County Government and Local leaders (County Commissioners, Deputy County Commissioners, Assistant County Commissioners, Chiefs, Assistant Chiefs, County, Sub County Administrators, Opinion Leaders among others).

#### 4.2: Details of Public Participation Meetings, Venues and Dates

No	Venue of the Meeting	Date	No. of Attendance
1	Lerata A	20 <sup>th</sup> Nov. 2018	56
2	Lengusaka Market	20 <sup>th</sup> Nov. 2018	85
3	Lolkuniani Market	21 <sup>st</sup> Nov. 2018	118
4	Nachola	22 <sup>nd</sup> Nov. 2018	171
5	Suiyan Manyatta	23 <sup>rd</sup> Nov. 2018	96
6	Baragoi CCF Hall, Baragoi Town	23 <sup>rd</sup> Nov. 2018	33
7	Kamuge, Suguta Valley	05 <sup>th</sup> Dec. 2018	118
8	Baraza Park, Lokori	06 <sup>th</sup> Dec. 2018	197

#### 4-1: Consultative Forums



Baraza meeting at Kamuge, Suguta Valley



Meeting in Baragoi



Focused group discussions with women



Focused group discussions with men.



Security briefing by chief at Nachola



Filling in the list of attendants in Lerata.



Consultative meeting with security officers in Naturkan, Samburu County





Participants were given the opportunity to comment about the proposed project, ask questions or suggest possible mitigation methods for the identified negative impacts.



Acceptance of the project by acclamation from the participants at Lolkuniani

#### **4.1.13 Health and Public Safety**

Secondary data was acquired from the available literature from the counties, mainly the recent Counties Integrated Development Plans. The data included demographic structure, population trends among others relevant to public and health safety. The data was reviewed along with available literature from reliable sources on health and public safety during road construction process. Field survey was done to collect the primary data on the location of various receptors such as settlements and trading centers close to the project road, health centres, location of services like schools, health facilities etc. as well as the locations of cattle watering points, crossing points to Manyattas, cattle salt licks etc. The vulnerability of the identified receptors in relation to the proposed road alignment was noted.

#### **4.1.14 Key Informants Interviews**

A reconnaissance survey was carried out in October 2018 whereby the key informants from the three counties were identified. A schedule for consultative meetings with the informants was agreed upon. Consultation were later held and minuted<sup>9</sup>. The key informants, apart from the local communities, are listed in Table 3.2

<sup>9</sup> Refer to the certified minutes for the meetings with informants in the appendix of this report.

### 4.3: Key Informants during the Consultative Public Participation

NAME		DESIGNATION	CONTACTS
<b>Isiolo and Samburu Counties</b>			
1	Mike Wangila AOI	County Commissioner Isiolo	0726239860
	KeNHA Upper Eastern Regional Office		
2	Eng. Albert Semutwa	Regional Manager	0721689770
3	Ms. Abby Osare	Inspector	0724292632
4	Eng. Benjamin Maara	Regional Manager	0722975272
5	Samuel Gitahi	Chief Roads Officer	0722478591
6	Ole Lessit	Inspector	0726157657
7	John Korir	County Commissioner, Samburu	0727404848
8	Joseph Chirchir	OCPD Samburu County	0722977465
9	Mr. Johnson Mwirigi	Deputy County Commissioner Samburu East	0721437710
10	Mr. James Mwayaya	Deputy County Commissioner Samburu North	0729366082
11	James Opiyo	OCS Baragoi	0722342738
12	Stephen Musyoka	AP Inspector Baragoi	0720059606
13	Christopher Lokarash	Chief Nachola Location:	0790833813
14	Andrew Letura	Grévy's Zebra Trust, Samburu Coordinator	0711357770
15	Francis	Ewaso Lions (Kenya Police Reserve)	07155739492
<b>Turkana County</b>			
16	Salim Fundi	OCPD, Lokori	0722982674
17	Mr. Manduku	County Commissioner, Lokori	
18	John Mark	Chief, Kamugu	0723235718

## 4.2 DEVELOPMENT OF THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

### 4.2.1 Objectives of the ESMP

- Identify potential impacts that may occur during the project cycle – design, construct, and commission/operation.
- Develop detailed specific mitigation measures with relevant costs implication that will need to be achieved during the project cycle;
- Specify responsibilities and institutional arrangement that will be put in place to ensure that the mitigation measures are implemented
- Integrating environment fully into the various activities of the proposed project and ensuring inclusion of environmental requirements into tender documents, continuing management and evaluation of the environmental performance of the project.
- Tracking to ensure the effectiveness of the mitigation measures at meeting the anticipated standards;
- Provide targets to achieve, timeframe and monitorial indicators.

#### 4.2.2 Categorization of Potential Impacts during the Project Cycle

The activities related to the proposed initiative have the potential to cause environmental impacts of varied significant levels. The impacts arising from the proposed project can be categorized into direct, indirect and cumulative impacts. These categories can be further broken down according to their nature, into positive or negative impacts, random or predictable impacts, local or widespread impacts, temporary or permanent impacts, and short- or long-term impacts. These impacts can be grouped as indicated in the table below.

#### 4.3: Categorization of Potential Impacts during the Project Cycle<sup>10</sup>

IMPACTS ON HUMAN AND NATURAL ENVIRONMENT			
POSSIBLE IMPACTS			
Predictable	Temporary	Permanent	Long (l) Short (s) Term
<ul style="list-style-type: none"><li>Improved accessibility</li><li>Shortening of travel time</li></ul>	<ul style="list-style-type: none"><li>Occupational hazards</li><li>Noise</li><li>Dust</li><li>Solid waste</li></ul>	<ul style="list-style-type: none"><li>Redevelopment</li><li>Increased business</li><li>Improved land value</li><li>Change of scenery</li></ul>	<ul style="list-style-type: none"><li>Increased formal /informal employment (s)</li><li>Change of landscape (l)</li><li>Aesthetic beauty (+ve)</li></ul>

For an impact to occur there must be an interaction between project activity - presence of infrastructure associated with the operation of project plant, equipment or vehicles and a receptor and physical action or, or the actions of project employees. While receptor represent someone or something that could be influenced by the Project, including human health, water resources, air quality, ecological habitats or species, cultural heritage assets, and the wider environment.

#### 4.4: Impacts Terminologies and Clarifications

Term	Definition
Direct Impact	Occurs as a result of activities undertaken in direct connection to the project
Indirect Impact	Occurs as a consequence of a direct impact (sometimes as part of a chain of events) and may be experienced at a point in space or time that is removed from the direct impact.
Secondary Impact	Socioeconomic and cultural changes which may be experienced at a point in space or time that is removed from both direct and indirect impacts.
Cumulative Impacts	Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project.
Inter-related impacts	The impacts resulting from the inter-relationship of different topic-specific impacts upon the same receptor (e.g., where the impacts from noise and impacts from air quality affect a single receptor such as fauna).

<sup>10</sup> The hereby listed possible impacts are just but are few. Further impacts are explained elsewhere in this report.



Positive or negative impacts	Impacts can be either negative or positive. Positive impacts merit just as much consideration as negative ones, as international, national and local policies increasingly press for projects to deliver positive biodiversity outcomes. Positive impacts can be considered for all the definitions above.
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#### 4.2.3 Assessing Significance of Impacts and Impacts Rating Scales

Significance of an impact is used in this assessment to express the consequence of an impact and is determined by considering the magnitude of the impact alongside the importance, or sensitivity, of the receptor or resource, in accordance with defined significance criteria. For example, construction activities can result in increased levels of noise, and potential disturbance to noise sensitive receptors (i.e. people or ecological receptors).

The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance rating matrix.

For some types of impact e.g. noise quality, there are empirical, objective and established criteria for determining the potential impact significance (e.g. if a standard is breached or a protected area is damaged). However, in other cases assessment criteria are more subjective and require professional judgment to a greater degree.

#### 4.4: Significance Rating Matrix

Consequence (Magnitude+ Geographic extent + Duration of the impact)																
Likelihood of Activity	Frequency of	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	

#### 4.5: Positive / Negative Mitigation Rating and Associated Colour Code

Significance rating	Value	Colour Code	Negative Impact Management Recommendation	Positive Impact Management Recommendation
Very high	126-150		Propose mitigation measures	Maintain current management
High	100-120		Propose mitigation measures	Maintain current management
Medium high	77-105		Propose mitigation measures	Maintain current management
Low medium	52-75		Maintain current management	Improve current management

Low	25-50		Maintain current management	Improve current management
Very low	4-24		Maintain current management	Improve current management

#### **4.2.4 Further Impacts Rating and Ranking Scale**

##### **Consequence Ranking of Identified Impact**

The level of consequence for each identified impact is determined by examining a number of factors relating to the activity as shown in table below

#### **4.6: Categories of Impacts and Ranking**

Category	Ranking	Definition of Impacts
Catastrophic	5	Transboundary and/or national scale impact
Major	4	Regional to national scale
Moderate	3	Local to regional scale impact.
Minor	2	Local scale impact.
Negligible	1	Impact largely not discernable on a local scale being absorbed by natural environmental.
None	0	Impact absorbed by local natural environment with no discernable effects.
Positive	+	Activity has net positive and beneficial affect resulting in environmental improvement.

##### **Likelihood Ranking Of Activity Occurring**

Likelihood in this assessment is the likelihood of an activity occurring, which will result into an impact. Table below shows the criteria for the ranking level of likelihood of the occurrence of an activity.

Category	Ranking	Definition of Impacts
Certain	5	The activity will occur under normal operating conditions
Very Likely	4	The activity is very likely to occur at some time under normal operating conditions
Likely	3	The activity is likely to occur at some time under normal operating conditions
Unlikely	2	The activity is unlikely to but may occur at some time under normal operating conditions
Very Unlikely	1	The activity is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.

##### **Significance Ranking for the Impacts**

The significance of the identified impacts was determined by calculating the product of an environmental aspect's consequence and likelihood of occurrence. The possible significant rankings are presented in table below.

#### 4.7: Significance Ranking of Impacts

Ranking (Consequence X Likelihood)	Significance
> 16	Critical
9 – 16	High
6 – 8	Medium
2 – 5	Low
< 2	Negligible

## **5 POLICY, LEGAL AND REGULATORY FRAMEWORK**

### **5.1 THE CONSTITUTION OF KENYA 2010**

In Part 2 of the Constitution, on the Rights and Fundamental Freedoms, under Article 42 states that, "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".

Further, in Part 2 of the Constitution on Environmental and Natural Resources, Article 70 (1) on Enforcement of environmental rights, it states that,

"(1) If a person alleges that a right to a clean and healthy environment recognized and protected under Article 42 has been, is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress in addition to any other legal remedies that are available in respect to the same matter.(2) On application under clause (1), the court may make any order, or give any directions, it considers appropriate—

- a) to prevent, stop or discontinue any act or omission that is harmful to the environment;
- b) to compel any public officer to take measures to prevent or discontinue any act or omission that is harmful to the environment; or
- c) to provide compensation for any victim of a violation of the right to a clean and healthy environment.

### **5.2 THE POLICY FRAMEWORK**

#### **5.2.1 Vision 2030 Development Strategy**

The LAPSSET Program is part of the Kenya Vision 2030 Strategy which is the national long-term development policy that aims to transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment. The Vision comprises of three key pillars: Economic; Social; and Political. The Economic Pillar aims to achieve an average economic growth rate of 10 % per annum and sustaining the same until 2030.

The Isiolo- Lokichar road project is an important component of Lapsset and therefore fully consistent with the Vision 2030.

#### **5.2.2 Integrated National Transport Policy (INTP)**

The development of the road corridor and access links will enhance both internal and regional mobility while facilitating the movement of inputs and outputs between production and market centres, particularly to rural areas. It would equally facilitate the accessibility of services especially health, education, markets, administration, water among others in rural areas. In particular, the development and improvement of roads in Northern region and other arid and semi arid lands (ASALs) of the country would facilitate the establishment of livestock based industries and enhance the development of irrigation agriculture in the region.

The Isiolo- Lokichar road project is listed as one of the ten main road corridors and is therefore fully consistent with the INTP.

### **5.2.3 Road Sub-Sector Policy and Road Sector Investment Programme (RSIP)**

The implementation of the RSIP will be carried out by the road agencies and through private sector participation. The road agencies are expected to outsource from the private sector most of the works, goods and services. Following the approval by Parliament of the policy on Public-Private Partnership (PPP) arrangements in financing and implementation of public projects, some components of the RSIP will be delivered through concessioning and other PPP methods.

The Isiolo- Lokichar road project is fully consistent with aims and objectives of the RSIP.

### **5.2.4 Counties Integrated Development Plans**

One of the objectives of the LAPSET Corridor study is to integrate the transportation system and land use pattern in order to optimally exploit the potential of the three countries being served by the Corridor, Isiolo, Samburu and Turkana.

The Isiolo- Lokichar road project is therefore fully consistent with aims and objectives of the Regional Development plans.

### **5.2.5 National Gender and Development Policy**

The overall objective of this policy is to facilitate the mainstreaming of the needs and concerns of men and women in all areas in the development process in the country. General policy objective is to enable men and women to have equal access to economic and employment opportunities. Specific objectives of this policy, which are relevant to the project road include:

Enhance measures that guarantee equity and fairness in access to employment opportunities, in both formal and informal sectors. The road contractor should therefore give both men and women equal opportunities in employment during road construction.

Priority should be given to communities and individuals living in close proximity to the project road as opposed to the contractor coming with his own employees from elsewhere. This can cause conflicts leading to disruption of road construction schedule. The contractor should be gender sensitive, especially when incorporating women into the road construction activities. It will be common that women might be more interested in carrying out traditional house chore activities as compared to strenuous road construction chores. However, there are various jobs that women can carry out during road construction.

### **5.2.6 HIV/AIDS Management Instruments**

Vision 2030 has the key objective of transforming the country into a globally competitive and prosperous nation with a high quality of life by 2030. It is anchored in three pillars—economic, social, and political. Under the Social Pillar, HIV is listed as one of the preventable diseases that continue to exert a heavy toll on the Kenyan population. For Kenya to achieve sustained economic growth as outlined in Vision 2030, a healthy population is critical.

The mandate of the National AIDS Control Council is to coordinate the multi-sectoral response to HIV in Kenya. In building upon this role, and seeking to forge a stronger response in the coming years, NACC, in partnership with a wide range of stakeholders, developed the Kenya National AIDS Strategic Plan 2009/10-2012/13 (KNASP III), whose vision is: 'An HIV-free Society in Kenya'.

During construction phase of the project road, employees and people in search for jobs along the project road is likely to generate a high risk of increased spread of HIV/AIDS

and STIs in the project area. This will be mitigated through HIV/AIDS/STI intervention programmes which should be put in place and effectively implemented and monitored. The implementers of HIV/AIDS mitigation measures will use the Results-Based Management (RBM) programme approach which will focus on 'results, which will be measurable or through change resulting from a cause and effect relationship and their awareness on HIV/AIDS.

#### ***5.2.7 The Kenya National Climate Change Response Strategy of 2010***

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

### **5.3 KENYA LEGISLATION AND REGULATIONS**

#### ***5.3.1 Explosives Act, Cap 115***

The contractor, apart from acquiring a license, should use explosives magazines as specified by The Explosive Act 115, subject to the provisions of the explosives (blasting explosives) rules, subsidiary legislation and special conditions.

Within all the quarries and where possible, the contractor should use low tension explosives (class 2) that do not cause flight of fragments.

Before carrying out the explosion exercise, the quarry supervisor should make sure that there is no one within the vicinity, especially children, men, women, idlers and livestock. The low tension blast should not be noticed after a radius of approximately 100 meters away, the safe blasting distance.

#### ***5.3.2 Labour Relations Act, No. 14 of 2007.***

This is an Act of Parliament to consolidate the law relating to trade unions and trade disputes, to provide for the registration, regulation, management and democratization of trade unions and employers organizations or federations, to promote sound labour relations through the protection and promotion of freedom of association, the encouragement of effective collective bargaining and promotion of orderly and expeditious dispute settlement, conducive to social justice and economic development and for connected purposes.

#### ***5.3.3 Occupation Health and Safety Act (OSHA), Cap 15 of 2007.***

The OSHA outlines and explains issues relating to safety, health and welfare of the workers and all persons lawfully present at workplaces. During the road construction phase, the contractor must comply with the following issues explained in this Act which are:

- Duties of employees
- Prohibition against creation of hazards.
- Machinery safety and safety general provisions.

#### ***5.3.4 Wildlife Act***

The wildlife Act of 2013 is meant to safeguard the wildlife and their habitats from any form of harm and negative exploitation. Infrastructural development such as the construction of roads may affect wildlife in different ways such as passing through their habitats hence an agent of stress and population fragmentation. The construction

process may also introduce pollutant elements into the wildlife habitat, hence the need for the protection by the act. Some of the specific chapters of the Act associated with the infrastructural development include:

Section I subsection 2 defines the application scope for the act to include all wildlife resources on public, community and private land, and Kenya territorial waters. This therefore covers any kind of wildlife that may be found the project site.

Section II subsection 7 defines the functions of the Kenya Wildlife Service and parts a covers the conservation and management of national parks, wildlife conservation areas and sanctuaries while part b covers provision of security for wildlife and visitors in wildlife habitats. These two clauses therefore covers the infrastructural development which may go through wildlife areas.

Section on conservation, protection and management Article 26 states that the environmental law, EMCA of 1999 will be applied in the management of the wildlife resources. The other law that will work in tandem with this Act is the Water Act under point 28. This gives anyone the right to use any water resource, reservoir or point, as may be needed in the construction process in this infrastructural development. Article 27 states no exemption of anyone from the application of the other environmental laws even if they have a licence/permit from the service. Subsection 29 states that anyone with a permit/licence to use any land under the jurisdiction of KWS (such as the one to be used for infrastructural development) must utilise this land in a sustainable manner. Subsection 46, 47 and 48 under this section covers the protection of endangered and threatened ecosystems, endangered and threatened species and the restricted activities involving listed species respectively. This point to the need to know the kind of biodiversity and habitats that can be affected by this project so as to develop the right engagement approach.

Section VI outlines the offenses and penalties regarding the protected wildlife and wild habitats. Subsection 89 covers the offenses relating to pollution, Article 91 covers licences and permits while subsection 92 covers the offenses relating to endangered and threatened species. To this effect:

- The management of the existing group ranches within where the road will traverse, in consultations with KWS and local community, guide and provide advice to the contractor on the best working practice. This will include areas whereby existing wildlife, not be interfered with, e.g. quarry sites, borrow pits as well as wildlife access paths, saltlicks etc. This will be mainly during sites preparation and operation phase of the project.
- The Contractor will be expected to abide by the law during construction phase in enhancing wildlife conservation and management for the entire project sites with presence of wildlife.

#### **5.3.5 Public Health Act, Cap 242**

Section 118 of this Act states that any factory or trade premises not kept in a clean state or free from offensive smell arising from any drain, privy, water closet or urinary or not ventilated as far as practicable, any gases or so overcrowded or so badly lighted or injurious or dangerous to the health of those employed therein is liable to be dealt with as provided in the Act. The contractor has to put in place the following measures to minimise the above factors that are injurious to the surrounding and to the employees, especially within the workmen's camp, asphalt plant or at quarries:

- Use of protective gear to be emphasised and monitored.
- To maintains that the toilets are cleaned and disinfected regularly.

- Working area at the workshop to be spacious enough spacious and comfortable for workers (ergonomic considerations at workplace).

### **5.3.6 The Sexual Offences Act of 2006**

This is an Act of Parliament to make provision about sexual offences, their definition, prevention and the protection of all persons from harm from unlawful sexual acts, and for connected purposes.

Considering that there are various primary schools and secondary schools within the project road areas, the contractor and his employees, especially men, should be well informed that they should desist in developing unlawful relationships with pupils with the objective of deceiving them. The law of Sexual Offences will be applied to them if found doing so and convicted in a court of law.

### **5.3.7 Work Injury Benefits Act, No. 13 of 2007**

This Act provides provisions for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes. The obligations of the employer is to make sure that the employer is insured and registered with an approved insurer in respect of any liability that the employer may incur under this Act, Rights to Compensation, e.g. in case of an accident and avoid any exposure of the employee to occupational diseases. The contractor should:

- Make sure the permanent workers are insured and registered with an insurer.
- Make sure there is an effective HIV/AIDS programme undergoing to the employees during the road construction phase.
- Make sure there is a trained First Aider at the working places and provide a well-equipped First Aid Kit.

## **5.4 NEMA AND ASSOCIATED REGULATIONS**

### **5.4.1 Environmental Management and Coordination Act (EMCA) 1999, (2015)**

Environmental Management and Co-ordination Act 1999 EMCA 1999 is the main environmental law governing the management and protection the environment in Kenya. The Act provides both legal and institutional framework needed for sustainable management of the environmental resources. It provides for the development of other subsidiary and more specific regulations to help in environmental management. Additionally, it establishes different institutions that carry out specified roles in the environmental management. These include NEMA, NEC and NET.

EMCA 1999 brings in the Environmental Impact assessment as an important tool to be used in the management of the environment and ensuring the integrity of the environment is maintained especially by the projects that can potentially have negative impacts on the environment. This Act puts the responsibility of ensuring the adherence to the EIA on NEMA, hence the involvement of the body in the EIA development process. These are directed in subsection 1 and 2 of Section 58 of the Act. The Act goes further to list the kind of projects which require EIA prior commencement under the Second Schedule. Road construction is listed under part 3 (a) and (b).

Section 50 of the Act covers conservation of biological diversity and part (c) states the Authority (NEMA) shall identify potential threats to biological diversity and devise measures to remove or arrest their effects”, and infrastructural development is a potential threat, hence the importance to consider how biodiversity and the environment in general can be impacted.



#### **5.4.2 The Environmental (Impact Assessment and Audit) Regulations 2003**

These regulations were developed following the directive by EMCA 1999 specifically Section 147 which calls for the Minister in charge of environmental affairs to develop regulations to guide the enforcement of the environmental law. According to Section 4 subsection concerning the approval of EIA (1) No proponent shall implement a project (a) likely to negatively affect the environment and (b) which requires an EIA to be carried out.

EIA has been carried out and approved as guided by the law. Subsection 2 forbids any licencing authority from issuing a licence to any project requiring EIA before an EIA has been done and the proponent issued with an EIA certificate. Under the Subsection 4 of these regulations, if the EIA raises issues that can affect more than one district, then the Authority shall submit the application to the relevant Provincial Environment Committee. This is very likely scenario for this project given that the road shall traverse several Counties. The importance of the local input by the people who are likely to feel the impact of a project is covered in Section 17 subsection (1).

#### **5.4.3 EMCA Waste Management Regulations, 2006**

The Environmental Management and Coordination (Waste Management) Regulations, 2006 were developed under the directive of EMCA 1999 to guide the management of waste materials in the environment, ensuring a clean and healthy environment to man and other forms of biodiversity. These regulations are relevant in this project for several reasons. First, this project will see people congregate at the project site and waste material are sure to be introduced in the environment. These will be in the form of wastes from the consumables, food stuff, packaging materials and even the some that will be used in the road construction process. Under Part II on the general provisions are the responsibilities of waste generators. The first responsibility states that no person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle. The second responsibility says that any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed of such waste in the manner provided for under these Regulations. These responsibilities are more or less summarised in the third regulations that any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose of such waste in a designated waste disposal facility. This will be important because all along the project area, waste materials will be produced and these will inform the development of a proper waste management system. Such handling are further guided in subsection 5 of the regulations under Segregation of the waste by the generator which states that Any person whose activities generate waste, shall segregate such waste by separating hazardous waste from non-hazardous waste and shall dispose of such wastes in such facility as is provided for by the relevant Local Authority. It is therefore important that the local authorities in the project sites are well informed so that they know of the kind of wastes the project will produce and consequently develop proper handling mechanisms in case they are not their already. Such will include proper transportation for which the guidelines are provided under the subsections 7, 8 and 9 of the regulations. It is also important for the project to know of the disposal ability of the local facilities and whether they are able to properly handle the kinds of wastes generated by the project as directed by subsections 12 and 13 of the waste management regulations and the relevant schedules therein.

#### **5.4.4 EMCA (Water Quality) Regulations, 2006, Legal Notice 121.**

Environmental Management and Coordination (Water Quality) Regulations, 2006, Legal Notice 121 outlines the protection of sources of water for domestic use, especially prevention of water pollution, protection of rivers, streams, springs, wells and other water sources. It also entails regulations on discharge of effluent into the aquatic environment, application for effluent discharge license, abstraction from a water body under environmental management plan as well as water pollution prohibition. The contractor should therefore, among others and as the situation will demands:

- Obtain water abstraction permit from the relevant authority (WRMA) before collecting water for road construction from any watercourse.
- Avoid dumping road construction spoil material into watercourses.
- Discharge his effluent at designated places only, which are approved by NEMA.

#### **5.4.5 EMCA (Air Quality) Regulations, 2014**

The Contractor shall ensure the compliance to emission of the air pollutants levels in adherence to the Ambient Air Quality levels specified in the regulations. The regulations have an objective to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The first paragraphs-Numbered 58 and 59- of Part XI detail the requirements on monitoring and assessment of ambient air quality. The construction activities will result to increased dust and gas emissions. Some construction machinery and trucks will generate exhaust fumes such as Carbon Oxides (CO<sub>2</sub>), Sulphur Oxides (SO<sub>2</sub>) and Nitrogen Oxides (NO<sub>2</sub>). The main sources of air emission and pollutants during the project cycle will be:

- Dust emission from the road construction activities
- Construction plant and equipment onsite
- Vehicular movement along the road under construction and from the identified raw material sites, -borrow pits and quarries.

During the construction phase, there will be the need for establishment of baseline levels of priority air pollutants set out in the second schedule of the regulation under Part I; General source pollutants and include; particulate matter, nitrogen oxides and sulphur oxides. The limits included in the first schedule of the regulations.

#### **5.4.6 EMCA (Noise and Vibration Control) Regulation, 2009**

Section 5 of the regulation warns on operating beyond the permissible noise levels while Section 6 gives guidelines on the control measures for managing excessive noises. In this context, the project team should observe the noise regimes for the different zones especially so for working in areas termed as silent zones which include institutions, and worship places, amongst others. These areas are permitted exposure to Sound Level Limits of not exceeding 40 dB (A) during the day and 35 dB (A) at night.

- The regulation states that a day starts from 6.01 a.m. to 8.00 p.m., while night starts from 8.01 p.m. – 6.00 a.m. Construction sites near the silent zones are allowed maximum noise level of 60 dB (A) during the day, whilst night levels are maintained at 35 dB (A). The time frame for construction sites is adjusted and the day is considered to start at 6.01 a.m. and ends at 6.00 p.m while night duration starts from 6.01 p.m. and ends at 6.00 a.m.
- Part III of the regulation gives guidelines on noise and vibration management from different sources. Sections 11, 12 and 13 of the stated part give guidelines on noise and vibration management from machines, motor vehicles and night

time construction respectively. Section 15 requires owners of activities likely to generate excessive noise - e.g. quarries- to conduct an ESIA. The above time limits must therefore be observed.

#### **5.4.7 EMCA (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006**

The Regulations requires proponents to conduct ESIA if their activities may have adverse impacts on ecosystems or lead to unsustainable use of natural resources or/and lead to introduction of exotic species. The regulation aims at increasing the coverage of protected areas and establishing new special status sites by providing guidelines for protecting endangered species. Section 5 of the regulation provides guidelines on Conservation of threatened species and Part III of the regulation guides on the access to genetic materials. The Section states that, the Authority shall, in consultation with the relevant lead agencies, impose bans, restrictions or similar measures on the access and use of any threatened species in order to ensure its regeneration and maximum sustainable yield.

- During the road's slope protection work within the deep terrains and along the various watercourses and wetland where the road will traverse, landscaping should be done by authorised specialists with showcases in road protection work, e.g. by the use of vetiver grass among other slope protection shrubs.
- No plant should be introduced either for landscaping or slope protection without the approval of the project's Client.

#### **5.4.8 Environmental Assessment and Monitoring Agencies**

The National Environment Council: The Council is responsible for policy formulation and directions for the purposes of developing the EMCA. The Council also sets national goals and, objectives, and determines policies, and priorities for the protection of the environment.

The National Environment Management Authority (NEMA): NEMA is responsible for general supervision and, co-ordination of all matters relating to the environment and is the principal instrument of government in the implementation of all policies relating to the environment. The authority is also responsible for monitoring compliance with all the NEMA regulations.

The Standards and Enforcement Review Committee (SERC): NEMA through EMCA has established standards for the various environmental parameters that require management and these include the water quality standards, noise and vibration control standards, and the waste management standards, amongst other. SERC, through the Compliance and Enforcement Department of NEMA monitors the compliance level of the project to ensure environmental control standards are implemented. The committee also follows on complaints reported by the public.

The County Environment Committees: These committees contribute to decentralization of activities undertaken by NEMA and thus enable local communities to have access to environmental management information. The committees also conduct quick site visits and review environment related reports of the projects and on occasions could attend site meetings.

#### 5.4.9 Compliance with Legal and Regulatory Requirements

Statute	Subsidiary Legislation	Triggers by the proposed Road Project
EMCA	EIA and Audit Regulations, 2003	In line with this legislation, the project is undertaking an EIA. Site specific EIAs will be required for the materials borrow pits
	EMCA (Conservation Of Biological Diversity And Resources, Access To Genetic Resources And Benefit Sharing) Regulations, 2006	The legislation requires full measures be taken to prevent introduction of alien/ invasive species of flora and fauna within the project site, and which will be complied with.
	EMCA (Noise And Excessive Vibration Pollution) (Control)	Maximum allowable noise levels will be set and which contractor will adhere to.
	National Sand Harvesting Guidelines, 2007	Sand harvesting activities, especially riverbed harvesting sites should adhere to the Sand Harvesting Guidelines
Water Act 2002	Legal Notice 171, 2007 (The Water Resource Management Rules.	Section 94 of the Act prohibits obstruction and pollution of water resources
		Section 25 requires that a Water Permit be obtained before abstraction of any water resource
		Part A of the sixth Schedule prohibits construction of permanent works and soil excavation in riparian areas.
OSHA, 2010	The Contractor will be required to provide safe working environment, to protect the employees on safety, health and welfare and all persons lawfully present at workplaces.	
Explosives Act Cap. 115	The contractor, apart from acquiring a license, should use explosives magazines as specified by The Explosive Act 115, subject to the provisions of the explosives (blasting explosives) rules, subsidiary legislation and special conditions. Within all the quarries and where possible, the contractor should use low tension explosives (class 2) that do not cause fright of fragments	
Constitution of Kenya 2010	The Contractor will be expected to adhere to: Section 69(2) requires Every person to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources. Section 70 (1) provides for enforcement of environmental rights in that, If a person alleges that a right to a clean and healthy environment recognized and protected under Article	
The Public Health Act (Cap. 242)	The Act mainly deals with management of public health with a major focus on prevention of contagious diseases. The Contractor will be expected to liaise with available health facilities as well as the HIV/AIDS, STD prevention, awareness and training services providers during the project.	
The National Land Commission (NLC) Act 2013	This Act creates the NLC with jurisdiction over compulsory land acquisition in Kenya.	

The Wildlife Management and Conservation Act 2013	The provisions in the Act will apply to all wildlife resources within the project sites, community and private land.. Further, under Section 34, WCMA enforces the requirement for EIA as follows:- A user or other related right shall not be granted under this Act where the requirement for a environmental, cultural, economic and social impact assessment license under the Environmental Management and Coordination Act, 1999 has not been complied with.
The County Government Act of 2012	The development of the project will have to adhere to the County Government for all the three counties
Penal Code (Cap 63) Revised Edition 2012	The Act makes it criminal for anybody to pollute common resources such as air, public water supply, acoustic quality, etc and stipulates fines for diverse offence. If the Contractor Contravenes or fails to comply with the provisions of this act, he will face the law.

## 5.5 INTERNATIONAL CONVENTIONS AND PRACTICE

### 5.5.1 *The Critical Habitat and IFC*

A critical habitat is defined by the Biodiversity Consultancy, (2012) as “a description of the areas of the planet of highest biodiversity conservation”. This concept was developed by the International Finance Corporation (IFC) in order to delineate areas which can be altered for development say in the form of infrastructural development and those that can't. It builds on the concept of sustainable development, which appreciates the other users of the environment like the different form of biodiversity, and therefore strikes a compromise between development and environmental protection. Consequently, IFC has developed a grading system with two tiers of critical habitats with different degrees of development allowed. Tier 1 critical habitats are the habitats with the highest importance to biodiversity, are tensile and therefore development is difficult to implement due to the potentially difficult or irreversible consequences to biodiversity. Tier 2 critical habitats on the other hand though highly important can allow for development though some measures can be put in place to minimise the consequences in the habitat.

Important factors when considering an area as a critical habitat are the kinds of species that utilise the place either throughout or at some stage of their life history, the conservation status of the species at the national, regional or international level and the uniqueness of such areas. Since the concept brings together different considerations, it can be viewed as a condensation of other land delineation factors such as Key Biodiversity Areas (KBAs), Important Bird Areas (IBAs) and Wildlife Parks. Seven criteria have been developed in the recognition of a place as a Critical Habitat based on the conservation status and life history of the species. These are;

1. Globally or nationally Critically Endangered or Endangered species;
2. Restricted-range or endemic species;
3. Concentrations of migratory and congregator species;
4. Highly-threatened and unique ecosystems;
5. Key evolutionary processes.
6. Most Legally Protected Areas and Internationally Recognised Areas such as KBAs and IBAs
7. Other areas of high biodiversity value, such as areas of high scientific value or areas of old growth forest.

This makes it imperative to fully understand the kind of biodiversity found in a project area because it is an IFC requirement that projects yield an increase of biodiversity and not diversity losses.

### **5.5.2 IUCN Threatened Species**

Threatened species is any species which is vulnerable, endangered, or critically endangered according to the IUCN classification. The nearly-threatened category refers to the animals likely to become threatened within the foreseeable future. With reference to IUCN categories, Dublin (2018) defines the different categories as:

The Critically Endangered (CR), is a category containing species with an extremely high risk of extinction due to rapid population declines of 80 to more than 90 percent over the previous 10 years (or three generations), a current population size of fewer than 50 individuals, or other factors.

The Endangered (EN) category on the other hand refers to species that possess a very high risk of extinction as a result of rapid population declines of 50 to more than 70 percent over the previous 10 years (or three generations), a current population size of fewer than 250 individuals, or other factors

Vulnerable (VU), a category containing those species that possess a very high risk of extinction as a result of rapid population declines of 30 to more than 50% per cent over the previous 10 years (or three generations), a current population size of fewer than 1,000 individuals, or other factors

The other group of classification for the non-threatened categories of the IUCN is Lower Risk (LR). Three categories found in this group are; Conservation Dependent (CD) which include species enjoying a continuous taxon-specific/habitat-specific conservation programme which when stopped would lead to the species moving to one of the threatened categories fast (normally within of five years). Near Threatened (NT) is a designation applied to species that are close to becoming threatened or may meet the criteria for threatened status in the near future. Last is the Least Concern (LC) category which contains taxa which do not qualify for Conservation Dependent or Near Threatened.

The last groups of two categories contain the species which have not been evaluated for the other categories due to inadequate or lack of information that can be used in the assessment. These are the Data Deficient (DD) category for species with inadequate information for any assessment of its risk of extinction based on its distribution and/or population status and lastly are the Not Evaluated (NE) category when the species has not been assessed against the IUCN criteria.

### **5.5.3 African Development Bank's Operational Safeguards**

The Bank's Operation Safeguard Policies for inclusion in the Integrated Safeguard Policies (ISS) are on the basis of the following considerations:

- Commitments in the Bank's existing policies;
- Relevance to key environmental and social issues in the region;
- Lessons learned from applying the environmental and social policies/procedures in the Bank;
- Harmonisation with other multilateral development banks and alignment with relevant international conventions and standards;
- Outcomes of stakeholder consultations; and

- Limiting the number of OSs to just what is required to achieve the optimal functioning of the ISS.

Relevant to the proposed project, the Operation Safeguards are intended to:

- Better integrate considerations of environmental and social impacts into Bank operations to promote sustainability and long-term development;
- Prevent projects from adversely affecting the environment and local communities or, where prevention is not possible, minimise, mitigate and/or compensate for adverse effects and maximise development benefits;
- Systematically consider the impact of climate change on the sustainability of investment projects and the contribution of projects to global greenhouse gas emissions;
- Delineate the roles and responsibilities of the Bank and its borrowers or clients in implementing projects, achieving sustainable outcomes, and promoting local participation; and
- Assist regional member countries and borrowers/clients in strengthening their own safeguards systems and their capacity to manage environmental and social risks.

The Operation Safeguards (Oss) are summarized below.

*OS 1: Environmental and Social Assessment.*

This overarching safeguard governs the process of determining a project's environmental and social category and the resulting environmental and social assessment requirements: the scope of application; categorization; use of a SESA and ESIA, where appropriate; Environmental and Social Management Plans; climate change vulnerability assessment; public consultation; community impacts; appraisal and treatment of vulnerable groups; and grievance procedures. It updates and consolidates the policy commitments set out in the Bank's policy on the environment.

*OS 2: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation.*

This safeguard consolidates the policy commitments and requirements set out in the Bank's policy on involuntary resettlement, and it incorporates refinements designed to improve the operational effectiveness of those requirements. In particular, it embraces comprehensive and forward-looking notions of livelihood and assets, accounting for their social, cultural, and economic dimensions. It also adopts a definition of community and common property that emphasises the need to maintain social cohesion, community structures, and the social interlinkages that common property provides.

The safeguard retains the requirement to provide compensation at full replacement cost; reiterates the importance of a resettlement that improves standards of living, income-earning capacity, and overall means of livelihood; and emphasises the need to ensure that social considerations, such as gender, age, and stakes in the project outcome, do not disenfranchise particular project-affected people.

*OS 3: Biodiversity and Ecosystem Services.*

The overarching objective of this safeguard is to conserve biological diversity and promote the sustainable use of natural resources. It translates into OS requirements

the Bank's commitments in its policy on integrated water resources management and the UN Convention on Biological Diversity. The safeguard reflects the importance of biodiversity on the African continent and the value of key ecosystems to the population, emphasizing the need to "respect, conserve and maintain [the] knowledge, innovations and practices of indigenous and local communities... [and] to protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements<sup>11</sup>.

*OS 4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency.*

This safeguard covers the range of impacts of pollution, waste, and hazardous materials for which there are agreed international conventions and comprehensive industry-specific standards that other multilateral development banks follow. It also introduces vulnerability analysis and monitoring of greenhouse gas emissions levels and provides a detailed analysis of the possible reduction or compensatory measures framework.

*OS 5: Labour Conditions, Health and Safety<sup>12</sup>.*

This safeguard establishes the Bank's requirements for its borrowers or clients concerning workers' conditions, rights and protection from abuse or exploitation. It covers working conditions, workers' organisations, occupational health and safety, and avoidance of child or forced labour.

**5.5.4 African Development Bank and Project Categorization**

*AfDB Category 1* projects are likely to induce significant and/or irreversible adverse environmental and/or social impacts, or to significantly affect environmental or social components that the Bank or the borrowing country considers sensitive. Some programme based operations or other regional and sector programme loans that have significant adverse environmental or social risks and are deemed to be Category 1. In some cases, projects are included in Category 1 because of their potential cumulative impacts or the potential impacts of associated facilities. Any project requiring a Full Resettlement Action under the provisions of the Bank's policy on involuntary resettlement is also deemed to be Category 1.

*Category 2:* projects are likely to have detrimental site-specific environmental and/or social impacts that are less adverse than those of Category 1 projects. Likely impacts are few in number, site-specific, largely reversible, and readily minimised by applying appropriate management and mitigation measures or incorporating internationally recognised design criteria and standards. An operation that involves resettlement activity for which an Abbreviated Resettlement Action Plan (ARAP) is required under the ESAPs is classified as Category 2.

*Category 3:* projects do not directly or indirectly affect the environment adversely and are unlikely to induce adverse social impacts. They do not require an environmental and social assessment. Beyond categorization, no action is required. Nonetheless, to design a Category 3 project properly, it may be necessary to carry out gender analyses, institutional analyses, or other studies on specific, critical social considerations to anticipate and manage unintended impacts on the affected communities.

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<sup>11</sup> Refer to the UN Convention on Biological Diversity (1992).

<sup>12</sup> Health, Safety, related impacts and mitigation measures are discussed further in this report



*Category 4: projects* involve Bank lending to financial intermediaries that on-lend or invest in subprojects that may produce adverse environmental and social impacts. Financial intermediaries include banks, insurance, reinsurance and leasing companies, microfinance providers, private equity funds and investment funds that use the Bank's funds to lend or provide equity finance to their clients. Financial intermediaries also include private or public sector companies that receive corporate loans or loans for investment plans from the Bank that are used to finance a set of subprojects. Financial intermediary subprojects equivalent to Category 1 and Category 2 are subject to the relevant OS requirements, as if they were directly financed Category 1 or Category 2 projects. However, if a client will use a Bank corporate loan to finance high-risk investment projects known at the time of loan approval, the loan can be considered Category 1.

Considering that proposed road project will run mainly on an existing road corridor, there will be having significant impacts on the human environment, land acquisition due to change of road alignment, displacement of traders who will have encroached upon the project road and who need to be resettled<sup>13</sup>. A Full Resettlement Action Plan (FRAP) will be done and therefore this project can be categorized under the provisions of the African Development Bank's policy to be Category 1.

### **5.5.5 The Project and the AfDB Safeguard Triggers**

#### **5.1: Policies/Guidelines and how they will be triggered by the Project**

POLICIES	TRIGGERS IN OPERATION PRINCIPLES
<b>Environmental Policies</b>	
OP 4.01: Environmental Assessment	<p><u>Triggers:</u> Impacts on physical, biological, social and cultural environments.</p> <ul style="list-style-type: none"> <li>• The natures of environmental and social risks are identified in the ESIA process.</li> <li>• The ESIA will determine whether the proposed project is environmentally and socially sound and sustainable (promote positive impacts, avoid/mitigate negative impacts).</li> <li>• There is transparency in the ESIA process and mechanisms provided for participation of stakeholders in the decision-making process for the project.</li> <li>• Assessment of the adequacy of the applicable legal and institutional framework, including applicable international environmental agreements, to confirm that they provide the cooperating government does not finance project activities that would contravene such international obligations.</li> </ul>
OP 4.04: Natural Habitats	<p><u>Trigger:</u> The project will likely affect the natural environment and protected areas (conservancies)</p> <ul style="list-style-type: none"> <li>• Precautionary approach to natural resources management.</li> </ul>

<sup>13</sup> A corridor of 500 meters wide has been suggested to harmonise and encompass the alignment of the road, the railway line and the oil pipeline. In case the harmonisation is adopted in the final design, quite a number of trading centres or areas in close proximity to them will be affected.

Social Policies	
OP 4.11: Physical Cultural Resources (PCR)	<p><u>Trigger:</u> PCR can be triggered by the project road's adverse impacts due to its closeness, in or near recognized cultural heritage sites culture-rich areas.</p> <ul style="list-style-type: none"> <li>• Road design to avoid/mitigate adverse impacts on PCR (sites, structures, natural features of historical, religious or other cultural significance).</li> </ul>
OP 4.12: Involuntary Resettlement	<p><u>Trigger:</u> Project alignment can affect structures and property within its road corridor/construction limit.</p> <ul style="list-style-type: none"> <li>• Project to avoid/minimize displacement of PAP where feasible.</li> <li>• Assist displaced PAPs to improve (or at least restore) pre-project living standards (resettlement as a development program)</li> <li>• RAP has promoted community participation in planning &amp; implementation of resettlement.</li> <li>• Provide assistance to PAPs through RAP process.</li> </ul>
OP 4.10: Indigenous Peoples (IP)	<p><u>Trigger:</u> Project affecting areas currently or historically occupied by Samburu, Turkana - the distinct, marginalized, vulnerable, social and cultural group attached to geographically distinct habitats or historical territories, with traditional cultural lifestyles.</p> <ul style="list-style-type: none"> <li>• Full respect will be fostered during the project cycle, on human rights and cultural lifestyles of IP.</li> <li>• Adverse effects to the IP will be avoided during the project cycle.</li> </ul>

## **6 BASELINE ENVIRONMENTAL AND SOCIAL PARAMETERS**

### **6.1 INTRODUCTION**

This chapter will describe the baseline environmental and social settings as described in the approaches in chapter 3 on Environmental and Social Impact Assessment methodology. It will mainly entail environmental baseline survey and environmental related social and economic baseline.

#### ***6.1.1 Layout of the Chapter***

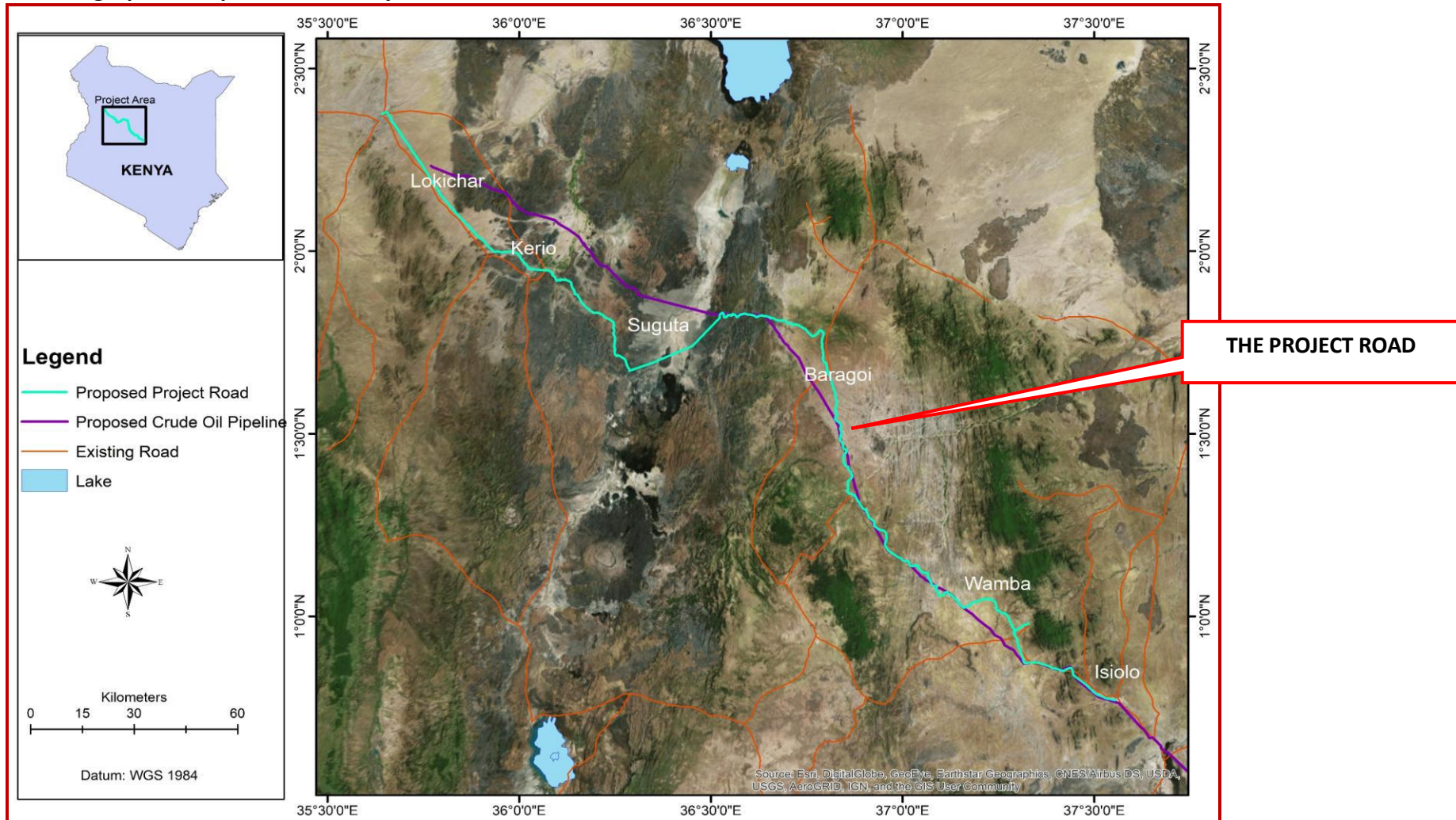
Issues that will be addressed in the introduction section will be Geographical Aspects and Boundaries; Administrative Set-up; Communications and Transport; Government, Non-Governmental and Community Based Organizations.

Environmental baseline survey will address Physiography and Geology, Soils, Climate, Air Quality, Surface and Groundwater Resources, Water Quality and Terrestrial Environment all within the areas traversed by the project. Further Aquatic Environment, Land Resources and Parks, Archaeological, Historical and Cultural Sites, Visual Aesthetics, Noise and Vibrations and management of Solid and Liquid Wastes will all be addressed.

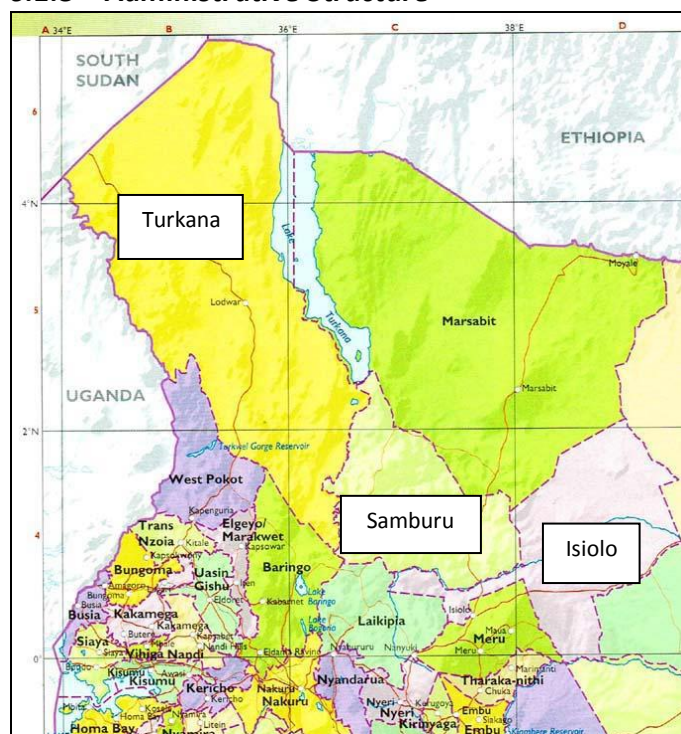
Section dealing with Environment-related Social and Economic Baseline aspects will address the following issues: Demography, Education, Housing, Land Tenure Systems, Labour Force, Livestock and Crop Production, Trade, Commerce and Industry, Health Settings, Security and Public Safety, Community Views and Concerns and Corporate Social Responsibility.

### 6.1.2 Geographical Aspects and Boundaries

#### 6.1: Geographical Aspects of the Project Road and Site



### 6.1.3 Administrative Structure



The project road will traverse through three Counties – Isiolo, Samburu and Turkana (highlighted).

#### Administrative Units in Isiolo

The County has three sub-counties, ten wards, 22 locations and 43 sub locations. The project road will traverse mainly through Isiolo sub-county. Isiolo sub-county has the highest number of wards (five) while Garbatulla has the highest number of locations (ten) and sub-locations (19). Merti sub-county is the largest area of 12,612 Km<sup>2</sup> while Isiolo sub-county is the smallest with an area of 3,269 Km<sup>2</sup>

#### 6.1: Administrative Units in Isiolo

Sub- County	Ward		Area (in km <sup>2</sup> )
Isiolo	Wabera	Bulla Pesa	3,269
	Burat	Oldonyiro	
	Ngaremara		
Merti	Chari	Cherab	12, 612
Garbatulla	Kinna	Garbatulla	9,819
	Sericho		

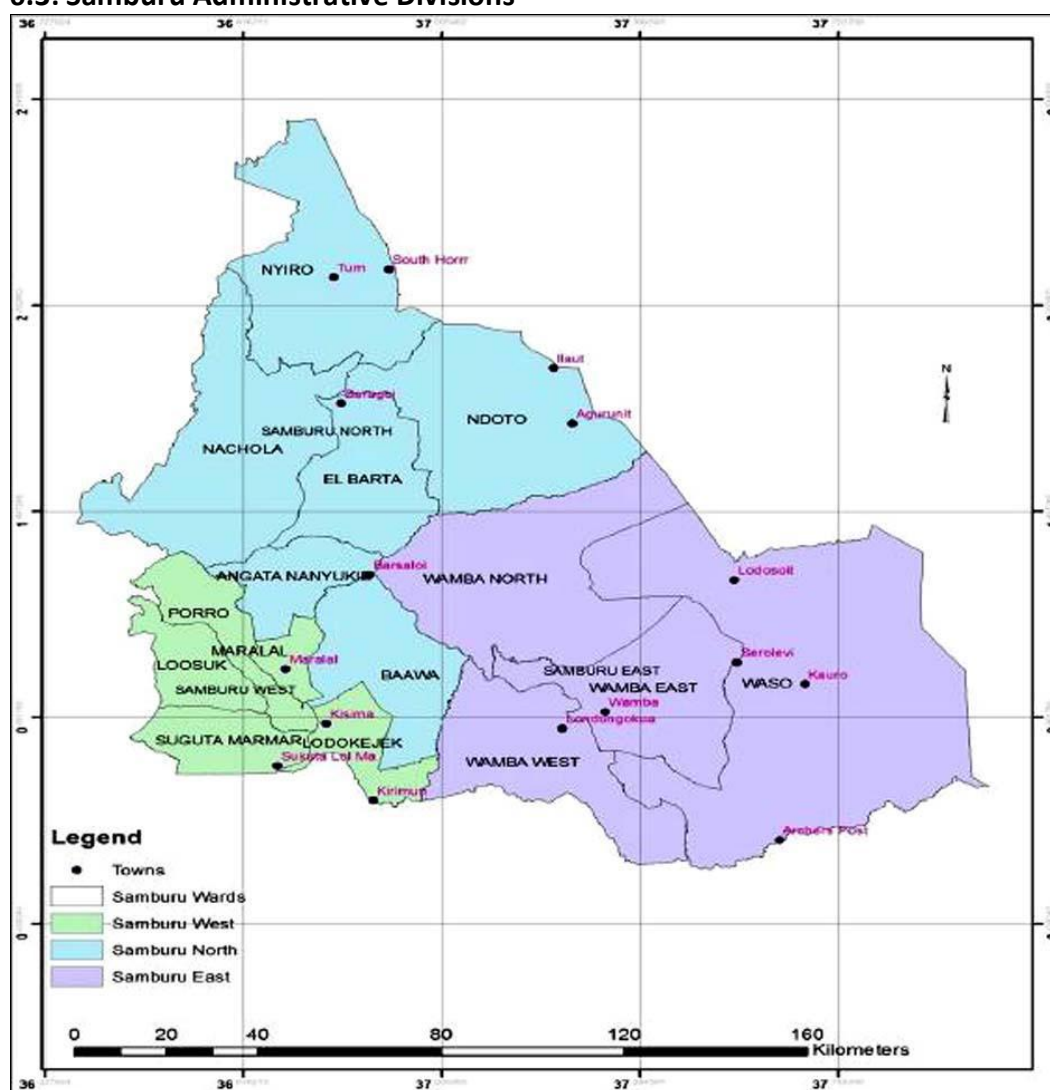


## 6.2: Administrative Units in Samburu

Sub County	Ward		Area (in km <sup>2</sup> )	Villages
Samburu West	Lodokejek	Suguta Marmar	3937.3	33
	Mararal	Loosuk		
	Poro			
Samburu East	Waso	Wamba West	10049.7	29
	Wamba East	Wamba North		
Samburu North	El Barta	Nachola	7035.1	46
	Ndoto	Angata Nanyokie		
	Nyiro	Bawaa		
<b>Total</b>			<b>21.022.1</b>	<b>108</b>

**Source:** County Government, Samburu 2018.

## 6.3: Samburu Administrative Divisions



**Source:** County Government, Samburu 2018.

Samburu County is administratively divided into three sub-counties, 15 wards and 108 villages.

### Administrative Units in Turkana

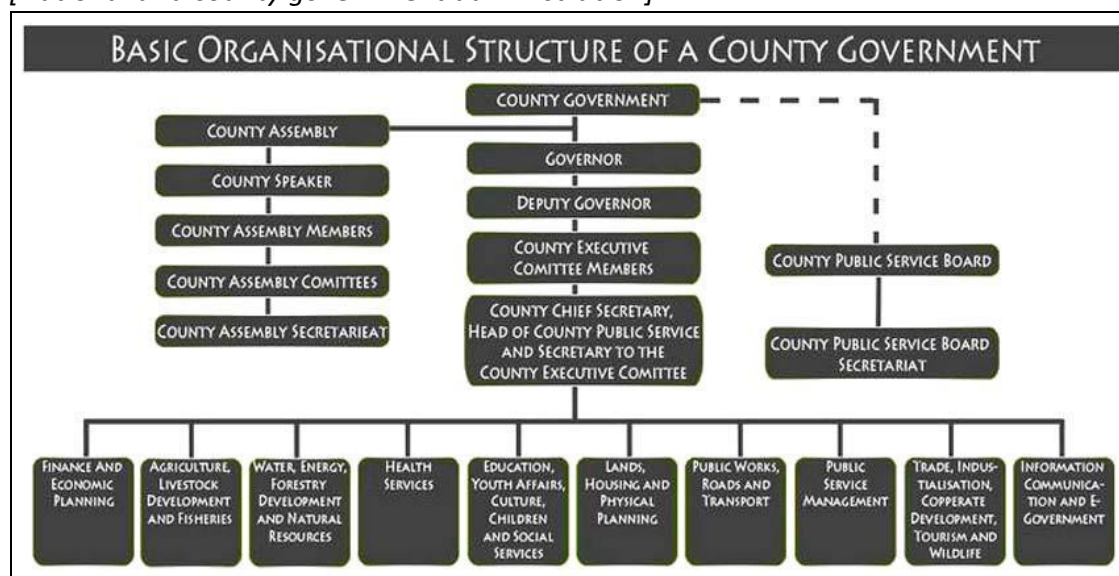
The County is administratively divided into 6 sub-counties, 17 divisions, 56 locations that are further sub-divided into 156 sub-locations. The project road will traverse through Lokichar, in Turkana South, Kochodin, Lokwamusing, Kamuge and into Samburu district through the Suguta Valley.

#### 6.4: Turkana Administrative Divisions

District	Ward	Area (in km <sup>2</sup> )
Turkana South	Lokichar	4537.6
	Kainuk	1684.1
	Katilu	1143.1
East	Lomelo	4215.9
	Lokori	7091.2
North	Kaaling	
	Lapur	
	Lokitaung	
<b>Total</b>		

**Source:** 2009 Kenya Population and Housing Census

*[National and county government administration]*



#### 6.1.4 Government, Public Benefit Organization (PBO) NGOs and CBOs

*[List of entities operating in the project area]*

NGOs play a key role in the socio-economic development of the three Counties traversed by the project road. The functions of the organisations are mostly found within the three Counties traversed by the road, whereby they carry out various programmes within the county. There are over 30 registered. The major organizations are listed below.

## 6.2: Review of Entities Operating within the Project area

Name of Organization		Areas of Operation and Relevant to the Project
1	AMREF	Medical services
2	APHIA-Plus-NAL	Development assistance
3	Food and Agriculture Organisation	Relief aid
4	IMC	Humanitarian aids
5	Lutheran World Federation	Humanitarian and development assistance
6	Medical Relief International	Medical services
7	Oxfam-GB	Poverty eradication initiatives
8	RAMATI	Development initiatives
9	Red Cross	Helping victims of poverty, disaster, or conflict.
10	Samburu Aid In Africa	Provision of basic health services, education bursaries and support for community-led development initiatives.
11	UN Child Fund	Children welfare
12	Vétérinaires Sans Frontières-	Medical services
13	World Food Programme	Food security

Apart from the listed entities, there are Self Help groups Women and Youth Groups and Community Based Organizations operating within the counties. These organizations play a key role in promoting the welfare of disadvantaged groups in the society. The construction of the road will ease the transportation burden for their members, while carrying out their activities for the public benefit.

### 6.1.5 Communications and Transport

The challenges faced by the road network sub-sector within all the project road areas include seasonal rivers that cut through roads and poor soils that increase the cost of road construction and maintenance. As a result, a number of roads are rendered impassable during the rainy seasons. Improvement of the road will not only improve connectivity and accessibility within the three Counties but will also play a role in improving the elusive security situation while at the same time open up the regions to potential investors and unlock the development potential of counties.

### 6-1: Transport Situation and Current Burden within the Project Sites







## **6.2 ENVIRONMENTAL BASELINE SURVEY**

### **6.2.1 Physiography and Geology**

#### **Samburu**

##### *Physical and Topographic Features*

The County falls on the northern interface between highlands and lowlands. To extreme west is Suguta Valley which is bounded on both sides by fault escarpments and floored by red clays, boulders and gravel fans. In the East of Suguta Valley, the County is characterized by repeated extensive high level plateaus which have been built by repeated floods of lava from the Rift valley. The highest parts of these plateaus are the Kirisia Hill, rising to 2000m above sea level. In the North of Baragoi - Tuum and South – Horr axis, the area rises to Mount Nyiro tapers northwards and falls steeply southwards. South and west of Mount Nyiro are peneplains which have been eroded to plains of lower levels ranging from 1000-1,350 m above sea level. These are noticeable at Kawap and the area between Lodungokwe and Wamba continuing eastwards and southwards. These plains are covered by red soils and sands derived from the adjacent slopes by sheet erosion. East of the central plains are the Mathew Ranges and the Ndoto mountains forming discontinuous ranges tending towards north-south of the eastern side of the county. Apart from the Lorroki plateau and the mountain ranges of Nyiro and Mathews, the rest of the County is a continuous basin which slopes northwards to Lake Turkana and east of Mathew Ranges. The high altitude of the plateau and the mountain ranges has resulted in indigenous forests which are all gazetted and preserved for rain catchments.

##### *Soils and Geology*

In the western parts of the county, the soil is mostly Sandy loam soils. Kirisia area has sandy loam and sandy clay soils, which are lithosol (shallow stony soils) and cambisols. In the areas covered by lithosols water run-off is common and erosion quite prevalent. Just as Kirisia, Lorroki has loam soils as the dominant one. These soils are mostly well-drained phaezems. However, some parts of it is covered by shallow lithosols, including the surrounding of Suguta Marmar where the risk of flooding is classified as medium. The lithic phase of the soils encourages run-off during periods of high precipitation.

In the northern part of the County consisting of Baragoi and Nyiro areas, the predominant soil covers are bouldery cambisols and lithosol. The soils are particularly more stoney and rocky on the southern slopes of Mt Nyiro and Ndoto mountains. These soils are shallow and have a lithic (stoney) phase, a characteristic that makes the soils prone to run off. On the eastern side that include Wamba and Waso areas, is significantly covered by weakly developed soils, mostly sandy and low in organic matter and in some places in Waso Division the soils are saline and sodic (mostly cambisols and solonetz).

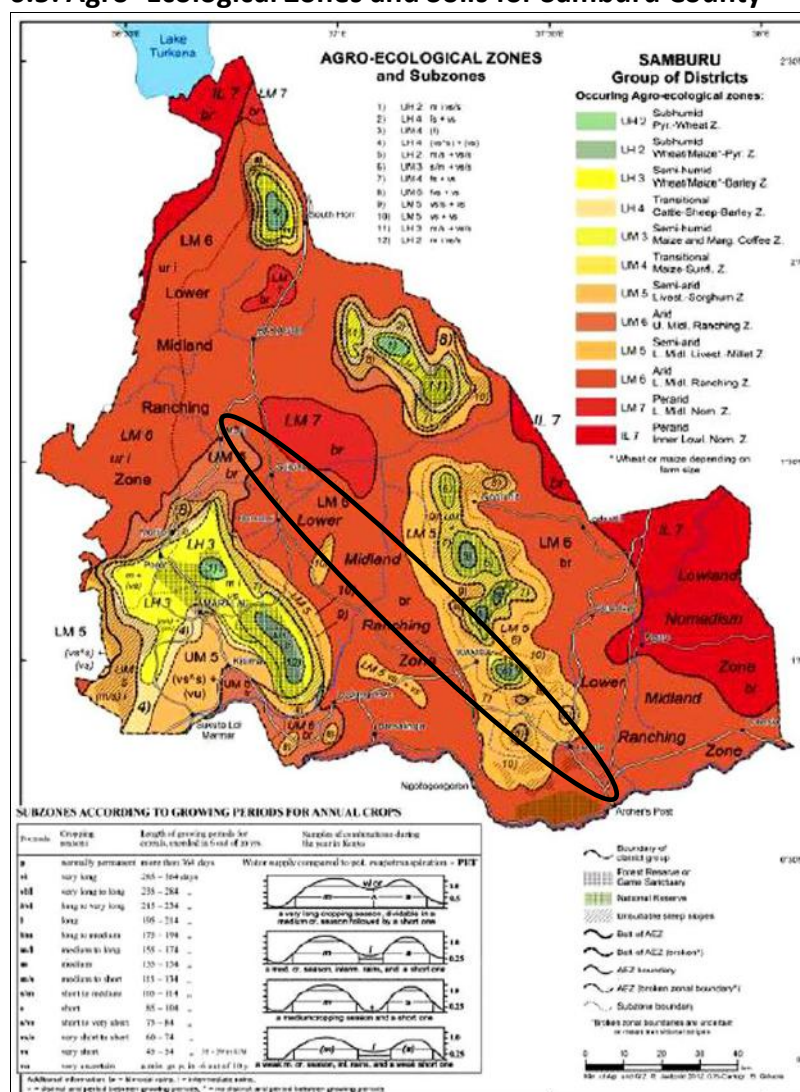
**Drainage Pattern:** The physiography of the region influences the drainage pattern. The County fall in drainage areas number two (Kerio Valley) and number five (Ewaso Nyiro). Main water sources in the county constitute surface and ground water. The Ewaso Ng'iro River flows northwards about 30 km, then changes the direction to flow eastwards. After turning sharply east through the gap between the Mukogodo hills in the south and the Karissa hills in the north, the river flows through a 70m deep gorge for about 60 km in Barselinga. There are several seasonal riverbeds or "laggas" which

during rainy seasons are filled with runoff water, making roads impassable and often leaving the area cut-off from the rest of the country.

**Ecological Zones:** More than 75% of the land in Samburu County classified as 'low-potential' rangeland, receiving between (250 – 600 mm) of rain annually. Only 140,900 hectares (7 % of the land area) is medium-to-high-potential land that is suitable for agricultural production receiving (600-900 mm) of rain per year. Samburu County has diverse agro-ecological zones that include Upper Highland Zones (UH), Lower Highland Zones (LH), Upper Midlands Zones (UM), Lower Midland Zones (LM) and Inner Low Land Zones (IL). The agro- ecological zones can be divided as follows:

1. Lower Highlands (LH 2-3) -1352.9 km<sup>2</sup>
2. Lower Highlands (LH 4-5) -1862.2km<sup>2</sup>
3. Upper midlands (UM 3-6) -2218.5km<sup>2</sup>
4. Lower midlands (LM 6-7) -13736.0km<sup>2</sup>
5. Intermediate Lowlands (IL) -1956.9km<sup>2</sup>

## 6.5: Agro- Ecological Zones and Soils for Samburu County



The project area covers mainly the lower midland ranching zone (LM6 - 7), with denuded dry bush savanna with bimodal rainfall and which covers 65% of the land.

### 6.3: Review of the Project Zone Coverage and Usage within Samburu County

Zone	Size	Potential	Remarks	Percentage
LH 2-3	135,290	Wheat, maize, beans, dairy cattle and sheep	Pyrethrum can be grown.	6%
LH 4-5	186,220	Barley, maize, beans, cattle, sheep,	Coffe can be grown	9.5%
UM 3-6	221,850	Maize, beans, cowpeas, green grams, cattle, sheep, goats	Coffee and sunflower	10.5%
LM 6-7	1,376,600	Cattle, sheep, goats and camel	Project site, ranches	65%
IL	195,690	Nomadic zone		9%

### 6-2: River Suiyan within the Project Alignment



River Suiyan, one of the various *lagga* crossing points along the project road

### Turkana

#### Physical and Topographic Features

The physiographic features in the county include low lying open plains, mountain ranges and river drainage patterns. Lake Turkana is at an elevation of 360 meters (1,181 feet) while the surrounding basin is anywhere from 375-914 meters (1,230-3,000 feet). The main mountain ranges of the county are Loima, Lorengippi, Mogila, Songot, Kalapata, Loriu, Kailongol and Silale mountains. The mountain ranges, because of their high elevation, are normally green, covered with dense bushes and high woody cover. The ranges support important economic activities like honey production, grazing during the dry season, wood production, and charcoal production. There are also water catchment sources thus supporting gum Arabica growing and small household shambas. The hills in the county consist of Tepes Hills in Kibish Division, Lokwanamor Hills and Lorionotom Hills in Kaikor Division, Pelekech Hills in Kakuma Division and Loima Hills in Loima Division which are characterized by large forests.

The open lying plains consist of the Kalapata and Lotikipi Plains. The plains form part of the arid area in the County and receive the lowest amount of rainfall of around 180 mm



per annum. These plains are dominated by dwarf shrub and grassland, which provide forage for livestock during and shortly after the rainy season. However, this forage dries rapidly at the onset of the dry season.

Rivers Tarach, Kerio, Kalapata, Malimalite and Turkwel are the major rivers in the county making them the most important with a potential of producing large amounts of food for the county, if properly utilized. Lake Turkana is the largest and most saline of the Rift Valley lakes. There is no outlet, and with reduced inflows and high evaporation, this results into depositing of salt in the soil and capping on the surface. The water level is subject to three to four metres seasonal fluctuations. In total, the water level dropped 10m between 1975 and 1992. River Omo from Ethiopia, which is permanent, drains into Lake Turkana. The lake is situated on the eastern part of the county, has northern island, and is endowed with a variety of wild animals namely: hippos, crocodiles and waterfowls.

Soils in Turkana County are not well developed due to aridity and constant erosion by water and wind. Often stone mantles cap them. Colluvial soils tend to be reddish over the basement system and generally grey buff or white over the volcanoes. Aeolian soils are dune sands either active or fossil; Alluvial soils range from coarse sands to flash flood silts, while black or brown clays occur locally in areas of impended drainage.

### **6-3: Varied Topographic Features within the Project Alignment**



## The figure contains two maps of Turkana County. The left map is titled "GEOLOGIC MAP OF TURKANA COUNTY". It shows various geological features such as faults, rivers, and different rock formations color-coded according to a legend. The legend includes categories like "Tectonic", "Sedimentary", "Igneous", and "Metamorphic". It also lists specific geological periods like "Upper Miocene", "Pliocene", and "Quaternary". A scale bar indicates 0 to 100 Kilometers. The right map is titled "Turkana Soils Potential". It displays soil potential zones across the county, color-coded by agricultural suitability. The legend for this map includes "No Data", "Natural Regeneration", "Pasture/Agroforestry", "Irrigated Pasture", "Agriculture", "Irrigated Agriculture", "Irrigated Rice", and "Water bodies". Both maps include coordinate systems and a north arrow.

## **Isiolo**

### **Physical and Topographic Features**

Most of the land in the county is flat low lying plain resulting from weathering and sedimentation. The plains rise gradually from an altitude of about 200 M above sea level at Lorian swamp (Habaswein) in the northern part of the county to about 300M above sea level at Merti Plateau.

There are six perennial rivers in the county namely; Ewaso Ngiro North, Isiolo, Kinna, Bisanadi, Likiundu and Liliaba rivers. Ewaso Ngiro North River has its catchments area in the Aberdare ranges and Mount Kenya. It also serves as a boundary mark between Isiolo North and Isiolo South constituencies. Isiolo River originates from Mount Kenya and drains into Ewaso Ngiro River. Kinna and Bisanadi rivers are found in the Southern part of the county and drains into the Tana River. Likiundu and Liliaba originate from Nyambene hills and drains into Ewaso Ngiro North River.

The county has a combination of metamorphic rocks and other superficial rock deposits. Tertiary rocks (Olive Basalt) are found in the northern parts of the county, where oil exploration has been going on. The areas covered with tertiary marine sediments that have a high potential for ground water harvesting.

### **Ecological Conditions**

The county is classified into three ecological zones namely Semi-Arid, Arid and the very Arid. Semi Arid zone covers part of Wabera Ward, Bulla Pesa Ward and some parts of Burat Ward in Isiolo North Constituency. It also covers some Southern part of Kinna Ward in Isiolo South Constituency. This zone covers five percent of the total area of the county and receives rainfall ranging between 400 – 650 mm annually. The relatively high rainfall is due to influence of Mount Kenya and Nyambene Hills in the neighbouring Meru County. The vegetation in this zone is mainly thorny bush with short grass. Arid zone covers Oldo/Nyiro, Ngare Mara and some parts of Burat Wards in Isiolo North Constituency and whole of Garbatulla Ward and northern part of Kinna Ward in Isiolo South Constituency. The zone covers 30 percent of the total area of the county. Rainfall received here ranges between 300 mm and 350 mm annually and supports grassland and few shrubs.

Severe arid zone covers Chari, Cherab, parts of Oldo/Nyiro Ward in Isiolo North Constituency and Sericho Ward in Isiolo South Constituency. These areas account for 65 percent of total area of the county. Rainfall received here ranges between 150 and 250 mm annually. The area is barren and very hot and dry most of the year.

#### **6.2.2 Soils<sup>14</sup>**

The alignment soils were investigated through excavation of trial pits at 0.5 km intervals. Each trial pit was accurately logged and samples retrieved for lab testing.

Standard laboratory tests conducted which included:

- Atterberg Limits
- Grading to 0.075 mm sieve size
- Standard Compaction Test
- CBR and swell after 4 days soak at 100 % MDD and at OMC

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<sup>14</sup> Refer to Soil/material investigation report for this project.

### **6.2.3 Climate**

The county is hot and dry in most months in the year with two rainy seasons. The short rains season occurs in October and November while the long rain occurs between March and May. The rainfall received in the County is usually scarce and unreliable posting an annual average of 580.2 mm. The wettest months are November with an average of 143 mm of rainfall and April with an average of 149 mm of rainfall.

The erratic and unreliable rainfall cannot support crop farming which partly explains the high food insecurity and food poverty levels recorded in the county. Rain fed crops are grown in Bulla Pesa, Wabera and Kinna wards where the black cotton soil retains moisture long enough to make crops mature.

High temperatures are recorded in the county throughout the year, with variations in some places due to differences in altitude. The mean annual temperature in the county is 29 degrees centigrade. The county records more than nine hours of sunshine per day and hence has a huge potential for harvesting and utilization of solar energy. Strong winds blow across the county throughout the year peaking in the months of July and August. The strong winds provide a huge potential for wind generated energy.

#### **Isiolo**

The county is hot and dry in most months of the year hence the vegetation cover is very low and scattered. The County is vulnerable to climate change, with the key vulnerabilities include drought and unpredictable rainfall, floods, and spread of water and vector-borne diseases, loss of forests and wetland ecosystems, land degradation and desertification and scarcity of portable water.

The County is mainly arid to semi-arid with two main rainfall seasons, namely the long rains season, which occurs between March and May with the peak in April. The short rains season, which is the most significant, occurs from October to December with the peak in November. Rainfall regime in the County is mainly governed by the Inter-tropical convergence zone, ENSO and vicinity of neighbouring high relief areas among other factors. The areas near Mount Kenya and Nyambene hills (Wabera, Bulla Pesa, Burat, Ngare Mara and Kinna wards) receive over 500mm of rainfall per year. The drier eastern and northern parts of the county receive less than 250mm.

Rainfall in the County is characterized with high inter-annual variability which directly affect hydrological, ecological and biochemical processes, which in turn, influence climate.

This erratic and unreliable rainfall supports limited crop farming over few parts of the county. These areas are Burat, Bulla Pesa, Wabera and Kinna wards where the black cotton soil retains moisture long enough to make crops mature.

#### **Samburu**

*Climatic conditions Rainfall:* The County Experiences Tropical climatic conditions. The driest months are January and February. The long rainy season falls in the months of March, April and May. The elevation and orientation of the major topographic features such as Mathew ranges and Ndoto hills influences rainfall distribution. Apart from South Horr and Wamba areas, short rains occur during the months of July and August, sometimes extending into September. At Wamba and South Horr areas, the short rainy season is usually delayed and occurs in October and November and sometimes extends into December. The southwest plains and the Lorroki Plateau receive between 500 mm and 700 mm of rain annually. The Nyiro and Ndoto Mountains and Matthews range receive the highest amount of rainfall between 750 mm and 1250 mm per annum. The



central basin and the plains east of the Matthews Range are the driest parts of the county with annual rainfall of between 250 mm and 500mm. Temperature: Annually, the county has annual mean temperature of 29°C with the maximum range being 33°C and minimum of 24°C. The central plains and the region east of the Matthews Range have the highest temperatures while the highland belts in the North Eastern side of Lorroki Plateau are cooler.

### **Turkana**

Turkana County is arid and semi-arid and is characterized by warm and hot climate. The temperatures range between 20°C and 41°C with a mean of 30.5°C. The rainfall pattern and distribution is erratic and unreliable with both time and space. There are two rainfall seasons. The long rains (akiporo) usually occur between April and July and the short rains between October and November and ranges between 52 mm and 480 mm annually with a mean of 200 mm. The driest periods (akamu) are January, February and September. The rainfall is distributed on an east-west gradient with more rainfall in the western parts and other areas of higher elevation. The rain falls in brief violent storms resulting in flush floods. The surface runoff and potential evaporation rates are extremely high.

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Due to the low rainfall and high temperatures there is a lot of evapo-transpiration resulting into deposition of salt in the soil and capping on the surface. As a result, only about 30 per cent of the county's soil can be rated as moderately suitable for agricultural production. These moderately fertile soils are found at the central plains of Lorengippi, the upper Loima, the lowlands of the Turkwel, Nakaton and Kawalathe drainage along the lake at the lower Kalokol, Turkwel and Kerio rivers and a portion of the Loru Plateaus.

#### **6.2.4 Air Quality**

Air quality samples will be taken every three months during the road's construction period. Project areas where the samples will be taken will be determined during the start of the project. The air quality survey report will mainly show the results and trends of the sampled parameter in relation to the established thresholds, and advice the Contractor/Client accordingly.

Suspended Particulate Matter (SPM) less than 10 micrometer in diameter (PM<sub>10</sub>) will be monitoring of the air quality. Parameters to be tested will be Sulphur Dioxides (SO<sub>2</sub>), Nitrogen Oxides (NO<sub>x</sub>), Carbon Monoxides and Hydrocarbons (HC), Ozone and Volatile Organic Compounds (VOCs) with a frequency of 24hr/day for two consecutive working days per week for two weeks at 4 months intervals during construction period. Monitoring should be at agreed locations for every along or within the project road.

#### **6.2.5 Surface and Groundwater Resources**

The road alignment crosses several drainage channels that have water during rainy seasons only. The main rivers and their chainage are:

- River Seiya at Km 39+500- Flow for short periods during and after the rains
- River Suguta – Km 187+250 – Good flow and appears to be throughout the year however the water is reportedly saline.
- River Kerio - Good flow and appears to be throughout the year.

**6-4: River Suguta in Samburu and River Kerio in Turkana**



River Suguta



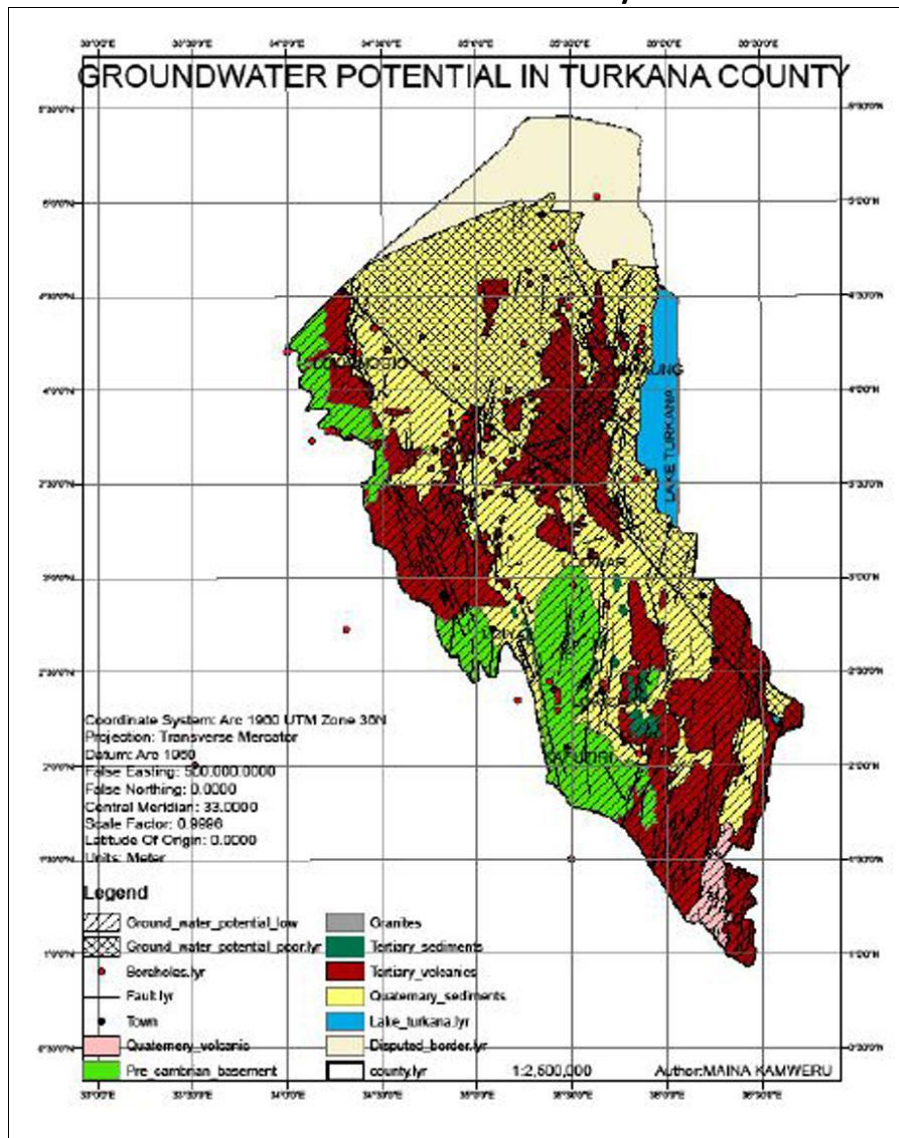
River Kerio



A woman scooping water from a shallow well on the banks of River Kerio in Lokori, Turkana.

**Source:** Consultant's team. Oct. 2018.

## 6.7: Ground Water Potential in Turkana County



### 6.2.6 Water Quality

Temperatures of surface water in the drainage system along the proposed road project is high in the rivers and surface streams which has an average temperature of 29°C and 30°C water pools and dugout wells recorded an average temperature of 26°C. Suguta River has the highest average water temperature of 35.6 °C. This is followed by Kerio River which recorded 30.5°C, surface water stream from lugga in Silange-Nanyukie 30.5°C. The lowest temperature in the drainage systems was recorded in hand dugout wells in Suiyan lugga 24.8°C, Silange-Nanyukie 25°C and Seiya lugga.

The highest water pH occurs in rivers (flowing water) with an average of a value of 8.42 while the lowest pH occur in surface streams and borehole. Suguta River has the highest pH of 9.51 among the surface water features but relatively low pH was recorded in Kerio and Ewaso Nyiro Rivers. The surface streams and borehole in Silange-Nanyukie has lowest water pH.

The highest EC and TDS observed in borehole water, surface streams in lugga while the lowest was recorded dugout wells and water pools. Among places visited Suguta River and surface stream in lugga in Silanga-Nanyukie has highest values of TDS and EC along the proposed road project. Sites with the lowest TDS and EC are in Ewaso Nyiro, Kerio Rivers.

TSS measurements was conducted on three river systems; Ewaso Nyiro, Kerio and Suguta Rivers. Ewaso Nyiro River discharges high amount of TSS, four times more than discharge in Kerio River and eight times more than discharge in Suguta River.

#### 6.4: Water Quality Parameter of Drainage Systems within the Project Sites

Location Name	Water Feature Type	Temp. (°C)	Conductivity (µs)	TDS (ppm)	pH	TSS
Suiyan lugga	Flowing water	24.8	543	352	8.00	
Barsaloi lugga	Flowing water	29.5	592	356	8.37	
Seiya lugga	Flowing water	26.15	340.5	219	7.93	
Ewaso Nyiro River	Flowing water	26.3	304	169	8.27	2163
Silanga-Nanyukie Lugga	Water pool	25	489	293	8.00	-
	surface stream (2cm deep)	30.3	4000	2000	7.36	-
	Borehole	29.5	3562	1764	7.13	-
Ngaroni (Baa lugga)	Water pool	27	933	644	7.96	-
	Dugout Well	25.0	1472	734	7.78	-
Nakukulas Lugga	Dugout well in lugga	28.5	373	186	7.9	
Kerio River	Flowing water	30.5	271	135	8.42	525
Suguta River	Flowing water	35.6	4000	2000	9.51	246

**Source:** Consultancy Team. Nov. 2018

#### 6.2.7 Terrestrial/ Aquatic Environment: Flora and Fauna

##### 6.2.7.1 Riverine (Riparian) Vegetation

The landscape of the proposed road project consists of *Acacia tortilis*, *A. senegalensis* and *Salvadora persica*. The riverine of luggas is predominated by the *Acacia tortilis* (Umbrella thorn) and *Salvadora persica* population. The distributions of these species are sustained along the watercourse by dispersal of their propagules by river or lugga water current. The luggas support the riverine vegetation with water throughout the year. Large luggas has high capacity to more Acacia trees in large population and sizes. For instance, there is relatively higher riverine tree covers in Seiya and Barsaloi due to their ability to store more water throughout the year that support plant growths.



#### 6-5: Common Riverine (Riparian) Vegetation within the Project Site



*Acacia tortilis* (background).  
*Calotropis procera* in the  
foreground in Nakukulas



*Ziziphus Mauritania* in  
Kang'thethein



Doum palms in Karuko Oasis



*Balanites aegyptiaca* (Naathu)



*Delonix elata* (Kula Mawe)

#### 6.2.7.2 Wetland Plants

Wetland plants are rare in lugga system; however, *Kanahia* species is common in the in Barsaloi and Ewaso Nyiro River. The banks of Suguta River are dominated by *Sporobolus* species; *S. africanus* and *S. spicatus*. Other lugga and wetlands do not have wetland dependent plants but terrestrial vegetation that is influenced by the dynamics of water in the landscape

#### 6-6: Wetland Vegetation



*Sporobolus africanus*



*Sporobolus spicatus*



*Hyphaene compressa*



*Kanahia* sp. In Ewaso Nyiro

#### **6.2.7.3 Aquatic/Wetland Reptiles and Amphibians**

The common aquatic reptiles and amphibians on surface water along the proposed road are crocodiles, frogs and turtles. Presence of the Nile crocodile is dominant in the downstream of the corridor of the proposed road project in Ewaso Nyiro River. Local account informed of presence of crocodiles in the upstream of Kerio River. Turtles and frogs were observations in earthenpan/waterpan in Nakukulas.

#### **6-7: Reptiles and Amphibians on Rivers Banks and Water Pans along the Project Road**



Nile Crocodile



*Ptychadena anchietae*







*Serrated Hinged Terrapin*

#### **6.2.7.4 Terrestrial Reptiles and Amphibians**

The dominant reptile in Lokichar area is the Speke's Sand Lizard Nakukulas and Kang'thethe in lugga was dominated by. White-Throated Savanna monitor was observed at Kang'thethe in within the lugga on Dum palms. Areas vegetated by *Sporobolus* species in Kerio River banks host the Nile Monitor Lizard; a species that was recorded by account in Ewaso Nyiro. Lugga with rocky banks in parts of the lugga course such as in Barsaloi, Seiya, Silanga-Nanyukie luggas and Ewaso Nyiro River has the Red-Headed Rock Agama.



#### 6-8: Reptiles and Amphibians observed along the Proposed Road Alignment

	
Speke's Sand Lizard	Blue-Headed Tree Agama
	
Mascarene ridged frog	Gallmanns sand frog

#### 6.2.7.5 Aquatic / Wetland Mammal Species

Two mammal species are accounted for in few sites along the proposed road project; these include Hippopotamus and Waterbucks. Waterbucks are wetland dependent animal that are mostly found on grassland near water areas such as rivers and lakes. On the other hand, hippopotamus depend on water habitat and wetland vegetation for survival. Its distribution has also been accounted for in Ewaso Nyiro River.

#### 6.2.7.6 Terrestrial Mammals Species

Mammal species concentrate near water features in the drylands. Some mammal species were observed near the lugga. Species that actively utilizes lugga are the Vevet monkey, Olive Baboons. Footprints were used to identify mammal species visitors to the lugga and water pans. These species include the Hyena, Leopard, Olive Baboons and the Jackal. Vevet monkeys are common in luggas with large riverine trees in Baragoi, and Ngwasi Lugga. Local people made citation of Lions and Giraffe seen drinking water in Ewaso Nyiro River; Waterbucks and Hippopotamus moving downstream of Ewaso Nyrio river. Also, movements of elephants have been observed towards downstream and upstream of Barsaloi and Suiyan Lugga.

### 6-9: Terrestrial Mammals Observed along the Proposed Road Alignment



Vervet monkey crossing lugga



Footprint of the Olive Baboon

#### 6.2.8 Land Resources

##### Isiolo, Land Use within the Project Site

Nyambene National Reserve borders the proposed Isiolo Bypass, from where the project road alignment joins the A2 - Isiolo-Marsabit-Moyale at km 13+650. The stretch of 13+ 650 km is within bushland neighbouring the National reserve. The area, just like 80% of the land in Isiolo is under the trusteeship of the county government. There is however land under private ownership, used for private investment in housing, industrial and commercial purposes along the A2 road to Lerata A2 junction (48+499km).

##### Land Use Samburu Areas Traversed by the Project Site

The road traverses through land which is either Trust land, communal land, government or private land. Trading centres at Lerata, Lengusaka, Barsaloi, Swari and Nachola are within Government land managed by the County Government. Communal land is managed by the communities while private land encompasses group ranches<sup>15</sup>.

The primary land use practices are pastoralism and wildlife conservation. These practices account for over 90 percent of the total land holding in the county and the areas where the land traverse.

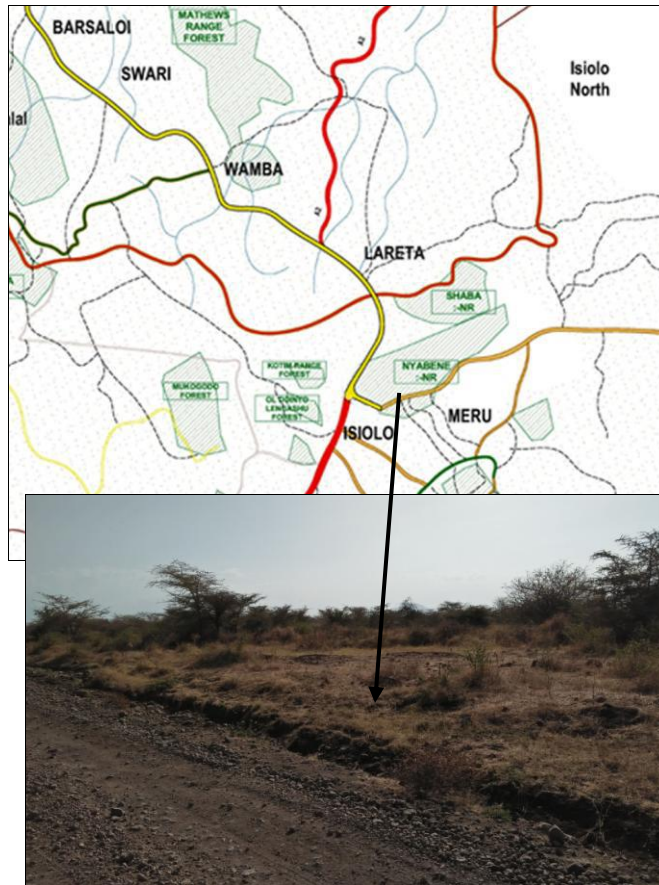
### 6-10: Swari Trading Centre, Samburu.



<sup>15</sup> Refer to details about community ranches and conservancies in chapter 5.31



#### 6-11: Land Use within Isiolo - Lerata Area Wamba Area and Road Alignment

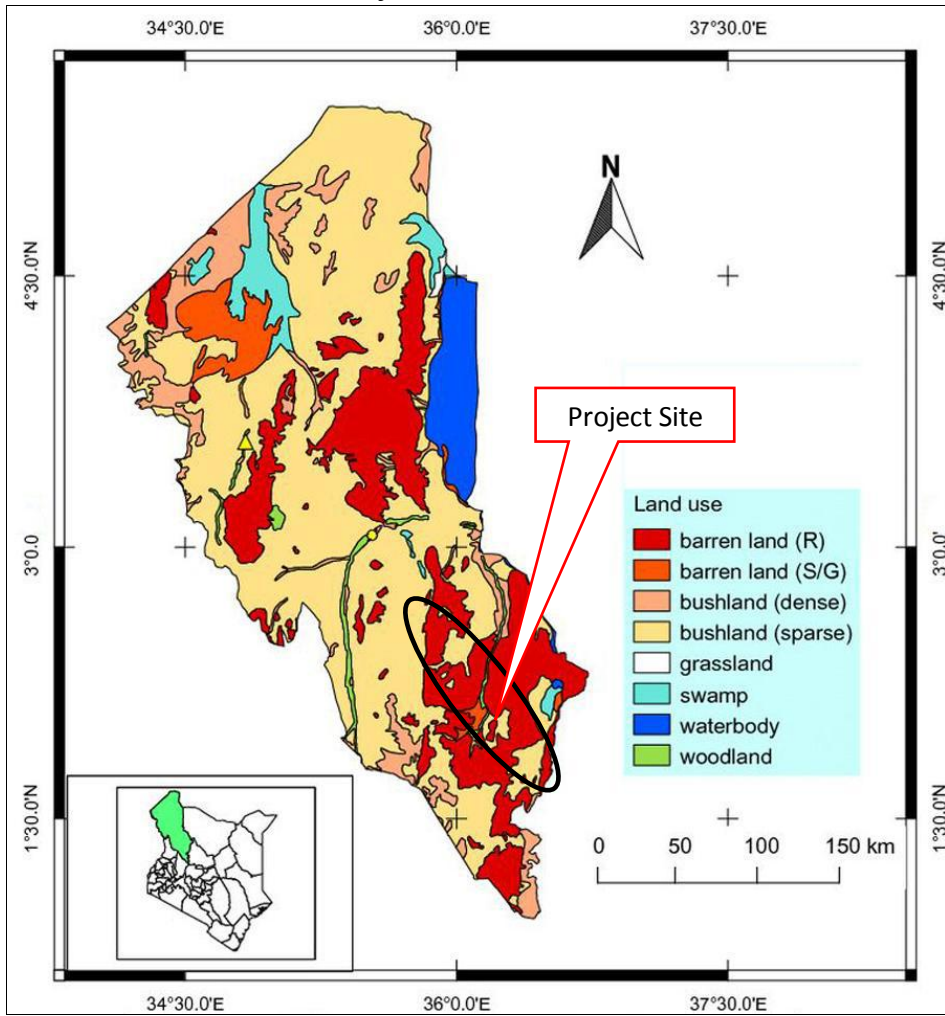


The project road from the proposed Isiolo Bypass: Nomadic pastoralism is prominent within the project site in Isiolo, which defines the lifestyle of most of the county's inhabitants. However, there are business ventures (shops) and institutions between km 13 + 650 to km 10 + 000 along the Isiolo Moyale road (A2). To avoid possible impacts on human and natural environment, the road alignment has avoided traversing through Nyambane Natural Reserve, avoided passing through or near Isiolo town by using Isiolo Bypass. It has been aligned to the existing A2 road (Isiolo-Marsabit-Moyale) avoid any intrusions along the existing environment.

#### **Land Use in Turkana Project Sites**

Land in Turkana within Kamuge, Lokori and Lokichar where the road will traverse is held in trust for the community by the County Council of Turkana. Apart from the trading centres, rest of the land is either used for grazing.

### 6.8: Land Use within the Project Site in Turkana



### 6-12: Road Project Scenes in Turkana, Samburu and Isiolo Counties










#### 6.2.9 Visual Aesthetics

The aesthetic qualities of the landscape can be accessed from both in the non-built and in built-up areas. The visual qualities of the landscape and the character of the landscape are a result of the topography and the geology, the water resources in the area, the climate, human influence and other land use. New roads should not cause serious visual disturbance to the landscape. Where possible, the proposed road should enhance the aesthetic qualities of the landscape and within built up areas. The project areas noted with aesthetic values during the road design stage/ESIA are listed below

#### 6.5: Visual Aesthetics and their Triggers

Triggers of Aesthetic Value		Site/Location Details	Site Photo
1	Nature of the unique built up areas close to project	Suguta valley. The main settlement area with traditional homesteads and locals	



2	Scenic landscape/ geological feature	<i>Lolokwe</i> mountain viewed from Lerata along the project road	
3	Landscape and traditional land use	Lerata, along the project road.	
3	Picturesque landscape / topography view	Project road at Lokori towards Kamuge in the Suguta valley.	
4	Scenic riverine vegetation, water resources, flora and fauna	Watercourse in Suguta valley, contrasting the dry landscape, neighbourhood.	

#### **6.2.10 Noise and Vibrations**

Noise and vibration will be expected during construction work, with impacts being experienced within the trading centres where the land will traverse. The centres are Lerata, Lengusaka, Nachola, Suriyan, Barsalo, Kamuge and Lokori.

Within the quarries sites, which the Contractor will be at liberty to select, he will be expected to control the noise levels by using low tension explosives (class 2) that do not cause fright of fragments.

Sampling of Noise and Vibrations will be done just before the project starts at sites which will be agreed upon by the OHS Advisor to the Contractor, the RE and the Client KeNHA. Tests will also be done at the identified quarry sites, which the Contractor will be extracting construction materials.

#### **6.2.11 Solid and Liquid Wastes**

Solid and liquid waste will originate from the Contractors Camp, vehicle garage and storage sites. Further waste will originate from construction site, -, spoil material, cleared vegetation, debris etc. The waste can be a health hazard if it is not disposed properly, and as per the requirements of NEMA waste management regulations.

## 6.6: Handling of Project's Solid and Liquid Wastes

Aspect (Project Areas)	Waste Type	Classification	Waste Handling Reuse/Recycling/ Disposal
Site Clearance	Vegetation (logs, timber, shrubs,	General solid waste	Offsite reuse, give area community as CSR
Bulk earthwork	Excavated material, soils	General solid waste	Reuse (in cut/fill)
Road Construction	Empty oil and other drums	General solid waste	Recycling
Compounds and Workshop Operation	Used Tyres	Special waste	Recycle (pyrolysis, retread),
	Waste generated by the maintenance of equipment including air, oil filters and rags	General solid waste	Disposal
	Oils, grease, fuels and other fluids	Liquid	Recycling, disposal where applicable
	Batteries	Hazardous waste	Recycling
	Domestic waste generated by workers art camps	General solid waste	Disposal
	Sewage	General solid waste	Disposal
Office (RE, Constructor's Camps Operations	Paper, cardboards, (plastics)	General solid waste	Recycle
	Ink cartridges	General solid waste	Recycle
	Plastic bottles	General solid waste	Recycle
	Food waste	General solid waste	Disposal

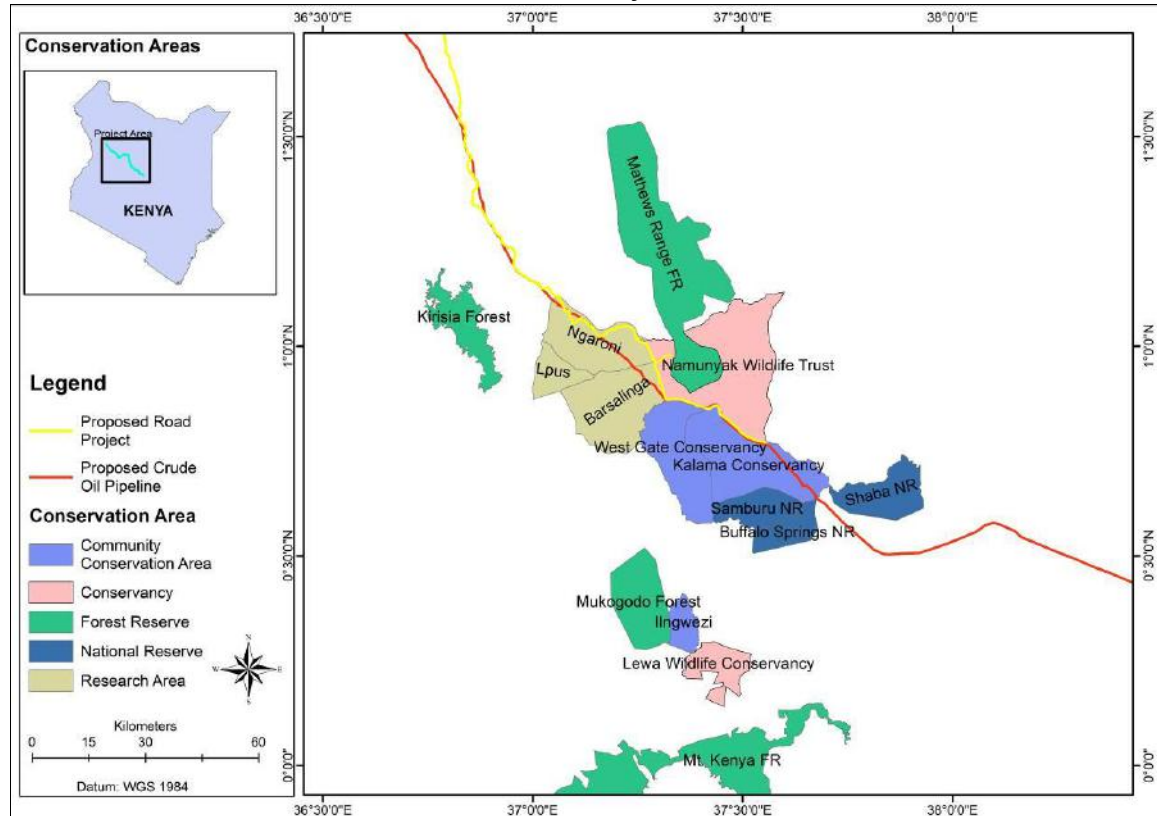
**Source:** Adopted from Waste and Resource Management Plan, NSW.

## 6.3 WILDLIFE CONSERVATION AREAS

### 6.3.1 Community Conservancies in Close Proximity to the Project Road

The Lokichar – Isiolo road project traverses through wildlife conservation areas that are categorised into community conservancies and near the protected areas. The proposed road passes through Ngaroni (Kalamdak) conservancy which is situated in Baragoi area. The proposed road passes along the boundary of Namunyak Wildlife Trust to the West, Barsalinga to the west, to the North of West Gate conservancy, and North of Kalama conservancies. Ngaroni conservancy has an area of 337 hectare, Namunyak 652 ha, Barsalinga 424 ha, West Gate 361 ha and Kalama 496 ha. The conservancies neighbour each other and has common wildlife species. However, conservancies in Wamba area; these include West Gate and Namunyak has more distribution of the endangered Grévy's Zebra than other conservancies including other parts of the country. Presence of elephants is also dominant in these conservancies. Other wildlife conservation areas are far from the proposed road alignment. These include Mathews Range Forest Reserve, Samburu National Reserve, Mukogodo Forest Reserve, Samburu and Shaba National Reserve.

## 6.9: Wildlife Conservation Areas within the Project Sites



## 6.7: Location and Nature of the Conservation Areas in Relation to the Project Road

Conservation Area	Distance (km) from the Proposed Road	Nature of Conservation
Kalama Conservancy	0	Community conservation area
West Gate Conservancy	0	Community conservation area
Namunyak Wildlife Trust	0	Conservancy
Ngaroni	0	Research Area
Barsalinga	0	Research Area
Mathews Range FR	1	Forest Reserve
Lpus	8	Research Area
Samburu NR	12	National Reserve
Kirisia Forest	12	Forest Reserve
Buffalo Springs NR	19	National Reserve
Shaba NR	20	National Reserve
Mukogodo Forest	39	Forest Reserve
Ilngwezi	44	Community conservation
Lewa Wildlife Conservancy	54	Conservancy
Mt. Kenya FR	69	Forest Reserve

### 6.3.2 Species of Conservation Importance

#### Elephant

The African Elephant is very general in its range, and tends to move between varieties of habitats (Blanc, 2008). It can be found in dense forest, open and closed savanna, grassland and, at considerable densities, in arid deserts. In eastern and Southern Africa the African Elephant is increasing at an annual average rate of 4.0 % per annum. The

major threat to the African Elephants arises from poaching for ivory and meat. In the current need for development and population expansion, which is accompanied by rapid land conversion, loss and fragmentation of habitat is the most important threat. Due to increase in elephant population over time there have been reports of increased human-elephant conflict, which further aggravates the threat to elephant populations. Earlier assessments of conservation status of elephants in 1996 by the IUCN SSC African Elephant Specialist Group listed elephant as Endangered (EN A1b) in IUCN Red List. In 2004 it was listed as Vulnerable (VU A2a) (Blanc, 2008 - in IUCN 2012).

### **Grévy's Zebra**

Grevy's Zebra is assessed as Endangered under criterion A2acd (Rubenstein et al., 2016). It also qualifies as Vulnerable under Criterion C1+2a(i) as there are <2,000 mature individuals. This number consists of approximately 2,350 individuals in Kenya (1,716 mature animals) in 2016 and about 230 individuals in Ethiopia (168 mature animals) in 2011 (Rubenstein et al., 2016). The species is declining at a rate of 10% over the next three generations if the population in Ethiopia declines severely, and additionally the largest subpopulation of Grevy's Zebra has <1,000 mature individuals (IUCN)<sup>16</sup>.

Grévy's Zebras are inhabitants of arid and semi-arid grass/shrublands near areas with access of permanent water (Rubenstein et al., 2016). They are predominantly grazers, although browse can comprise up to 30% of their diet during times of drought or in those areas that have been highly transformed through overgrazing.

### **6.8: Red listed Potentially Vulnerable Species of Wildlife along the proposed Road**

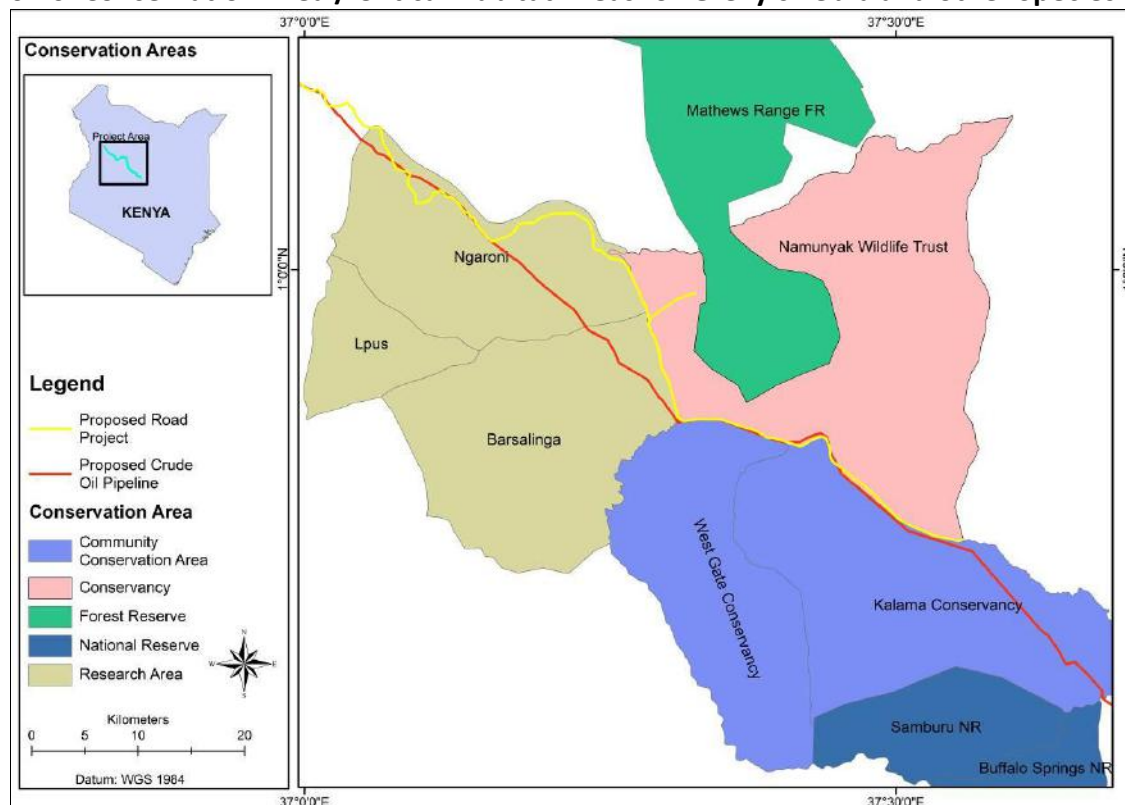
Common	Scientific Name	IUCN Conservation Status	Locality
Grévy's zebra	<i>Equus grevyi</i>	Endangered A2ac; Vulnerable C2a(i) ver 3.1	Wamba: Conservancies, • Westgate, • Namunyak • Kalama
African Elephant	<i>Loxodonta africana</i>	Vulnerable A2a ver 3.1	Barsaloi & Suiyan

#### **6.3.3 Critical Habitats**

The largest regional population of Grévy's zebra within the project site is in Samburu County. Grévy's Zebra is endangered and over 10% of global populations of Grévy's Zebra occur in the conservancies in Wamba area in West Gate and Kalama conservancies, and Namunyak Wildlife Trust and the neighbouring areas. This makes the area to be a critical habitat for conservation of the Grévy's Zebra population. Habitat of Grévy's Zebra occurs in Ethiopia and Kenya with the current estimation of 2,680. This population consists of 2,350 individuals in Kenya in 2016 and 230 individuals in Ethiopia in 2012. Grevy Zebras occur in arid and semi-arid grass/shrubland where they can gain access to permanent water.

<sup>16</sup> Named after *François Paul Jules Grévy*, then the president of France, who in the 1880s was given one zebra by the government of Abyssinia, - the Ethiopian Empire.

## 6.10: Conservation Area / Critical Habitat Areas for Grévy's Zebra and other Species



## 6.4 Projects Site and Ecosystem Services

### 6.4.1 Sand Harvesting

Sand harvesting is common on lugga that has substrate of the bed sandy deposits. Lugga which were observed with sand harvesting activity are Barsaloi, upstream of Baragoi lugga, Ewaso Nyiro River, and lugga in Garissa. Most of youths are engaged in sand harvesting as a means of earning an income.

### 6.4.2 Fishing

Only Ewaso Nyiro River support fishing for subsistence; few are sold in the local market. Dominant fish species caught is *Clarias gariepinus* and few Tilapia species.

### 6.4.3 Domestic and Livestock Water

Major luggas such as Baragoi, Suiyan, Barsaloi, Seiya and Silanga-Nanyukie are important for their capacity to store water and permeate subsurface flow of waters from catchments. This water is extracted by digging by hand to reach the waters in the lugga bed. In other places, boreholes sunken adjacent to the lugga provide water throughout the year that are used for domestic purposes and watering of livestock. Due to this, most villages or manyattas are located close to the lugga.

### 6.4.4 Salt licking for Livestock

Most of lugga bank in Baragoi and Wamba areas has salt deposit which is licked by livestock and wild herbivores for addition of minerals in the body. Locals say livestock that licks the salt deposit are not prone to diseases. The erosion of the lugga banks continuously exposes salt deposits for seasonal use.



#### **6.4.5 Livestock feed Provision**

The riverine Acacia trees support livestock with leaves and pods for foraging. These trees are distributed along the influence of lugga drainage system throughout the year. Livestock, therefore get feeds during drought period in the region.

### **6.5 SOCIAL-ECONOMIC BASELINE SURVEY**

#### **6.5.1 Social Characteristics**

#### **6.5.2 Economic Settings**

Industries, Trade and Commerce: The three Counties that will be traversed by project road have no manufacturing establishments /industries despite a huge potential in livestock product based industries. The main economic activity in the counties is livestock production and this provide a huge potential for hides and skins processing (tannery), camel and goat milk processing industries. Currently, there are various informal traders, associations and several unorganized artisans whose business will be boosted once the project road is operational, - especially in easy transportation of goods and services within the trading centres.

#### **6-13: Goats Trade in Lengusaka, Isiolo County**



Loading of goats at Lengusaka trading centre, along the project road. The goats are destined for Nairobi market. Livestock business will thrive once the road is bituminized.

#### **Tourism**

The main tourism attractions along the proposed road are the wildlife conservancies, and a wide range of hotels and campsites.

Samburu County and areas close to the project road is endowed with a variety of natural sceneries like the plateaus, escarpments, valleys and wildlife which could be tapped to promote tourism in the county in Turkana, the upcoming Ngamia oil project. All the counties have a population with fascinating traditional cultures, which has been an attraction mainly to foreign tourist. The construction of the road will therefore boost nature tourism, especially cultural, educational and adventure types of alternative tourism.

## 6-14: Cultural and Nature Tourism Attractions



Turkana Women and Children within their Traditional Setup



Scenic view of *Ol'olokwe* mountain, viewed from Lerata along the project road.

### 6.5.3 Health Settings

Health care within the Counties and areas where the proposed road traverse is a serious challenge facing the people. Banditry, poverty and the poor existing earth road make it nearly impossible for residents to access medical services. As a result, the sick walk for between 20 and 30km to health centers, which have no medical equipment or drugs and are at times managed by nurse aids<sup>17</sup>.

*In Isiolo*, there are two level four health facilities, the Isiolo and Garbatulla level four hospitals, five level health facilities and 34 level one health facilities. Most county's public health facilities lack adequate personnel. The health facilities have been experiencing shortage of health personnel. The doctor: population ratio for the county is 1:20,000<sup>18</sup>.

*Samburu County* has three hospitals, which include a County hospital in Maralal, a Sub-county hospital in Baragoi and a Mission Hospital in Wamba. The total number of doctors in the entire county is eight (2017) distributed in these hospitals. This gives a doctor patient ratio of 1: 31991. The distance to the nearest health facility is 20 KM thus restricting accessibility of health care services in the County.

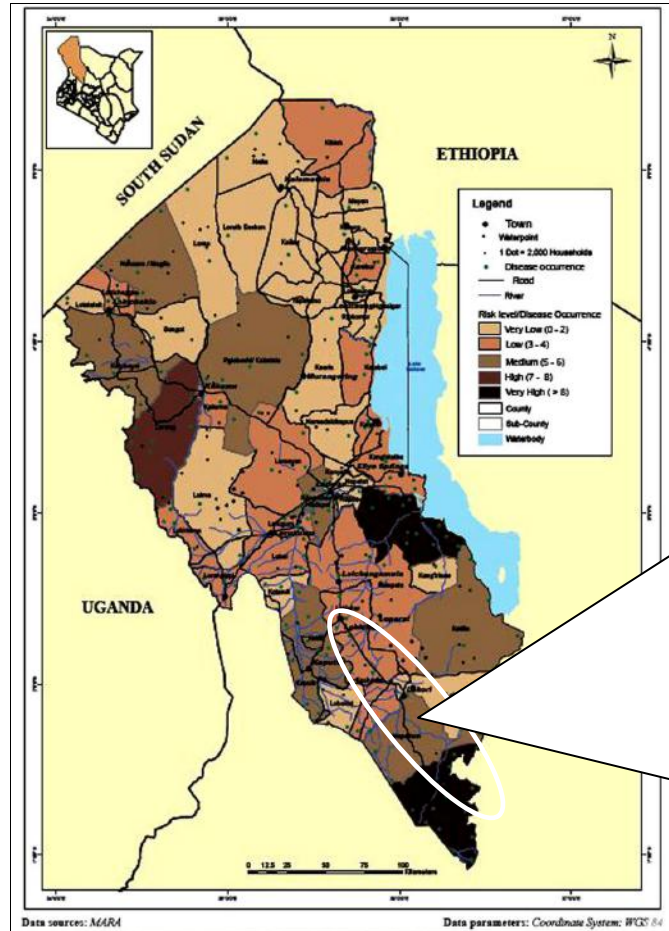
*In Turkana* County, there are four level IV hospital, 9 health centers and 71 dispensaries. Staffing of existing facilities is low. Doctor population ratio stands at

<sup>17</sup> Refer to the Hazard Atlas, Turkana and Samburu, 2015,

<sup>18</sup> Tiers of healthcare in Kenya are classified into various levels. Level 1 = Community Unit within the community, Level 2 = Dispensary within the village level, Level 3= Health Care Centre, Level 4= District Hospital, Level 5= Provincial Hospital and Level 6 = National hospital.

1:70,000. The development of the road will increase connectivity to the existing health facilities, attract more health personnel due to improved communication/road and avoid the high turnover of medical personnel in search of better working areas.

#### 6.11: Prevalence of Diseases within the Project Sites in Turkana



The Road project Area (*marked*)

In Lokori, the prevalence of diseases is relatively low. The comparatively low rate can be attributed to accessibility of the town and availability of medical services. However, in Lomelo, Kamuge towards Samburu through Suguta valley, the prevalence of diseases is quite high compared with Kochodin and Lokichar. This can be due to the inaccessibility of the valley and security reasons for the available medical personnel within the area.. The road will change this situation by creating reliable connectivity to the so called remote areas in Lomelo and Kamuge.

#### 6.5.4 Security and Public Safety

Livestock rearing by the communities within the three counties are common. Access to pasture during the dry season is a key source of conflict between the pastoralists, mainly Samburu and the Turkana. Search for grazing pastures by these communities is associated with cattle rustling and associated conflicts, which in most cases are fatal. Wealth (livestock) and proliferation of illicit arms are the further causes of cattle raids in the county.

Once the road starts being operational, it is anticipated that the rate of cattle rustling will be lower due to improved surveillance by police.



## 6.12: Turkana: Conflict Zones



These conflicts lead to destruction of social amenities, loss of economic opportunities and lives. These have been major causes of insecurity as they normally end up in highway banditry and cattle rustling. Insecurity has been a major drawback to economic development in the county. Most of the cases of insecurity reported in the county are related to cattle rustling.

Below: Security Officers and Herd of Cattle



livelihood diversification options compatible with pastoralism, interaction between communities and state security presence in the conflict hot spots will be strengthened.



### **6.5.5 Community Views and Concerns**

#### **Positive Concerns:**

- The road will open up business opportunities
- It will be cheaper and faster travelling along the road in commuter vehicles.
- There will be job opportunities during construction phase
- Locals, if given the opportunity will provide materials for road construction work

#### **Negative Concerns:**

- People (workers) may bring in bad ill behaviours within the communities who live in close proximity to the road.
- Dust and accidents as a result of careless driver during construction phase
- Family break – up after workers receive for compensation or local employees

### **6.5.6 Corporate Social Responsibility (CSR)**

Request for CSR made during public consultations were not viable. The modality of coming up with meaningful community CSR projects during construction phase of the road has been explained in chapter 7.2.12 of this document.

## 7 ANALYSIS OF PROJECT ALTERNATIVES

One of the most important of all public assets in Turkana, Samburu and Isiolo Counties is the road infrastructure. However, it is not sufficiently developed. Well-developed road infrastructure provides access to the crucial contribution to economic development and brings important social benefits. Road is of vital importance in order to make a region grow and develop. In addition, the road provides access to employment, social, health and education services, crucial in fighting against poverty. All these benefits are poorly developed within the counties where the road will traverse. The road will therefore open up new developments in the Northern and Eastern regions which are hitherto considered to be “remote”.

The proposed government investment projects is expected to improve the economic and social welfare of the people in the in the Counties it traverse and the country as a whole. Some of the economic benefits that will come along with the project are quantifiable in financial terms while others are not, although their benefits are quite substantial. These exogenous non-quantifiable benefits are:

*International Benefits:* The road project will lead to increased trade between Kenya and Ethiopia, South Sudan and Sudan.

*Access to health services:* Improved transportation as a result of the project road will improve access to health services which will in turn improve people’s health, increase their productivity in their social economic activities.

*Access to education:* The improved road will help to ease and provide greater access to education which will translate into increased productivity. Increased access to education will also reduce cattle rustling which has been attributed, among other factors, lack of youth education.

*Growth of market centres:* The Growth of market centres along the road corridor will lead to increased job opportunities and economic activities of the people which will not only contribute to economic growth in these three counties but will also reduce insecurity, as young people will engage in those productive activities rather than criminal activities, like cattle rustling.

*Tourism:* The three counties of Isiolo, Samburu and Turkana have a great potential for tourism development, especially alternative tourism<sup>19</sup>. Samburu County for instance - is endowed with a wealth of wildlife concentrated both within and outside protected parks and conservancies. The protected wildlife areas include the expansive Namanyak Wildlife Conservancy and Trust, Sera Conservancy Trust, Westgate Community Conservancy and Kalama Community Conservancy. These are rich in wildlife like lions, elephants, giraffes, buffalo, leopards, ostriches and many more.

The completion of the road project will help the three counties realize their tourism potential which is largely unexploited due to insecurity and lack of infrastructure.

*Other affected economic activities:* The construction of the road project will also lead to increased production and marketing of agriculture, livestock rearing, fishing, forestry, mining and economic activities in all of the three counties.

### **The No-Construct/Without Project Option**

The second option, no construct/no project alternative will not achieve the objective of the project since opening up of the marginalized and the so called ‘remote areas’ of the counties, which will be traversed by the road will not be achieved. Failure to construct

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<sup>19</sup> Examples of alternative tourism are cultural, educational, scientific, adventure and rural tourism (After Mieczkowski, 1995, in conceptualization of tourism).

and operate the road will lead to the failure of achieving one of the Kenya's national long-term development policies that aims to transform Kenya – especially Isiolo, Samburu and Turkana - into a newly industrializing, middle-income country, by providing a high quality of life to all its citizens by 2030 in a clean and secure environment. Socio-economic development will be hampered by poor accessibility to the counties where the road passes; waste of economic time while travelling - among other negative impacts - will be experienced. This is not a desirable alternative.

Further, a review of Economic Indicators for the project will show that it will be incorrect not to implement the project. The economic survey done for the project in 2018 indicated that:

- The Net Present Value (NPV), measured as the difference between the discounted benefits and costs over the analysis period is positive. A positive NPV indicates that the investment is justified economically.
- Economic Internal Rate of Return (EIRR), measured at discount rate at which the NPV = 0. The EIRR was greater than the discount rate, showing that the investment is economically justified.

Traffic analysis done for annual average daily traffic (AADT) for ten to twenty years has projected a continuous trend in traffic increase along the project road, from Isiolo bypass, Isiolo to Lerata, Lerata to Wamba, Wamba to Baragoi, Baragoi to Lokori and Lokori to Lokichar, as indicated in the table below.

	MC	C	4WD/Pickup	Matatu	Bus	LGV	MGV	HGV	Art	Other	Total
Section 1 Isiolo Bypass											
Existing Traffic (2015 AADT)	3,251	1,369	712	203	15	42	51	10	4	4	5,661
Base Year 2022 AADT	6,791	2,183	1,089	311	26	72	88	18	60	7	10,644
2032 AADT (year 10)	11,062	3,730	1,740	497	48	136	166	33	87	10	17,509
2042 AADT (year 20)	16,144	5,577	2,515	718	75	215	263	53	121	12	25,681
CESA 2042 (20 years)	9,706,577										
Section 1B Isiolo - Lerata											
Existing Traffic (2015 AADT)	2,907	982	815	421	72	93	139	50	49	4	5,532
Base Year 2022 AADT	6,072	1,566	1,247	644	121	159	237	85	125	7	10,263
2032 AADT (year 10)	9,891	2,676	1,992	1,028	224	302	450	161	181	10	16,915
2042 AADT (year 20)	14,434	4,002	2,879	1,487	348	477	710	255	250	12	24,842
CESA 2042 (20 years)	26,177,074										
Section 2 Lerata-Wamba											
Existing Traffic (2015 AADT)	47	48	-	-	7	69	47	25	-	-	243
Base Year 2022 AADT	140	94	-	-	16	150	102	54	54	-	610
2032 AADT (year 10)	228	160	-	-	30	284	194	102	78	-	1,076
2042 AADT (year 20)	333	240	-	-	47	448	306	162	108	-	1,644
CESA 2042 (20 years)	11,591,997										
Section 3A Wamba-Baragoi											
Existing Traffic (2015 AADT)	38	14	12	7	1	2	2	1	1	1	79
Base Year 2022 AADT	82	24	21	13	5	6	6	5	58	5	224
2032 AADT (year 10)	105	44	37	23	8	11	11	8	104	8	359
2042 AADT (year 20)	196	66	54	33	13	18	18	13	144	12	555
CESA 2042 (20 years)	6,393,688										
Section 3B Baragoi-Lokori											
Existing Traffic (2015 AADT)	4	-	10	-	-	-	5	-	-	-	19
Base Year 2022 AADT	18	2	23	2	2	2	15	2	56	2	125
2032 AADT (year 10)	30	4	42	4	4	4	27	4	100	3	220
2042 AADT (year 20)	44	6	61	6	6	6	44	6	139	5	318
CESA 2042 (20 years)	6,268,627										
Section 4 Lokori-Lokichar											
Existing Traffic (2015 AADT)	471	50	245	34	50	97	128	128	26	22	1,251
Base Year 2022 AADT	1,410	97	445	62	105	210	277	277	97	41	3,021
2032 AADT (year 10)	2,296	166	712	99	193	398	524	524	141	67	5,120
2042 AADT (year 20)	3,352	249	1,029	144	301	628	827	827	195	101	7,552
CESA 2042 (20 years)	35,675,197										

The No-Construct/Without Project Option will be undesirable. Regional economic growth through trade facilitation, integration, interconnectivity between the counties and Kenya, Ethiopia and South Sudan, socio-economic development along the Corridor among other benefits will not be achieved.



## 8 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

### 8.1 PROJECT ENVIRONMENTAL AND SOCIAL POTENTIAL IMPACTS

#### 8.1.1 Positive impacts (Environmental, social and economic)

##### Environmental

##### Social

- Introduce and diversify culture as well as communities' integration due to easy access through the project road.
- Improve alternative tourism, - cultural, adventure, rural, educational - tourism within the scenic sites in the three counties
- Improved socio-infrastructural facilities

##### Economic

- Improve livestock industry within the three Counties. This will be through the opening up of the area which has been previously neglected for marketing of farm produces and livestock especially goats, sheep, cows and camels.
- Increase of local incomes during construction phase, - the contractor and road construction team, - will contribute to elevate the economy of local people and community.
- Creating employment opportunities: society along the road section will benefit from temporary jobs including food vendors and so forth.
- Improvement of transport as well as reduction in traffic problems related to poor condition of the existing road.
- Less damage to vehicles, especially PSV plying along the project sites
- Lower vehicles operating costs, private and commercial.
- Easy access to administration centres, markets and schools.
- Travelling and waiting time for public transport to be shortened

#### 8.1.2 Negative Impacts and Mitigation Measures

Negative Impacts		Mitigation Measures
<b><i>Social Negative Impacts</i></b>		
1	Loss of Properties; There will be loss of land parcels, residential houses, some commercial/business structures, crops etc.	Where possible, the road alignment to maintain the existing road alignment to avoid affecting the existing parcels of land and property.
2	Possible displacement of persons from their previous settlements.	The RAP to address displacement of PAPs
3	Possibility of the occurrence of sexually transmitted disease (including HIV) in the project area due to presence of new people from different areas seeking for temporary jobs at the construction sites.	HIV/AIDs awareness, training and prevention training services to be provided to the project workers with the objective of changing the sexual related characters of the workers.
4	Likelihood of family separations. Experience shows that many family heads tend to go to project area seeking for jobs thereby running away from their families, but also the same occurs to children.	Local and church elders, opinion leaders to offer guidance and counseling to those travelling away and separating with their families because of the available job opportunity.
5	Sexual harassment will be anticipated during the implementation of the proposed Isiolo – Lokichar road due to	Community policing, local elders to handle sex harassment issues.

	the work related pressures in term of delivery.	
6	Gender violence especially fighting for financial gains that result from the proposed project.	
7	School Dropout: experience from other areas shows that children opt to leave school seeking for temporary jobs, especially those who are found nearby the project.	All project employees to be at least 18 years. Area chiefs to inspect the young workers employed at the project site, whether they are over 18 years or whether they have finished school.
8	Erosion of shared customs, obligations, values, language, religious beliefs and other elements, which make a social or ethnic group distinct.	These will be inevitable consequences of improving the road, which will come along as irreversible secondary impacts.
<b>Environmental Related Negative Impacts</b>		
9	Soil erosion and sedimentation during construction phase	Earthworks operations shall be carried out such that surfaces shall be designed with adequate falls, profiling and drainage to promote safe run-off and prevent ponding and flooding. Run-off will be controlled to minimise the water effects in outfall areas. Good housekeeping (site clean-ups, use of disposal bins, etc.) on the site project
10	Deposition of silt and refuse into existing streams or domestic watercourses such streams, ponds, boreholes, water pans etc.	
11	Water contamination during construction phase.	Contractor to avoid heavy excavation/earthwork during wet seasons and especially near the existing watercourses.
12	Air pollution due to dust during construction phase, from plumes of dust by construction vehicles during haulage of materials to and from construction site.	Contractor to use water browser to mitigate dust plumes within the construction sites. Construction vehicles to observe speed limits within built up areas, especially trading centres.
13	Visual intrusion within quarry sites, borrow pits and stock piles	ESIA to be carried out before the start of the quarrying activities. The Contractor to comply with the requirements in the ESIA licence, especially decommissioning process of the material sites and borrow pits. The Contractor to comply with the requirements in the EMP, ESIA reports for the road, quarries and camps.

## 8.2 IMPACTS ASSESSMENT AND MITIGATIONS

The identified impacts and their possible mitigation measures have been identified in the tables 7.2.1 to 7.2.15. The identified residual impacts refer to those environmental effects predicted to remain after the application of mitigation measures. The predicted residual effects have been considered mainly during construction, operation and decommissioning stages of the project road. Further, the significance criteria for environmental effects have been classified into their magnitude (low/high), geographical extent, significant/not significant, duration and reversibility. Recommendations have been made in the EMMP

### 8.2.1 Physiography and Geology

#### Impacts

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

#### Mitigation Measures

- i. Slope gradient maintenance and not to be vertical
- ii. Erosion control measures
- iii. Site reclamation or rehabilitation during decommissioning phase of the project.

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

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

#### Recommendations

Refer to the mitigation measures above

### 8.2.2 Soils

#### Impacts

- i. Soil pollution from inappropriate disposal of waste, e.g. used oils from the Contractor's camp, workshops or from spills. Pollutants will end up being soaked into the soil and will lead to soil contamination.
- ii. Soil erosion during earthwork

#### Mitigation Measures

- i. Earthworks operations shall be carried out such that surfaces shall be designed with adequate falls, profiling and drainage to promote safe run-off and prevent ponding and flooding, with the associated soil erosion.
- ii. Run-off will be controlled as per specified and approved shop drawings for specific areas using scour checks, gabions, vegetation control etc. and to minimise the water effects in outfall areas.
- iii. Good housekeeping (site clean-ups, use of disposal bins, etc.) on the site project
- iv. Waste oil to be collected by a NEMA licensed waste dealer.
- v. Provide competent professionals in running machinery, workshop.
- vi. Provide waste container for collecting waste
- vii. Excavations to avoid accelerating situations of soil erosion

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

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

#### Recommendations

The Contractor to comply with the EMMP during construction

### 8.2.3 Climate

#### Impacts

- i. Damage of drainage structures due to erratic and heavy downpour as a result of climate change.
- ii. Possible emissions of CO<sub>2</sub>, CO, SO<sub>2</sub>, NO<sub>x</sub> and PM10 will result from the construction activities and operation of the proposed road.

#### Mitigation Measures

i.	Designed and constructed of drainage structures to withstand periodic heavy floods and runoff water.
<b>Residual Impacts</b>	
i.	CO <sub>2</sub> and N <sub>2</sub> O emissions during construction will have a negligible impact on climate, along the 142km road sites.
<b>Recommendations</b>	
Contractor to adhere to the EMMP	

#### 8.2.4 Air Quality

<b>Impacts</b>	
i.	Dust plumes from construction vehicles
ii.	Emissions of gaseous pollutants from diesel powered construction equipment
iii.	Fugitive dust emissions from excavating and moving earth, construction equipment and the concrete batch plant.
iv.	Project contribution to GHG emissions (CO <sub>2</sub> )
<b>Mitigation Measures</b>	
i.	Use of enclosures, hoods, shrouds, and sprays (wet batching) for possible concrete batch plant.
ii.	Monitor PM <sub>10</sub> if concerns
iii.	Employment of high-volume samplers to control plumes dust.
iv.	Active earthworks areas along the project road to be watered, mainly trading areas. Water misting or sprays will be used through water bowsers as required if particularly dusty activities are necessary during dry periods.
v.	Vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust and observe minimal speed especially within built up areas.
vi.	Diesel exhaust emissions from excavators, loaders, hauling trucks to be regularly checked.
vii.	Faulty machinery on site, producing smoke plumes to be withdrawn and repaired
viii.	Reduce emissions of (CO <sub>2</sub> /GHG) by implementing measures to improve efficiency and through
ix.	Selection of effective emissions control technologies for machines, e.g. by having vehicles fitted with catalytic converter to control exhaust emissions, filters and adsorbers.
<b>Residual Impacts (Nature of Impact, Geographic Scale, Significance)</b>	
i.	During construction phase: Negligible; Temporary, Local, Minor. Only to be experienced within the construction sites, quarries and during material haulage.
ii.	During operational phase: Negligible nature of impacts which will be temporary, localized and of minor significance.
<b>Recommendations</b>	
Contractor to adhere to the EMMP	

#### 8.2.5 Surface and Groundwater Resources

<b>Impacts</b>	
i.	Pollution of groundwater sources during construction phase (bridges construction work).
ii.	Interference and depletion of existing community water sources during construction phase.
iii.	Infiltration of contaminants from on-site activities into soils, pollution and degradation of water quality of underlying aquifer during earthwork, excavations, oil wastes from the camp/garage.
iv.	Impact to human health - Human exposure through direct contact, drinking

contaminated water / ingestion of contaminants.
<b>Mitigation Measures</b> <ul style="list-style-type: none"> <li>i. Drainage structures that will be constructed –cross culverts, at the river courses be at appropriate positions.</li> <li>ii. Stone pitching and side drains to cover meaningful lengths along the prone protection areas.</li> <li>iii. Timing of the construction of proposed bridges at Seiya, Naliyo, Suguta and Kerio to coincide with dry periods to avoid possible water pollution.</li> <li>iv. Contractor to adhere to waste regulations within the riparian zones/ within the watercourses.</li> <li>v. Bitumen trucks should be washed at designated areas only.</li> </ul>
<b>Residual Impacts (Nature of Impact, Geographic Scale, Significance)</b> <ul style="list-style-type: none"> <li>i. During construction phase the noted impacts have low significance since they are site based and localized to construction sites only. They have minimal significance due to their limited site specific geographical scale.</li> <li>ii. During operational phase, the listed impacts will have low magnitude of impacts along the 417.5km road project (extent).</li> </ul>
<b>Recommendations</b> Contractor to adhere to the EMMP

### 8.2.6 Terrestrial/ Aquatic Environment: Flora and Fauna

<b>Impacts</b> <ul style="list-style-type: none"> <li>i. Direct impacts on landscape during earthworks, -fill and cut sections, removal of trees, borrow pits etc.</li> <li>ii. Road can cause interference to wildlife's natural environment (habitats' removal), create barrier to the wildlife crossing points, migratory points and breeding areas.</li> <li>iii. Opening up new areas to human utilization, for example when a new road and new bore holes enable people and cattle to be moved into new areas</li> <li>iv. Impact on trees with cultural significance.</li> </ul>
<b>Mitigation Measures</b> <ul style="list-style-type: none"> <li>i. Provide underpass within the identified wildlife crossing points.</li> <li>ii. Designs of the proposed bridges at major river crossings along the road to be designed as per the specifications of the drainage engineer and as per the approved shop drawing for the drainage structures.</li> <li>iii. Site for sinking the boreholes to be agreed upon by the community and County administrators to avoid people and livestock relocating to the new site.</li> </ul>
<b>Residual Impacts: (Value/Sensitivity, Magnitude of Impact, Significance)</b> <ul style="list-style-type: none"> <li>i. During Construction Phase: Impacts of High Sensitivity value:</li> <li>ii. Their magnitude is minor</li> <li>iii. Their significance is adverse</li> </ul>
<b>Recommendations</b> Comply with recommendations in the EMMP.

### 8.2.7 Land Resources

<b>Impacts</b> <ul style="list-style-type: none"> <li>i. Temporary use of land for construction purposes, e.g. contractors camp, batching plant's site.</li> <li>ii. Permanent acquisition of land for bypasses and after road realignment from the existing corridor (e.g. Isiolo and Baragoi bypass)</li> <li>iii. Road will attract new ribbon (linear) settlements within the trading centres neighbouring the Community Conservancies (Kalama Conservancy, West Gate Conservancy, Namunyak Wildlife Trust, Ngaroni and Barsalinga)</li> <li>iv. Possible wildlife kills and illegal trade in wildlife products will represent a major threat</li> </ul>
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	to the wildlife conservancies traversing the project road.
v.	Possible animal kills due to fast moving vehicles during the roads operation phase.
<b>Mitigation Measures</b>	
i.	Contractor to consult the management of existing wildlife conservancies and community before starting any activities, - quarrying, sinking borehole etc.
ii.	Contractor's camps to be located away from migratory corridors.
iii.	State security, Kenya police, KPR and community policing to be strengthened to avert illegal poaching.
iv.	Provide signage and or underpass at the identified wildlife and livestock crossing points.
<b>Residual Impacts: (Value/Sensitivity, Magnitude of Impact, Significance)</b>	
i.	During construction phase the noted impacts have high significance in relation to community's attachment to land and its value. They are however site based and localized to construction sites/and acquired land parcels only (Isiolo and Baragoi bypasses and road realignments. They have minimal significance due to their limited site specific geographical scale.
ii.	During operational phase, the listed impacts will have low magnitude of impacts along the 417.5km road project (extent).
<b>Recommendations</b>	
The Contractor to comply with EMMP requirements	

### 8.2.8 Grévy's Zebra Trust (GZT) and Ewaso Lions Concerns to the Road Project

Infrastructure development projects have been one of the threats facing wildlife. The proposed project will have impacts to wildlife in the regions it will traverse. To this effect, GZT has a mission of conserving and the growth of wildlife, mainly Grévy's zebra and they have been involved in raising their concerns for the proposed project. Ewaso Lions is dedicated to conserving lions and other large carnivores by promoting co-existence between people and wildlife lions in the northern rangeland within where the project road traverses.

#### The Grévy's Zebras



#### 8.2.8.1 Pre-Identified Wildlife Corridors and Critical Crossing Points<sup>20</sup>

GTZ has identified various migratory corridors used by the wildlife within the proposed areas of the road alignment. The data collected for the identified corridor was based on local knowledge and stakeholders discussions on key species, which included Grévy's zebra, reticulated giraffe, African wild dog, cheetah, lion and African elephant.

Using the road alignment drawings, the groups have mapped the critical crossing points for the wildlife and classified them into Levels 1, 2 and 3, level 1 being the most critical.

#### 8.2.8.2 Proposed Mitigation Measures within the Critical Crossing Points

Although there are around forty (40) crossing points that were identified along the project road along with the related mitigation measure, implementation of the

<sup>20</sup> Information from GZT presentation at NORKEN Int, Ltd offices in Nairobi and consultations with the group in Samburu.



suggested mitigation measures will first be done to the identified critical crossing points, classified as Level 1. There are other levels, 2 and 3.

Some of the Level 1 Critical Crossing Points that will be considered will include:

- Kalama Community Wildlife Conservancy and Sera Wildlife Conservancy crossing points Km 18 + 400 where animals cross within a valley, km 21+ 400 26+460 crossing area. Suggested mitigation measures include cut and fill, cut and cover the road section.
- Ndikiv Enasunayi and Sabsab Ndikire to Lekat, Dam Area (km 15+000 to km 21+000) where wildlife crosses from Namunyak to Westgate wildlife conservancies. Within this area, road elevation (ecopassage) for wildlife crossing has been recommended. There are further elevations detailed in this report.
- At Archers Post (km 00+000) after the A2 Isiolo-Marsabit junction. An elevation of the road has been suggested. Further consultations will be necessary, especially on the viability of the suggested mitigation measure.
- Lpus pass (km 26+460) and Lamparnai km 37+480, - the elephant crossing points, from Namunyak Wildlife Conservancy area to and from Maebei Conservancy.

The wildlife breeding areas, - mainly Grévy's Zebra – have been identified. The road has avoided the areas and no activities will be carried out near the area. Table 5.9 has details on Level 1 CCP.

#### 8.1: Level 1 Highest Priority Areas for the Wildlife's Critical Crossing Points

CCP	Location	Chainage	Proposed Mitigation Measures
1	Archers Post	1+000	Elevation
2	Lakiperen to Jerunak	13+000	Cut and cover
3	Lgweita	12+000	Cut and cover
4	Samarmar	9+000	Cut and cover
5	Ndikiv Enasuyai	19+000	Elevation
6	Sabsab Ndikir to Lekat	21+000	Elevation
7	Dam Area	23+000	Elevation
8	Lenchekut	20+000	Elevation
9	Swari village Livestock crossing	31+000	Elevation
<b>Proposed Areas of Road Realignment, Level 1 Priority</b>			
10	Lenchekut		Realignment 1
11	Lengulisie		Realignment 2

**Source:** Adopted from Grévy's Zebra Trust, April 2019.

### 8.2.1 Applicable Animal Calming Ways for Less Critical Crossing Points, Levels 2, 3

#### 8-1: Speed Bumps and Warning Signs for Calming Traffic



Use of speed bumps to calm traffic within the animal crossing areas. The bumps are approx. 150 meters apart. Warning signs on the existence of bumps have also been erected

#### 8-2: Eye-Catching Information Signs on Animals' Crossing Points



The signs - as indicated in the photo - can be placed as strategic and eye catching sections of the project road.

#### 8-3: Underpass Animals Crossing Points



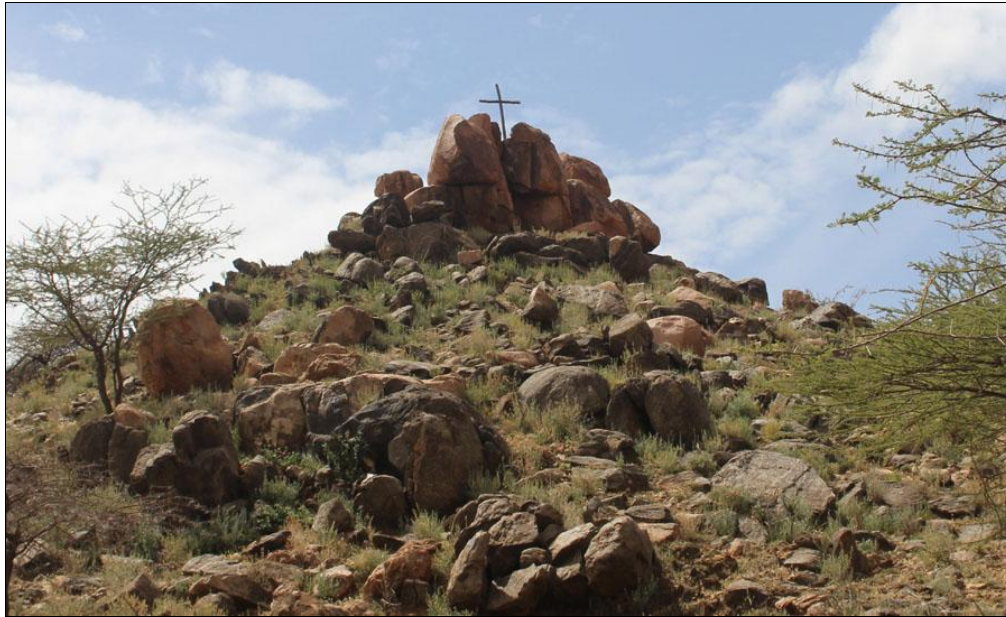
Underpasses can be erected from where small animals can be crossing the project road, avoiding possible animal kills.

**Source:** Voi-Mwatate-Maktao Road. Oct. 2019

### 8.2.2 Archaeological, Historical and Cultural Sites

The road alignment does not traverse within any archaeological sites. An area of worship was identified at km 34+ 20.

#### 8-4: Religious Sacred Site



##### Impacts

- i. Possible destruction of cultural sites during construction phase, bush clearing, earthwork, salt lick, *Moran* initiation sites, sacred trees
- ii. Possible interference with existing grave sites during excavations and earth works on realigned road sections and bypasses.

##### Mitigation Measures

- i. Cultural sites, sites of historical importance, graves etc to be identified during design stage, and especially during the RAP process.
- ii. Existing grave sites, animal salt lick areas, community commemoration sites (trees) to be identified during design stage and during the RAP process.

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

- i. Impacts of High Sensitivity value:
- ii. Their magnitude is Minor
- iii. Their significance is Adverse

##### Recommendations

Refer to mitigation measures above

#### 8.2.3 Visual Aesthetics

##### Impacts

- i. Direct encroachments on the scenic landscapes along the project road during cut and fill, cut sections and borrow pits.
- ii. Earthwork and excavation on natural greenfield along the project road, exposing an unsightly landscapes

##### Mitigation Measures

- i. Road alignment to avoid visual intrusion on scenic sites.
- ii. Adjustments to slopes and borrow pits, to be away from picturesque sites
- iii. Timely decommissioning of the borrow pits and quarries to be done to eliminate traces of visual intrusion on the landscape

##### Residual Impacts

- i. Impacts of moderate value:
- ii. Their magnitude is minor
- iii. Their significance is minor

##### Recommendations

The Contractor to comply with EMMP requirements

#### 8.2.4 Noise and Vibrations

##### Impacts

- i. Noise related disturbances, discomfort to the road's immediate neighbours during construction phase.
- ii. Destruction of activities due to noise, e.g. near learning institutions

##### Mitigation Measures

- i. Engineering Controls: Maintain the construction equipment, avoid unnecessary running/idling of work machinery, use noise screens, fix silencers on mobile and noisy equipment
- ii. Administrative Controls: restrict access to noisy working areas, run noisy equipment only when need be, Contractor rotate workers performing noisy tasks
- iii. Personal Protective Equipment (PPE): Contractor to provide workers with appropriate earplugs/earmuffs to reduce their exposure to noise only

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

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

##### Recommendations

Contractor to comply with the EMMP

#### 8.2.5 Solid and Liquid Wastes

##### Impacts

- i. Waste generation from stripped top soil and excavations
- ii. Construction activities will generate solid wastes which include trash, scrap items, oily rags and empty product drums.
- iii. Spills and leaks may also occur from vehicles and heavy equipment used during the construction operations, which may result in soil contamination.
- iv. Waste oil from the servicing of vehicles and miscellaneous solid wastes

##### Mitigation Measures

- i. Consider waste minimization practices, Reduce, reuse, recycle (e.g. waste tyres from trucks, scrap metal).
- ii. Segregate waste at the point of generation, especially at Contractor's camp
- iii. All waste to be handled and managed in accordance with EMCA (Waste Management) Regulations, 2006

##### Residual Impacts

During construction phase, the residual impacts are as follows:

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

##### Recommendations

Contractor to comply with the EMMP

#### 8.2.6 Social Characteristics

##### Impacts

- i. *Demographic*: anticipated changes to population numbers and distribution within the existing (and yet to develop) trading centres in close proximity to the project road, from Lerata, Lengusaka, Barsaloi among others.
- ii. *Cultural*: Change of traditional customs and values – especially the Samburu and Turkana communities due to internal migration of people with different cultural customs and values and from different ethnic background.
- iii. *Socio-psychological*: Possible change to quality of life and wellbeing after improved



infrastructure and associated developments amenities.
<b>Mitigation Measures</b> <ul style="list-style-type: none"> <li>i. Local authorities to control unauthorized construction of shanty structures within the trading areas, which attracts the uncontrolled residential slums developments</li> <li>ii. Introduction of cultural events and sites along the trading centres and sites.</li> </ul>
<b>Residual Impacts (Nature of Impact, Geographic Scale, Significance)</b> <ul style="list-style-type: none"> <li>i. During construction phase, the nature of impacts (demographic, cultural and socio-psychological) will be negligible along the 417km road. The impacts geographical scale will mainly be localized to construction sites only and impacts significance will be negligible.</li> <li>ii. During operation phase, and with time, the impacts will be of major significance (demographics of the trading centres), localized within the towns and of medium significance.</li> </ul>
<b>Recommendations</b> Contractor to comply with the EMMP

### 8.2.7 Health Settings

<b>Impacts</b> <ul style="list-style-type: none"> <li>i. Potential impacts from generated dust during construction phase.</li> <li>ii. Increased potential effects from air emissions, caused by construction equipment.</li> <li>iii. Potential effects of waste management and control measures during the construction phase.</li> <li>iv. During operation phase, possible increased potential effects from air emissions, caused by vehicular traffic.</li> </ul>
<b>Mitigation Measures</b> <ul style="list-style-type: none"> <li>i. Conduct basic Occupational Health Training programs to construction workers during construction phase.</li> <li>ii. Ensure workers are oriented to the specific hazards of individual work assignment.</li> <li>iii. Conduct toolbox talks focusing on relevant health and safety issues.</li> <li>iv. HIV/AIDS, STDs awareness, training and prevention services to be offered throughout the project period.</li> <li>v. A Code of Conduct should be distributed to all workers, and health personnel should reinforce their efforts to combat diseases during the construction period.</li> <li>vi. Workers to be sensitized on the consequences of social ills and promiscuous behaviours (over consumption of alcohol, STDs, HIV /AIDS etc).</li> <li>vii. Contractor to establish mobile clinic within the construction sites</li> </ul>
<b>Residual Impacts(Nature of Impact, Geographic Scale, Significance)</b> <ul style="list-style-type: none"> <li>i. During construction phase, health related impacts will be low but not negligible along the 417km road. The impacts geographical scale will mainly be localized within construction sites only and impacts significance will be minimal.</li> <li>ii. During operation phase, the impacts will be of major low, localized along the project road.</li> </ul>
<b>Recommendations</b> The Contractor to employ a safety and health advisor to be handling all safety and health related issues. Review of health setting to be done and reviewed on monthly basis.

### 8.2.8 Security and Public Safety

<b>Impacts</b> <ul style="list-style-type: none"> <li>i. Disruption of work progress as a result of insecurity within the workplace or at camps</li> <li>ii. Delay of work progress</li> <li>iii. Damage of property</li> </ul>
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<b>Mitigation Measures</b> <ol style="list-style-type: none"> <li>Provide security guards at camps and selected working areas on 24/7 basis.</li> <li>Adhered to high standards of safety</li> <li>Construction vehicles should drive carefully,</li> <li>Gravel should be watered at construction sites/built up areas to avoid dust.</li> <li>Provide condoms to construction workers.</li> <li>Use secure storage facilities for toxic materials.</li> <li>Employees to be provided PPE.</li> <li>Contractor to provide regular toolbox talks to the workers, to cover security and safety, among other issues.</li> </ol>
<b>Residual Impacts (Nature of Impact, Geographic Scale, Significance)</b> <ol style="list-style-type: none"> <li>During construction phase, the nature of impact is negligible. The impacts geographical scale will mainly be localized to construction sites only and impacts significance will be of major significance.</li> <li>During operation phase, the impacts will be localized and significant.</li> </ol>
<b>Recommendations</b> Contractor to adhere to the EMMP

### 8.2.9 Community Views and Concerns/Public Consultation

Public consultations were carried out with the objective of gaining views, concern and value in regards to possible negative and positive impacts due as a result of the project road during its project cycle. Through this, it was anticipated that transparency and accountability throughout the project cycle will be achieved. Possible conflicts between the project client (KeNHA/Gok), Contractor, proponents, stakeholders and community members living in close proximity to the proposed project sites would be addressed and solved at an earlier stage.

Interviews and consultative public meetings (barazas) were the main techniques which were used to consult the public and interested parties.

A total of eight meetings were held along the trading centres within the project road, which was adequately attended by over 800 stakeholders.

### 8.2: Recurrent Issues of Concern and Views from the Community

Issues of Concern Discussed	Participants Views and Suggestions
<b>Pre-Construction / Design Phase</b>	
Land acquisition during design and surveying process	<ul style="list-style-type: none"> <li>A group number of participants wanted to know if their property will be affected through the alignment and road design.</li> </ul>
Identification of livestock road crossing points to salt licking areas, water points, dams or to Manyatta	<ul style="list-style-type: none"> <li>All the crossing points should be identified during design stage.</li> </ul>
Sources of raw materials for road construction, whereby an EIA will be required	<ul style="list-style-type: none"> <li>The road Contractor to consult the management of the community wildlife conservancies and local community before starting any extraction of materials</li> </ul>
Sources of water for construction, sinking boreholes – EIA will be required.	<ul style="list-style-type: none"> <li>Community to be consulted first before water abstraction or borehole is sunk.</li> </ul>



Identification of Environmental & Social sensitive location	<ul style="list-style-type: none"> <li>Community will assist the RAP team to identify all the Environmental &amp; Social sensitive locations</li> </ul>
Areas of social and cultural significance, - sacred trees or sites, grave sites.	<ul style="list-style-type: none"> <li>Contractor's failure to recognize and respect the areas of social significance can create conflicts with the community members.</li> <li>The areas to be identified before the start of construction work.</li> </ul>
<b>Construction Phase</b>	
Employment, - youth (men and women) during construction phase Location of workmen's camps and related impacts.	<ul style="list-style-type: none"> <li>Locals should be given job the opportunity, especially low-skilled tasks as opposed to the Contractor bringing in workers from elsewhere.</li> <li>Women should be given job opportunities, mainly less strenuous tasks.</li> </ul>
Haulage of raw materials from quarries and borrow pits	<ul style="list-style-type: none"> <li>Locals should be given the opportunity to supply raw materials to the contractor<sup>21</sup>.</li> </ul>
<b>Operation Phase</b>	
Possible increase in wildlife kills / poaching along migratory corridors (crossing points) at Namunyak (Wamba hills in North to Wamba in North).	<ul style="list-style-type: none"> <li>Information signs at wildlife crossing points along the project road.</li> </ul>
Poaching and increase of trade in bush meat.	<ul style="list-style-type: none"> <li>The Government, in coordination with KWS, KPR and local community wildlife organisations members to organize a seminar to seek for solutions on handling poachers and illegal traders bush meat traders<sup>22</sup></li> </ul>
Insecurity for road users or tourists driving along the project road	<ul style="list-style-type: none"> <li>Police posts to be constructed at the possible volatile areas.</li> </ul>
Highway robbery during road operation.	<ul style="list-style-type: none"> <li>Additional police posts to be built along the project road.</li> <li>Constant police control</li> </ul>

#### **8.2.10 Social Amenities along the Project Road**

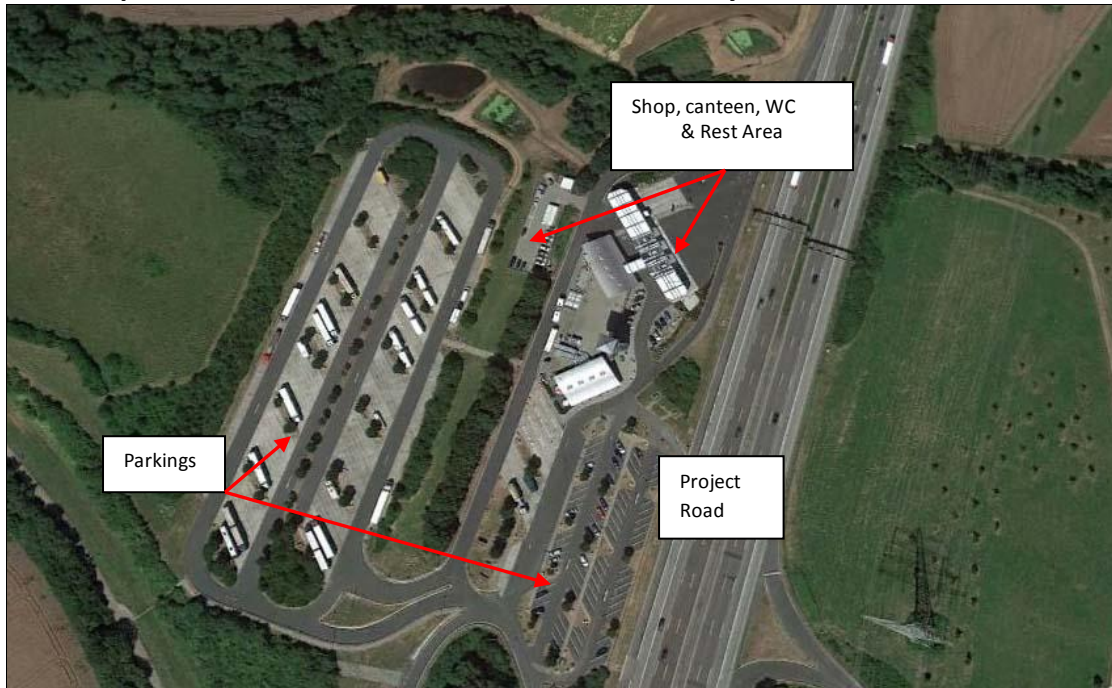
Rest areas have been recommended as the apt roadside social amenities for the project road, at a spacing of 50kms from Lerata – Wamba junction. The most scenic roadside amenities will be at km 150+ 600, 164+ 400, the sections from Naturkan towards the scenic Suguta valley and from Kamuge towards the valley. The access road to the recommended rest area will be tarmacked, with entry and exit points from the project road. The rest areas will be having the following specifications:

- Vehicles parking area,
- Restaurant with toilet/ wash room for men and women.
- Security lighting.

<sup>21</sup> The Contractor has to meet specific standards of the materials used.

<sup>22</sup> The idea of holding seminars was however not fully supported, e.g. by police officer in Baragoi who noted that solutions to handle poachers lies with the community, and not with the Government.

### 8-5: Sample Plan View of a Rest Area Roadside Amenity



Suggested construction site for the sample rest area will be at km 164+400, a scenic area facing Suguta valley. It will be expected that during the road's operation phase, commercial filling stations with rest areas, - vehicle parking, restaurants and toilets will be built. Their locations and designs will be regulated by government mandated authorities, among them KeNHA.

The recommended roadside amenity will primarily be:

- Erected to meet the needs of travelers. The project road will cover approx 417 km. For the long distance travelers, e.g. from Isiolo to Baragoi, there will be need for reducing fatigue and related crashes.
- They will also provide facilities for travelers to stop clear of traffic and therefore avoiding collisions with stopped vehicles on the road.

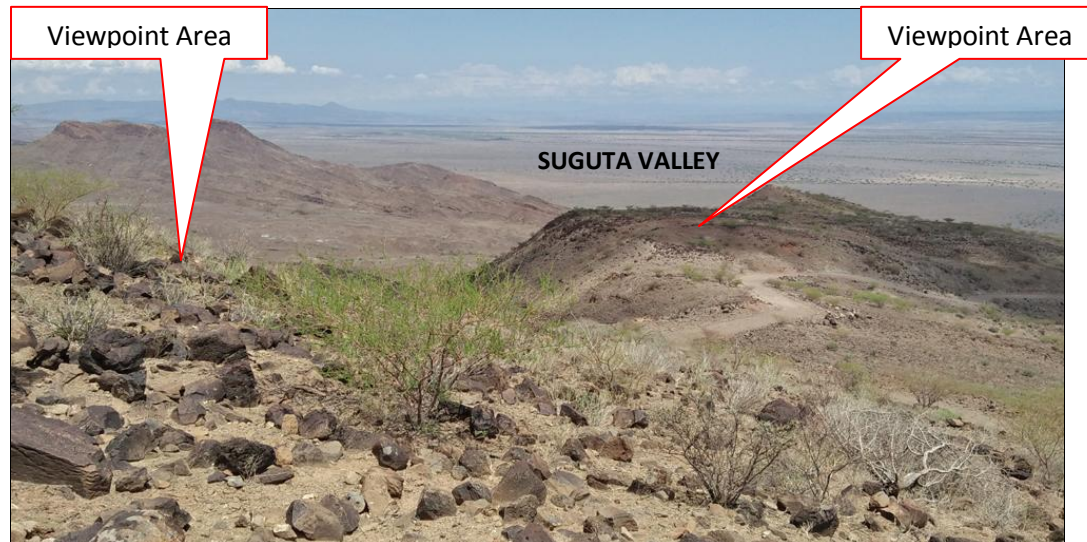
#### **8.2.11 Areas of Scenic Interest**

Suguta valley km 184 to 186 and km 205 to 203, - Kamuge areas offers good scenic sites where viewpoints of the Suguta valley can be erected. The viewpoint should:

- To be landscaped to provide a parking area for vehicles and the viewers.
- To be provide with a protected viewing area guardrail to protect the viewers from falling.

The community should however be guided in the management of the scenic sites and locals' interactions with travelers at the scenic sites.

## 8-6: Areas of Scenic Interest



Suguta valley viewed at km 186+000.



Road section viewed from Naturkan, at km 150+600

## 8.3 CLIMATE CHANGE AND POTENTIAL IMPACTS TO THE PROJECT

### 8.3.1 *Temperature Trends and Climate Change*

Rise in temperature has evidenced climate change in Kenya, and especially within the project areas, the arid Turkana, Samburu and Isiolo Counties where the project road will traverse.

Observations and projections made from 1975 and projected upto 2025 indicates that both the minimum (night time) and maximum (daytime) temperatures have been on an increasing (warming) trend. The minimum temperature has risen generally by 0.7 – 2.0 °C and the maximum by 0.2 – 1.3 °C<sup>23</sup>. Within the project areas (refer to Fig. 7.1, project areas marked), - for the months March, April, May and June- the projected temperature changes from 1975 to 2025 ranges from +0.7 °C to 1.1°C.

<sup>23</sup> For further details, refer to: National Climate Change Response Strategy, 2010, Evidence and Impacts of Climate Change in Kenya, pg. 9.



### 8.3: Temperatures Trends, - Observed and Projected - in the Project Areas

Project Area	Observed and Projected Precipitation Change	Comments on the 50 Year's Trend/ Possible Impacts
Isiolo	<+0.7°C	Gradual temperature rise
Samburu	+/-1.1°C	Gradual temperature rise
Turkana	+/-1.1°C	Gradual temperature rise

#### 8.3.2 Rainfall

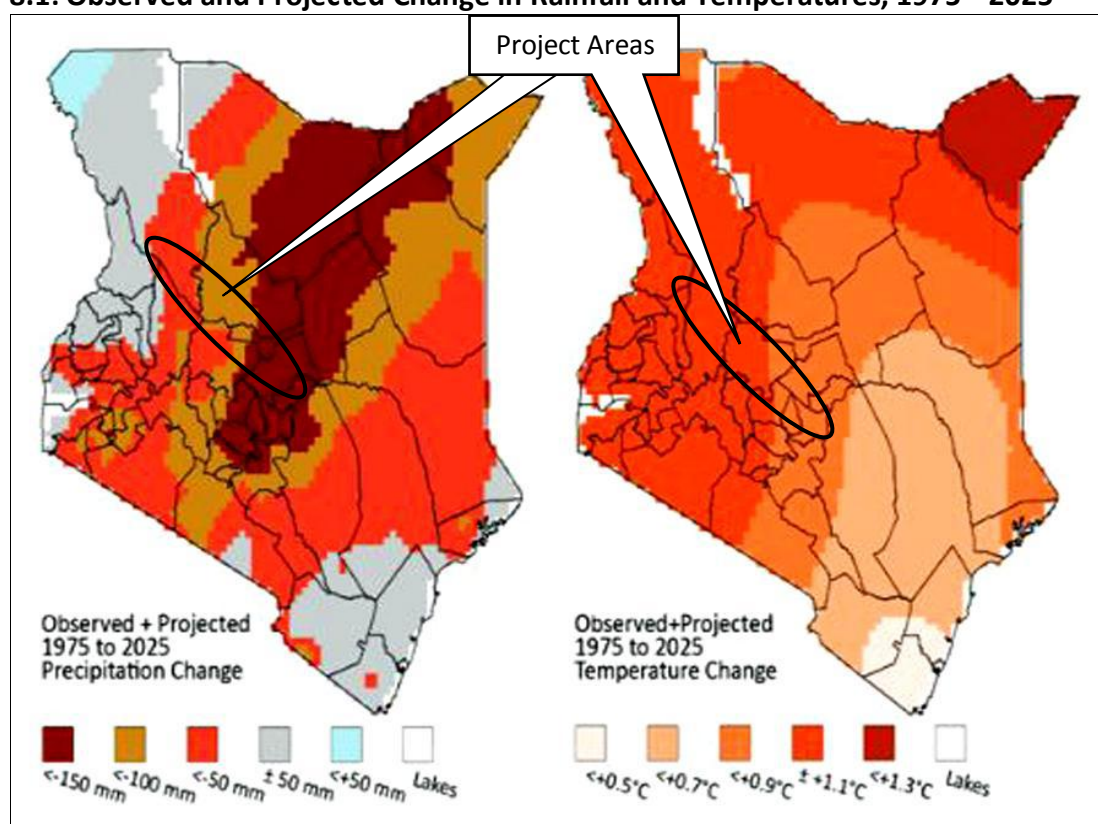
Rainfall periods are becoming shorter, irregular and unpredictable not only within the project areas but in the country in general. Prolonged droughts are more frequent and severe. From the observed and projected precipitation change from 1975 to 2025, (Fig. 7.1), it will be noted that there will changes in precipitation as listed in table 7.3 below:

### 8.4: Rainfall Trends, - Observed and Projected - in the Project Areas

Project Area	Observed and Projected Precipitation Change	Comments on the 50 Year's Trend
Isiolo	<-150mm	Gradual decline
Samburu	<-100mm	Gradual decline
Turkana	<-50mm	Minimal decline

*Source:* adapted from USAID's Famine Early Warning System Network, 2010.

### 8.1: Observed and Projected Change in Rainfall and Temperatures, 1975 - 2025



*Source:* USAID's Famine Early Warning System Network, 2010.

### 8.3.3 Potential Impacts as a Result of Climate Change

Flooding has been witnessed during the erratic rainy period mainly in Samburu and Turkana, with associated damages of existing roads. Drainage systems near the roads are overwhelmed by excessive water flow. This possible impact for the proposed road has been taken into account during the design phase, especially in drainage and related structure.

To mitigate possible flood related impacts along the project road and within the watercourses, hydrology, structures and roadside drainage have been analysed and appropriate structures proposed to manage hydrological related effects to the road along the watercourses. Table 7.4 has details on the recommended structures

### 8.5: Structures for Floods Mitigation, Location and Chainage

No.	Location	Catchment Area	Estimated Peak Flood Flows (m <sup>3</sup> /s)		Recommended Type and Sizes	
		CA (Km <sup>2</sup> )	Q <sub>25-yr</sub>	Q <sub>50-yr</sub>	Type and Size	Hydraulic Capacity Q= 1.833+1.655(n-1)W*H <sup>1.5</sup>
1	7+830	121.00	355.89	<b>406.73</b>	BRIDGE PCI TRIPLE SPAN 20X4M	<b>630.00</b>
2	8+270	0.51	5.29	<b>5.99</b>	SINGLE CELL RCBC 2MX1.5M	<b>7.78</b>
3	39+570	4,601.00	535.81	<b>756.35</b>	BRIDGE PCI TRIPLE SPAN 40X3.55M	<b>929.00</b>
4	128+590	5.00	39.63	<b>44.88</b>	TWIN CELL RCBC 5MX2M	<b>49.33</b>
5	138+380	525.00	694.28	<b>793.46</b>	FOUR SPAN BRIDGE PCI 30X3M	<b>1,348.00</b>
6	189+450	0.04	<b>0.34</b>	0.39	SINGLE BARREL 900MM DIA RCPC	<b>1.09</b>
7	210+090	4.00	27.28	<b>30.89</b>	TWIN CELL RCBC 4MX2M	<b>39.46</b>
8	211+555	2.00	21.72	<b>24.60</b>	TWIN CELL RCBC 3MX2M	<b>29.60</b>
9	212+130	1.60	<b>13.43</b>	15.21	TWIN CELL RCBC 2MX2M	<b>19.73</b>
10	213+540	0.83	<b>8.25</b>	9.35	SINGLE CELL 2MX2M RCBC	<b>10.37</b>
11	213+310	0.17	<b>1.84</b>	2.08	TRIPLE BARREL 900MM DIA RCPC	<b>3.27</b>
12	218+890	2.90	22.19	<b>25.13</b>	TWIN CELL RCBC 3MX2M	<b>29.60</b>
13	242+920	9,500.00	1,854.56	<b>2,433.78</b>	FOUR BARREL 900MM DIA RCPC	<b>3,475.00</b>

## **9 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)**

### **9.1 OBJECTIVES OF THE ESMP**

This section shall specify that the ESMP aims to bring the project into compliance with applicable national environmental and social legal requirements and the Bank's safeguards policies and procedures. The other objective of the ESMP is to outline the mitigating/enhancing, monitoring, consultative and institutional measures required to prevent, minimize, mitigate or compensate for adverse environmental and social impacts, or to enhance the project beneficial impacts. It shall also address capacity building requirements to strengthen the Borrower's safeguards capacities if necessary. Its aim is also to specify the environmental and/or social loan conditions or covenants that are part of the project loan agreements to ensure that the project meets the Bank's safeguards requirements

### **9.2 COMMUNICATION WITH STAKEHOLDERS, GRIEVANCE REDRESS MECHANISM**

#### **9.2.1 *Communication with Stakeholders***

During the public consultations multiple groups of stakeholders were consulted. The stakeholders were those with an interest in the project development, and who will be involved in the further consultative process. The main groups of stakeholders are:

##### *Directly Affected People*

The directly affected people are those who derive their living along the proposed Isiolo – Lokichar road. These people will be destabilized in their business and residential homes while some losing their assets, trees and land. All the directly affected people were informed and consulted on major issues concerning relocation, livelihood rehabilitation and income restoration. They all adequately participated in the socio economic survey.

##### *Indirectly Affected Persons*

These group of stakeholders includes all those who reside in areas neighbouring the project area or are reliant on operations in the project area who may be have to adjust their livelihoods e.g. pastoralists along the proposed Isiolo – Lokichar road.

##### *Government Agencies and Other Organizations*

To ensure the interests of the affected persons are fully entrenched in the RAP process and income restoration, the consultant adopted a thorough consultation with the affected persons, representatives of any affected group, any interested group and the various administrative and government departments along the project area. Such consulted parties include: Isiolo, Samburu and Turkana Counties, county commissioners, deputy county commissioners, assistant county commissioners, chiefs, assistant chiefs, village elders, representatives of the Ministry of Transport, Infrastructure, Housing and Urban Development among others.

#### **9.2.2 *Grievance Process***

The grievance process is designed to ensure that PAPs have opportunity to access the project and have their concerns addressed. In addition, it allows the project to be active in identifying solutions to grievances. It should be noted that the grievance procedure will not replace the existing legal process in Kenya, rather based on consensus, it will seek to resolve issues quickly so as to expedite receipt of entitlements and smooth



resettlement without resorting to expensive and time-consuming formal legal action. If this procedure fails to provide a solution, complainants can still seek legal redress.

The project will therefore put in place an extra-judicial mechanism for managing grievances and disputes based on explanation and mediation by a third party, preferably a committee comprising local leaders and trusted citizens independent of the project. Every aggrieved person shall be able to trigger this mechanism, while still being able to resort to the formal judicial system, if they so wished.

### **9.2.3 The Overall Grievance Mechanism**

KeNHA will form a grievance committee comprising its staff, local leaders and members of a local NGO if any. The Grievance committee will receive information from three main sources:

- Directly from affected persons.
- From the implementation team executing the resettlement.
- From the Monitoring and Evaluation Officer (KENHA staff)

All grievances will be recorded with a grievance log which will be held at by KENHA's representative/ staff (Grievance Officer). The log would indicate grievances, date lodged, actions taken to address or reasons the grievance was not acted on (i.e. the grievance was not related to the resettlement process), information provided to complainant and date the grievance was closed. Grievances can be lodged at any time, either directly or through a grievance committee member. The process for lodging a complaint is outlined below:

- A Grievance Officer will receive the complaint. The complaint must be provided in-person by the complainant.
- The Grievance Officer will ask claimant questions in Kiswahili language write the answers in English and enter the answers in English onto the Grievance Form.
- A local leader will witness translation of the grievance into English.
- The local leader and Complainant will both sign the Grievance Form after they confirm accuracy of the grievance.
- The Grievance Officer lodges the complaint in the Grievance Log.

Grievances shall be resolved, and status reported back to complainants within 2 weeks. If more time is required, this shall be communicated clearly and in advance to the aggrieved person.

Once the Grievance Committee has determined its approach to the lodged grievance, this will be communicated to the grievance officer, who will communicate this to the complainant. If satisfied, the complainant signs to acknowledge that the issue has been resolved satisfactorily. If the complainant is not satisfied however, the complainant notes the outstanding issues, which may be re-lodged with the Grievance Committee or the complainant may proceed with judicial proceedings.

## **9.3 AUDITING AND MONITORING**

Pursuant to EMCA, second schedule of the Environmental Management and Coordination Act (1999), environmental audits will be carried out after the first year of operation. Areas to be audited will include material sites (quarries), contractor's asphalt plant and the workmen's camp.

#### **9.4 THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)**

Table 9.1 has details on the EMP matrix

## 9.1: Environmental Management Plan

Project Activities	Environmental Impacts.	Proposed Mitigation Measure / Action Plans	Monitoring/Inspection Type, Institutional Measures and Responsibility	Cost Estimates / Outlays	Targets to Achieve	Timeframe and Monitorial Indicators
<b>SITE PREPARATION AND CONSTRUCTION PHASE</b>						
<ul style="list-style-type: none"> <li>• Surveying and road alignment</li> </ul>	Land acquisition	<ul style="list-style-type: none"> <li>• Carry out RAP to address PAPs issues of concern in land acquisition and road alignment process.</li> <li>• Hold a consultative meetings with key stakeholders to seek project acceptance</li> <li>• Review existing EA audit report for existing material sites within the site and note all the contentious issues</li> <li>• Identify all critical wildlife crossing points and implement appropriate mitigation measures to avoid wildlife vehicle collision.</li> </ul>	<p>Scheduled clarification and confirmation meetings to be organized by:</p> <ul style="list-style-type: none"> <li>• KeNHA</li> <li>• NLC</li> <li>• Local Authorities (DCC, Chiefs)</li> <li>• Management staff of Grévy's Zebra Trust, and Ewaso Lions</li> </ul>	To be established in the RAP after valuation process	Minimal or no land related complaints or conflicts with the PAPs; Compensations to the PAPs	Before the start of construction work.
<ul style="list-style-type: none"> <li>• Seismic and ground stability testing.</li> </ul>	<ul style="list-style-type: none"> <li>• Noise, aerial emissions of dust pollution.</li> <li>• Depletion of vegetation cover.</li> <li>• Incidents of ground vibrations.</li> <li>• Water pollution.</li> <li>• Disturbance of wildlife</li> </ul>	<ul style="list-style-type: none"> <li>• Use explosives magazines as specified by the Explosive Act 115, during seismic and ground stability testing.</li> <li>• Sensitize workforce on the relevance of using PPE.</li> <li>• Inform and sensitize the local community on the planned project, especially dates, time when seismic ground stability testing will take place and the necessary precautions.</li> </ul>	<p><b>Monthly planned verification inspections by<sup>24</sup>:</b></p> <ul style="list-style-type: none"> <li>• KeNHA</li> <li>• Resident Engineer</li> <li>• Highway Engineers</li> <li>• Contractor.</li> <li>• Environmentalist</li> </ul> <p><b>Spontaneous inspections by:</b></p> <ul style="list-style-type: none"> <li>• County Environment Officer.</li> <li>• Kenya KWS.</li> <li>• Representatives of Community/Group Ranches</li> </ul>	As per the Bill item and the requirements under clause 1.15 of the standard specifications for road and bridge document.	Minimize or avoid any diverse negative effects that may result from the named project activities.	<p><b>Timeframe:</b> Monitoring and inspections to be carried out within the sites preparation phase and before construction begins.</p> <p><b>Monitorial Indicators</b></p> <ul style="list-style-type: none"> <li>• Noise levels in dB</li> <li>• Constituents of dust</li> <li>• Level of water pollution</li> </ul>
<ul style="list-style-type: none"> <li>• Site clearance,</li> <li>• Removal of top soil, vegetation.</li> <li>• Road diversions</li> </ul>	<ul style="list-style-type: none"> <li>• Soil erosion</li> <li>• Depletion of vegetation cover.</li> </ul>	<ul style="list-style-type: none"> <li>• Install erosion control measures on exposed areas.</li> <li>• Control /manage excavation activities, earthworks.</li> </ul>	<p><b>Monthly planned verification inspection by:</b></p> <ul style="list-style-type: none"> <li>• KeNHA</li> <li>• Resident Engineer</li> </ul>	as per the bill item on abating plumes of dust/soil erosion.	Minimal dust and accidents on road diversions.  Landscaped road	<p><b>Timeframe:</b> Monitoring to be carried out during preparation period and before construction work.</p>

<sup>24</sup> All planned inspections to be firmed up by the monthly environmental monitoring report and monthly consultative meeting at site office with key stakeholders.

<ul style="list-style-type: none"> <li>• water abstraction</li> <li>• Construction of support infrastructures.</li> </ul>	<ul style="list-style-type: none"> <li>• Air pollution, dust and noise.</li> <li>• Loss of socially /economically useful vegetation/ land components.</li> </ul>	<ul style="list-style-type: none"> <li>• Install drainage structures properly</li> <li>• Landscaping, re – vegetation, backfill of exposed surfaces around the sites.</li> <li>• Planting of grass to be done within preparation and clearing phase and just before rains.</li> <li>• Avoid clearing vegetation using herbicides.</li> </ul>	<ul style="list-style-type: none"> <li>• Highway Engineers</li> <li>• Contractor.</li> <li>• Environmentalist</li> </ul> <p><b>Technical and planned Inspections by:</b></p> <ul style="list-style-type: none"> <li>• Resident Engineer</li> <li>• Inspectorate Officers, Ministry of Water and Irrigation.</li> </ul> <p><b>General Inspections by:</b></p> <ul style="list-style-type: none"> <li>• Community leaders /opinion leaders</li> <li>• Enforcement and Compliance Officers from respective county authorities.</li> </ul>		<p>environ with minimal soil erosion.</p>	<p><b>Monitorial Indicators</b></p> <ul style="list-style-type: none"> <li>• Soil contaminants.</li> <li>• Amount of soil lost.</li> <li>• Land ownership documents.</li> <li>• Water pollution.</li> </ul>
Hydrology and drainage.	<ul style="list-style-type: none"> <li>• Soil erosion</li> <li>• Accidents</li> <li>• Water pollution</li> </ul>	<ul style="list-style-type: none"> <li>• Roads design and related activities not to encroach on environmentally sensitive areas such as wetlands or traditional cultural sites,</li> <li>• Replant road reserve with grass or stabilizing shrubs (e.g. vetiver grass) to prevent soil erosion.</li> <li>• Design adequate culverts for all crossings to accommodate peak runoff from effective catchments and swamps.</li> </ul>	<p><b>Monthly planned verification inspections by:</b></p> <ul style="list-style-type: none"> <li>• KeNHA</li> <li>• Resident Engineer</li> <li>• Highway Engineers</li> <li>• Contractor.</li> <li>• Environmentalist</li> </ul> <p><b>Spontaneous inspection by:</b></p> <ul style="list-style-type: none"> <li>• County Environment Officer.</li> <li>• Ministry of Water and Irrigation.</li> </ul>	As per bill Item in the BoQ and in the engineering estimates.	Minimal soil erosion, water pollution and accidents.	<p><b>Timeframe:</b></p> <p>Monitoring to be carried out during preparation period and before construction work.</p> <p><b>Monitorial Indicators</b></p> <ul style="list-style-type: none"> <li>• Soil contaminants.</li> <li>• Amount of soil lost.</li> </ul>
<ul style="list-style-type: none"> <li>• Setting up of site camp, offices.</li> </ul>	<ul style="list-style-type: none"> <li>• Disposal of solid waste at camp.</li> <li>• Waste construction materials.</li> </ul>	<ul style="list-style-type: none"> <li>• Provide proper solid waste disposal facilities at camp.</li> <li>• Provide proper sanitation facilities.</li> </ul>	<p><b>General inspection by:</b></p> <ul style="list-style-type: none"> <li>• OHS Advisor</li> <li>• Highway Engineer</li> <li>• Inspectorate and Enforcement Officers from local authorities in the respective Counties</li> <li>• Fire safety inspectorate section (County Authority)</li> <li>• Administration Police.</li> </ul>	As per bill Item in the BoQ and in the engineering estimates.	To avoid negative impacts on the project natural environment.	<p><b>Timeframe:</b></p> <p>During site preparation period.</p> <p><b>Monitorial Indicators</b></p> <ul style="list-style-type: none"> <li>• Levels of soil erosion.</li> <li>• Extent of lost vegetation cover.</li> <li>• Displacements</li> </ul>

Excavation, acquisition work, transportation and storage of raw materials (gravel sites, hardstone, stockpile area etc)	<ul style="list-style-type: none"> <li>• Soil erosion.</li> <li>• Air pollution</li> <li>• Noise, aerial emission of dust.</li> <li>• Land degradation</li> <li>• Loss of land value at raw material sites and stockpile.</li> <li>• Loss of vegetation.</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor to consult community and relevant authority before any work starts.</li> <li>• Identified quarry sites and borrow pit sites to be exhausted, reinstated and rehabilitated before opening other sections.</li> <li>• Exhausted quarries to be backfilled.</li> <li>• Limit earth movements to dry season.</li> <li>• Borrow pits should be rehabilitated.</li> <li>• Balance cut and fills to avoid deposition.</li> <li>• Use appropriate methods of controlling soil erosion.</li> <li>• Control speed of construction vehicles and impose speed limits for all.</li> <li>• Prohibit idling of vehicles</li> <li>• Sensitize workforce.</li> <li>• Maintain work equipment</li> </ul>	<p><b>Monthly verification inspections by:</b></p> <ul style="list-style-type: none"> <li>• KeNHA</li> <li>• Resident Engineer</li> <li>• Highway Engineers</li> <li>• Contractor.</li> </ul> <p>Environmentalist</p> <p><b>Spontaneous inspection by:</b></p> <ul style="list-style-type: none"> <li>• NEMA official from the</li> <li>• Traffic police officers (from project areas).</li> <li>• County water and irrigation officers, Ministry of Water and Irrigation.</li> </ul>	As per provisions of Bill 7 of BoQ	To avoid negative impacts on the project natural environment	<p><b>Timeframe:</b> During site preparation period.</p> <p><b>Monitorial Indicators</b></p> <ul style="list-style-type: none"> <li>• Levels of soil erosion.</li> <li>• Extent of lost vegetation cover.</li> <li>• Displacements</li> </ul>
River regulation, water acquisition impounding, abstraction and use.	<ul style="list-style-type: none"> <li>• Water pollution.</li> <li>• Soil erosion</li> <li>• Social conflicts with communities.</li> </ul>	<ul style="list-style-type: none"> <li>• Solid waste, fuels, oil should not be discharged on the land surface and then into the river.</li> <li>• Cleaning and maintenance of equipment and machines to be done only at designated places.</li> </ul>	<p><b>Verification inspections by:</b></p> <ul style="list-style-type: none"> <li>• Contractor</li> <li>• Water officer, Ministry of Water and Irrigation.</li> <li>• Road Engineer.</li> <li>• District Water Catchment / Appropriation Board officer from Samburu East/Central Districts</li> </ul>			<p><b>Timeframe:</b> During site preparation period.</p> <p><b>Monitorial Indicators</b></p> <ul style="list-style-type: none"> <li>• Issues of concern raised by communities</li> <li>• Levels of soil erosion.</li> <li>• Extent of lost vegetation cover.</li> </ul>
Haulage of materials	<ul style="list-style-type: none"> <li>• Dust emission</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure on site speed regulations for haulage trucks.</li> <li>• Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles (First acquire consent from community and WRMA to sprinkle water).</li> <li>• Use of protective gear.</li> </ul>	<p><b>Verification inspections by:</b></p> <ul style="list-style-type: none"> <li>• Contractor</li> <li>• Community elder (chief) living close to haulage route PAP</li> </ul>	As per bill No. 7/8 of the standard specifications for road and bridge construction document.	To avoid dust impacts for residents near road pedestrians and possible dust related eye diseases.	<p><b>Timeframe:</b> During construction</p> <p><b>Monitorial Indicators</b></p> <ul style="list-style-type: none"> <li>• Issues of concern raised by affected communities.</li> </ul>

Project Activities / Impact Sources	Environmental Impacts.	Proposed Mitigation / Action Plans	Type of Monitoring / Inspection	Cost Estimates / Outlays	Targets to Achieve	Timeframe and Monitorial Indicators
<b>PROJECT OPERATION AND MAINTENANCE PHASE</b>						
<ul style="list-style-type: none"> <li>Decommissioning and rehabilitation of raw material sites- quarry and borrow pits.</li> <li>Landscaping of material stockpile and spoil areas.</li> </ul>	<ul style="list-style-type: none"> <li>Development of badlands.</li> <li>Land degradation.</li> <li>Abandoned borrow pits.</li> <li>Loss of land value around material sites (stockpile and spoil areas).</li> <li>Loss of vegetation</li> <li>Accidents at borrow pits, quarry sites.</li> </ul>	<ul style="list-style-type: none"> <li>Institute Standard Operation procedures (SOP)</li> <li>All materials from stockpile areas to be removed and the area to be landscaped.</li> <li>All waste and surplus materials at spoil areas to be collected and disposed at designated places and not dumped within the road reserve.</li> <li>Replant vegetation on reserve, diversion route upon completion</li> <li>Quarry pits to be covered with soil and thus creating farming land.</li> <li>Borrow pits to be fenced and used as water harvesting points where applicable Harvested water to benefit communities nearby (alternative)</li> <li>Plant trees at appropriate places to serve as pollution screen.</li> </ul>	<p><b>Scheduled and verification inspection by:</b></p> <ul style="list-style-type: none"> <li>KeNHA officials</li> <li>NEMA official</li> <li>Environmentalist</li> </ul> <p><b>Technical Inspections by:</b></p> <ul style="list-style-type: none"> <li>Road Design Engineers</li> </ul>	Costs to be guided by the annual roads maintenance budgetary allocation.	Minimal negative impacts on the natural and human environment.	<p><b>Timeframe:</b> Suggested monitoring and inspection to be carried out during operation phase and immediately after completion.</p> <p><b>Monitorial Indicators:</b></p> <ul style="list-style-type: none"> <li>Feedbacks from community members/ complaints after project monitoring.</li> <li>Review of the analyzed parameters and their impact levels (such as, pH, BOD, COD, Silica, Oils, Metals etc).</li> </ul>
Waste Management	<ul style="list-style-type: none"> <li>Generated waste resulting from various operations.</li> <li>Oil pollution.</li> </ul>	<ul style="list-style-type: none"> <li>Provide appropriate options for waste management.</li> <li>Assess opportunities for reducing solid waste generation in particular of hazardous and undesirable materials (oils and grease).</li> <li>Dumping of oil residuals and any other waste to be done in designated areas only.</li> <li>Encourage segregation of waste from the source and use the 3R waste management approach: <i>Reduce, Reuse and Recycle.</i></li> <li>Design provisional waste material storage</li> </ul>	<p><b>Spontaneous and general inspection by:</b></p> <ul style="list-style-type: none"> <li>Public Health Officers, Respective County Officers</li> <li>Respective County Officers Traffic Police</li> <li>Contractor</li> </ul>	as per provisions of Bill 1.17 of the standard specifications.	Minimal negative impacts on the natural and human environment	<p><b>Timeframe:</b> Monitoring and inspection to be carried out during construction and decommissioning phase.</p> <p><b>Monitorial Indicators:</b></p> <ul style="list-style-type: none"> <li>Constituents of generated waste.</li> <li>Public complaints.</li> <li>Status of machinery, tools and vehicles used for the project..</li> <li>Analysis of type of waste and quantities inventory.</li> </ul>



		<p>for the sorted out waste at the site (e.g. spoil area)</p> <ul style="list-style-type: none"> <li>• Dispose all unwanted structures, wastes and unused materials in accordance to NEMA Waste Management Regulations.</li> <li>• Undertake an inventory of the type of waste and quantities.</li> </ul>				<ul style="list-style-type: none"> <li>• Housekeeping status of stockpile areas and spoil areas.</li> </ul>
Health, safety and security issues. (Construction and operation)	<ul style="list-style-type: none"> <li>• Increase of road and related accidents.</li> <li>• Occupational injuries.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain provisions for road safety e.g. through installing signage and awareness information on road condition such as black spots etc.</li> <li>• Encroachments upon road reserve to be avoided.</li> <li>• Provide facilities for accidental spillages to combat risk.</li> <li>• Use secure storage facilities for toxic materials.</li> <li>• Employees to be provided PPE.</li> <li>• Workers to be sensitized on the consequences of social ills and promiscuous behaviours (over consumption of alcohol, STDs, HIV /AIDS etc).</li> </ul>	<p><b>Spontaneous and general inspection by:</b></p> <ul style="list-style-type: none"> <li>• Public Health Officers from Respective County</li> <li>• Traffic Police</li> <li>• Contractor</li> <li>• Road Engineer</li> </ul>	Costs provided under the road maintenance budgetary allocation.	High level of safety awareness with respect to the road users (drivers and pedestrians)	<p><b>Timeframe:</b> Monitoring and inspection to be carried out during construction and decommissioning phase.</p> <p><b>Monitorial Indicators:</b></p> <ul style="list-style-type: none"> <li>• Frequency of accidents</li> <li>• Time and the areas where accidents occur</li> <li>• Public complaints</li> <li>• Identifiable causes of accidents.</li> </ul>
Ergonomic risks during construction and operation.	<ul style="list-style-type: none"> <li>• Hazards due to heavy manual lifting of tools and equipment.</li> <li>• Accidents due to improper handling of tools / equipment.</li> </ul>	<ul style="list-style-type: none"> <li>• Train workers on appropriate methods of manual lifting of heavy equipment and materials to avoid occupational health complaints such as musculoskeletal disorders of the back which can lead to the damaging the spinal cord, among other negative health impacts.</li> </ul>	<p><b>Spontaneous inspection by:</b></p> <ul style="list-style-type: none"> <li>• Contractor</li> <li>• Public Health Officers from Respective County</li> <li>• Traffic Police</li> <li>• OH&amp; S inspectors, Ministry of Labour.</li> </ul>	Costs provided under the road maintenance budgetary allocation.	To avoid and discourage any noted substandard working practice with the objective of protecting the workers and road users.	<p><b>Timeframe:</b> Monitoring and inspection to be carried out during construction and operation phase.</p> <p><b>Monitorial Indicators:</b></p> <ul style="list-style-type: none"> <li>• Frequency of accidents</li> <li>• Equipment, tools and machines causing accidents.</li> <li>• Areas where occupational accidents frequently occur.</li> </ul>

## 9.5 GENERAL EHS PLANS REQUIREMENTS IN CONSTRUCTION PROJECT

### 9.5.1 Occupational Health and Safety Plans

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

No	CONTENTS OF THE HEALTH AND SAFETY PLAN	CLARIFICATIONS
1	Contractors Health & Safety Policy / Statement	The policy should be placed at selected places within the camp(s) and offices. It should be clear, visible and legible in English and Kiswahili.
2	Management & Supervision Organizational Chart.	This will be in form of a flow chart, to be displayed clearly in specific offices at the camps. It will assist in identifying the respective management staff and supervisors.
3	Construction Risk Assessment	The assessment should consist: (i) Risk assessment leader, (ii) Risk assessment team members (iii) Date of risk assessment. This will involve Identifying the risks, their description, probability of getting involved in the risk and impacts from the risk. A description of control measures/procedures/methods to manage the risk will be provided.
4	Fall Protection Plan	This will involve listing risk types, their description, probability of getting involved in the risk and impacts from the risk. Control measures/procedures/methods to manage the risk and the responsible person.
5	Hazardous Work/Activities-Method Statements	Hazardous work/Activity (HWA) method statement will be provided by listing the HWA, their description, Method To be followed / Used to safely carry Out the hazardous activity and the responsible person.
6	Personal Protective Equipment Requirements	A billboard with clear drawing of PPEs and their description will be provided.
7	Measures to Control the Condition and Use of Tools and Equipment	Description of various tools will be provided. Measures & procedures to ensure safe condition & use of tool/equipment and responsible person named.
8	Fire Prevention and Control Measures	Details of control and safety measures to be taken during storage and use of the inflammable substance
9	Environmental Protection Measures	A schedule of waste materials and effluents types of wastes will be identified. Description of waste/effluent generated on the site will be provided. Disposal/ effluent disposal methods and procedures to be named. Further, name and contact details of the company responsible for disposal of waste will be provided.
10	First Aid Arrangements -	First Aid Arrangements will include: Name(s) of first aiders on the work site. Number of and location of first aid boxes Details of other first aid/emergency medical arrangements made
11	Construction Site Signage	There will be a graphic illustration of the signage and the description on where to use/wear.

### 9.5.2 Borrow Pits/Quarry Rehabilitation Plans

#### 9.2: Borrow Pit/Quarry Rehabilitation Plan

MATERIAL SITE HISTORY, DESCRIPTION OF CURRENT STATUS AND DETAILS ON DECOMMISSIONING				
Name of Material Site	Sites Operational Functional History	Records of Assessment Activity by Authority (NEMA, OSHA etc)	Records on Contractors Interaction with Owner and Local Community	Impacts on the Site and Community due to Interactions
Names of material site to be indicated after selection by the contractor	<ul style="list-style-type: none"> <li>When it was last utilized?</li> <li>Was there any agreement on rehabilitation?</li> <li>Was it rehabilitated after use?</li> </ul>	<ul style="list-style-type: none"> <li>Are records available or not available?</li> </ul>	<ul style="list-style-type: none"> <li>Were there any records (official correspondence) between stakeholders?</li> </ul>	<ul style="list-style-type: none"> <li>Were there any impacts?</li> <li>How were they addressed?</li> </ul>
	<b>DETAILS ON PROPOSED DECOMMISSIONING</b>			
	<b>Alternative Considered</b>	<b>Type of Decommissioning Approach</b>	<b>Details of Work</b>	<b>Technical Baseline and Assumptions for the Project</b>
	<ul style="list-style-type: none"> <li>List of alternatives (water pan, do nothing alternative, fill up, dump site etc).</li> </ul>	<ul style="list-style-type: none"> <li>Involve the quarry owners in planning the decommissioning type</li> </ul>	<ul style="list-style-type: none"> <li>Clarification on work schedule with details of decommissioning activities.</li> </ul>	<ul style="list-style-type: none"> <li>List and review the assumptions and possible impacts</li> </ul>
	<b>MANAGEMENT OF THE MATERIAL SITE</b>			
	Contract Out, Use of Construction Manager	Training	Schedule	
	<ul style="list-style-type: none"> <li>Details of contract type</li> </ul>	<ul style="list-style-type: none"> <li>Details of contract type</li> </ul>		
<b>WORK AND ENVIRONMENTAL PROTECTION DURING DECOMMISSIONING</b>				
Names of material site to be indicated after selection by the contractor	<b>Occupational Safety</b>	<b>Occupational Exposure</b>	<b>Environmental Compliance Program (Audits etc.)</b>	<b>Safety Analysis and Review of Decommissioning Activities</b>
	<ul style="list-style-type: none"> <li>OSHA guidelines to be adhered to</li> </ul>	<ul style="list-style-type: none"> <li>Occupational exposures and mitigation.</li> </ul>	<ul style="list-style-type: none"> <li>Were Audits carried out, EMP adhered to? etc</li> </ul>	<ul style="list-style-type: none"> <li>Details on the safety analysis while decommissioning</li> </ul>
	<b>WASTE MANAGEMENT</b>			
	Waste Minimization Techniques Used	Waste Handling	Waste Management	
	<b>FINAL SITE SURVEY</b>			
	Independent Verification Inspection by NEMA County Environmental Officer			Independent Verification by Community Leaders

#### ***9.5.2.1 Borrow Pits and Quarries Reinstatement during and After Project Completion***

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

#### ***9.5.2.2 Suggested Contents of Borrow-pit/Quarry Lease Agreement***

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

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

Agreement between the Contractor, the area chief and the land owners (community) should be avoided.

#### ***Before the Start of Quarrying Activities***

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

#### ***After Completion of Quarrying Activates***

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

### 9.5.2.3 Sample Template for Material Site Reinstatement Compliance Certification



# Kenya National Highways Authority

Quality Highways, Better Connections [info@kenha.co.ke](mailto:info@kenha.co.ke) [www.kenha.co.ke](http://www.kenha.co.ke)

CONSTRUCTION OF ISILO- LOKICHAR ROAD PROJECT  
CONTRACT NO .....

## COMMITMENT CERTIFICATION AND LEASE REVIEW FOR USE AND REINSTATEMENT OF MATERIAL SITE

### 1. MATERIAL SITE DETAILS

Location:.....

Plot Reg. No:.....

Chainage:..... Acreage:.....

Site Owner(s):..... ID No:.....

### 2. CONTRACTOR

We, ..... do hereby certify that the above named material site will be used and reinstated by us (Contractor) to the satisfaction of the Client **KeNHA, RE, NEMA** and as per the agreement between us (Lessee) and the Lessor (the Land Owner).

Signed:..... Designation:..... Date:.....

### 3. SITE OWNER

I/We, ..... do hereby certify that the above named material site will be used and reinstated by the Contractor **to my satisfaction**, the satisfaction of the Client **KeNHA, RE, NEMA** and as per the agreement between me (Lessor) and the Lessee (the Contractor).

Signed:..... Designation:..... Date:.....

### 4. COUNTY ENVIRONMENTAL OFFICER

I, ..... have reviewed the Lease Agreement between the above named Contractor and the material site owner(s) for acquiring road construction materials from the named material site.

The material site Lease Agreement is: Approved..... Not Approved.....

Signed:..... Designation:..... Date:.....

### 5. PROJECT'S RESIDENT ENGINEER

This is to certify that I have reviewed the Lease Agreement for the named material site.

I hereby Approve..... Not Approve..... the Lease Agreement.

Signed:..... Date:.....

### 6. KeNHA - ENVIRONMENT AND SOCIAL SAFEGUARD DEPARTMENT/HEALTH SAFETY DEPT

Comments/Instructions:.....  
.....

### 9.5.3 Vehicle/Traffic Management Plan

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

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

### 9.5.4 Waste Management Plan

Specific sources of liquid and solid waste will be:

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

Some of the waste will include waste oil, effluent disposal (septic tanks), drilling slurries and drilling fluids, wastewater from site and dredging. Table 8.1 has details on managing the waste during construction period.

### 9.3: Waste Management Plan during Construction Phase

Process	Waste Management during Construction Phase		
Actions	Requirements	Responsibility	Timing
	Spoils from bulk earthworks will be stockpiled and reused where possible	Construction Manager	Throughout the Construction period
	Waste from site office/camp and repairs and maintenance will be segregated at source and disposed as per the procedure for solid waste management	Site Office Project Manger	Throughout construction works
Performance Indicators	No waste will be deliberately or unintentionally released	Site Manager / Construction Manager	Throughout construction works
Monitoring	Waste quantities measured and recorded on a daily basis	Site Office Project Manager	Throughout construction works
Reporting	Reporting to Site Office Project Manager and HSE Advisor	All staff	Throughout construction works
	Any reporting to Resident Engineer and NEMA	Site Office Project Manager	Throughout construction works
Corrective Actions	Awareness and training of waste handling.	Site Office Project Manager	Throughout construction works



#### **9.5.5 Camp Design / Installation Plan**

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

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

#### **9.5.6 Ancillary Plans**

Ancillary plans for the Construction sites should include:

##### Facilities at the Workmen's Camp

- Potable water supply in quantity and quality,
- Safe access road is required at camps
- Waste (all kind of solid and liquid wastes) generated should be disposed off in accordance with NEMA's Waste Management Regulations) 2006, Part II, Solid Waste, which has provisions on disposal methods

##### Sanitation Facilities

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

##### Health care Facilities:

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

Further recommended ancillary provisions during road operation stage will include

- Rural road pedestrian footpaths and cycle tracks where expected number of pedestrians and cyclists exceed 1,000 per day.
- Service roads through market centres. This will include Lerata (km 4+500 Lerata-Wamba section, Wamba (Wamba loop km 5+000), Sari, Nachola, Lokori (km 122+900 Lokori-Lokichar Section 4) and Lokichar (km 190+200 Lokori-Lokichar
- Climbing lanes, bus bays and heavy truck parking.

**9.5.7 Spills Prevention and Response Plan**

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

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

Table 8.4 has outlines some of the contents of the spills prevention and response plan.

**9.4: Issues of Concern in the Spills Response Plan**

	Contractors Areas of Concern in the Plan	Examples of Issues of Concern in the Plan
1	Contractor Responsibilities	<ul style="list-style-type: none"> <li>• Contractor to follow proper procedures storage and handling of hazardous materials.</li> <li>• Train employees to control the identified waste and recyclable products in the containers provided.</li> <li>• Maintain Material Safety Data Sheets (MSDS) on file for hazardous chemicals used on the project and ensure employees follow all of the incorporated requirements.</li> <li>• Use correct PPEs.</li> </ul>
2	Fueling and Maintenance of Equipment or Vehicles	<ul style="list-style-type: none"> <li>• Use drip pans and absorbents under or around leaky vehicles;</li> <li>• Dispose of or recycle oil and oily wastes in accordance with NEMA.</li> <li>• Clean up spills or contaminated surfaces immediately, using dry clean up measures and eliminate the source of the spill to prevent discharge or a furtherance of an ongoing discharge</li> </ul>
3	Washing of Equipment and Vehicles.	<ul style="list-style-type: none"> <li>• Provide an effective means of minimizing the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other types of washing.</li> <li>• Avoid washing activities in the existing water courses.</li> </ul>
4	Disposal of Waste Products	<ul style="list-style-type: none"> <li>• Separate hazardous waste from construction waste.</li> <li>• Store waste in sealed containers, which are constructed of suitable materials to prevent leakage and corrosion, and which are labeled.</li> <li>• Provide waste containers (e.g., dumpster or trash receptacle) of sufficient size and number to contain construction and domestic wastes.</li> </ul>

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

### **9.5.8 Emergency Response Plan (ERP)**

#### **9.5.8.1 Emergency/Disaster Preparedness Plans for the Proposed Road Project<sup>25</sup>**

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

- Objective:
  - To define emergency situations that may arise during the construction phase of the project;
  - To prepare emergency response plans in line with the identified emergency situations;
  - To put systems in place to equip facility with emergency equipment;
  - To put mechanisms in place to test the emergency procedures and propose improvements.
  - Keep contacts, both internal and external, of persons in charge for management of emergencies and disasters.
- Emergency situations have been defined as follows:
  - Occupational health and safety
    - Fire outbreak
    - Flooding
    - Fatality on site
    - Serious accident leading to multiple personal injuries
    - Illness due to food poisoning
    - Mass illnesses arising from inhalation and contact with hazardous chemicals
  - Environmental incidents/Disasters
    - Incidents / accidents that may lead to stoppage of works for more than 1 working day;
    - Incidents that may significantly impart negatively on the project and lead to negative publicity within the project neighbourhood and to the media
    - Incidents that may cause damage and harm to the environment, especially pollution to soil, water sources and air pollution.
- The process for Identification of Significant Occupational Safety and Health Risks; Identification of Significant Environment all Aspects has come up with the following as emergency situations that are likely to occur:
  - Occupational Health and Safety incidents:
    - Fire outbreak at residential and offices camps, heavy equipment, plants and motor vehicles;
    - Fatality at site;
    - Multiple serious injuries;
    - Food poisoning from workers canteen;

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<sup>25</sup> **Emergency** is something dangerous or serious, such as an accident that happens suddenly or unexpectedly and needs fast action in order to avoid harmful results. A **disaster** is an event that results in great harm, damage, or death, or serious difficulty. It results from the combination of hazards (potentially damaging physical events), conditions of vulnerability and insufficient capacity or measure to reduce the potential of negative consequences of risk, - the probability of harmful consequences.

- Camp invasion scare
- Environmental and social incidents
  - Fire outbreak at the Camp, equipment, and plants;
  - Oil spillage leading to surface and ground water contamination and soil degradation;
  - Chemicals spillage, fire;
  - Camp invasion by local residents due to perceived injustices ranging from employment opportunities, degradation of environment and moral related issues due to labour influx.
- Preventative measures:
  - All Emergency measures shall have preventative measures documented and implemented. These shall be outlined in the risk assessments conducted in section 2 above
  - Whenever new or modifications of processes are put in place, the risk assessment shall be reviewed to incorporate the modification or introduction of new processes.
- Repair and Maintenance of emergency equipment
  - An initial fire survey shall be done jointly with a DOSHS approved fire inspector;
  - Emergency equipment shall be procured as per the recommendation of the fire inspector;
  - Once the equipment has been procured and installed, there shall be monthly inspections by the Health and Safety Officer who shall record observations in a prescribed format. For equipment that shall require top up, services for repair and maintenance shall be sought;
  - Periodic repairs shall be conducted on a quarterly basis or as per the advice of emergency equipment and service provider.
- Emergency response team
  - An emergency response team shall be constituted. This team shall have the membership and responsibilities as shown in

#### **9.5.8.2 Composition and Tasks of Emergency/Disaster Preparedness Response Team**

	<b>EMERGENCY ROLE</b>	<b>RESPONSIBILITIES DURING EMERGENCIES</b>
1.	Emergency Controller	<ul style="list-style-type: none"> <li>- The overall coordinator of reported emergencies</li> <li>- Monitor the situation as it unfolds</li> <li>- Contact with GoK Officers and the Consultants Engineers</li> <li>- Give media brief where need be</li> <li>- Delegate the duties to any other manager where necessary</li> </ul>
2.	Assistant Emergency Controller	<ul style="list-style-type: none"> <li>- Deputise the emergency controller</li> <li>- Liaise with affected stakeholder stakeholders</li> <li>- Update the emergency controller on feedback from stakeholders</li> </ul>
3.	Emergency Coordinator	<ul style="list-style-type: none"> <li>- Liaise with the emergency services on site</li> <li>- Liaise with affected stakeholders</li> <li>- Give feedback to the Emergency controller</li> <li>- Spearhead the roll call at the assembly points</li> <li>- Announce all clear once the emergency situation eases up</li> <li>- Write the report and learning arising from the emergency response. Distribute the report to the emergency team</li> </ul>
4.	Assistant Emergency	<ul style="list-style-type: none"> <li>- Deputise the Emergency controller</li> <li>- Coordinate and translate with the Chinese workers</li> </ul>

	EMERGENCY ROLE	RESPONSIBILITIES DURING EMERGENCIES
	Coordinator	
5.	Emergency Marshalls	<ul style="list-style-type: none"> <li>- Ensure emergency alarm is raised</li> <li>- Mobilise workers in their areas of jurisdiction</li> <li>- Where safe to so, ensure that the emergency situation is averted</li> <li>- Ensure all workers, visitors and sub-contractors have evacuated to the assembly point</li> </ul>

- Emergency drills/practices
  - An emergency response centre shall be established on site. Likewise, an alternative emergency centre shall be designated in event that the aforementioned response centre is rendered out of use;
  - A response plan shall be developed for each of the identified emergency situations;
  - Each of the identified drills shall undergo tests at least once a year
  - Lessons learnt during the drills shall be documented and improvements for future drills and emergencies proposed and implemented in the next drill / emergency.
- Emergency contacts
  - Emergency contacts shall be documented and distributed in all offices and notice boards including security gatehouses;
  - The contacts shall include: police, fire emergency services, ambulance services
  - The contacts list shall be revised at least once a year to ascertain validity telephone numbers and individuals names.

#### **9.5.8.3 Occupational and Safety Concerns during Construction Phase**

Based on the identified hazards, the contractor shall evaluate the risk by considering the likelihood of occurrence and severity. The likelihood of occurrence shall be based on Very Low, Low, Medium, High or Very High. A numerical system can also be used ranging from 1 to 5. The extent of the rating shall be based on the controls that the contractor has put in place. It shows an evaluation of the risk, severity and causal factors.

The risk assessment shall be used to prioritise the remedial measures. Risks with high evaluation scores shall be given priority for remedying the situations.

#### **9.5.8.4 Occupational and Safety Concerns during Operation Phase**

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

Towards this, the remedy shall be:

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

#### **9.5.9 Environmental Awareness Plan**

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

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

#### **9.5.10 Decommissioning Plan for the Camps and other Installations**

The decommissioning plan will be prepared by the Contractor just before completion and handing over the project road to the Client. All the obsolete items at the camps, contractor's garages, old tyres among other items will be segregated and disposed by a NEMA registered waste handler. The decommissioning plan will be in form of a matrix with the following details:

- Decommissioning steps and tasks
- Hazards and possible risks
- Control/preventive measures to the possible hazards
- Details of responsible personnel in taking decommissioning actions
- Timeframe for implementing the decommissioning plan.

### **9.6 COST OF THE PROJECT**

The cost of the project will be **Ksh. 66,269,333,869** (Sixty Six Billion, Two Hundred and Sixty Nine Million, Three Hundred and Thirty Three Thousand, Eight Hundred and Sixty Nine). The gross cost per km will be Ksh. 180,079,711.60



## 10 CONCLUSION AND RECOMMENDATIONS

Positive socio-economic impacts will be experienced during the project cycle, and which can be mitigated. The alignment of the proposed road has taken into account the developing Isiolo town, and therefore the need of the 14km bypass away and north of Isiolo town. Social impacts on livelihoods, loss of property has been addressed by the proposed bypass. The road further bypasses Wamba and Barsaloi trading centres to avoid possible interference with existing land, property, loss of livelihood associated with land acquisition process.

Road safety related mitigation measures have been suggested which includes the use of road furniture, speed bumps within built up areas (mainly trading centres), signage, and road marking guardrails among others.

Road's impact to the biophysical environment will be significant. The impacts will mainly be during construction and operation phase of the road. Critical wildlife habitat areas which the road will traverse include community wildlife conservancies, - Kalama, West Gate, Namunyak Wildlife Trust and Wildlife research areas Barsalinga, Ngaroni.

It has been noted that the alignment passes across animal settlements and breeding areas mainly between Wamba and Baragoi.

The principle potential impact on the community wildlife conservancy, migratory and breeding areas will be disturbance due to construction activities. Once constructed, the permanent and operational effects relate to collision risk is considered to be minimal, and to a lesser extent the loss of habitat. Residual effects on wildlife migratory and breeding grounds during the construction have a high sensitivity value, with negative impacts and minor residual impacts.

To mitigate the impacts, the critical crossing points for the wildlife will be mapped including the breeding areas. Pre-construction surveys and appropriate supervision will be put in place to avoid disturbance. Further, the design team has avoided the breeding areas and also it will provide crossings points where the road passes through the migratory corridors. The road alignment has avoided traversing through Nyabane Natural Reserve. Possible impacts on the natural reserve have thus been avoided.

In view of socio-economics, the proposed project will have residual significant positive impact on business, retail and alternative tourism, by improving the accessibility of the existing trading centres, tourist sites - wildlife conservancies and cultural tourism sites. Population increase within these areas will be expected. Ribbon developments and growth of the existing trading centres will be expected during the road's operation stage, leading to significant cumulative impacts. The trading centres include Lerata, Lengusaka, Swari, Barsaloi, Naturkan and Lokori are all likely to develop during its operation stage.

Significant cumulative impacts during construction phase will be expected, especially from the selected material sites. Further, noise from vehicles will create further cumulative impacts during this stage.

There is evidence of the effects of climate change, from temperature and rainfall trends within the counties traversed by the project road. Observed and projected precipitation change in Isiolo and Samburu has been noted to be gradual after reviewing the trend in 50 years period, with gradual decline to <-150mm and <-100mm respectively. Turkana has a minimal decline of precipitation, recorded as <-50mm within the observed years. Temperatures' trends within the observation period has been rising gradually; Isiolo <+0.7°C, +/-1.1°C and Turkana +/-1.1°C.

## 11 REFERENCES

AFRICAN DEVELOPMENT BANK GROUP. (2013): Integrated Safeguards System. Policy Statement and Operational Safeguards. Safeguards and Sustainability Series, Vol. 1 - Issue 1.

GOK. (2007): Occupational Safety and Health Act, No. 15. Gov. Printer. Nairobi.

GOK. (2009): Ministry of Roads Design Manual for Roads and Bridges

HELMUDT SCHMIDT. (1983): Farm Management Handbook of Kenya.

LAPSSET CORRIDOR DEVELOPMENT AUTHORITY. (2017): Strategic Environmental Assessment Study in the LAPSSET Corridor Infrastructure Development Project-LCIDP.

MINISTRY OF TRANSPORT AND COMMUNICATION (1986): Standard Specifications for Road and Bridge Construction. Nairobi.

GOK.(1999): Environmental Management and Coordination Act (EMCA). Government Printer, Nairobi, Kenya

GOK. (2000): National Gender and Development Policy.

GOK. ( 2009): Kenya National Aids Strategic Plan 2009/10 – 2012/13

WASIKE, WILSON. (2001): Road Infrastructure Policies in Kenya: Historical Trends and Current Challenges. In: KIPPRA, Working Paper No. 1.

U.S. DEPARTMENT OF ENERGY. (Ed). (2000): Decommissioning Plan Handbook. Department of Energy, Washington, D.C, U.S.A.

RALPH JÄTZOLD. (1987): The Agro-ecological Zones of Kenya and their Agro-Economical Dynamics. Trier.

NORTHERN RANGELAND TRUST (Ed)(2015): NRT State Of Conservancies Report, 2015.

KRHODA GEORGE OKOYEL, AMIMO MESHACK et al. (2015): Africa Journal of Physical Sciences 2 (1) (2015). Department of Geography and Environmental Studies, University of Nairobi.

STATE OF QUEENSLAND (2014) (Ed): Significant Residual Impact Guideline. Department of Environment and Heritage Protection, Queensland Environmental Offsets Policy, 2014.

GOK. (2007): Kenya Vision 2030.

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (2011): Integrated National Land use Guidelines for a Sustained Societal Attributes – Infrastructure, Environmental Resources and Public Safety.

TURKANA COUNTY GOVERNMENT. (2015): Natural Resource Mapping and Context Analysis, Turkana.

REPUBLIC OF BOTSWANA. (2001): Planning and Environmental Impact Assessment of Road Infrastructure. Ministry of Works, Transport & Communications, Gaborone, Botswana.

JILING WANG. (2014): Effectiveness of wildlife crossing structures on providing habitat connectivity for wild animals. Faculty of Forestry, University of British Columbia. Thesis paper for Bsc in Forest Resource Management.

NSW. (2016): Technical Guide Management of Road Construction and Maintenance Wastes. Issue No. 10, 2016.

## **12 APPENDICIES**

*[Minutes and questionnaires of public consultation, photos etc]*