Kenya National Highways Authority

Quality Highways, Better Connections

Feasibility Study in the Mombasa Gate Bridge Construction Project, Mombasa County

Environmental and Social Impact Assessment Study Report for the Mombasa Gate Bridge Construction Project: Volume One
Main ESIA Report
July 2018

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EXECUTIVE SUMMARY

THE PROJECT

The Government of the Republic of Kenya, through the Kenya National Highway Authority-KeNHA and support of the Government of Japan through JICA, is developing the Mombasa Gate Bridge Construction Project with the aim of providing a functional road connection between Mombasa Island and Mombasa Mainland South both separated by the Likoni Channel which is currently crossed through ferries operated by the Kenya Ferry Service (KFS). Overtime, increase in volume of passenger and vehicular traffic across the channel have challenged the viability of the ferry service especially during peak demand hours which are characterised by huge backlogs of humanity and motor vehicles traffic waiting to cross. Expansion of the ferry service is constrained by the need to keep the Channel free for use by vessels calling into the Kilindini harbour, and whose movement requires interruption of the Ferry Service thus constraining time-efficient demand management. Provision of a bridge connecting Mombasa Island to the Mainland South Coast as anticipated in the Mombasa Gate Bridge Construction Project is targeted at eliminating this bottleneck and further underpinning on-going initiatives aimed at opening up Kenya's South Coast for economic development.

A recently concluded pre-feasibility Study for the Mombasa Gate Bridge Construction Project defined the project in terms of site location, engineering scope, social and environmental impacts, physical and economic displacement impacts, among others thus paving the way for Feasibility Study and Detailed Design which have been contracted out to a Consortium led by Katahira Engineers of Japan. As part of the Feasibility Study and, in keeping with both Kenyan and international requirements for sustainable development, the MGB Project was subjected to an Environmental and Social Impact Assessment for the design, implementation, commissioning and decommissioning phases of the project.

This Report highlights salient social and environmental issues associated with the design, construction and operational aspects of the Project. The Report has been prepared under contract by Lead Experts from Repcon Associates, an Environmental Firm of Experts duly registered and licensed by NEMA (NEMA Registration No. 0002) and other Government of Kenya (GoK) agencies.

SCOPE OF THE ESIA STUDY

Conduct of ESIA Studies in Kenya is legally anchored in the Environmental and Coordination Act (EMCA) Cap 387 and its 2015 Amendment. Section 58 of EMCA as amended in 2015 requires all projects proposed for implementation in Kenya be subjected to integrated environmental impact assessment as directed by NEMA. The Second Schedule of EMCA specifies projects that require to be subjected to EIA studies and particularly lists criteria under section 1 (General) as follows:-

(a) an activity out of character with its surrounding;
(b) any structure of a scale not in keeping with its surrounding;
(c) major changes in land use.

Screened against this Schedule and criteria, the proposed Mombasa Gate Bridge Project and approach roads are deemed to require a full cycle ESIA Study in that the 1.4Km long, 200m high bridge structure will intrude into the general skyline of Mombasa in a manner previously unforeseen in the area and in the process displace people from property,

shelter and livelihoods. Construction activity is also likely to interfere with operations of the Kilindini Harbour, which is the economic lifeline for hinterlands in both Kenya and the region.

Contractual Scope of the ESIA Study is defined by the Study Terms of Reference –TORs (Appendix 1.1) which stipulate Study Tasks as follows: -

1) To collect information and carry out baseline surveys which are necessary for EIA;
2) To predict and assess the impacts on natural and social environment
3) To propose mitigation measures and monitoring plans;
4) To prepare the materials for Public Consultation meetings, and attend these meetings to assist KeNHA and KEI; and
5) To assist KeNHA on the submission of ESIA study report to NEMA and acquisition of the license.

APPROACH TO THE ESIA STUDY

Activities of the Detailed ESIA Stage followed the Study workplan approved as part of the Project TORs and entailed the following:-

(i) Data collection

Secondary data for the route of traverse was obtained from diverse sources such as GOK planning documents and policy blue prints, professional reports and releases, etc all of which provided an insight into the socio-economic and biophysical baseline for the target area. Preliminary opinions formed from review of such documentation were re-validated during fieldwork undertaken within districts to be traversed by the road.

(ii) Field work and public consultations

Fieldwork largely entailed onsite investigations to familiarize with the baseline environment of the area potentially affected by the project. Analysis of potential impacts was based on investigations undertaken along the entire traverse where data on physiographic, pedology, hydrology and drainage, ecology and cover vegetation, land tenure, settlement and land-use patterns, ecologically and economically sensitive resources were collected. Fieldwork entailed several standalone studies namely;-

- The flora and fauna mapping study
- The Air quality and noise monitoring survey
- The Marine Sediment and water quality survey
- Stakeholder engagement and socio-economic survey

Findings from these surveys are reported starting Chapter Five below whereby accruing information formed the basis for impact prediction.

(iv)Data analysis and impact prediction

Upon data analysis, potential environmental impacts (both positive and adverse) were predicted based on available tools. The magnitude, significance, and acceptability of predicted impacts were evaluated with a view to determining whether observed adverse impacts are significant enough to warrant mitigation. The potential environmental

impacts were described in both quantitative and qualitative terms through application of existing body of knowledge, checklists, flow charts, and monographs and from input from diverse stakeholders. In particular, impact prediction in this study drew heavily on five documents namely:-

i) The Third Schedule to Legal Notice 101

ii) JICA Guidelines for Environmental and Social Considerations

iii) The World Bank Safeguard Policies

iv) The Sectoral checklists for the Roads Sector developed by the World Bank;

v) The Checklist of Environmental Characteristics developed by the Department of Environmental Affairs of the Republic of South Africa and,

vi) The Reference Guidelines for Environmental Assessments (which incorporates the Leopold Matrix) developed by USAID / REDSO / WCA–Abidjan.

Impacts were further screened for occurrence and significance of residual (those which cannot be mitigated satisfactorily) and cumulative impacts with a view to providing a basis of making recommendations on the way forward for the project.

(v) Formulation of an Environmental and Social Management Plan

Measures or interventions necessary to minimize, reduce, avoid or offset identified adverse impacts were evaluated and presented in form of an Impact Mitigation Plan for the proposed development. Such evaluation also included an assessment of Project Alternatives as reported in Chapter Five below. The ESMP also identified modalities for monitoring and evaluation to ensure compliance in implementation of proposed mitigation measures. This involved development of monitoring indicators and procedures for continuous generation of project monitoring data and information.

(vi) Reporting procedure

The ESIA Study methodology as described above culminated with production of a Draft Environmental and Social Impact Assessment Study Report

THE ESIA STUDY TEAM

This Environmental and Social Impact Assessment study was undertaken by a multi-disciplinary team bringing together skills as follows:-

- Mr. Michael Wairagu- Environmental and Social Safeguards expert
- Mr. Nancy Kanyi - EIA Lead Expert
- Charles Ngatia--Marine Biologist
- Mr. Norman Gachathi-Ecologist
- Edwin Obadha-Biometrician

CVs for this Team are attached as Appendix 1.2 to this report.

The ESIA Study also drew heavily from technical input from the JICA Study Team of counterparts namely:-

Mr. Soemu Oshita- Technical Team Leader
Mr. Masato Watanabe- Highway Engineer
Mr. Tsukasa Akiba- Bridge Engineer

Mr. Keiichi Ohasi- Highway Engineer
Mr. Tsutomu Nishioka- Maintenance Engineer
Mr. Taiji Tanoguchi- Environmental and Social safeguards Specialist
Mr. Takao Fukuma- Resettlement Specialist

Activities of the MGB at prefeasibility study inclusive of the ESIA Process were also coordinated and directed through a coordination forum that drew representation from diverse lead agencies including KeNHA, KRC, MCG, NMK, KCAA, KPA, KMA, DoD, whose input is captured in Chapter Seven under stakeholder Engagement.

FINDINGS OF THE STUDY

Based on impact prediction and scoping tools, potential impacts from proposed road upgrading and operation have been predicted and analysed with outcome as follows:-

Positive impacts: Positive impacts of the bridge will accrue from provision of a functional road connecting the MMS area to the rest of Kenya through Mombasa, a factor that will greatly mitigate current feeling of isolation and resultant political resentment. The MGB will open up MMS for economic development and enhance access to markets down to COMESA region and thus anchor all pillars to Vision 2030.

Adverse impacts: The most salient observation from this study is that at construction stage, the bridge could interfere with cargo flow into and out of the Port which could have stifling effects on both the nation and Regional economies and can cause Mombasa Port to loose the esteemed position as the Port of Choice in the region. Efforts must be made to mitigate against such loses.

Once completed, the massive engineering structure will permanently intrude into the Mombasa skyline and thus alter the landscape completely while imposing a height capping for vessels with mast heights above the design vertical clearance of 69 m above sea level. However, this Ksh 80billion worth of investment (pa capita cost of Ksh 1.9 million) is likely to be a major attraction to the coastal city and could even replace Fort Jesus as the Main attraction while simultaneously decongesting Mombasa CBD to the advantage of both visitors and town inhabitants.

Once completed, the bridge will irreversibly impose a physical barrier to movement and access within villages and will introduce perpetual threats of accidents to people and their livestock. Heavy traffic along the new road is likely to escalate noise levels which already exceed statutory limits and could introduce polluted runoff into the Mweza Creek.

THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

A core outcome of this EIA process was the formulation of an ESMP to guide resolution of adverse impacts anticipated from construction and operation of the proposed Mombasa Gate Bridge. Core features of the ESMP are as follows:-

Impact Mitigation Strategy and Plan

Design of the MGB was largely guided by the principle of avoidance as the core mitigation strategy. Thus, by analysing alternative alignments of the bridge, it was possible to choose one with minimal impacts on the social and biophysical environment which was in itself, a strategic intervention towards mitigation.

Key observations are that most adverse impacts are short-term and will disappear once civil works ends while residual impacts will require careful monitoring and coordination with relevant Lead Agencies. Towards implementation of the Impact Mitigation Plan, several sub-plans have been proposed to address specific regimes of impacts as follows:-

1) A Resettlement Action Plan to address displacement impacts,
2) A Construction Management Plan to ensure orderly execution of construction activity.
3) An Environmental Mitigation Plan to guide general resolution of environmental concerns at both construction and operation stages
4) A Health and Safety Plan to resolve OHS concerns,
5) A Traffic Management Plan to resolve all traffic related concerns,
6) A Landscape Conservation Plan,
7) A Communication Plan to guide dissemination of project information to stakeholders.

Core players in Impact Mitigation

The burden of mitigation largely lies with the Project Contractor under supervision by KeNHA through the Supervising Consultant. The Contract for Civil Works will bear relevant clauses binding the contractor to institute environmental mitigation as recommended in this study. Thus, in this case, the core monitoring strategy for this project will be through site meetings, in which case, it is recommended that respective County Environmental Coordinators for Mombasa and Kwale be invited to such meetings. Other stakeholders such as the District Labour Officer should also initially attend such meetings to ascertain that measures towards securing the health and safety of workers have been put in place. When completed, the Road Project will be subject to statutory environmental and quality audits during the Defect Liability Period and the Contractor will be liable to repair all defects including those pertaining to environmental mitigation.

Overall, it is the impression of this study that, the proposed MGB Project is a critical economic undertaking to which national and regional development targets are tied. It is one of the Vision 2030 flagship projects and, subject to adoption of mitigation measures and proposal made here-in, it should be supported by all.

RECOMMENDATION

Through this ESIA Study Report, the Kenya National Highway Authority (KeNHA) through the Director General - the proponent - wishes to disclose that the proposed development of the Mombasa gate Bridge has impacts that can readily be mitigated and managed. The majority of adverse impacts identified are of a short-term nature and will cease once the civil works phase is completed. Further, other impacts can be contained through effective planning and management using available means of mitigation. By such disclosure, the prayer of the client to NEMA is for the project to be granted environmental licensing

ACRONYMS

AEWA	-	African Eurasian Water Bird Agreement
AIDS	-	Acquired Immuno-Deficiency Syndrome
asl	-	above sea level
BOQs	-	Bill of Quantities
Cap	-	Chapter of the laws of Kenya
CBD	-	Central Business District
CDA	-	Coastal Development Authority
CIDP	-	County Integrated Development Plan
CITES	-	The Convention on Trade in Endangered Species
CMS	-	Convention on the Conservation of Migratory Species of Wild animals
DEC	-	District Environment Committee
DG	-	Director General
EA	-	Environmental Assessment
EIA	-	Environmental Impacts Assessment
EMCA	-	Environmental Management & Coordination Act, 1999
ESIA	-	Environmental and Social Impact assessment
ESMP	-	Environmental Social Management Plan
ESU	-	Environmental & Social Unit
EU	-	European Union
FAO	-	Food and Agriculture Organisation
g-C^{-m2} yr^{-1}	-	Grams Carbon per square metre per year
GDP	-	Growth Domestic Product
GHG	-	Green House Gas
GM(SP)	-	General Manager (Special Projects)
GoK	-	Government of Kenya
GPS	-	Global Position System
HIV	-	Human Immuno-Virus
IMP	-	Impact mitigation plan
IUCN	-	International Union for the Conservation of Nature
KALRO	-	Kenya Agriculture and Livestock Research Organisation
KEI	-	Katahira & Engineers
KeNHA	-	Kenya National Highways Authority
KeRRA	-	Kenya Rural Roads Authority
KFS	-	Kenya Forest Service
KMA	-	Kenya Maritime Authority
KPA	-	Kenya Ports Authority
KURA	-	Kenya Urban Roads Authority
KWS	-	Kenya Wildlife Service
LN	-	Legal Notice
m, m^2, m^3		Metre, square metre, cubic metre
MCA	-	Member of County Assembly
MDGs.	-	Millennium Development Goals
MNB	-	Mombasa Northern Bypass
MNBR	-	Mombasa Northern Bypass Road
MOR	-	Ministry of Roads
MOU	-	Memorandum Of Understanding
MTP	-	Medium Term Plan
NEMA	-	National Environment Management Authority
NMK	-	National Museum of Kenya
NMK-CFCU	-	NMK Costal Forest Conservation Unit
OHS	-	Occupational Health and Safety
OP	-	Bank Operational Policy

OSHA	-	Occupational Safety and Health Act
PCU	-	Project Coordination Unit
PE	-	Project Engineer
PET	-	Potential Evapo-transpiration
ppm		Parts per million
PRSP	-	Poverty Reduction Strategy Paper
RAP	-	Resettlement Action Plan
RE	-	Resident Engineer
TOR	-	Terms of Reference
UNCED	-	United Nations Conference on Environment and Development
UNEP	-	United Nations Environment Programme
UNFCCC	-	United Nations Framework Convention on Climate Change
USAID/REDSO/ WCA – Abidjan	-	United States Agency for International Aid / Regional Development Services Office / West and Central Africa
WB	-	The World Bank
WB SGPs	-	World Bank Safe Guard Policies
WMCA	-	Wildlife Management and Conservation Act
WRMA	-	Water Resources Management Authority
µg		microgram (unit of measure)

TABLE OF CONTENTS

CHAPTER ONE: INTRODUCTION

1.1: BACKGROUND

The Government of the Republic of Kenya, through the Kenya National Highway Authority-KeNHA and support of the Government of Japan through JICA, is developing the Mombasa Gate Bridge Construction Project with the aim of providing a functional road connection between Mombasa Island and Mombasa Mainland South both separated by the Likoni Channel which is currently crossed through ferries operated by the Kenya Ferry Service (KFS). Overtime, increase in volume of passenger and vehicular traffic across the channel have challenged the viability of the ferry service especially during peak demand hours which are characterised by huge backlogs of humanity and motor vehicles traffic waiting to cross. Expansion of the ferry service is constrained by the need to keep the Channel free for use by vessels calling into the Kilindini harbour, and whose movement requires interruption of the Ferry Service thus constraining time-efficient demand management. Provision of a bridge connecting Mombasa Island to the Mainland South Coast as anticipated in the Mombasa Gate Bridge Construction Project is targeted at eliminating this bottleneck and further underpinning on-going initiatives aimed at opening up Kenya's South Coast for economic development.

A recently concluded pre-feasibility Study for the Mombasa Gate Bridge Construction Project defined the project in terms of site location, engineering scope, social and environmental impacts, physical and economic displacement impacts, among others thus paving the way for Feasibility Study. As part of the Feasibility Study and, in keeping with both Kenyan and international requirements for sustainable development, the MGB Project was subjected to an Environmental and Social Impact Assessment for the design, implementation, commissioning and decommissioning phases of the project as specified in the Terms of Reference (Appendix 1.1). This Report highlights salient social and environmental issues associated with the design, construction and operational aspects of the Project. The Report has been prepared under contract by Lead Experts from Repcon Associates, an Environmental Firm of Experts duly registered and licensed by NEMA (NEMA Registration No. 0002) and other Government of Kenya (GoK) agencies. Profiles of the key staff who undertook the study is presented in Appendix 1.2.

1.2: SCOPE OF THE ESIA STUDY

1.2.1: Geographical Scope

A full disclosure of the Mombasa Gate Bridge Project is provided in Chapter Two below. The project aims at constructing a 1.4 Kilometre long bridge across the Likoni Channel starting from Lumumba Road at King'orani Prison in Mombasa Island, then crossing the Channel at Ganjoni to land in the Jamvi La Wageni area of Likoni along the Mweza Creek. The bridge will henceforth proceed as a 10.4 Km long embankment road traversing Likoni, Mtongwe and Shika Adabu locations of Likoni Sub County to join the Mombasa Southern bypass at the Ziwani lake area of Kiteje in Kwale County.

1.2.2: Legal Scope in the ESIA Study

Conduct of ESIA Studies in Kenya is legally anchored in the Environmental and Coordination Act (EMCA) Cap 387 and its 2015 Amendment. Section 58 of EMCA as amended in 2015 requires all projects proposed for implementation in Kenya be subjected to integrated environmental impact assessment as directed by NEMA. The Second Schedule of EMCA specifies projects that require to be subjected to EIA studies and particularly lists criteria under section 1 (General) as follows:-

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Screened against this Schedule and criteria, the proposed Mombasa Gate Bridge Project and approach roads are deemed to require a full cycle ESIA Study in that the 1.4Km long, 200m high bridge structure will intrude into the general skyline of Mombasa in a manner previously unforeseen in the area and in the process displace people from property, shelter and livelihoods. Construction activity is also likely to interfere with operations of the Kilindini Harbour which is the economic lifeline for hinterlands in both Kenya and the region.

1.2.3: Contractual Scope

Contractual Scope of the ESIA Study is defined by the Study Terms of Reference –TORs (Appendix 1.1) which stipulate Study Tasks as follows: -

6) To collect information and carry out baseline surveys which are necessary for EIA;
7) To predict and assess the impacts on natural and social environment
8) To propose mitigation measures and monitoring plans;
9) To prepare the materials for Public Consultation meetings, and attend these meetings to assist KeNHA and KEI; and
10) To assist KeNHA on the submission of ESIA study report to NEMA and acquisition of the license.

Chapter Three below provides an exposition of measures taken to ensure conformity with TOR requirements that the ESIA Study be conducted in line with national legislation for environmental management and the JICA Guidelines for Environmental and Social Considerations.

1.2.4: Thematic Scope of the Study

The substantial focus and scope of ESIA Studies is stipulated in the Third Schedule to Legal Notice 101 of EMCA. The following issues may, among others, be considered in the making of environmental impact assessments.

1. Ecological Considerations -

(a) Biological diversity including -
  (i) effect of proposal on number, diversity, breeding habits, etc. of wild animals and vegetation;
  (ii) gene pool of domesticated plants and animals e.g. monoculture as opposed to wild types.

(b) Sustainable use including -
  (i) effect of proposal on soil fertility;
  (ii) breeding populations of fish, game or wild animals;
  (iii) natural regeneration of woodland and sustainable yield;
  (iv) wetland resource degrading or wise use of wetlands.

(c) Ecosystem maintenance including -
  (i) effect of proposal on food chains;
  (ii) nutrient cycles ;
  (iii) aquifer recharge, water run-off rates etc;
  (iv) a real extent of habitants;
  (v) fragile ecosystems.

2. Social considerations including -

(a) economic impacts;
(b) social cohesion or disruption;
(c) effect on human health;
(d) immigration or emigration
(e) communication - roads opened up, closed, rerouted

(f) effects on culture and objects of culture value

3. Landscape -

(a) views opened up or closed;
(b) visual impacts (features, removal of vegetation, etc;
(c) compatibility with surrounding area;
(d) amenity opened up or closed, e.g recreation possibilities.

4. Land uses -

(a) effects of proposal on current land uses and land use potentials in the project area.
(b) possibility of multiple use.
(c) effects of proposal on surrounding land uses and land use potentials.

5. Water:

Important aspects to consider are the effects of the proposal on:
(a) water sources (quantity and quality) -
    (i) rivers;
    (ii) springs;
    (iii) lakes (natural and man-made);
    (iv) underground water;
    (v) oceans;
(b) drainage patterns / drainage systems;

In designing the scope of investigations under the ESIA Study for the Mombasa Gate Bridge, this Third Schedule to EMCA formed a fundamental technical and legal checklist.

1.3: APPROACH TO THE ESIA STUDY

Essentially, a full cycle ESIA Study entailed four major stages namely;- Project Report/ Scoping, Detailed Investigations, Public Review and Final Report Stage activities under which are briefly highlighted in sections below.

1.3.1: Screening Stage

The process of developing a project report is a legal requirement under Section 58(1) of the EMCA-1999 (Principal Statute) and its 2015 amendment. Further, Section 6 of part 1 of the LN 101 stipulates that *"An application for an Environmental Impact Assessment License shall be in the form of a Project Report in the form set out in the First Schedule to these Regulations, and the applicant shall submit the application together with the prescribed fee to the Authority.*

However, towards fast tracking the ESIA Process, NEMA now requires all largescale ESIA Projects to proceed straight to Detailed ESIA Stage without need for preparation of a Project Report. Towards This TORs foe the Detailed ESIA Study were prepared and issued to NEMA and were approved on 26th June 2018 alongside the Curriculum Vitae for the ESIA Study Team. Appendix 1.1 provides a copy of the NEMA approved TORs.

1.3.2: Detailed ESIA Stage

Activities of the Detailed ESIA Stage followed the Study workplan approved as part of the Project Report and entailed the following:-

(i) Data collection

Secondary data for the route of traverse was obtained from diverse sources such as GOK planning documents and policy blue prints, professional reports and releases, etc all of which provided an insight into the socio-economic and biophysical baseline for the target area. Preliminary opinions formed from review of such documentation were re-validated during fieldwork undertaken within districts to be traversed by the road.

(ii) Field work and public consultations

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Upon data analysis, potential environmental impacts (both positive and adverse) were predicted based on available tools. The magnitude, significance, and acceptability of predicted impacts were evaluated with a view to determining whether observed adverse impacts are significant enough to warrant mitigation. The potential environmental impacts were described in both quantitative and qualitative terms through application of existing body of knowledge, checklists, flow charts, and monographs and from input from diverse stakeholders. In particular, impact prediction in this study drew heavily on five documents namely:-

vii) The Third Schedule to Legal Notice 101

viii) JICA Guidelines for Environmental and Social Considerations

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x) The Sectoral checklists for the Roads Sector developed by the World Bank;

xi) The Checklist of Environmental Characteristics developed by the Department of Environmental Affairs of the Republic of South Africa and,

xii) The Reference Guidelines for Environmental Assessments (which incorporates the Leopold Matrix) developed by USAID / REDSO / WCA–Abidjan.

Impacts were further screened for occurrence and significance of residual (those which cannot be mitigated satisfactorily) and cumulative impacts with a view to providing a basis of making recommendations on the way forward for the project.

(v) Formulation of an Environmental and Social Management Plan

Measures or interventions necessary to minimize, reduce, avoid or offset identified adverse impacts were evaluated and presented in form of an Impact Mitigation Plan for the proposed development. Such evaluation also included an assessment of Project Alternatives as reported in Chapter Five below. The ESMP also identified modalities for monitoring and evaluation to ensure compliance in implementation of proposed mitigation measures. This involved development of monitoring indicators and procedures for continuous generation of project monitoring data and information.

(vi) Reporting procedure

The ESIA Study methodology as described above culminated with production of a Draft Environmental and Social Impact Assessment Study Report. The study was formulated in line with Regulation 18 of Legal Notice 101 of EMCA which requires that:-

(1) A proponent shall submit to the Authority, an environmental impact assessment study report incorporating but not limited to the environmental following information:-

a) the proposed location of the project;

b) a concise description of the national environmental legislative and regulatory framework, baseline information,

c) and any other relevant information related to the project; the objectives of the project;

d) the technology, procedures and processes to be used, in the implementation of the project;

e) the materials to be used in the construction and implementation of the project;

f) the products, by-products and waste generated project;

g) a description of the potentially affected environment;

h) the environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated;

i) alternative technologies and processes available and reasons for preferring the chosen technology and processes;

j) Analysis of alternatives including project site, design and technologies and reasons for preferring the proposed site, design and technologies.

k) an environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment; including the cost, time frame and responsibility to implement the measures;

l) provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the cause of carrying out activities or major industrial and other development projects;

m) the measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies;

n) an identification of gaps in knowledge and uncertainties which were encountered in compiling the information;

o) an economic and social analysis of the project;

p) an indication of whether the environment of any other state is likely to be affected and the available alternatives and mitigating measures; and such other matters as the Authority may require.

THE ESIA STUDY TEAM

This Environmental and Social Impact Assessment study was undertaken by a multi-disciplinary team bringing together skills as follows:-

- Mr. Michael Wairagu- Environmental and Social Safeguards expert
- Mr. Nancy Kanyi - EIA Lead Expert
- Charles Ngatia--Marine Biologist
- Mr. Norman Gachathi-Ecologist
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PRESENTATION OF THE REPORT

This report is presented in Thirteen Chapters which integrate the content for ESIA Study Reports as stipulated in Regulation 18 of LN 101. The Chapters have further been lumped in three Sections for ease of handling as follows:-

i) Chapter One (this chapter) outlines the background and procedure to the ESIA Study Process;

ii) Chapter Two provides a description of the project as proposed by KeNHA;

iii) Chapter Three reviews relevant policies, legal, regulatory and administrative frameworks governing conduct of environmental assessment in Kenya;

iv) Chapter Four provides the pre-project baseline environment;

v) Chapters Five, Six and Seven report on the outcome of empirical charactrisation based on measurements and studies.

vi) Chapter Eight reports on the outcome of stakeholder consultations;

vii) Chapter Nine provides an analysis of alternatives in project development

viii) Chapter Ten analyses potential impacts of the project

ix) Chapter eleven provides the Environmental / Social Management and Monitoring Plan (ESMP) developed for the project;

x) Chapter Twelve provides the conclusion and recommendations of this Environmental and Social Impact Assessment Study.

Volume Two: Appendices to the Study

CHAPTER TWO: COUNTRY AND SECTOR REVIEW

2.1: THE COUNTRY PERSPECTIVE

2.1.1: Location

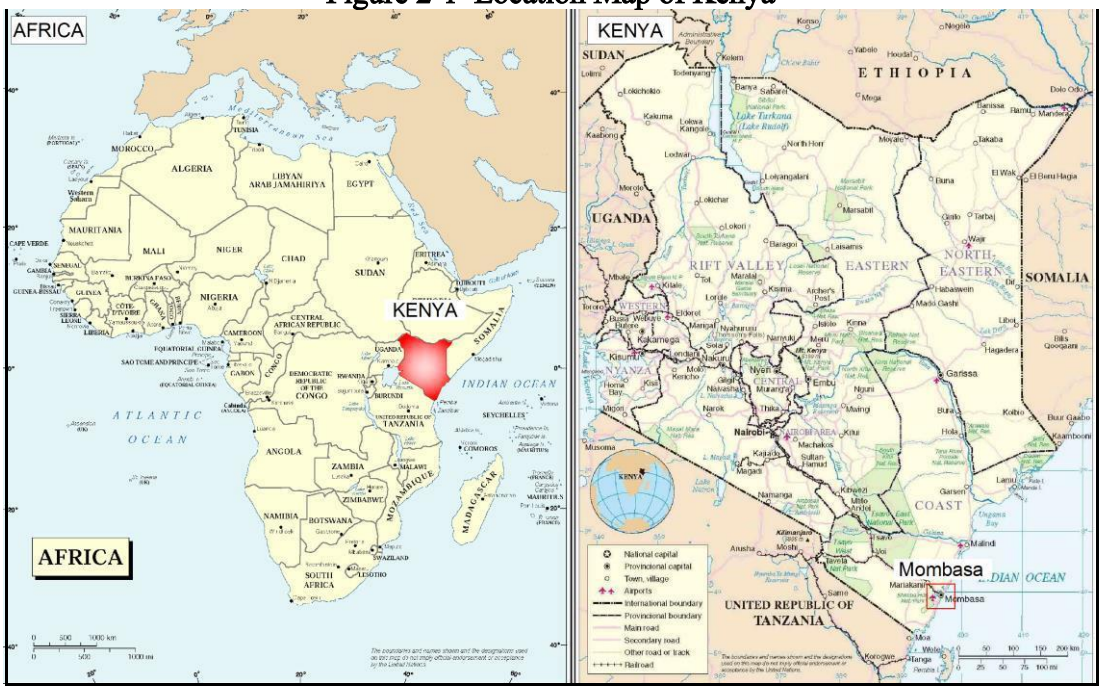
Kenya is located in the eastern part of Africa, and it is bordered to the north by Somalia and Ethiopia, to the west by South Sudan and Uganda, and to the south by Tanzania. Kenya has 47 counties, and the area of Kenya is 591,958km2, which is 1.5 times larger than that of Japan. The population of Kenya was 41,800,000 persons in 2013 with 80% of the population following Christianity and 10% following Islam. Kenya, Tanzania, Uganda, Rwanda, and Burundi form the East African Community (hereinafter referred to as "EAC") and have been promoting economic integration such as trade liberalization between them.

Table 2-1: Basic Statistics on Kenya

Content	Indicator
Area	591,958km^2 (1.5 times larger than Japan)
Population	41,800,000 persons (2013, Source: KNBC)
Capital	Nairobi (Population: 3,140,000 persons)
Language	Swahili, English (official language)
Religion	Christian (83%), Islamic (11%)
Tribe	Kikuyu, Luhya, Kalenjin, Luo etc.
Currency Unit	Kenya Shilling (KSh)

Source: Japan External Trade Organization (JETRO)

Figure 2-1 Location Map of Kenya



Source: The Study Team

2.1.2 Economic Conditions of Kenya

(1) Macro-Economy

GDP growth rate and GDP per capita from the year 2004 to 2013 are shown in Table 2.2. GDP growth rate fell in 2008 and 2009, but the annual average growth rate in the decade was 4.8%. GDP (real) increased by 150% and GDP per capita (real) increased by 240% in the decade. These economic indicators show the steady growth in GDP for Kenya in recent years.

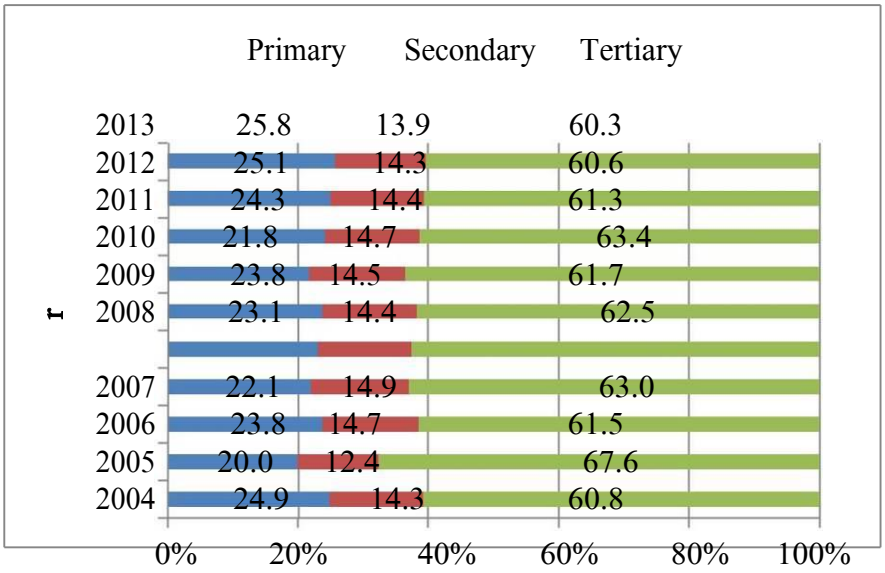
Table 2.2: Historical GDP (2004-2013)

Year		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
GDP (nominal)	Billion KSh	1,110	1,175	1,249	1,337	1,358	1,394	1,475	1,541	1,611	1,686
GDP (real、2001)	Billion KSh	1,274	1,716	1,623	1,829	2,077	2,376	2,570	3,047	3,404	3,798
GDP Growth (real)	%	5.1	5.9	6.3	7	1.6	2.7	5.8	4.4	4.6	4.7
GDP per Capita (nominal)	KSh	37,284	40,292	44,899	49,204	54,371	62,982	66,807	77,061	83,724	90,876
GDP per Capita (real. 2001)	KSh	32,463	33,442	34,574	35,969	35,553	36,962	38,346	38,956	39,621	40,345

(2) Industries

GDP share by industry sector from the year 2004 to 2013 is shown in Figure 2.2. GDP share of the primary industry was 26%, the secondary industry was 14%, and the tertiary industry was 60% in the year 2013. Proportion of the GDP by industries has been stable for a decade.

Figure 2.2: GDP Share by Industries (2004-2013)



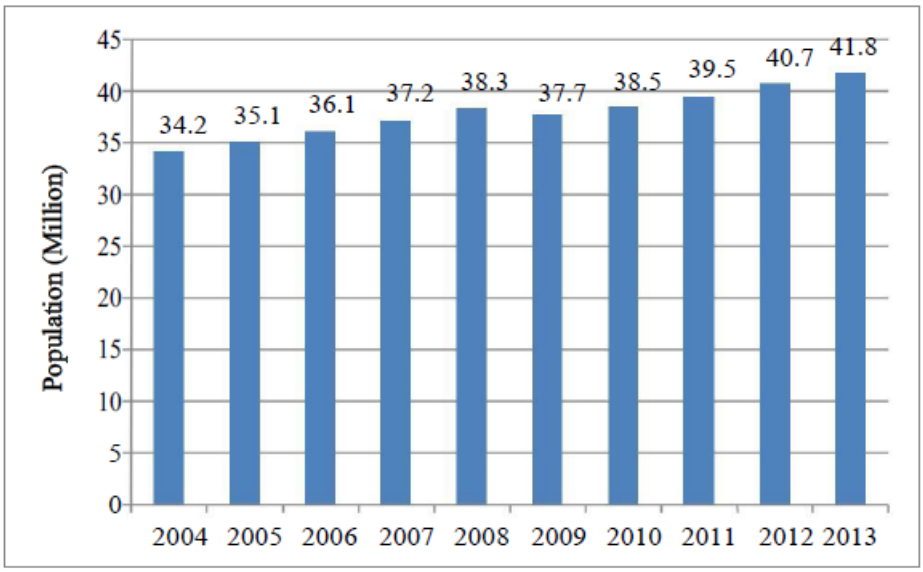
Note: Nominal GDP

Source: Kenya National Bureau of Statistics

(3) Population

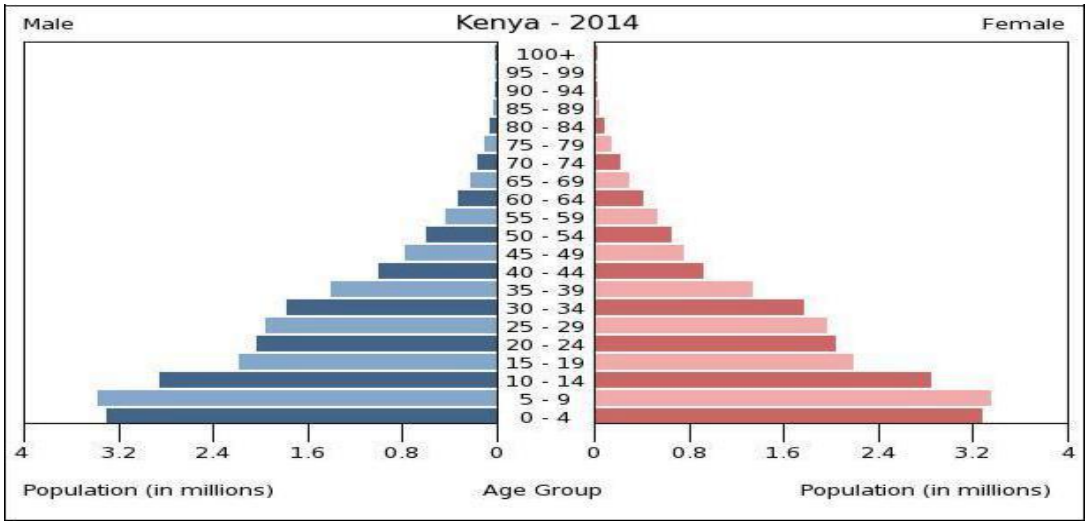
The historical population of Kenya from the year 2004 to 2013 is shown in Figure 2.3. The population in 2013 was 41,800,000 and the annual average growth rate for the decade was 2.3%. The population structure is shown in Figure 2.4 and this shows that the ratio of younger generations to other generations is much higher and it follows that this will be a driving force of economic growth from the point view of securing the workforce in the future.

Figure 2.3: Population



Source: Kenya National Bureau of Statistics

Figure 2.4: Population Structure

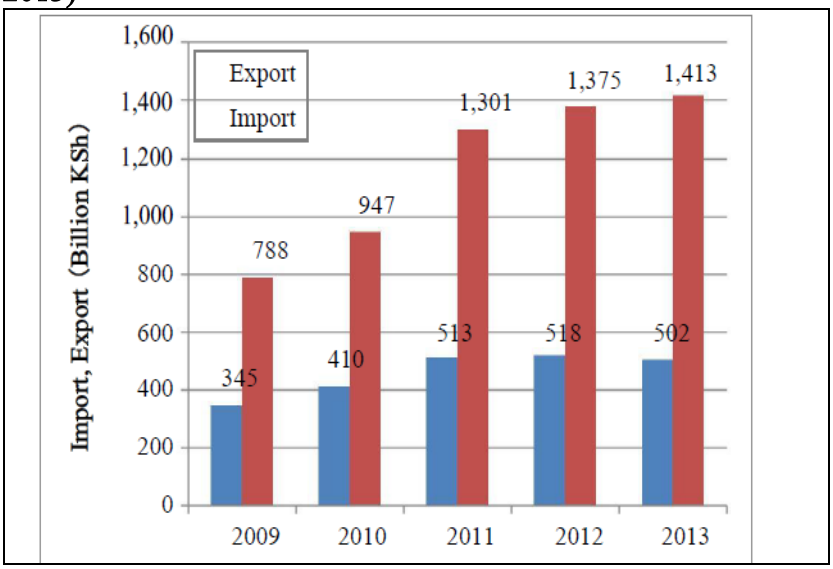


Source: The Central Intelligence Agency of USA, The World Factbook

2.1.3: Trade in Kenya

Imports and exports from the year 2009 to 2013 are shown in Figure 2.5. Imports increased by 180% and exports increased by 145% during this period. Imports were 2.8 times larger than exports in the year 2013.

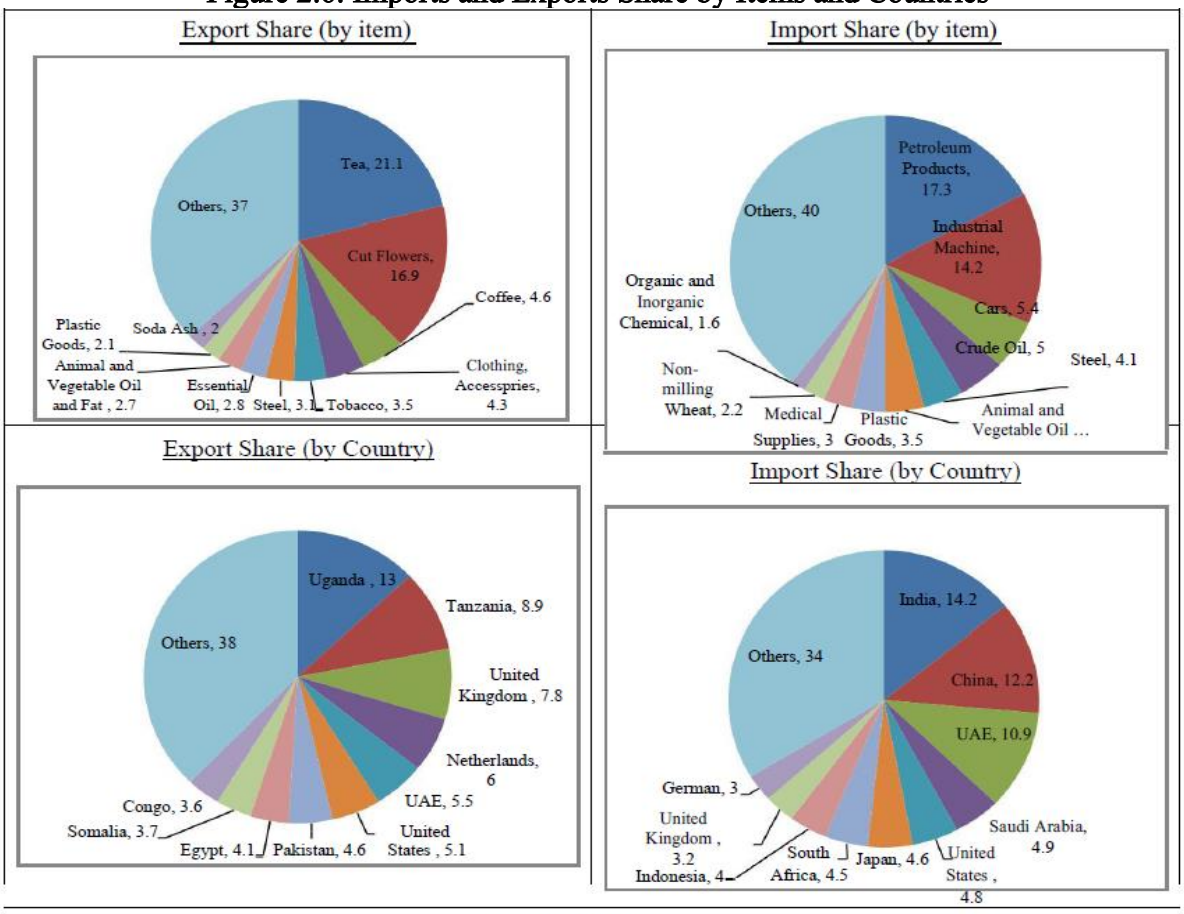
Figure 2.5: Imports and Exports (2004-2013)



Source: JETRO

Imports and exports share by items and countries for 2012 are shown in Figure 2.6. It can be seen that farm products account for a high percentage in export items, namely tea at 21%, cut flowers at 17%, and coffee at 5%. Kenya is the third largest tea production country in the world after China and India, and Kenya is the largest tea export country in the world. Major import items include petroleum products at 17%, industrial machine at 14%, and cars at 5%. Major import partner countries are not only neighboring countries like Uganda and Tanzania, but also the United Kingdom and the Netherlands both of whom mainly import cut flowers. Other major import partner countries are Asian countries such as India, China, UAE, Saudi Arabia, and Middle East countries. Imports from Japan were Ksh 63.135Billion and this was ranked 6th after the United States.

Figure 2.6: Imports and Exports Share by Items and Countries



Source: JETRO

2.1.4: Economic Conditions of Neighbour Countries

Economic indicators for neighbour countries in the year 2013 are shown in Table 2.3. The population of each of these countries varies between 9 million and 90 million, with population growth rates in all of them exceeding 2%. GDP per capita of all countries except Kenya and South Sudan were less than USD 1,000. THE GDP and the GDP per capita for Kenya were the highest in the EAC.

Table 2.3: Economic Condition of Neighbour Countries

Country	Population (million)	Population Growth Rate (%)	GDB (Billion USD)	GDB Growth rate (%)	GDP per capita (USD)
EAC Kenya	44.4	2.7	45.1	5.6	1,016
Uganda	36.8	3.3	6	8.5	626
Tanzania	46.3	3	32.5	7	703
Burundi	9	2.4	2.7	4.5	303
Rwanda	10.6	2.1	7.4	5	698
Other Countries					
Ethiopia	88.9	2.4	48.1	9.7	542
Congo (COD)	77	3	30.6	8.5	398
South Sudan	10.9	4.8	13.7	24.4	1,262

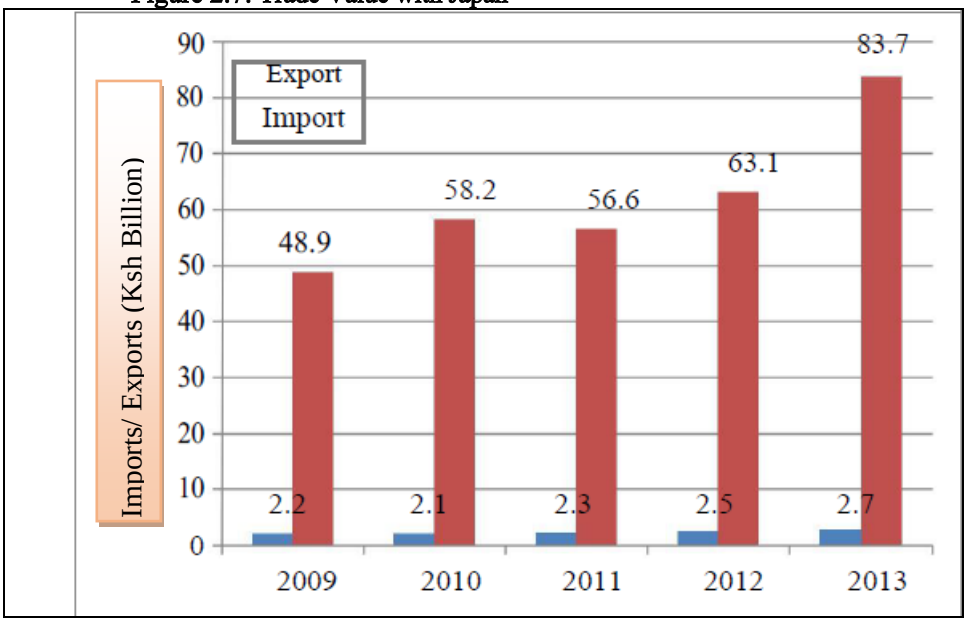
Source: International Monetary Fund

2.1.5: Relationship with Japan

(1) Trade

Trade value with Japan from the year 2004 to 2013 is shown in Figure 2.7. Trade value with Japan grew continuously, and imports increased by 1.7 times and exports increased by 1.2 times during the 5 years. Imports were 31 times larger than exports in the year 2013.

Figure 2.7: Trade Value with Japan



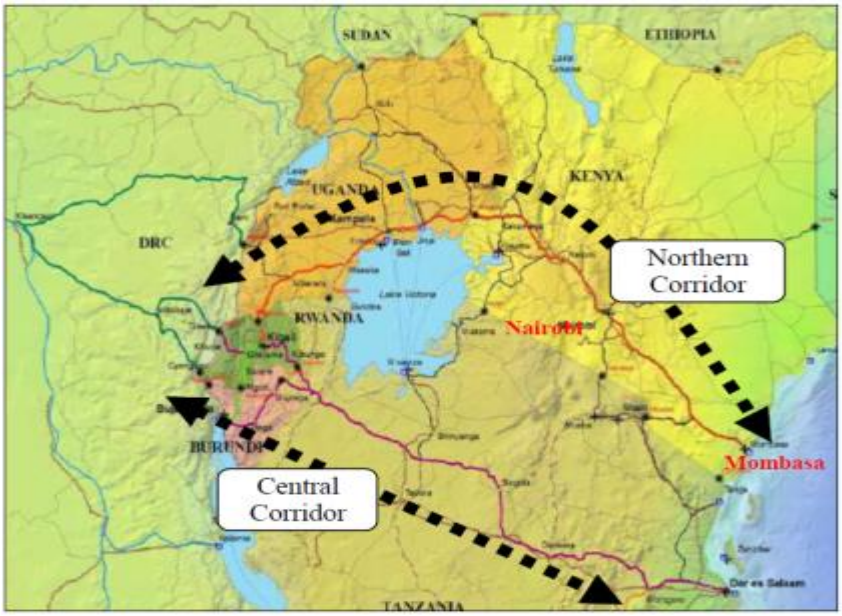
Major import items from Japan were heavy industry products such as vehicles (66%), steel (14%), and machine (5%). Major export items to Japan were plants (36%), spice, tea and coffee (26%), and conditioning food (23%).

2.2: OVERVIEW OF ROAD SECTOR

2.2.1 International Corridor in EAC

EAC has two major road corridors, namely the Northern Corridor and the Central Corridor (Figure 3-9). The Northern Corridor starts from Mombasa and runs through Kenya, Uganda, Rwanda and Burundi and has a total length of 2,038km. The Northern Corridor is the primary freight transport route from Mombasa port for EAC countries and as well as South Sudan and Ethiopia. The Central Corridor runs through Tanzania, Rwanda, Burundi, and Uganda serving as a freight transport route from Dar-es-Salaam port to neighboring countries. The Central Corridor works as a transport route for tea and coffee from Burundi and Rwanda to Dar-es Salaam Port, and for cotton produced in the western side of Tanzania to Dar- es- Salaam Port.

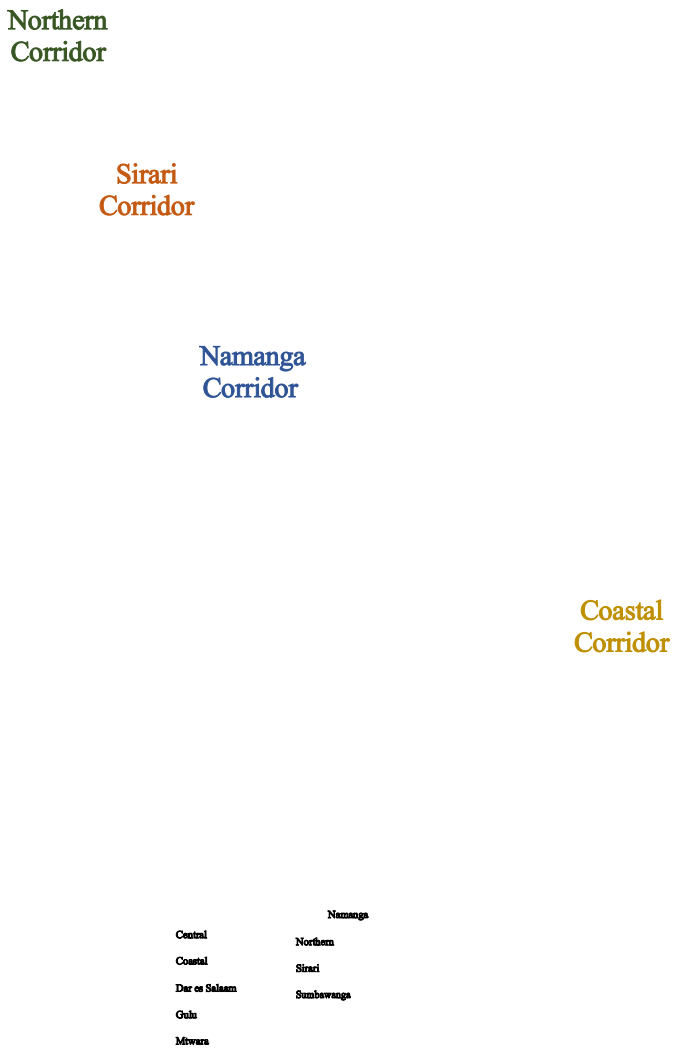
Fig 2.8: Main Corridors



Source: EAC, Corridor Diagnostic Study of the Northern and Central Corridors of East Africa, 2011

Figure 2.9 shows a corridor map prepared by EAC. In addition to the Northern Corridor, three other corridors, namely the Sirari Corridor, Namanga Corridor, and Coastal Corridor, pass through Kenya from the north to the south. The Sirari Corridor connects the east side of Lake Victoria and the northwest of Kenya, the Namanga Corridor connects the capital cities of Kenya and Tanzania, and the Coastal Corridor connects two major ports in East Africa, namely Mombasa and Dar-es- Salaam.

Figure 2.9: Corridor in EAC



Source: East African Community Secretariat, East African Transport Strategy and Regional Road Sector Development Program, 2011

2.2.2 Road Network in Kenya

Four road management agencies made up of Kenya National Highways Authority (hereinafter referred as "KeNHA"), Kenya Urban Road Authority, Kenya Rural Road Authority and Kenya Roads Board are established under the jurisdiction of the Ministry of Transport and Infrastructure. KeNHA is in charge of construction, operation and maintenance of national roads and the proposed bridge is located on a national road. Accordingly KeNHA is the implementation agency for the Project. Roads are classified into 5 classes from A to E in Kenya. The total road length of roads is 63,574km, with the total length of class A being 3,618km (6%) and total length of class B being 2,682km (4%). Approximately 15% of all roads are paved representing some 9,273km. 78% of Class A roads are paved. Class A roads encompass the following : the A109 being part of the Nothern Corridor, the A14 connecting Mombasa and Tanzania, and the A104, A2 and A3 which connect Nairobi to Tanzania, Ethiopia and Somalia respectively.

Figure 2.10: Road Network in Kenya

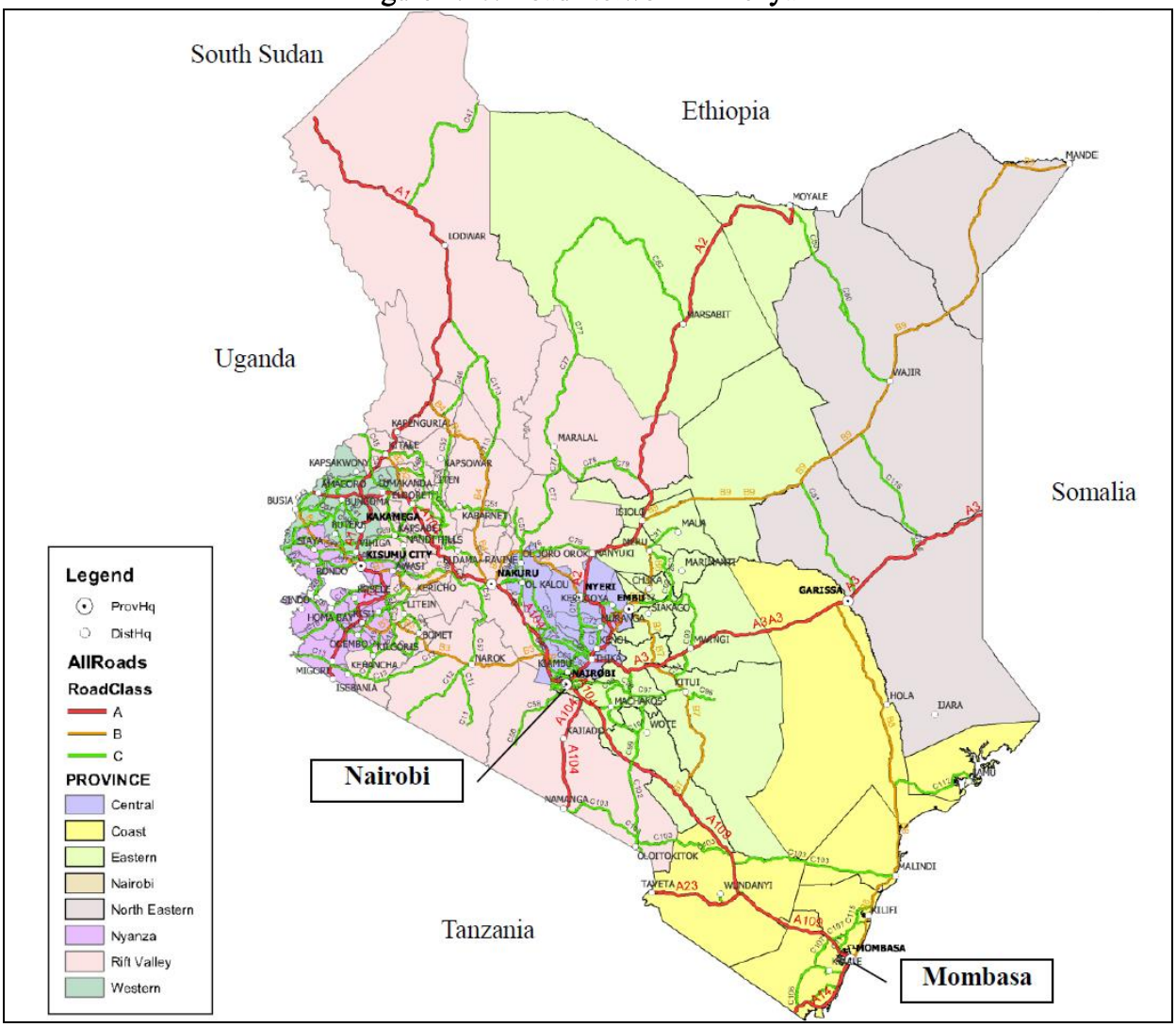


Table 2.5:Road Length in Kenya

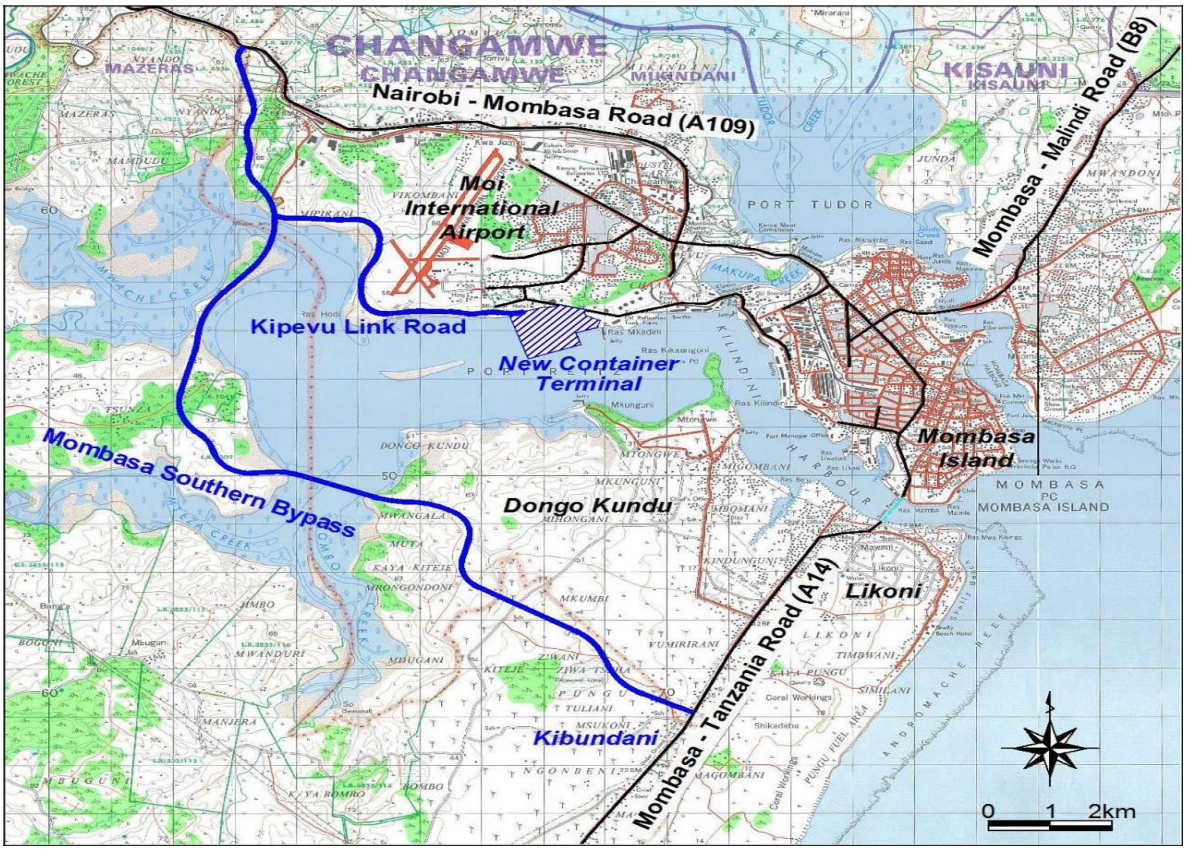
Road class	Premix	Length by Surface Type (km)			Total
		Surface dressing	Gravel	Earth	
International Trunk Roads (A)	1,244.91	1,563.81	715.11	94.48	3,618.31
National Roads (B)	350.21	1,166.26	819.29	346.14	2,681.90
Primary Roads (C)	642.89	2,198.16	3,601.64	1,552.90	7,995.59
Secondary Roads (D)	76.63	1,183.10	5,701.93	4,087.73	11,049.39
Minor Roads (E)	165.81	542.04	8,215.89	17,982.57	26,906.31
Special Purpose Roads	24.88	114.63	4,929.69	6,253.78	11,322.98
All classes	**2,505.33**	**6,768**	**23,983.55**	**30,317.60**	**63,574.4**

Source: KeNHA

2.2.3 Road Network in Mombasa

The road network in Mombasa includes three trunk roads connecting to Mombasa Island. These are the A109 towards Nairobi in the West, the B8 towards Malindi in the north and the A14 towards Tanzania in the south. The existing road network in Mombasa is composed of roads connected with the A109 and A14. As a result of this traffic concentrates along the arterial roads in the central area resulting in congestion. Mombasa Island is the economic hub of Mombasa with the east side facing towards the Indian Ocean, and the western and northern sides connecting to the mainland via a causeway and a bridge respectively. The Southern part of the island and the Likoni District on the mainland are separated by the 500m wide Likoni Channel (Kilindini Harbor). This requires the residents of Likoni District and traffic from/to the southern coastal area to cross the harbor by the Likoni Ferry. The Mombasa Southern Bypass construction project that connects the A109 to the A14 has started. However, the project road does not connect Mombasa Island and Likoni District. Therefore, the construction of Mombasa Gate Bridge (hereinafter referred as "the target bridge") connecting Mombasa Island to Likoni District has become indispensable.

Figure 2.11: Road Network in Mombasa



Source: The Study Team

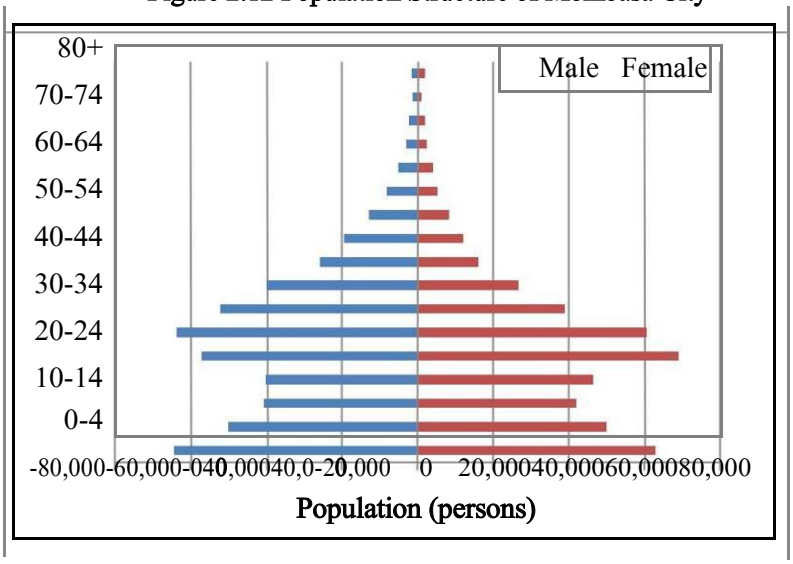
2.3: OUTLINE OF THE PROJECT AREA

2.3.1 Overview of Mombasa

Mombasa is a coastal county of the Republic of Kenya and is the second-largest city in the country. The population of Mombasa was found to be 938,131 by a population census survey carried out in the year 2009. The population of the twenties and thirties age group is larger than any other age group. It is assumed that this age group includes a young workforce that has moved to Mombasa from other counties. The total area of Mombasa is 295km2 which includes 65km2 of water area. Mombasa was the trade hub for Arabian merchants in the 12th century and is now the biggest trade hub port in East Africa. Mombasa port handles 19,000,000 ton of freight cargo (about 730,000 TEU). Mombasa Island is connected to the mainland on the north and west sides of the Island by roads. On the south side of the Island the only connection to the mainland is via the Likoni Ferry.

This ferry is used for freight and passenger transport crossing Kilindini Habor, and includes vehicles from the north since the A14 from Likoni District runs to Tanzania.

Figure 2.12 Population Structure of Mombasa City

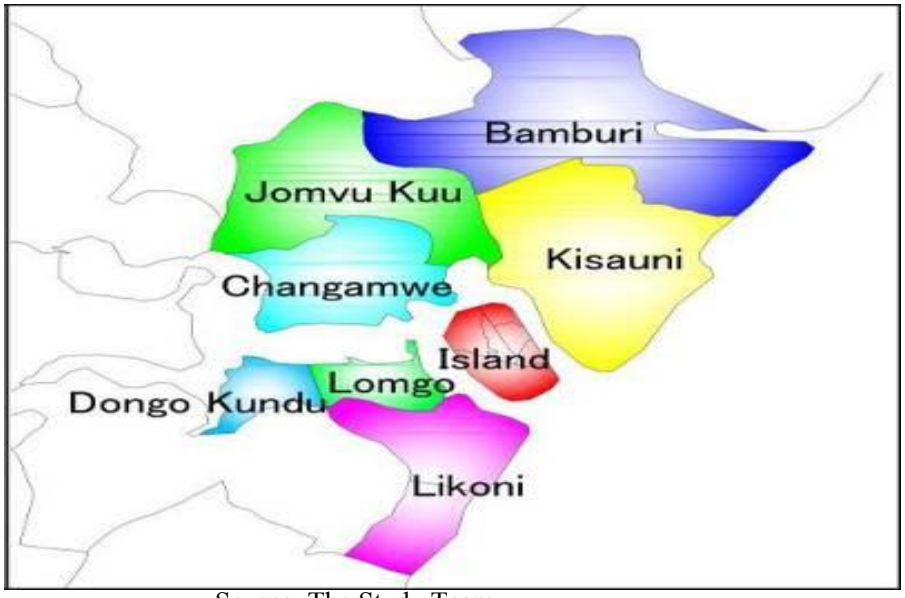


Source: The 2009 Kenya Population and Housing Census, Kenya National Bureau of Statistics

2.3.2 Population Distribution

The district map and district population in and around Mombasa in the year 2009 are shown in Figure 2-12 and Table 2-6. The annual population growth rate in all districts with the exception of Mombasa Island and industrial area of Changamwe is around 5%. Of particular relevance is the annual population growth rate in Likoni which is 6.5%.

Figure 2.12: Districts Map



Source: The Study Team

Table 2.6:Population Distribution

	1999	2009	AAGR (%)

Island	142,808	143,128	0.0
Kisauni	199,625	308,141	4.4
Banburi	44,199	71,914	5.0
Mombasa District Total	386,632	523,183	3.1
Likoni	59,372	111,804	6.5
Lomgo	35,311	54,204	4.4
Changamwe	110,150	132,692	1.9
Jomvu Kuu	63,780	117,487	6.3
Kilindini District Total	268,613	416,187	4.5
Total	655,245	939,370	3.7

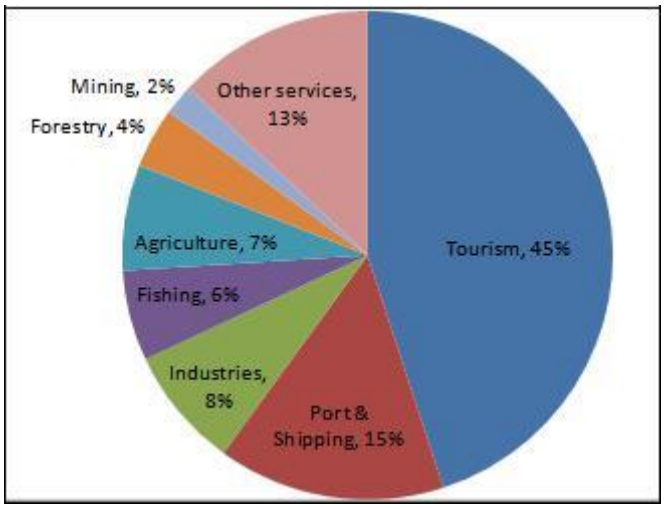
Note: AAGR means Average annual growth rate

Source: Kenya National Bureau of Statistics

2.3.3 Regional Economy

Tourism is the main economic driver in the Kenyan coast area accounting for 45% of the regional economy, with shipping and port activities following at 15%, and industries at 8%.

Figure 2.13: Industrial Share in Mombasa and Coastal Region



Source: National Environmental Management Authority, Kenya, State of the Coast Report (2007)

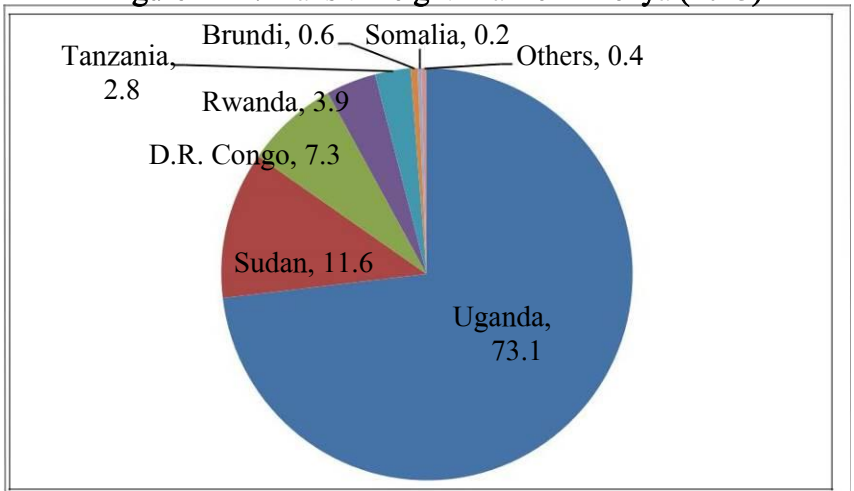
a) Tourism

Tourism generates 18% of foreign currency income representing 9.2% of GDP in Mombasa and the Coast Region. This tourism provides 270,000 job opportunities directly and indirectly. Revenue from tourism is both substantial and reliable for the central government and the local government. Many large passenger ships from foreign countries come to Mombasa Port. Authorities for the Coastal Region are keen to attract tourists since the southern coastal area beyond Mombasa has many beautiful beaches. However, it takes a long time to reach these beaches from Mombasa Island since there is no channel crossing route except for the Likoni Ferry. Accordingly, the tourism industry emphasizes that mitigation of traffic congestion around the ferry jetty is critical for the development of tourism in the southern coastal area.

b) Port and Shipping

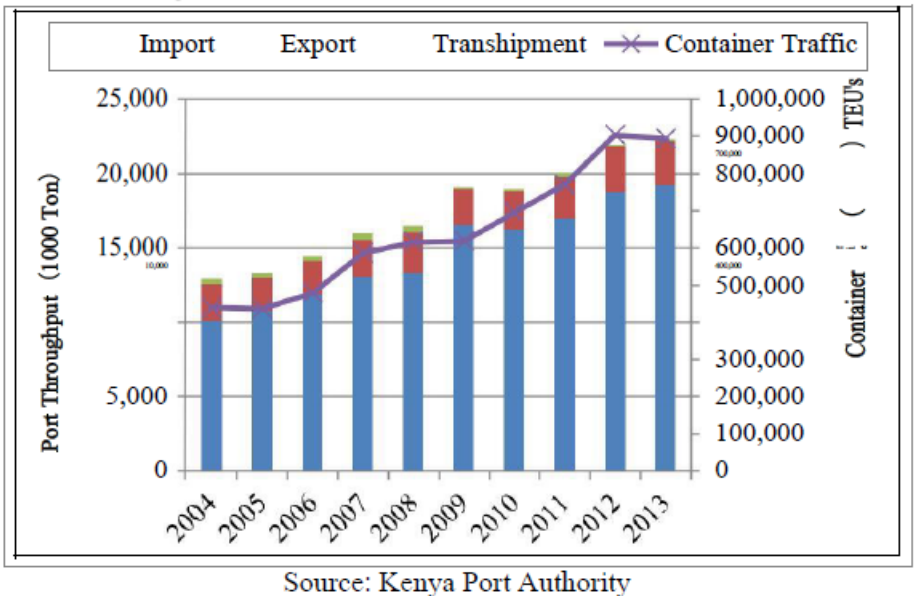
Mombasa Port is the only port supporting the shipping industry in Mombasa and the Coastal region. Mombasa is the starting point of the Northern Corridor which is the primary freight transport route of EAC and is the principal harbor for landlocked countries such as Uganda, Rwanda, Burundi and South Sudan. The volume of freight handled by Mombasa Port has increased as the economies of Kenya and neighboring countries have developed. Before the improvement of Mombasa Port in August 2013, some cargo ships had to use Dar- es- Salaam Port instead of Mombasa Port due to lack of handling capacity of Mombasa Port. However, after improvement of Mombasa Port to make it passable for Panama class vessels, the freight handling capacity of Mombasa Port increased by 30%. Kenya Port Authority (hereinafter referred as "KPA") manages Mombasa Port, and it employs more than 5,000 persons. Port and shipping industry contributes to the development of the economy of Mombasa.

Figure 2-14: Transit Freight Traffic in Kenya (2013)



Source: Kenya Port Authority

Figure 2-15: Container Volume in Mombasa Port



Source: Kenya Port Authority

c) Manufacturing

Manufacturing industries represent less than 10% of GDP. Development of a Special Economic Zone (hereinafter referred as "SEZ") Development Project in Dongo Kundu is under study by the Government of Kenya supported by the Japan International Cooperation Agency (hereinafter

referred as "JICA"). JICA is supporting to develop the Mombasa area since it is the starting point of the international corridor leading to EAC and neighboring countries.

2.3.4 Overview of the Likoni Ferry

The Likoni Ferry connects Mombasa Island and Likoni District which are separated by a 500m wide channel. There is no detour so all traffic between Mombasa Island and the southern coastal area use the Likoni Ferry. According to a traffic count survey in 2013, the Likoni Ferry carries 3,000 vehicles and 80,000 passengers during the 12 hours of daytime from 7am to 7pm. The frequency of the ferry arrival/departures is every 10 minutes in the morning and the evening peak hours and every 15 minutes during nonpeak hours in the daytime. The frequency of the ferry operation is shown in Table 3-7. Regardless of such frequent operations, there is a long queue of vehicles from the ferry jetty waiting to board due to the insufficient capacity of the ferry to meet traffic demand. Moreover, the ferry service has to be suspended when vessels entering Mombasa Port pass through the channel. Likoni Ferry is operated by Kenya Ferry Service (hereinafter referred as "KFS") which generates income from fares and a subsidy from the Government of Kenya (hereinafter referred as "GOK"). The ferry fare by vehicle type is shown in Table 2-8. Pedestrians are free of charge.

Table 2-7 Frequency of Ferry Operation

Time	Frequency
4:00 – 5:00	30 min
5:00 – 6:00	15 min
6:00 – 10:00	10 min
10:00 – 17:00	15 min
17:00 – 20:00	10 min
20:00 – 2:00	30 min
2:00 – 4:00	60 min

Table 2-8 Ferry Fare

Vehicle Type	Fare (KSh)
Car (up to 4.5m)	90
Car (up to 6.0m)	120
Cars 4×4	200
Pickup	120
Pickups (1 ton), Vans	220
Car Towing	240
Truck (up to 5.5m)	280
Truck (up to 10m)	700
Truck (up to 16.5m)	1,250
Trailers (Empty)	5,550
Trailers (Loaded)	7,950
Mini Buses (up to 7.0m)	450
Buses (9.0-11.0m)	880
Bicycles Loaded	60

Source: Kenya Ferry Service

2.3.5 Overview of the Project Site Condition

A candidate site for the loop bridge is the park at the Mombasa Island side called Mama Ngina Park on Mombasa Island and YWCA Likoni in Likoni District. There are many small shops and vendors along the roads at the both side.

CHAPTER THREE: DISCLOSSURE OF THE MOMBASA GATE BRIDGE PROJECT

3.1: PROJECT SCOPE

3.1.1: Ownership

The MGB is a project of the Government of Kenya implemented by the Kenya National Highways Authority (KeNHA) with support of the Government of Japan through JICA.

The Project will however largely be implemented within Mombasa County under jurisdiction of Mombasa County Government. Other core stakeholders to the project are summarised in tabular form in Table 3.1 below.

Table 3.1: Summary analysis of stakeholders in development of the MGB Project

SN	Stakeholder	Main Stake
1	Government of Kenya	Project Owner
2	Kenya National Highway Authority-KeNHA	Executing Agency under direction of the Ministry of Transport and Infrastructure
3	Government of Japan through JICA	Strategic Partner
4	Mombasa County Government	Enjoys political, administrative and planning jurisdiction
5	Kenya Ports Authority	Legal jurisdiction over Likoni Channel
6	Kenya Maritime Authority	Has legal jurisdiction over Maritime Transport in Kenya
7	Kenya Navy	Relies on Likoni Channel for operations
8	Kenya Ferry Service	Has legal mandate over transportation across the channel
9	Mombasa/ Likoni residents	Major stakeholders to a safe, time and cost efficient mode of transport across the channel
10	Investors	

For purposes of this ESIA Study KeNHA in capacity of Executing Agency is the proponent.

3.1.2: Administrative jurisdiction

The Bridge originates in Mombasa Island and lands in Mombasa Mainland South in the Likoni area and thereafter continues as an approach road linking to the proposed Mombasa Southern Bypass Road at the boundary with Kwale County.

Table 3-2: Coordinates in the Project Traverse

Project Section	Crucial points	Co-ordinates		Elevation (m)
		Easting	*Northing*	
Mombasa Island side	KM00-King'orani Prison	39°39'37.26"E	4° 3'18.50"S	24
	Moi Avenue junction	39°39'27.30"E	4° 3'34.64"S	21
	Liwatoni Interchange	39°39'41.51"E	4° 3'52.24"S	
	Archbishop Mackarrios interchange at Mnazi Moja road	39°39'19.59"E	4° 3'55.28"S	18
	Main Pier	39°39'43.96"E	4° 4'27.56"S	3
Mombasa mainland south	Likoni Pier	39°39'12.40"E	4° 4'30.36"S	7
	Touchdown point	39°38'52.76"E	4° 05'02.81"S	15
	Mtongwe Rd Interchange	39°38'17.41"E	4° 05'50.59"S	19
	A14 Road interchange	39°38'39.33"E	4° 06'01.76"S	16
Kwale	Ziwani interchange with MSBR	39°37'17.22"E	4° 06'22.41"S	37

3.1.3: Bridge location

Fig 3.1 and Plate 3.1 below trace the entire traverse of the 10.4 Kilometer long MGB Project including associated developments. The bridge will start from Mombasa Island and cross overhead the Likoni Channel to land in the Mombasa Mainland South area connecting with the proposed Mombasa Southern Bypass.

In the Mombasa Island side, the bridge structure starts on Lumumba Road near King'orani Prison in rising gently to cross over the Mombasa Railway Station, then overhead Moi Avenue to the west of Canon Towers. Henceforth, the bridge proceeds overhead Archbishop Makarios Rd to Ganjoni, turns right overhead Liwatoni and crosses Likoni Channel to enter Likoni side at the ruins of the abandoned Sultan of Zanzibar Place near Puma Primary school. The bridge then proceeds along the western shoreline of Mweza creek and starts descending ultimately touching down near the Javi la Wageni Primary School from where it proceeds as a 4 lane highway to cross Mtongwe Rd at the Post Office then joining the Mombasa Southern Bypass at Ziwani on the boundary with Kwale County.

Thus, contrary to popular expectation, and for reasons to be disclosed in Chapter six below, the bridge will not be developed at the current Ferry Crossing Point connecting the A14 highway at both Likoni and Mombasa Island.

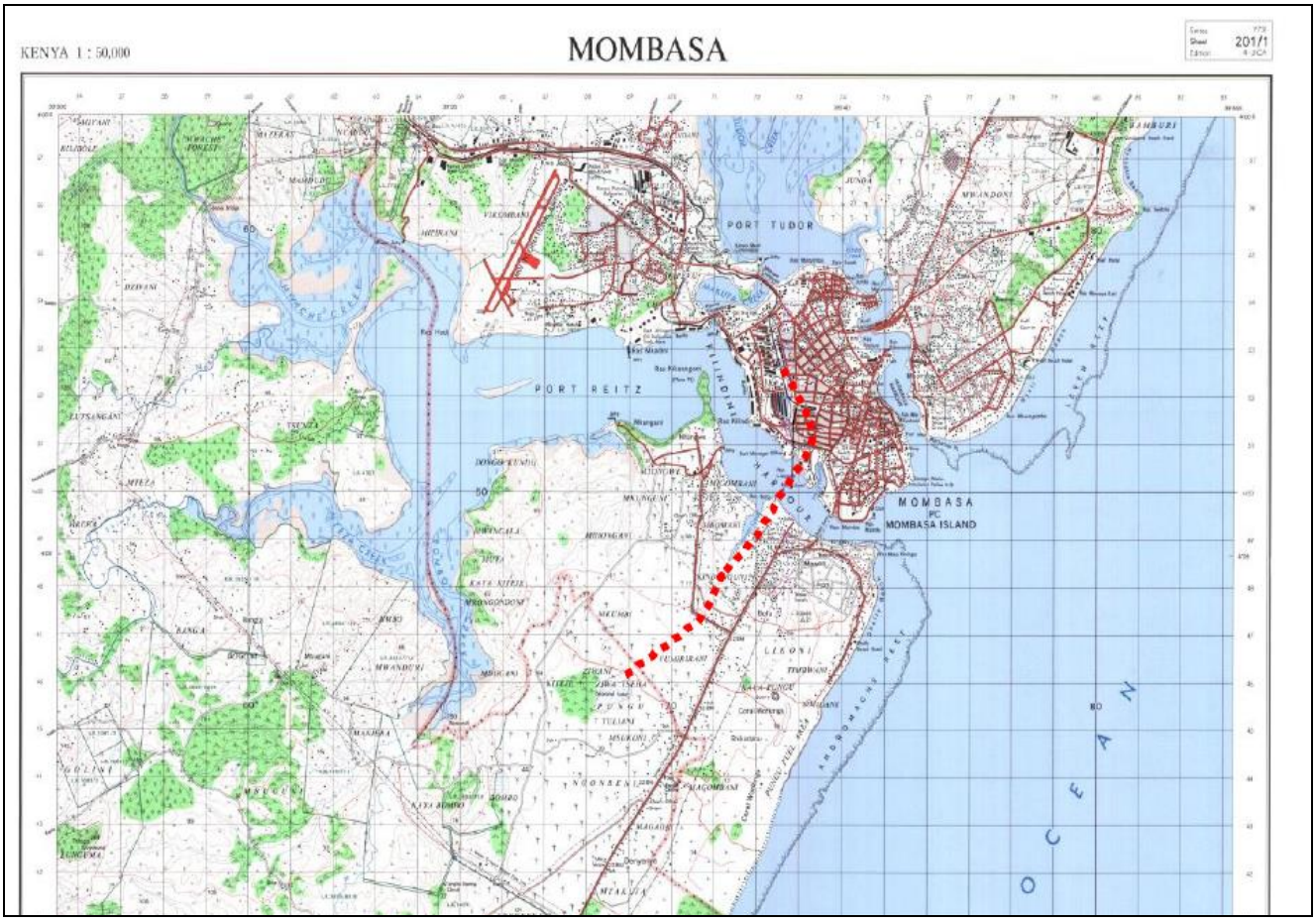


Fig 2.1: Map of MGB Traverse in Mombasa and Kwale Counties
Source: This Study

3.2: PROJECT DESIGN

3.2.1: Project Components

The entire bridge assembly has 2 major components namely the main bridge and approach roads (plates 3.1 and 3.2). Bridge design also allows for six interchanges through which traffic will access the bridge.

3.2.2: Design specifications for the bridge structure

Bridge dimensions:

Fig 3.1 provides a schematic layout of the bridge structure. A 1.32 kilometre-long steel cable-stayed comprised of three spans supported by 4 piers on both the Mombasa Island and Likoni sides of the channel is proposed. The main span is 660 metres long and will be anchored by 2 piers mounted at the shallow shore line opposite COMARCO on Mombasa side and in front of the Zanzibar Palace Ruins on the Likoni side. Side spans will be 330m long and will be supported on 2 additional piers on either side.

Design width is 24 metres to allow for a 4 lane carriage (Fig 3.23) for motorized transport and a single pedestrian passage. Non motorized transport has no provision on the bridge.

Plate 3.1: Schematic layout of the Mombasa Gate Bridge Project

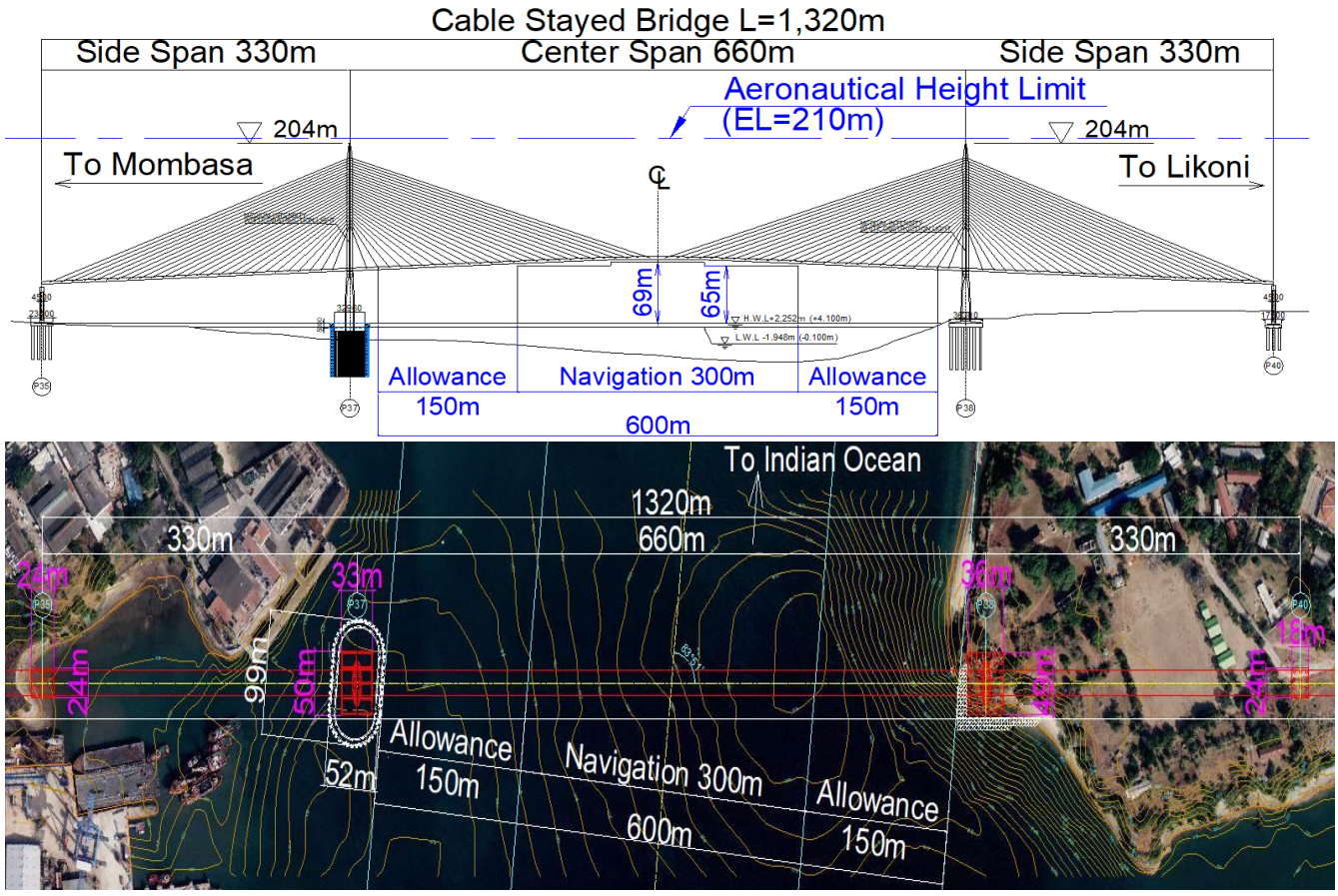


Fig 3.2: Schematic layout of the bridge structure-side view

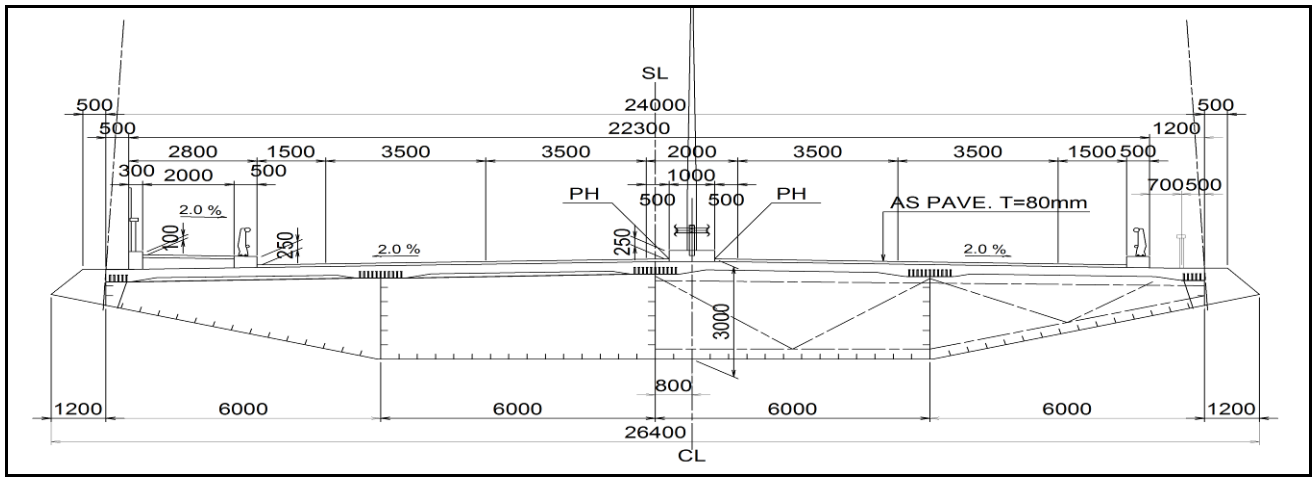


Fig 3.3: Schematic layout of the bridge structure-cross sectional view

Clearance specifications:-

Development of an overhead bridge across the Likoni channel faces the challenge of providing for multiple uses. A bridge across the over 600m wide channel must make provision for vessels to access and leave the Kilindini Harbour while vehicles pass overhead and then on into Mombasa City roads must therefore be quite high with appropriate slopes at reasonable cost. Given such considerations, clearances have been provided for as schematically indicated in Fig. 3.3 above.

Provision for vertical navigation clearance: A clearance of 69m above the highest water level (Fig 3.2) has been provided to allow for the highest draft vessels to enter and leave the Kilindini harbour. Any vessels taller than this calling into the Port in future have the option of docking in the Mbaraki area.

Provision for lateral navigation clearance: Out of the 600 m of span width at the proposed bridge construction site, 300m on the deeper, Likoni side have been identified for use by vessels navigating into and out of the Harbour with a 150m allowance on either side in case of vessels going out of control. There is therefore, a whole 600m clearance in between the 2 bridge piers, the Island side of which will be protected with rubber vendors as an anti-collision measure for small vessels navigating the shallow waters.

Provision for aeronautical clearance: Bridge elevation at the top has been set at 204m *asl* (Fig 3.2) in conformity with the 210m aeronautical capping imposed by the Kenya Civil Aviation Authority.

3.2.3: Design specifications for approach roads

Fig 3.4 traces the bridge approach roads in the Mombasa Island side of the bridge. Three categories of approach roads are anticipated as follows: -

Two-lane carriage way/viaduct: At Km00 start point, the bridge will take off from Lumumba road as a 2-lane elevated viaduct (Fig 3.4) with side roads/ service lanes. The viaduct will proceed till Moi Avenue interchange where it will acquire 2 ramps to serve Moi Avenue.

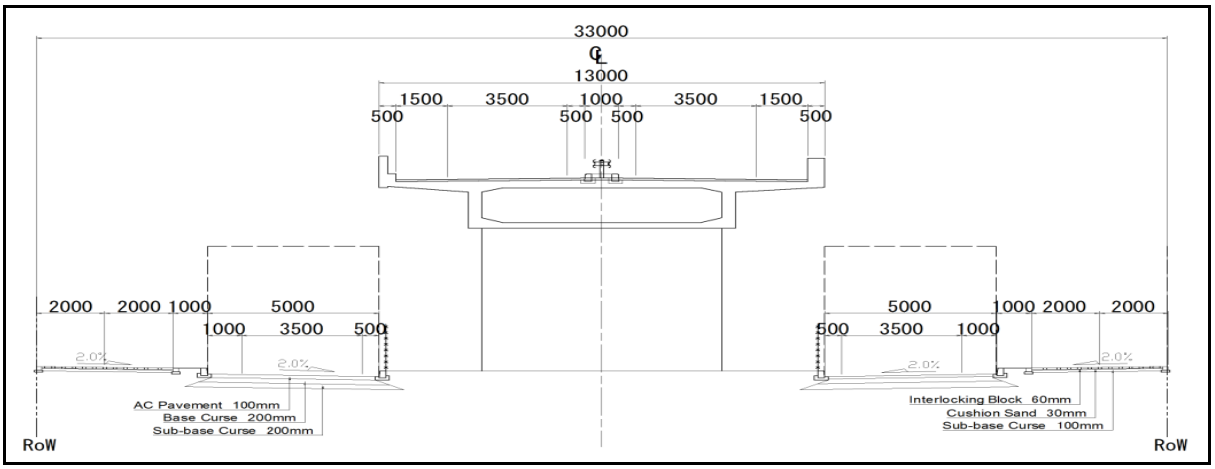


Fig 3.4: Two lane carriage

Two lane double carriage roads with ramps: At Moi Avenue, the Viaduct road will receive two ramps to now comprise a 2-lane main line and single lane rampways on either side (Fig 3.5). The side lanes will be used to either direct or discharge traffic to and from the main bridge into Archbishop Makarios and Moi Avenue roads in Mombasa.

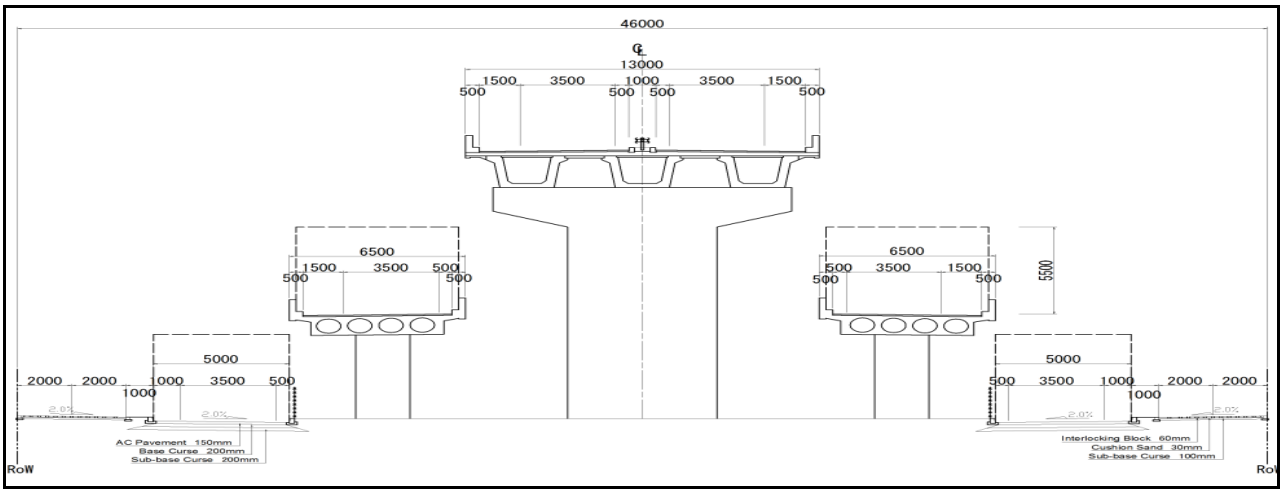


Fig 3.5: A 2-lane carriage way with ramp roads

4-lane double carriage roads: Fig 3.6 presents a cross section of a four-lane single carriage road which will be used to connect directly to the bridge on the Likoni side, thereafter proceeding for 4.7 kilometers till the project end at the interchange with the Southern Bypass Road. This main line will be franked by 5m wide service lanes on either side to serve the traverse area.

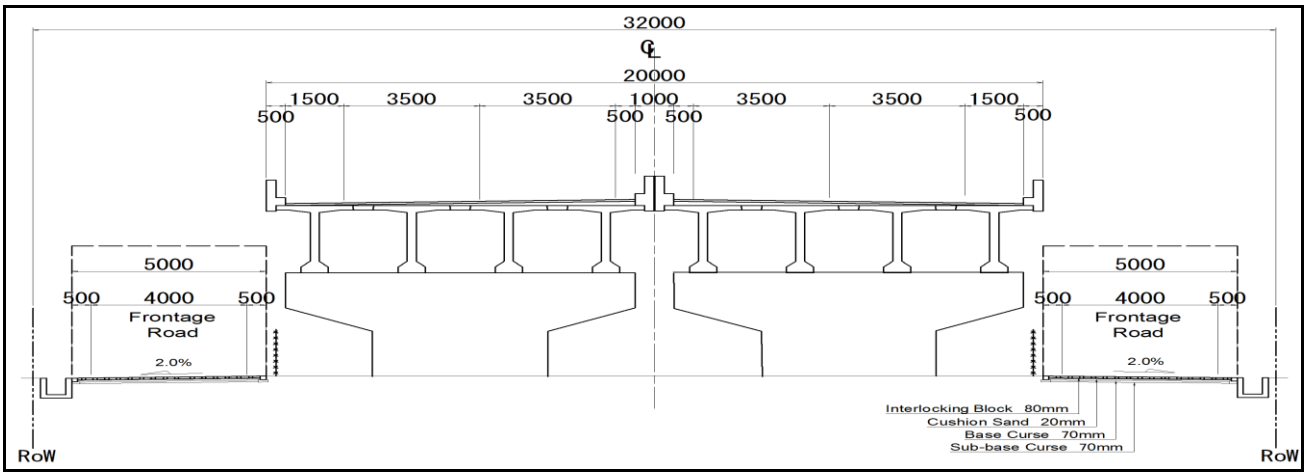


Fig 3.6: 4-lane double carriage road

CHAPTER FOUR: POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This chapter defines the policy, legislative and institutional frameworks which will govern development, implementation and operationalization of the proposed Mombasa Gate Bridge Project.

By design, the MGB project cuts across many sectors of the economy, some of which enjoy protection under diverse local, national, regional and global policy/ legal tools. An analysis of requirements of such tools has been undertaken as part of the ESIA process to ensure that the MGB Project output attains the goals of social acceptability, economic viability and technically sustainability in line with internationally accepted standards for good practice. A detailed analysis of potential inter-phasing of the Project with diverse legal instruments is summarised in Appendix 3.1 and briefly highlighted in sections below.

4.1: THE POLICY FRAMEWORK

Policy Thrust: Since independence, successive governments have pursued the policy of sustainable development. This was later on captured and elaborated in the Environmental Management and Coordination Act EMCA of 1999 and later on accorded constitutional weight in the National Constitution 2010 which declared a safe environment to be a universal right for every Kenyan.

Four policy frameworks are considered relevant to development of the MGB Project namely: -

- National Policy Framework for development planning
- National Policy Frameworks for Transport including the roads sub sector
- National Policy Framework for environmental management
- Policy frameworks for the Mombasa County Government

4.1.1: Policy Framework for Development Planning in Kenya

National Constitution 2010:

See under 4.2.1 below.

Sessional Paper Number 10 of 2012 on Kenya Vision 2030

Sessional Paper Number 10 of 2012 on Kenya Vision 2030 is the National Policy Economic Blueprint that entrenches Kenya Vision 2030 as the long-term development strategy for Kenya towards achieving a "globally competitive and prosperous country with a high quality of life by 2030. Specifically, Vision 2030 aims at transforming Kenya into "a newly industrializing, middle income country providing a high quality of life to all its citizens in a clean and secure environment as anticipated in the Millennium Development Goals which is anchored on 3 pillars[1]:

- The Economic Pillar aims to achieve a sustained annual growth rate of 10% by 2030,
- The Social Pillar seeks to create a just, cohesive and equitable social development, and;
- The Political Pillar envisions a democratic system that is issue based, people centered, results oriented and is accountable to the public.

[1] *Kenya Vision 2030, http://www.vision2030.go.ke/ (accessed August 26, 2014)*

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

Relevance of Mombasa Gate Bridge to the Economic Pillar: By promoting investment in the six priority sectors of tourism; agriculture; wholesale and retail trade; manufacturing; IT enabled services (previously known as business process outsourcing); and financial services identified under the Economic Pillar [2], Vision 2030 seeks to achieve and sustain annual GDP growth rate at 10% up to 2030 and thereby generating resources required to address targets set out in the Sustainable Development Goals. This creates the urgent need of investing in both Flagship Projects and requisite infrastructure. Against this backdrop, the proposed provision of a bridge linking Mombasa Island to Mombasa Mainland south as currently conceived is fully harmonized with the vision as it will touch and underpin all six areas identified under the Economic Pillar.

Relevance to the Social Pillar: With regard to environmental quality, Vision 2030 anticipates a Kenyan nation characterized by a clean, secure and sustainable environment by 2030 and sets the goals for 2012 and which are yet to be achieved as: (i) to increase forest cover from less than 3% at present to 4% and (ii) to lessen by half all environment-related diseases. Specific strategies will involve promoting environmental conservation in order to provide better support to the economic pillar flagship projects and for the purposes of achieving the Sustainable Development Goals (SDGs); improving pollution and waste management through the design and application of economic incentives; and the commissioning of public-private partnerships (PPPs) for improved efficiency in water and sanitation delivery. Kenya will also enhance disaster preparedness in all disaster-prone areas and improve the capacity for adaptation to global climate change. In addition, the country will harmonize environment-related laws for better environmental planning and governance.

The Mombasa Gate Bridge as an enabler to Vision 2030: Realisation of the objectives and targets of the three pillars hinges on successful implementation of the enablers or foundations namely;- Infrastructure, ICT, Science, Technology and Innovation, Land Reforms, Public Sector Reforms, Labour & Employment, Ending Drought Emergencies, National values and Ethics, Security, Peace Building and Conflict Resolution.

Sector Plan for Infrastructure 2013 – 2017: The Second Infrastructure Medium Term Sector Plan provides a road map for Kenya's economic, social and political development over the 2013/14 to 2017/18 fiscal years. The Plan 2013-2017 identifies key programmes/projects, policy, legal and institutional reforms that the government will implement towards realization of the Constitution of Kenya 2010, sector priorities, and the long-term objective of Kenya Vision 2030. Efficient, accessible and reliable infrastructure is an enabler for sustained economic growth, development and

[2] Recently, a seventh Sector on Oil and Mineral Processing has been added to the economic pillar (GOK, 2013: Mombasa County Development Profile).

poverty reduction. Accordingly, the vision of the infrastructure sector is "Deploying World Class Infrastructure Facilities and Services". The targets for the infrastructure under the Second MTP will be to gradually close Kenya's infrastructure deficit while building on the achievement of the First MTP 2008-2012. In this regard, the Second MTP recognizes the aspirations of Vision 2030, achievements, emerging issues and challenges of the First Medium Term Plan (MTP 2008-2012).

The Infrastructure Sector Plan recognizes the progress recorded in the development and expansion of airports, ports, roads, rail, pipelines, hydropower, geothermal plants, ferries, housing, buildings and other public works facilities during the implementation of the projects/programmes, policy/legal and institutional reforms during the First MTP. The implementation of infrastructure sector projects and programmes is aimed at contributing to a sustainable growth in agriculture, manufacturing, and service sectors in order to achieve an overall GDP growth rate of 10 per cent by 2017. During the plan period, 5% of the GDP is targeted to be generated from investments in the transport and infrastructure sector. The plan therefore assesses the existing capacity of infrastructure sector and identifies emerging issues and challenges which must be addressed to support enhanced growth. The Plan also outlines the policies/legal reforms to be pursued by the Government in the plan period towards the Kenya Vision 2030 aspirations.

**Sustainable Development Goals (SDG`s):** The SDG`s consist of 17 goals to be achieved by 2030. They constitute an integrated, indivisible set of global priorities for sustainable development. Their target is to build on the foundation laid by the MDGs, by seeking to complete the unfinished business of the MDGs and respond to new challenges. SDG`s are accompanied by targets and will be further elaborated through indicators focused on measurable outcomes. The goals and targets integrate economic, social and environmental aspects and recognize their inter-linkages in achieving sustainable development in all its dimensions. Each government will set its own national targets guided by the global level of ambition but taking into account national circumstances. These goals include;

Goal 1 End poverty in all its forms everywhere

Goal 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Goal 3 Ensure healthy lives and promote well-being for all at all ages

Goal 4 Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Goal 5 Achieve gender equality and empower all women and girls

Goal 6 Ensure availability and sustainable management of water and sanitation for all

Goal 7 Ensure access to affordable, reliable, sustainable and modern energy for all

Goal 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Goal 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Goal 10 Reduce inequality within and among countries

Goal 11 Make cities and human settlements inclusive, safe, resilient and sustainable

Goal 12 Ensure sustainable consumption and production patterns

Goal 13 Take urgent action to combat climate change and its impacts*

Goal 14 Conserve and sustainably use the oceans, seas and marine resources for sustainable

development

Goal 15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Goal 16 Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Goal 17 Strengthen the means of implementation and revitalize the global partnership for sustainable development

The implementation of the sustainable development goals will depend on a global partnership for sustainable development with the active engagement of Governments, as well as civil society, the private sector and the United Nations system.

The National Poverty Eradication Plan : The NPEP has the objective of reducing the incidence of poverty in both rural and urban areas by 50 percent by the year 2015; as well as strengthening the capabilities of the poor and vulnerable groups to earn income. It also aims to narrow gender and geographical disparities and create a healthy, better-educated and more productive population. This plan has been prepared in line with the goals and commitments of the World Summit for the Social Development (WSSD) of 1995. The plan focuses on the four WSSD themes of the poverty eradication; reduction of unemployment; social integration of the disadvantaged people and the creation of an enabling economic, political, and cultural environment. This plan is to be implemented by the Poverty Eradication Commission (PEC) formed in collaboration with Government Ministries, community-based organizations and private sector.

The Poverty Reduction Strategy Paper (1999): This strategy paper was published by the Government in 2001. The two key goals of the strategy is poverty reduction and economic growth. The document outlines the priorities and measure necessary for poverty reduction and economic growth. The objectives of economic growth and poverty reduction are borne out of realization that economic growth is not a sufficient condition to ensure poverty reduction. In this regard, measures geared towards improved economic performance and priority actions that must be implemented to reduce the incidence of poverty among Kenyans have been identified. With respect to the environment the paper proposes that adequate awareness be created among stakeholders regarding environmental costs and benefits. It further calls for community involvement and participation in environmental management and conservation.

Towards ensuring harmony with this policy thrust, the ESMP requires priority job placement to be accorded to residents of the traverse area.

Sessional Paper No. 3 of 2009 on National Land Policy: The National Land Policy was formulated with the aim of securing rights over land and provide for sustainable growth, investment and reduction of poverty in line with Government overall development objectives. The policy will offer a framework of policies and laws designed to ensure the maintenance of a system of land administration and management that will provide:-

(a) All citizens with opportunity to access and beneficially occupy and use land;

(b) Economically viable, socially equitable and environmentally sustainable allocation and use of land;

(c) Efficient, effective and economical operation of land markets;

(d) Efficient and effective utilization of land and land-based resources; and

(e) Efficient and transparent land dispute resolution mechanisms.

Requirements of this Policy will be triggered in the project which will entail land acquisition towards creating a reserve for the new roads. A comprehensive Resettlement Action Plan will be developed to guide resolution of all displacement impacts associated by the Road.

4.1.2: Policy Frameworks for Transport including the roads sub sector

Sessional Paper No. 5 of 2006 on the Development and Management of the road sub-sector for sustainable economic growth provided the legal and institutional framework for the management of roads. The Sessional Paper which was approved by Parliament on October 19, 2006, also spelt out policies to be pursued by the Government in the medium term for sustained growth. The goal of the policies outlined in this Sessional Paper is to attain an efficient road sector that supports and promotes economic growth through the cost-effective provision and maintenance of infrastructure that is necessary for safe and reliable road transport. The key objectives of the policies are: -

- To reduce transport costs and travel time by improving the condition of roads, including reducing congestion on urban roads by increasing capacity.
- To increase accessibility
- To optimise use of available resources
- To increase the resources available for investment in the road sector
- To enhance preservation of existing road assets
- To create a conducive environment for increased private public partnership
- To enhance road safety and cater adequately to the needs of Non-Motorized Traffic (NMT)
- To enhance ownership through stakeholder's participation in the road sector
- To achieve an optimal institutional framework for effective implementation

The Road Sector Investment Programme-RSIP (2010-2024): The RSIP outlines the strategies, programmes and projects for the development of Kenya's road infrastructure in the short, medium and long-term to enable achievement of the Kenya Vision 2030. In order to exploit the growth potential from tourism, agriculture, manufacturing, wholesale and retail trade, business process outsourcing and financial services, it is necessary to improve and develop roads. The RSIP will enable the Government to pursue its policy as outlined in the Sessional Paper No. 5 of 2006 on the Development and Management of the Road Sub-Sector for Sustainable Economic Growth. The policy will guide the Road sub-sector in ensuring that environment, gender issues, the needs of non-motorized transport, and the requirements of the physically challenged are among the core considerations in roads matters.

The main purpose of this RSIP is "to provide good roads for a globally competitive and prosperous Kenya". Its specific objective is to detail the country's road network infrastructure development and maintenance needs for the medium and the long term in order to facilitate guided, secure, aggressive, timely and quality investment for maximum benefits to the overall economy. The RSIP includes: -

(i) An outline 15-year investment plan; and

(ii) A detailed 5-year implementation programme.

The RSIP covers all road works from construction of new roads to rehabilitation and maintenance utilizing all resources that are expected to be made available. This Programme outlines prioritized road sub-sector investments and associated budgetary requirements designed to modernise our roads network in line with Kenya Vision 2030. To achieve this will require the country to invest upwards of Seven (7) Trillion Kenya Shillings on our roads in the plan period. Implementation of the RSIP promises the enhanced mobility and connectivity necessary to accelerate the transformation of Kenya into a globally competitive economy.

Sessional Paper No. 2 of 2012 on the Integrated National Transport Policy: Substantial progress has been made in roads following the reforms informed by the Sessional Paper No. 5 of 2006. Prior to the reforms of 2006 in the roads sub—sector, the uncertainties, duplication of roles and inconsistency in the road asset management system largely contributed to poor state of roads in the country. The reforms under the Sessional Paper No 5 of 2006 realized the four basic building blocks necessary for effective roads management i.e. ownership, clarified responsibility, stable financing and commercialized management.

In May 2009, the Integrated National Transport Policy (INTP) was developed to clarify the roles of the various players in the delivery and management of transport infrastructure and services. The INTP seeks to address the challenges in the transport sector through integration of transport infrastructure and operations as well as responding to market needs of transport. In a bid to plan future road investments, the Ministry of Roads developed a Road Sub-Sector Investment Programme (RSIP) 2010 to 2024 which outlines the strategies, programmes and projects for the development of Kenya's road infrastructure in the short, medium and long term. The state department responsible for roads shall implement and periodically update the RSIP for national trunk roads and county roads to ensure prioritization for existing and future road network. Planning of maintenance Works will be systematic and in accordance with the Road Sector Investment Programme (RSIP) for the period 2010 to 2024 published in May 2011.

4.1.3: Policy Frameworks for Environment and Development

Sessional Paper No 1 of 1996 on Environment and Development: Sessional Paper No 1 of 1996 is the official statement on national policy on environment and was released in 1996 following recommendations of the National Environment Action Plan (NEAP) of 1994. The NEAP process had been launched earlier in 1992 following the Country's participation in the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro during which Kenya alongside other nations became a signatory to Agenda 21 which called on all nations to pay closer attention to environmental management at national level. Through Sessional Paper No 1 of 1996, the Kenya Government guarantees every citizen the inalienable right to a clean and healthy environment and commits to pursue a policy strategy of integrating environmental sensitivity into national development planning process and sets broad policy objectives as follows:

- Optimal use of natural land and water resources in improving the quality of human environment;
- Sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations;
- Integration of environmental conservation and economic activities into the process of sustainable development;
- Meeting of national goals and international obligations by conserving bio-diversity,

arresting desertification, mitigating effects of disasters, protecting the ozone layer and maintaining an ecological balance on earth.

- Among other provisions, Sessional Paper No. 1 of 1996 also sets out sectoral priorities for environmental sustainability which in most cases have been operationalized through formulation of guidelines for quality and environmental management in respective sectors. The Environment Management and Coordination Act (EMCA, 1999) has since also been enacted to secure implementation of the national policy on environment.

Execution of an ESIA Study for the MNBR and BLR in line with Cap 387 and LN 101 of EMCA will secure harmony with the aspirations of the National Policy on Environment and Development.

4.1.4: Policy Frameworks for Mombasa County Government

The Mombasa County Integrated Development Plan 2013-2017: This County Government of Mombasa has already developed a County Integrated development plan which is modelled along the Vision 2030 format and cascades down the various pillars to relevant issues within the County.

The Strategy paper outlines the National Status and aspirations for each pillar, to provide a background to the County situation analysis and Strategy. On infrastructure, the vision is "to provide cost-effective world -class infrastructure facilities and services in support of Vision 2030". Poor infrastructure has been identified as a major constraint to doing business. It's repeatedly cited as a necessity in improving the livelihoods by people living farming and pastoralist areas.

The CIDP`s (2013-2017) operating Vision is to make Mombasa County a vibrant modern regional and commercial hub with a high standard of living for its residents. This vision appreciates that Infrastructure is a basic pillar for global competitiveness and a foundational enabler towards the county`s vision. Improving transport infrastructure in the county is primarily aimed at reducing traffic congestion within the CBD and this will eventually be achieved by offering various planned alternatives including;

1. Water transport is likely to contribute to a reduction of transport congestion in Mombasa if it is made attractive.
2. If use of cars in Mombasa is discouraged at the same time increasing parking fee.
3. Construction of commuter railway from west mainland to the island, from CBD to Nyali and on to the Likoni ferry.
4. Construction of a second Nyali bridge between Tudor area to Mishomoroni
5. Construction of the Dongo kundu bypass linking Port Reitz to Mainland South.
6. Improvement of ferry services at Likoni and Mtongwe with new vessels and reconstructed approach roads.
7. Construction of a marshalling yard to take care of heavy commercial vehicles.
8. Construction of a bus terminal for public transport.

Essentially, the development of the Mombasa Gate Bridge as proposed is in line with stated strategies for economic transformation in the County. The project bridge enjoys overwhelming support within the County leadership.

4.2: JICA GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSINDERATIONS

4.2.1: Categorization

JICA classifies projects under three categories according to the extent of environmental and social impacts. To make this classification, JICA considers an outline of the project, the scale, the site condition, and the environmental impact assessment scheme in host countries.

Category A: Projects are classified as Category A if they are likely to have significant adverse impacts on the environment and society. Projects with complicated impacts or unprecedented impacts, which are difficult to assess or which have a wide range of impacts or irreversible impacts, are also classified as Category A. Projects are also classified as Category A if they require a detailed environment impact assessment by environmental laws and the standards of the recipient governments. The impacts may affect an area broader than the sites or facilities subject to physical construction. Category A, in principle, includes projects in sensitive sectors (i.e., characteristics that are liable to cause adverse environmental impact) and projects located in or near sensitive areas.

The proposed Mombasa Gate Bridge falls among Appendix 2.1(7/8) for sensitive sectors and accompanies large scale resettlement and is therefore decidedly a Category A project.

Category B: Projects are classified as Category B if their potential adverse impacts on the environment and society are less adverse than those of Category A projects. Generally, they are site-specific; few if any are irreversible; and in most cases normal mitigation measures can be designed more readily.

Category C: Projects are classified as Category C if they are likely to have minimal or little adverse impacts on the environment and society.

4.2.2: Screening of MGB Project against JICA Checklist

(i) Gap Analysis between Kenya System and JICA Guidelines:

JICA requires that, in principle, appropriate environmental and social considerations be undertaken, according to the nature of the project, and along procedures set by host governments, Cap 387 in case of Kenya. Table 4.1 provides an analysis of measures taken to ensure compliance of the MGB to JICA requirements/ principles for environmental and social considerations. Gaps should be compensated in this ESIA.

Table 4.1: Gap Analysis between Kenya System and JICA Guidelines

Subject	JICA Guidelines	System of (Country)	Comparison/Gap and Project Policy
Underlying Principles	- Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan. (JICA Guidelines, Appendix 1.1)	- There is no system to examine alternatives and mitigation measures on early stage.	On this survey, stakeholders meetings and public consultation meetings are held, and their opinions are reflected on a route selection, alternatives and mitigation measures.
Information Disclosure	- EIA reports (which may be referred to differently in different systems) must be	- Language of EIA report is not	- There is no gap about the language on

Subject	JICA Guidelines	System of (Country)	Comparison/Gap and Project Policy
	written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to local residents, written materials must be provided in a language and form understandable to them. - EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents and copying must be permitted. (JICA Guidelines, Appendix 2)	designated. Official language is English, and EIA report is written with English. -	information disclosure. -
Consultations with Local Stakeholders	-For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans. (JICA Guidelines, Appendix 1.5 Social Acceptability 1) - In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared. - Consultations with relevant stakeholders, such as local residents, should take place if necessary throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared. (JICA Guidelines, Appendix 2. EIA Reports for Category A Projects)	- Three times stakeholder meetings on affected areas and communities are compulsory during EIA survey. On the stakeholder meetings, project outlines and impacts are explained, and opinions are gathered. -	- On the early stage, the survey team held stakeholders meetings and public consultation meetings. And the opinions were reflected to route selection and other planning matters.
Scope of	- The impacts to be assessed with regard	- On the EIA, below	- Impact items of JICA

Subject	JICA Guidelines	System of (Country)	Comparison/Gap and Project Policy
Impacts to Be Assessed	to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety. (JICA Guidelines, Appendix1.3 Scope of Impacts to Be Assessed 1) - In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project. (JICA Guidelines, Appendix1.3 Scope of Impacts to Be Assessed 2)	items are examined (not limited) : Ecosystem Economic and social impacts Landscape Land use Water area - Evaluation for the derivative, secondary, and cumulative impacts is not described. The impacts throughout the project cycle are not considered.	Guidelines are included in EIA report. - In case that derivative, secondary and cumulative impacts are expected, these impacts are evaluated in EIA report.
Monitoring, Grievance Mechanism	- Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders. (JICA Guidelines, Appendix1.8 Monitoring 3) - When third parties point out, in concrete	- There is no description about disclosure of monitoring results. EIA documents submitted to NEMA	- Easy access for EIA report is encouraged and agreed with KeNHA.

Subject	JICA Guidelines	System of (Country)	Comparison/Gap and Project Policy
	terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems. (JICA Guidelines, Appendix 1.8 Monitoring 4)	are available by prescribed manner.	
Ecosystem and Biota	Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests. (JICA Guidelines, Appendix 1.6)	GOK may declare a lake shore, wetland, coastal zone or river bank to be protected area and impose such restrictions as he considers necessary, to protect the lake shore, wetlands, coastal zone and river bank from environmental degradation.	There is no gap.
Indigenous Peoples	Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses. (JICA Guidelines, Appendix 1.8)	Constitution of Kenya describes obligation for needs of indigenous people.	In case that the existence of indigenous people is confirmed in the project site, appropriate measurements are applied.

(ii) Analysis of Measures to Mitigate Impacts: Multiple alternatives must be examined in order to avoid or minimize adverse impacts and to choose better project options in terms of environmental and social considerations. In the examination of measures, priority is to be given to avoidance of environmental impacts; when this is not possible, minimization and reduction of impacts must be considered next. Compensation measures must be examined only when impacts cannot be avoided by any of the measures.

Appropriate follow-up plans and systems, such as monitoring plans and environmental management plans, must be prepared; the costs of implementing such plans and systems, and the financial

methods to fund such costs, must be determined. Plans for projects with particularly large potential adverse impacts must be accompanied by detailed environmental management plans.

(iii) Scope of Impacts to be assessed: The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety.

In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project.

(iv) Compliance with Laws, Standards, and Plans: Projects must comply with the laws, ordinances, and standards related to environmental and social considerations established by the governments that have jurisdiction over project sites (including both national and local governments). They must also conform to the environmental and social consideration policies and plans of the governments that have such jurisdiction. Projects must, in principle, be undertaken outside of protected areas that are specifically designated by laws or ordinances for the conservation of nature or cultural heritage (excluding projects whose primary objectives are to promote the protection or restoration of such areas). Projects are also not to impose significant adverse impacts on designated conservation areas.

(v) Social Acceptability: Projects must be adequately coordinated so that they are accepted in a manner that is socially appropriate to the country and locality in which they are planned. For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans.

Appropriate consideration must be given to vulnerable social groups, such as women, children, the elderly, the poor, and ethnic minorities, all members of which are susceptible to environmental and social impacts and may have little access to decision-making processes within society.

(vi) Ecosystems and Biota: Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests.
Illegal logging of forests must be avoided. Project proponents etc. are encouraged to obtain certification by forest certification systems as a way to ensure the prevention of illegal logging.

(vii) Involuntary Resettlement: Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the people who will be affected.

People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents etc. in a timely manner. Prior compensation, at full replacement cost, must be provided as much as possible. Host countries must make efforts to enable people affected by projects and to improve their standard of living, income opportunities, and production levels, or at least to restore these to pre-project levels. Measures to achieve this may include: providing land and monetary compensation for losses (to cover land and property losses), supporting means for an alternative sustainable livelihood, and providing the expenses necessary for the relocation and re-establishment of communities at resettlement sites.

Appropriate participation by affected people and their communities must be promoted in the planning, implementation, and monitoring of resettlement action plans and measures to prevent the loss of their means of livelihood. In addition, appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

For projects that will result in large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. It is desirable that the resettlement action plan include elements laid out in Annex A of OP 4.12.

(viii) Indigenous Peoples: Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses.

When projects may have adverse impacts on indigenous peoples, all of their rights in relation to land and resources must be respected in accordance with the spirit of relevant international declarations and treaties, including the United Nations Declaration on the Rights of Indigenous Peoples. Efforts must be made to obtain the consent of indigenous peoples in a process of free, prior, and informed consultation.

Measures for the affected indigenous peoples must be prepared as an indigenous peoples plan (which may constitute a part of other documents for environmental and social consideration) and must be made public in compliance with the relevant laws and ordinances of the host country. In preparing the indigenous peoples plan, consultations must be made with the affected indigenous peoples based on sufficient information made available to them in advance. When consultations are held, it is desirable that explanations be given in a form, manner, and language that are understandable to the people concerned. It is desirable that the indigenous peoples plan include the elements laid out in Annex B of OP4.10.

(ix) Monitoring: After projects begin, project proponents etc. monitor whether any unforeseeable situations occur and whether the performance and effectiveness of mitigation measures are consistent with the assessment's prediction. They then take appropriate measures based on the results of such monitoring.

In cases where sufficient monitoring is deemed essential for appropriate environmental and social considerations, such as projects for which mitigation measures should be implemented while monitoring their effectiveness, project proponents etc. must ensure that project plans include feasible monitoring plans.

Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders.

When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems.

Table 4.1: Application of JICA Guidelines in Project Development

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations	Responsibility
Permits and Explanation	1) EIA and Environmental Permits	① Have EIA reports been officially completed?	EIA License will be obtained in 2018. Other permits will be obtained before groundbreaking.	KeNHA
	(2) Explanation to the Public	① Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public?	Extensive public participation undertaken and will continue especially towards implementation of the RAP. Public support quite high	KeNHA
Mitigation Measures	1) Air Quality		Baseline studies undertaken to document project ambient air quality status. Construction and operation phase air emissions likely to increase and will require close monitoring.	KeNHA
	(2) Water Quality	① Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas?	Effluent quality will be monitored closely during operation phase.	KeNHA
	(3) Noise and vibration	① Do noise and vibrations from vehicle and train traffic comply with the country's standards?	Baseline studies were undertaken to document pre-project noise levels. Construction and operation phase will escalate noise level and monitoring will be required.	KeNHA
Natural Environment	(1) Protected Areas	① Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	Project will not traverse protected areas	KeNHA
	(2) Ecosystem and biota		As above.	KeNHA

		② Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?	11 tree species are Near Threatened or Vulnerable while an additional one is endemic to Mombasa were recorded in the section between Bofu Maskani (Port Reitz Shoreline) and Ziwani of MMS. Twelve (12) special concern birds;- IUCN Red LIST Data (2), Convention for Migratory Species –CMS (7) and AEWA(8) were recorded in the MMS section between Bofu and Ziwani with nine (9) of them being recorded in the Ziwani area.	
		⑥ In cases where the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?	Underpasses will be provided to facilitate free movement across the road. There is a possibility of introduction of Prosopis in building materials which will call for extensive screening of material sites and post project surveillance for presence of Prosopis.	
Social	(1) Resettlement	① Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?	Project will displace settlements and livelihoods.	KeNHA
		② Is adequate explanation on relocation and compensation given to affected persons prior to resettlement?	Road was realigned to reduce impacts	
		③ Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?	Compensation has been computed but not disclosed to Pap's. The same will take place during tendering phase.	
		④ Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, and people below the poverty line, ethnic minorities and indigenous peoples?	Vulnerable groups were identified, and special measures put in place	
		⑤ Are agreements with the affected persons obtained prior to resettlement?	A RAP has been prepared and complete with a rationalized Entitlement Matrix.	
		⑥ Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?	An implementation framework was proposed and funds are being identified.	
		⑦ Is a plan developed to monitor the impacts of resettlement?	A RAP monitoring Plan was put in place.	

	(2) Living and Livelihood	① Where roads or railways are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers?	Road has potential to block rural access roads but this will be mitigated at design stage.	KeNHA
		Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?		
		② Is there a possibility that the project will adversely affect the living conditions of inhabitants other than the affected inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	Opening of new road will cause urbanization of the entire corridor and hence change land use patterns.	
		③ Is there a possibility that diseases, including communicable diseases, such as HIV will be introduced due to immigration of workers associated with the project?	Likely	
		Are adequate considerations given to public health, if necessary?	Yes. As part of ESMP	
		④ Is there a possibility that the project will adversely affect road traffic in the surrounding areas (e.g., by causing increases in traffic congestion and traffic accidents)?	None	
		⑤ Is there a possibility that roads and railways will cause impede the movement of inhabitants?	This is very likely. A comprehensive mitigation campaign has been proposed	
		⑥ Is there a possibility that structures associated with roads (such as bridges) will cause a sun shading and radio interference?		
	(3) Heritage	① Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	Not likely.	KeNHA
	(4) Landscape	① Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	Not likely.	KeNHA
	(5) Ethnic Minorities and Indigenous Peoples	① Where ethnic minorities and indigenous peoples are living in the rights-of-way, are considerations given to reduce the impacts on culture and lifestyle of ethnic minorities and indigenous peoples?	There are no ethnic minorities along the road.	KeNHA

		② Does the project comply with the country's laws for rights of ethnic minorities and indigenous peoples?	Road has been screened against local and World Bank safeguards and found to be compliant.	
	(6) Working conditions	① Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?	Construction phase will adhere to all relevant labor and safety laws in Kenya.	KeNHA
		② Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents and management of hazardous materials?		
		③ Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public sanitation) for workers etc.?	These will be taken care of in line with the OHSA 2007.	
		④ Are appropriate measures being taken to ensure that security guards involved in the project do not violate safety of other individuals involved, or local residents?	As above Project will obey all relevant local laws including the Penal Code.	
Others	(1) Impacts during Construction	① Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	Pre-project baseline mapping was undertaken and data will be used to monitor parameters during construction and operation The ESMP has adequate social safeguards.	KeNHA
		② If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?		
		③ If construction activities adversely affect the social environment, are adequate measures considered reducing impacts?		
	2) Monitoring	① Does the proponent develops and implement monitoring program for the environmental items that are considered to have potential impacts?	A monitoring Plan has been developed	KeNHA
		② Are the items, methods and frequencies included in the monitoring program judged to be appropriate?		
		③ Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?	The Monitoring Plan is being updated to be comprehensive	

		④ Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	As above Monitoring will conform to requirements of Legal Notice 101 of EMCA.	
Note	Reference to Checklist of Other Sectors	① Where necessary, pertinent items described in the Forestry Projects checklist should also be checked (e.g., projects including large areas of deforestation).	Noted	KeNHA
		② Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).		
	Note on using Environmental Checklist	① If necessary, the impacts to trans boundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as trans boundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	Noted	KeNHA

4.2.3: World Bank's Safeguard Policies

The World Bank is not involved in any way in the development of the Mombasa Gate Bridge Project. However, the Bank is an international pace-setter in securing sustainable development in which case, the Safeguard Polices find direct application in any project pursuing sustainability. As such, this ESIA Study Report has been formulated to address and cater for both Kenyan and World Bank requirements for impact assessment. The World Bank's safeguard policies are designed to ensure that projects proposed for Bank financing are environmentally and socially sustainable, and thus improve decision-making. An analysis of possible triggers of the WB SGPs by the MGB (Table 4.3) indicates that the project is likely to trigger 5 out of 10 WB safeguards which are briefly highlighted in sections below. For a full description of all WB safeguard policies, the reader is referred to www.worldbank.org.

Table 4.3: Analysis of Potential Triggers to World Bank Safeguards Policies

World Bank Safeguard policy		Triggers	Trigger mechanism
1	Environmental Assessment (OP4.01)	Triggered	Project is category A and must undergo mandatory Environmental Assessment in line with OP4.01
2	Natural Habitats (OP 4.04)	Triggered	Project passes through the natural vegetation belts along riparian areas at the Mweza Creek
3	Forestry (OP 4.36)	Not triggered	Project does not traverse protected forests
4	Pest Management (OP 4.09)	No trigger	Project has no known interaction with this trigger
5	Physical Cultural Property (OP 4.11)	Triggered	Bridge pier located near a sacred site and communal graveyards

6	Indigenous Peoples (OP4.10)	Possible trigger	Bridge passes in close vicinity of sacred shrines considered important in traditional religious worship and belief systems
7	Involuntary Resettlement (OP 4.12)	Triggered	This is a completely new alignment that will require land acquisition.
8	Safety of Dams (OP 4.38)	No Trigger	Project will not involve construction of dams
9	Projects on International Waters (OP 7.50)	No Trigger	No project activities are planned for in International Waters
10	Projects in Disputed Territories (OP 7.60)	No Trigger	MGB does not traverse disputed territories
	Total triggers	5	

Environmental Assessment (OP 4.01): OP 4.01 requires Environmental Assessment (EA) for projects proposed for Bank financing to ensure that they are environmentally sound and sustainable, and as a basis for decision making. Under OP 4.01 projects are screened and assigned either of four categories each of which requires different levels of environmental assessment as follows:-

- *Category A:* A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.
- *Category B:* A proposed project is classified as Category B if it's potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects.
- *Category C*: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.
- *Category FI:* A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary in subprojects that may result in adverse environmental impacts.

The proposed construction of MGB has been assigned Environmental Category A and hence requiring environmental assessment. From experience, subjecting of proposed projects to environmental and social impact assessment as stipulated under Cap 387 and its tools simultaneously resolves requirements of OP 4.01 and the same will be achieved in terms of the project under review.

OP 4.01 also requires full disclosure of Projects which, in the case of the MGB has been partly achieved through stakeholder consultations as reported in Chapter Eight above while more disclosure will take place during the Public Review Period stipulated for ESIA Study Reports. During this process, the ESIA Study Report will be made publicly available to project-affected groups within the entire route of traverse at places to be specified by NEMA following which, their comments will be incorporated into the final ESIA Study Report and will also influence design of the project.

OP 4.12 on Involuntary Resettlement: OP 4.12 requires that a Resettlement Action Plan (RAP) be prepared for all projects that anticipate displacement of both settlements and livelihoods. The

policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts. Given that road reserves for the proposed MGB doe not exist in Likoni side, land acquisition will be inevitable thus displacing people from livelihoods and property in full trigger of OP 4.12. A RAP process is already underway.

OP 4.04 on Natural Habitats: This Policy seeks to ensure that World Bank-supported infrastructure and other development projects consider the conservation of biodiversity, as well as the numerous environmental services and products which natural habitats provide to human society. The policy strictly limits the circumstances under which any Bank-supported project can damage natural habitats (land and water areas where most of the native plant and animal species are still present). Specifically, the policy prohibits Bank support for projects which would lead to the significant loss or degradation of any Critical Natural Habitats, whose definition includes those natural habitats which are legally protected, officially proposed for protection, or unprotected but of known high conservation value.

The proposed MGB does not traverse protected areas but passes through natural disturbed habitats especially along riparian areas whose full biodiversity status is not fully assessed for conservation ranking. Indeed, given that the conservation status for individual species as required of by Legal Notice 160 of Cap 387 is yet to take place, the pre-cautionary principle has been invoked in this Study so as to allow for a possible trigger to OP 4.04. A full botanic mapping of the route of traverse for the MGB has been conducted as reported in Chapter Five below.

OP 4.10 on Indigenous People: Communities fitting the description of Indigenous Peoples as defined in OP 4.10 have not been encountered within the traverse, more so in-spite of claims of occurrence of such people in Mombasa County. However, the MGB traverses areas in close vicinity of sacred shrines locally revered and preserved as centres for traditional worship and belief handed down through generations from ancestors. As such, while the people may not answer to the description of indigenous, the shrines and their usage are indigenous in character and require recognition as such.

Kenya has no local law addressed to conservation of shrines especially if not gazette under any other law in which case, OP 4.10 will have overriding effect in minimizing potential impact on kayas and groves along the traverse.

OP 4.11 on Physical Cultural Property: This policy addresses physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community.

The entire inland coastline of Mombasa along the three creeks of Port Reitz (including Mweza Creek), Tudor and Mtwapa are of immense historic value on account of ancient civilizations. Activities in construction of the proposed MGB will remain attuned to requirements of Cap 260 of the laws of Kenya especially with regard to chance finds and Cultural Impact Assessment.

Harmonization of WB and GOK requirements for social and environmental sustainability: Experience has shown that both OP 4.10 of the World Bank and EMCA 1999 are generally aligned in principle and objective in that:-

- Both require Environmental Assessment before project implementation leading to

development of comprehensive Environmental and social Management plans to guide resolution of social and environmental impacts as anticipated.

- Both require public disclosure of ESIA Study Report and stakeholder consultation during preparation,
- While OP 4.01 of World Bank stipulates different scales of ESIA Study Report for different category of projects, EMCA requires ESIA Study Report for all sizes of projects, which are required to be scoped as relevant
- Where EMCA requires consultation of Lead Agencies comprising of relevant sectors with legal mandate under GoK laws, the WB has equivalent safeguards for specific interests.
- The Bank requires that stakeholder consultations be undertaken during planning, implementation and operation phases of the project which is equivalent to the statutory annual environmental audits at the operation phase of projects in Kenya.

The understanding of this ESIA Study Report study is that, pursuit of an in-depth ESIA Study process as stipulated by EMCA 1999 is adequate to address all World Bank requirements for environmental and social assessment.

4.3: THE CROSS-NATIONAL PLANNING CONTEXT

The Mombasa Gate Bridge serves the A14 Road which is part of the Multinational Malindi – Mombasa – Lunga Lunga / Tanga – Bagamoyo Road and is therefore influenced by policy tools reigning in both Kenya and the region. This section is devoted to analysis of the latter whereby relevant policy frameworks include those of the African Economic Community and its tools namely;-

- African Union
- COMESA

The Policy thrust under each category is explored in sections below.

4.3.1: African Union and its Tools

Focus of the African Union: The African Union has shifted focus from supporting liberation movements in the erstwhile African territories under colonialism and apartheid, as envisaged by the OAU since 1963 and the Constitutive Act, to an organization spear-heading Africa's development and integration in pursuit of An integrated, prosperous and peaceful Africa, driven by its own citizens and representing a dynamic force in global arena. Towards this, the AU has set sight on 12 objectives as follows:-

- To accelerate the political and socio-economic integration of the continent;
- To encourage international cooperation, taking due account of the Charter of the United Nations and the Universal Declaration of Human Rights;
- To establish the necessary conditions which enable the continent to play its rightful role in the global economy and in international negotiations;
- To promote sustainable development at the economic, social and cultural levels as well as the integration of African economies;

Agenda 2063 of the AU-The Africa We Want: Agenda 2063 of the AU is a strategic framework for the socio-economic transformation of the continent over the next 50 years building on and seeking to accelerate the implementation of past and existing continental initiatives for growth and sustainable development in pursuit of the AU Vision. Under Agenda 2063, Seven (7) African Aspirations have been identified namely:-

- A Prosperous Africa, based on inclusive growth and sustainable development
- An Integrated continent, politically united, based on the ideals of Pan Africanism and the vision of Africa's Renaissance
- An Africa of good governance, democracy, respect for human rights, justice and the rule of law
- A Peaceful and Secure Africa
- Africa with a strong cultural identity, common heritage, values and ethics
- An Africa whose development is people driven, relying on the potential offered by people, especially its women and youth and caring for children
- An Africa as a strong, united, resilient and influential global player and partner

Goals 25 and 26 (under AA2) are relevant to the MGB Project:-

25. By 2063, the necessary infrastructure will be in place to support Africa's accelerated integration and growth, technological transformation, trade and development. This will include high-speed railway networks, roads, shipping lines, sea and air transport, as well as well-developed ICT and the digital economy. A Pan-African High-Speed Train Network will connect all the major cities/capitals of the continent, with adjacent highways and pipelines for gas, oil, water, as well as ICT Broadband cables and other infrastructure. This will be a catalyst for manufacturing, skills development, technology, research and development, integration and intra-African trade, investments and tourism.

26. The world-class infrastructure, accompanied by trade facilitation, will see intra-African trade growing from less than 12% in 2013 to approaching 50% by 2045. Africa's share of global trade shall rise from 2% to 12%. This will in turn spur the growth of Pan-African companies of global reach in all sectors.

The New Partnership for Africa's Development-NEPAD-: The NEPAD programme is widely accepted as the continent's framework for sustainable development and the achievement of the Millennium Development Goals (MDGs) but a new ambition has emerged to go beyond mitigating poverty and its effects towards building a prosperous future with a common rallying call: transforming Africa.

The Programme for Infrastructure Development in Africa (PIDA), developed by the African Union Commission (AUC), NEPAD Agency, African Development Bank (AfDB), United Nations Economic Commission for Africa (UNECA) and Regional Economic Communities (RECs), promotes regional economic integration by building mutually beneficial infrastructure and strengthening the ability of countries to trade and establish regional value chains for increased competitiveness. The 51 PIDA Priority Action Plan (PAP) programmes and projects are spread across the four sectors of Energy, Transport, Information and Communication Technology (ICT) and Trans-boundary Water. The programmes and projects are expected to lead to an integrated continent, fuelling international trade, job creation and sustainable economic growth. To boost intra-African trade and raise the continent's competitiveness in the global economy, the programme sets out short-

term goals to be achieved by 2020, medium-term goals to be achieved by 2030 and long-term goals by 2040. PIDA is a solution by and for Africans which was endorsed by African Heads of State and Government at their 18th Summit in January 2012 in Addis Ababa, Ethiopia. Development of the MGB will facilitate linkage of the Lamu Gateway Development Project (LAMU Port) which is priority intervention under PIDA to its southern hinterland.

4.3.2: The Inter-Governmental Authority on Development-IGAD

Objectives: IGAD aims to expand the areas of regional co-operation, increase the members' dependency on one another and promote policies of peace and stability in the region in order to attain food security, sustainable environment management and sustainable development.

The IGAD strategy is to attain sustainable economic development for its member countries. Regional economic co-operation and integration are given special impetus and high priority to promote long-term collective self-sustaining and integrated socioeconomic development. The leading principles of the IGAD strategy are stipulated in the agreement establishing IGAD, but are also mindful of the UN Charter and AU Constitutive Act. IGAD's aims and objectives are to promote joint development strategies and gradually harmonize macro-economic policies and programmes in the social, technological and scientific fields;

- Harmonize policies with regard to trade, customs, transport, communications, agriculture and natural resources, and promote free movement of goods, services, and people within the sub-region;
- Create an enabling environment for foreign, cross-border and domestic trade and investment;
- Initiate and promote programmes and projects to achieve regional food security and sustainable development of natural resources and environmental protection, and encourage and assist efforts of member states to collectively combat drought and other natural and man-made disasters and their consequences;
- Develop a coordinated and complementary infrastructure in the areas of transport, telecommunications and energy in the sub-region;
- Promote peace and stability in the sub-region and create mechanisms within the sub-region for the prevention, management and resolution of interstate and intrastate conflicts through dialogue;
- Mobilize resources for the implementation of emergency, short-term, medium-term and long-term programmes within the framework of sub-regional cooperation;
- Facilitate, promote and strengthen co-operation in research development and application in science and technology

4.3.3: The Common Market for Eastern and Southern Africa-COMESA

The Common Market for Eastern and Southern Africa (COMESA) is a Regional Integration grouping of African States comprising Burundi, Comoros, Democratic Republic of Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia and Zimbabwe, which have agreed to promote regional integration through trade development and to develop their natural and human resources for the benefit of their

people. COMESA was formed in December to serve as an organization of free independent sovereign States that have agreed to cooperate in developing their natural and human resources for the good of all their people. In this context, the main focus of COMESA has been on the formation of a large economic and trading unit to overcome trade barriers faced by individual States in pursuit of objectives:-

- to attain sustainable growth and development of the member States by promoting a more balanced and harmonious development of its production and marketing structures;
- to promote joint development in all fields of economic activity and the joint adoption of macro-economic policies and programmes to raise the standard of living of its peoples and to foster closer relations among its member States;
- to co-operate in the creation of an enabling environment for foreign, cross border and domestic investment including the joint promotion of research and adaptation of science and technology for development;
- to co-operate in the promotion of peace, security and stability among the member States in order to enhance economic development in the region;
- to co-operate in strengthening the relations between the Common Market and the rest of the world and the adoption of common positions in international fora; and
- to contribute towards the establishment, progress and the realisation of the objectives of the African Economic Community.

As one of the pillars of the African Economic Community, COMESA's Vision is to "be a fully integrated, internationally competitive regional economic community with high standards of living for its entire people ready to merge into an African Economic Community". COMESA has recognized infrastructure development as a priority and strategic focus area that requires special attention. The Strategic Objective to be pursued is, therefore, to effectively address constraints related to the improvement of infrastructure and services in the region in order to reduce the cost of doing business and also and to enhance competitiveness, through fostering physical regional connectivity and deepening infrastructure integration.

4.4: LEGAL REGULATORY FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT IN KENYA

4.4.1: Constitutional Provisions

Kenya now has a new Supreme law in form of the National Constitution which was promulgated on the 27th of August 2010 and which takes supremacy over all aspects of life and activity in the New Republic. Section 42 of the Constitution guarantees the right to a clean and healthy environment for all citizens through a raft of measures while Section 69 (1)-*f* requires the State to *Establish systems of environmental impact assessment, environmental audit and monitoring of the environment.* In Sections 69 and 70, the Constitution has *inter alia* identified National Obligations in respect of the environment and Enforcement of Environmental Rights respectively as follows:-

Section 69 (1): The State shall—

(a) ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;

(b) work to achieve and maintain a tree cover of at least ten per cent of the land area of

Kenya;

(c) protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;

(d) encourage public participation in the management, protection and conservation of the environment;

(e) protect genetic resources and biological diversity;

(f) establish systems of environmental impact assessment, environmental audit and monitoring of the environment;

(g) eliminate processes and activities that are likely to endanger the environment; and

(h) Utilise the environment and natural resources for the benefit of the people of Kenya.

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

Section 70 provides for enforcement of environmental rights thus:- 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. 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.

For the purposes of this Article, an applicant does not have to demonstrate that any person has incurred loss or suffered injury.

Essentially, the New Constitution has embraced and provided further anchorage to the spirit and letter of Cap 387 whose requirements for environmental protection and management have largely informed Sections 69 through to 71 of the Document. In Section 72 however, the new constitution allows for enactment of laws towards enforcement of any new provisions of the Supreme Law.

4.4.2: Requirements of reigning environmental legislation in Kenya

The framework law on environment, the Environmental Management and Coordination Act, 1999, was amended in May 2015 and took effect on 17 June 2015. The Act makes diverse provisions towards securing sustainable environmental management as follows:-

(i) EMCA requires EIA for all new projects

Section 58 requires that an Environmental Impact Assessment (EIA) study precede all development activities proposed to be implemented in Kenya. The Act further requires that EIA studies so designed, be executed in accordance with the Guidelines for Conduct of EIAs and Environmental Audits (Kenya Gazette Supplement No. 56 of 13th June 2003) as published by the National Environmental Management Authority (NEMA).

The Second Schedule of Cap 387 specifies projects that require to be subjected to EIA studies. Under this schedule, there is no minimum size threshold below which an EIA is not necessary. Indeed, an appraisal of the proposed road construction triggers requirements for an EIA under this Second

Schedule. The EIA Report has thus been prepared in compliance with this requirement.

(ii) EMCA provides for gazettement of Environmental Regulations:

Under Cap 387, NEMA has gazetted legal tools that govern conduct of EIAs and general environmental protection. The MGB has been screened against these tools with results that (Table 4.4) all nine tools will be triggered. Detailed analysis of the trigger mechanism and modalities for mitigation are provided in Chapter 8. Specifications of these guidelines would require to be captured in the Contracts for Construction to ensure that contractors are legally bound to undertake mitigation alongside general construction work.

Table 4.4: Analysis of the Project triggers to Cap 387 and its tools

Regulation	Focus	Status
Legal Notice 101 of June 2003 - Environmental (Impact Assessment and Audit) Regulations, 2003	This is the tool that gives legal foundation to conduct of ESIA Studies in Kenya.	Triggered
Legal Notice 160 of 1st Dec 2006- Environmental Management and Co-ordination Act (Conservation of Biological Diversity) Regulations 2006	This legislation requires full measures be taken to prevent introduction of alien/ invasive species of flora and fauna and is important because of the Prosopis menace in the coast.	Triggered
Legal Notice 19 (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009	Regulation 17 requires special measures to be taken to prevent siltation of the seashore.	Triggered
Legal Notice 61 of 22nd May 2009- Environmental Management and Co-ordination Act (Noise, and Excessive Vibration Pollution) (Control) Regulations, 2009	Sets standards for noise levels	Triggered
Legal Notice 120 of 29th Sept 2006- Environmental Management and Co-ordination Act (Water Quality Standards) Regulations 2006	Regulation 24 prohibits any kind of pollution of water meant for fisheries, recreation or any other use and sets quality standards for diverse waters.	Triggered
Legal Notice 121 of 29th Sept 2006- Environmental Management and Co-ordination Act (Waste Management) Regulations 2006	Sets standards for waste management	Triggered
Prevention of Pollution in Coastal Zone and other segments of the environment regulations, 2003	Regulation 3 prohibits discharge any hazardous substance, chemical, oil or oily mixture into the territorial waters of Kenya or any segment of the environment.	Triggered
National Sand Harvesting Guidelines, 2007	Sets guidelines for sustainable sand harvesting in Kenya	Triggered
Legal Notice 73 of 31st May 2007 - Environmental Management and Co-ordination Act (Controlled Substances) Regulations	Sets guidelines on handling and use of controlled substances. There will be need to screen the MGB for controlled substances	Triggered
Legal Notice No.34 Environmental Management and Co-ordination (Air Quality) Regulations, 2014	Sets standards for Air Quality	Triggered

(iii) EMCA requires inter-Sectoral Coordination in project development

In recognition that Cap 387 is an umbrella law coordinating diverse sectoral statutes all of which are

still in force, Legal Notice 101 requires that the respective sectors be consulted as Lead Agencies in making decisions pertaining to environmental assessment for projects in respective sectors. This is to ensure that NEMA does not approve projects that contradict sector policies and legislation. In conformity with this requirement, we have screened the proposed development against most relevant statutes to map out the potential triggers. In sections below, we highlight sectoral laws and policies likely to be triggered by the MGB as currently proposed.

4.4.3: Requirements of other relevant legislation

Kenya Maritime Authority Act, 2006

This Act of Parliament provides for the establishment of the Kenya Maritime Authority with responsibility to monitor, regulate and coordinate activities in the maritime industry. The Act allocates functions to the KMA which are deemed relevant to development and operation of the proposed gate Bridge as follows:-

- administer and enforce the provisions of the Merchant Shipping Act, 2009 (No. 4 of 2009) and any other legislation relating to the maritime sector for the time being in force;
- co-ordinate the implementation of policies relating to maritime affairs and promote the integration of such policies into the national development plan;
- develop, co-ordinate and manage a national oil spill contingency plan for both coastal and inland waters and shall in the discharge of this responsibility be designated as the "competent oil spill authority";
- maintain and administer a ship register;
- deal with matters pertaining to maritime search and rescue and coordinate the activities of the Kenya Ports Authority, the Kenya Navy and any other body engaged during search and rescue operations; and
- enforce safety of shipping, including compliance with construction regulations maintenance of safety standards and safety navigation rules;

A representative of the KMA sits in Coordination Committees charged with development of the MGB which guarantees that interests of the KMA will be factored in the development of the Gate Bridge.
KMA is also the designated Kenyan Focal Point for MARPOL Convention and is key in spearheading initiatives against marine pollution.

Kenya Ports Authority Act-1978:

Cap 381 became effective on 20th January 1978 with the objective of providing for the establishment of the Kenya Ports Authority and connected purposes. The Act provides a generally generous mandate to the KPA but, section 2 (j) is relevant to construction activity in the MGB as it confers power on the KPA to prohibit, control or regulate the use by any person of the services performed, or the facilities provided, by the Authority; or the presence of any person, ship, vehicle or goods within any port or on any premises occupied by the Authority. Deployment of all construction equipment for use in the MGB will require authorization by the KPA.

Fisheries Act-1989:

Act No.5 of 1989 provides for the development, management, exploitation, utilization and conservation of fisheries and for connected purposes. Sections 7(1) and 8(5) are relevant in bridge construction as they criminalize illegal fishing thus:-

7(1) No person shall use any vessel for fishing in Kenya's fishery waters unless there is in force in relation to the vessel a valid certificate of registration.

8(5)Any person who catches fish in Kenya fishery waters without a licence, or in contravention of the conditions imposed on a licence, issued under this Act shall be guilty of an offence and liable to a fine not exceeding twenty thousand shillings or to imprisonment for a term not exceeding two years or to both.

Contractors and staff engaged in bridge construction will require to adhere to provisions of this law.

Explosive Act Cap 115:

This Act makes diverse requirements in the handling and use of explosives thus:-

8. Licence necessary to deal in explosives
   (1) No person, other than the manufacturer, shall sell, deal in or dispose of any explosive unless he is in possession of a licence granted under this Act.
   (2) For the purposes of this section, a manager, as defined in the Mining (Safety) Regulations (Cap. 306, Sub. Leg), who in outlying districts and in accordance with rules supplies other consumers, shall not be deemed to be a dealer, unless he sells at a profit.
   (3) Any person who contravenes subsection (1) shall be guilty of an offence and liable to a fine not exceeding three thousand shillings or, in default of payment, to imprisonment for a term not exceeding one year.
9. Permit necessary to acquire blasting materials
   (1) No person shall purchase or otherwise acquire blasting materials except under the authority of, and to the extent authorized in, a written permit issued by an inspector.
   (2) No person shall sell or dispose of blasting materials to any person who fails to produce at the time of the transaction a permit of the type referred to in subsection (1) nor shall any person sell or dispose of any such materials in excess of the quantity referred to in such permit.
   (3) Any person who contravenes this section shall be guilty of an offence and liable to a fine not exceeding three thousand shillings or, in default of payment, to imprisonment for a term not exceeding one year.
10. Prohibition of importation and exportation of explosives without permit
    No person shall import or export, or cause to be imported or exported, any explosive, unless he has obtained a permit issued, in the case of blasting materials, under the authority of an inspector, or, in the case of other explosives, by any person authorized by the Commissioner to issue such a permit

All blasting works in the construction of the Mombasa gate Bridge will adhere to requirements of this statute.

The Occupational Health and Safety Act of 2007

The Occupational Safety and Health Act, 2007, is an Act of Parliament to provide for the safety, health and welfare of all workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act applies to all workplaces and workers associated with it; whether temporary or permanent. The main aim of the Act is to safeguard the safety, health and welfare of workers and non-workers. Part 9 states that the occupier or employer shall establish a health and safety committee

where twenty or more people are employed and such an employee shall prepare a written statement of his general policy with respect to the safety and health at the work place. Further, the occupier shall prepare annual safety and health audits by a qualified person.

It is thus recommended that all Sections of the Act related to this project, such as provision of protective clothing, clean water and insurance cover are observed so as to protect all from work related injuries or other health hazards. The same are captured in the ESMP including commentaries in section 10.4.5.

The Public Health Act (Cap. 242)

The Public Health Act provides for the protection of human health through prevention and guarding against introduction of infectious diseases into Kenya from outside, to promote public health and the prevention, limitation or suppression of infectious, communicable or preventable diseases within Kenya, to advice and direct local authorities in regard to matters affecting the public health to promote or carry out research and investigations in connection with the prevention or treatment of human diseases. This Act provides the impetus for a healthy environment and gives regulations to waste management, pollution and human health all of which are infringed by road construction and operation activities.

Part IX section 115 states that no person shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires Local Authorities to take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 waste pipes, sewers, drains or refuse pits in such a state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health. Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin.

All camps established for purposes of construction of the MGB shall be operated in harmony with the Public Health Act Cap 242 which has largely informed section 10.4.5 below.

The Penal Code (Cap. 63)

Section 191 of the Penal Code states that any person who voluntarily corrupts or fouls water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same act says a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons in dwellings or business premises in the neighbourhood or those passing along public way, commit an offence.

The Water Act 2002:

In March 2003 the *Water Act 2002* came into effect. The *Water Act 2002* provided the legal framework for management and conservation of water resources in line with the new policy changes. New institutions with separate functions were established, and decentralized decision making is reflected in autonomous regional bodies.

Section 25 of the Act requires a permit to be obtained for among others any use of water from a water resources, discharge of a pollutant into any water resource. According to section 29 of the same Act, application for such a permit shall be subject to public consultation as well as an environmental impact assessment as per the Environmental Management and Coordination Act, 1999.

Under Section 35, conditions of the permit may also be varied if the Authority feels that the water so used is causing deterioration of water quality or causing shortage of water for other purposes that the Authority may consider has priority.

Construction activity under the MGB Project especially pertaining to sourcing of construction water and operations within riparian areas will adhere to conditions of the Water Act 2002 and its Legal Notice 171 of 28th Sept 2007 (The Water Resource Management Rules 2007).

The Physical Planning Act (Cap 286):

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

The Wildlife Management and Conservation Act 2013:

The Wildlife Conservation and Management Act, 2013, came into force on 27th December 2013 and apply to all wildlife resources on public, community and private land. Under Section 34, the WCMA enforces the requirement for Environmental assessment thus;- A user or other related right shall not be granted under this Act where the requirement for a strategic environmental, cultural, economic and social impact assessment licence under the Environmental Management and Coordination Act, 1999 has not been complied with.

The wildlife resource base of the traverse is not fully understood in which case, this study has taken liberty to conduct a full inventory of fauna and flora of the traverse as reported in Chapter Seven below.

Schedule Six and Seven of the Wildlife Management and Conservation Act 2013 lists species that are considered endangered and invasive in Kenya respectively. The same have been applied as screening tools in this ESIA Study.

The Forest Conservation and Management Act, 2016

This is an ACT of Parliament to give effect to Article 69 of the Constitution with regard to forest resources; to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socio-economic development of the country and for connected purposes.

The Forest Conservation and Management Act, 2016 applies to all forests on state, community and private land whereby the focus is on:-

a) good governance in accordance with Article 10 of the Constitution;
b) public participation and community involvement in the management of forests;
c) consultation and co-operation between the national and county governments;
d) the values and principles of public service in accordance with Article 232 of the Constitution;
e) protection of indigenous knowledge and intellectual property rights of forests resources; and,

f) international best practices in management and conservation of forests.

As part of this ESIA Study, all the sacred groves occurring near the traverse have been mapped and clearly documented to ensure informed decision making in construction activity.

The Coast Development Authority Act No 6 of 1989 (Cap 444)

The Coast Development Authority Act was enacted in 1989 and commenced on January 18th, 1999 expressly to provide for the establishment of the Coast Development Authority (CDA) to plan and co-ordinate the implementation of development projects in whole of the Coast Province and the exclusive economic zone and for connected purposes. Under Section 8, the Cap 444 outlines functions of the CDA as follows:-

a) to plan for the development of the Area and initiate project activities identified from such planning in the development and through the Government generally;
b) to develop an up-to-date long range development plan for the Area;
c) to initiate such studies, and carry out such surveys of the Area as may be considered necessary by the Government or the Authority, and to assess alternative demands within the Area on the natural resources thereof, and initiate, operate, or implement such projects as may be necessary to exploit those natural resources including agriculture (both irrigated and rainfed), forestry, wildlife and tourism industries, electric power generation, mining, and fishing, and to recommend economic priorities;
d) to co-ordinate the various studies of schemes within the Area such that human, water, animal, land and other resources are utilized to the best advantage and to monitor the design and execution of planned projects within the Area;
e) to effect a programme of both monitoring and evaluating the performance of projects within the Area so as to improve such performance and establish responsibility thereof, and to improve future planning;
f) to co-ordinate the present abstraction and use of natural resources, especially water, within the Area and to set up effective monitoring of abstraction and usage;
g) to cause and effect the construction of any works deemed necessary for the protection and utilization, of the water and soils of the Area including hydro-power development for multipurpose utilization of water resources;
h) to ensure that landowners in the Area undertake all the measures specified by the Authority to protect the water and soils of the Area;
i) to identify, collect, collate and correlate all such data related to the use of water and other resources and also economic and related activities within the Area as may be necessary for the efficient forward planning of the Area;
j) to maintain a liaison between the Government, the private sector and other interested agencies in the matter of the development of the Area with a view limiting he duplication of effort and ensuring the best use of the available technical resources;
k) to examine the hydrological effects and the subsequent ecological changes on the development programmes and evaluate how they affect the economic activities of the persons dependent on river environment;
l) to implement development projects and programmes whose primary objective is to promote socio-economic development of the Coast Province in particular and Kenya in general;
m) to plan and liaise with the relevant authorities as necessary in the exploration and development of the extensive fishing and marine activities an Kenya especially the exclusive economic zone.

The proposed MGB project falls within the planning jurisdiction of the CDA and is therefore subject to this Act. Indeed, CDA did confirm that development of a bridge over Likoni was initially their concept.

Roads Act 2007:

The core feature of the Kenya Roads Act 2007 which came into effect in September 2007 was the creation of three autonomous Authorities (KeNHA, KeRRA and KURA) to take care of national, rural and urban roads respectively. Sections 3(2) (b), 4(2) (b) and 10(2) (b) are quite relevant to development and operation of power distribution lines as they place all road reserves under the respective jurisdictions of KeNHA, KeRRA and KURA depending on the category of the road. In essence, any infrastructure service provider intending to utilize a road reserve will require consent of the respective road authority. Further, under Section 27, the respective road authority has power to cause relocation of infrastructure from the road reserve thus:-

> (2) *Where any infrastructure utility is located within a road reserve, the provider or operator of such infrastructure utility shall, upon written request by the responsible Authority, relocate such infrastructure utility to a location or alignment approved by the Authority at no cost to the Authority.*
>
> *(3) Where an Authority intends to exercise any power under sub-section (2) it shall give reasonable notice of its intention to do so to the person having control of such infrastructure utility, and such person shall cause to be removed such infrastructure utility within sixty days.*
>
> *(4) Where, under subsection (2) or (3), any person having control of an infrastructure utility fails to remove such infrastructure utility within the time stated in the notice, the concerned Authority may remove such infrastructure utility at the cost of the person who was unable to comply with the notice under subsection (3).*

Given the provisions of the Roads Act 2007, it is important that all developers targeting to use road reserves to liaise closely with the relevant road authorities. The same position was articulated during consultations with KeNHA and KeRRA undertaken as part of this study.

The County Government Act 2012

The County Government Act of 2012, which has been adapted to the Constitution's State and County structure in relation to devolution, stipulates the County planning issues in Part IX. The County Government Act declares the County Integrated Plan to be central to the County's administration and prohibits any public spending outside of the plan. The Act clarifies that the County Integrated Plan to be broken down into the economic plan, physical plan, social environmental plan and spatial plan. Also, the Act states that the County Plan commands,

- County Integrated Development Plan
- County Sectoral Plans
- County Spatial Plan
- Cities and urban areas plans as stipulated by Urban Areas and Cities Act

The Traffic Act, Cap. 403

The Act empowers police officers to stop and remove from the road vehicles producing noxious

emissions or to charge their owners in a court of law. Under the Traffic Rule, every motor vehicle shall be constructed, maintained and used so that no avoidable smoke or visible vapour is emitted there from. Pollution of the atmosphere occurs on the highway either by use of adulterated petroleum products or non-roadworthy vehicles, aircraft, rail-locomotives and ships. The Traffic Act requires that the vehicles shall only use the fuel specified in the vehicle license. The control of vehicular pollution is an example of grossly inadequate standards and enforcement. The Traffic Act prohibits the operation of motor vehicles that emit black fumes that pollute the air and cause visibility problems. The problem with this requirement is that there is no standard measure or definition of what constitutes black fumes or visibility problems. The Act does not address specific pollutants that are particularly harmful, such as Lead and carbon monoxide.

Part (V) of the Traffic Act deals with driving and other offences relating to the use of vehicles on road and is therefore critical in terms of management of safety within roads. This section, therefore will largely apply in the management of safety in the proposed Mombasa gate Bridge and access roads.

The National Transport and Safety Authority Act, 2012:

This law provides for the establishment of the National Transport and Safety Authority with the sole role of ensuring provision of safe road transport in Kenya. Specifically, the functions of the NTSA are to:-

a) advise and make recommendations to the Cabinet Secretary on matters relating to road transport and safety;
b) implement policies relating to road transport and safety;
c) plan, manage and regulate the road transport system in accordance with the provisions of this Act;
d) ensure the provision of safe, reliable and efficient road transport services; and
e) administer the Act of Parliament set out in the First Schedule and any other written law.

In pursuit of stated functions, the NTSA Act 2012 empowers the Authority to advise the Government on national policy with regard to road transport system and develop and implement road safety strategies in which case, the NTSA is a fundamental stakeholder in the operation and management of the proposed Mombasa Gate Bridge.

The Lands Act No. 6 of 2012:

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

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

Under the Lands Act 2012, The Wayleaves Act, Cap 292 and The Land Acquisition Act, Cap. 295

have been revoked but Sections 8 and 9 allow for Compulsory Acquisition as an option in acquiring land for public utility. This section will come in handy in formulating a Resettlement Action Plan for the Project.

The Land Registration Act, No. 3 of 2012:

The Land Registration Act (LRA), 2012 was assented to on 27th April, 2012 and commenced on 2nd May, 2012 with the objective and purpose of revising, consolidating and rationalizing the registration of titles to land to give effect to the principles and objects of devolved government.

Sections 18 to 21 of the LRA 2012 deal with establishment and maintenance of boundaries to land. Section 21(1) is relevant to development of power distribution lines in it that it criminalizes interference with boundaries thus;- Any person who defaces, removes, injures or otherwise impairs a boundary feature or any part of it unless authorized to do so by the Registrar commits an offence and is liable on conviction to imprisonment for a term not exceeding two years or to a fine not exceeding two hundred thousand shillings or to both. This is relevant to all road construction including setting of new reserves for roads as proposed under the MGB Project which should subsequently respect all boundaries.

Under the LRA 2012, Statutes previously related to land property namely;- The Indian Transfer of Property Act 1882, The Government Lands Act, (Cap 280), The Registration of Titles Act, (Cap 281), The Land Titles Act, (Chapter 282) and The Registered Land Act, (Cap. 300) now stand repealed.

The Environment and Land Court Act No.19 of 2011:

This law was assented to on 27th August 2012 and commenced on 30th August 2012 to give effect to Article 162(2)(b) of the Constitution; to establish a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land, and to make provision for its jurisdiction functions and powers, and for connected purposes. Section 13 (1) of the Act gives the Court original and appellate jurisdiction to hear and determine all disputes in accordance with Article 162(2)(*b*) of the Constitution and with the provisions of this Act or any other written law relating to environment and land. In exercise of its jurisdiction under Article 162 (2) (*b*) of the Constitution, the Court shall have power to hear and determine disputes relating to environment and land, including disputes:-

- relating to environmental planning and protection, trade, climate issues, land use planning, title, tenure, boundaries, rates, rents, valuations, mining, minerals and other natural resources;
- relating to compulsory acquisition of land;
- relating to land administration and management;
- relating to public, private and community land and contracts, choses in action or other instruments granting any enforceable interests in land; and
- any other dispute relating to environment and land.

This statute is deemed relevant to all development proposed for implementation in Kenya as it provides for legal recourse for disputes relating to environment and land. This is a law that any developer including KeNHA could take recourse to especially given the numerous disputes associated with land acquisition in the coast area.

The Agriculture Act, Cap 318:

This statute seeks to promote and maintain a stable agriculture, to provide for the conservation of the soil and its fertility and to stimulate the development of agricultural land in accordance with the accepted practices of good land management and good husbandry. This Act primarily guides and regulates farming practices. The Agriculture Act is the principal land use statute covering, inter-alia, soil conservation and agricultural land use in general.

In 2009, the Minister for Agriculture gazetted **The Agriculture (Farm Forestry) Rules, 2009** with the objective and purpose of promoting and maintaining farm forest cover of at least 10 per cent of every agricultural land holding and to preserve and sustain the environment in combating climate change and global warming.

Rule 5 (1) requires every person who owns or occupies agricultural land shall establish and maintain a minimum of 10% of the land under farm forestry which may include trees on soil conservation structures or rangeland and cropland in any suitable configurations; provided that the species of trees or varieties planted shall not have adverse effects on water sources, crops, livestock, soil fertility and the neighbourhood and should not be of invasive nature.

Rule 6 allows an inspector to take action within area of jurisdiction to ensure that land owners and occupiers comply with requirements of rule 5 above. Regulation 10 on harvesting of farm trees requires the following:

- Every land owner or occupier shall ensure that harvesting of trees shall be done in such a manner as to maintain a 10 per cent tree cover at all times, with large scale harvesting requiring a harvesting plan as governed by the provisions of the Forests 2005.
- The District Agricultural Committee shall establish mechanisms to facilitate the process of notification and approval for ease of harvesting by land owners or occupiers.
- A person shall not harvest trees from a farm forest without notification and approval as provided for in paragraph (ii).
- Harvesting, processing and movement of farm forest products for commercial purposes shall be governed by the provisions of the Forests Act 2005.

From this analysis, it is apparent that an innovative approach to treatment of on-farm trees has been established. As such, contrary to past practices, contractors contemplating removal of farm trees to create way leaves will require authority from the Sub County Agricultural committees.

Public Procurement and Disposal Act 2005:

The purpose of this Act is to establish procedures for procurement and the disposal of unserviceable, obsolete or surplus stores and equipment by public entities to achieve the following objectives -

- to maximize economy and efficiency;
- to promote competition and ensure that competitors are treated fairly;
- to promote the integrity and fairness of those procedures;
- to increase transparency and accountability in those procedures; and
- to increase public confidence in those procedures;
- to facilitate the promotion of local industry and economic development.

All procurement of services related to the Mombasa Gate Bridge will be subject to this statute.

The National Museums and Heritage Act-Cap 216 (2006):

Kenya is rich in its antiquities, monuments, cultural and natural sites which are spread all over the country and the Act aims to preserve this national heritage. The National Museums of Kenya is the custodian of the country's cultural heritage, its principal mission being to collect, document, preserve and enhance knowledge, appreciation, management and the use of these resources for the benefit of Kenya and the world. Through the National Museums of Kenya many of these sites are protected by law by having them gazetted under the Act.

Section 30 of the Act requires all discoveries of buried artefacts to be reported to the NMK/ GOK. In is a requirement under this law for Cultural Impact Assessment Studies coordinated by the NMK to precede development in any culturally sensitive site including the entire Kenya's coastline in which case, the NMK has been contacted in the case of the MGB development planning.

4.4.4: Codes, Specifications and Standards

(i) The Ministry of Roads - Environmental and Social Unit:

The Ministry of Roads has established an Environmental and Social Unit (ESU) in the Roads Department whose objectives is to achieve a comprehensive policy in terms of environmental management in the road sub-sector and to strengthen the capacity within the Ministry to be able to handle environmental and social issues. The role of the ESU is to:-

1) *Develop environmental road sub-sector standards and guidelines;*
2) *Ensure compliance with Environmental Management and Co-ordination Act of 1999, and Environmental Impacts Assessment and Audit Regulation of 2003 as they relate to the road sub-sector;*
3) *Review and update Roads Department documents e.g. standard specification and contract documents;*
4) *Participate in inspection for certification of substantial completion of work carried out by the roads department;*
5) *Screen proposed road rehabilitation project to determine environmental impact assessment category;*
6) *Review environmental and social management plans that have been prepared;*
7) *Set up a system for continuous monitoring and periodic surveillance;*
8) *Audit road rehabilitation, improvement and maintenance activities;*
9) *Work with and obtain feedback from the District and Provincial Engineers on all roads.*
10) *Liaise with Government, parastatals and non-governmental organisations concerned with environmental issues including NEMA, with a view to addressing common priorities;*
11) *Create awareness and sensitise the public with regard to proposed road projects, their potential impacts and the need for planning in the event that people are going to be affected;*

12) *Ensure compliance of the road sub-sector EIAs with public consultation and disclosure procedures as required by the Environmental Management and Co-ordination Act and the requirements of the various international financing institutions and development partners;*

13) *Set up a computerised environment and socio-economic database relevant to road work activities.*

(ii) Standard Specification for Road and Bridge Construction:

The Ministry of Roads produced the "Standard Specification for Road and Bridge Construction" in 1986. These are often referred to when addressing aspects of road projects environmental impacts. The Standard Specifications for Road construction has guidelines on environmental protection and mitigation. Standard Specification Clauses 116, 117, 125, 135, 138 address protection of the environment, with regard to water, health, safety and accidents, water supply, maintenance of the engineers' staff houses, offices, laboratories, and attendance upon the engineer and his staff.

The provisions of these laws, standards and codes must not be contravened during project implementation, thus the provisions are largely supportive of EMCA 1999; must form part of the legal basis for environmental mitigation, avoidance, prevention, compensation, restoration and enhancement. The following key clauses are included in the specifications:

i *Section 1: General*

ii *Clause 115, Sub-clauses (c), (e), (f), (g), (i) and (k) General conditions for protection of environment;*

iii *Clause 116 Protection of water resources;*

iv *Clause 117 Health, safety and accidents;*

v *Clause 118 Preservation and maintenance of fences and gates;*

vi *Clause 119 Use of explosives;*

vii *Clause 120 Protection of existing works and services;*

viii *Clause 124 Provision of land;*

ix *Section 6: Quarries, borrow pits, stockpile and spoil areas.*

The Standard Specifications for Road construction has guidelines on environmental protection and mitigation. Standard Specification Clauses 116, 117, 125, 135, 138 address protection of the environment, with regard to water, health, safety and accidents, water supply, maintenance of the engineers' staff houses, offices, laboratories, and attendance upon the engineer and his staff. The provisions of these laws, standards and codes must not be contravened during project implementation, thus the provisions are largely supportive of Cap 387; must form part of the legal basis for environmental mitigation, avoidance, prevention, compensation, restoration and enhancement.

(iii) Guidelines for Prevention and Control of Soil Erosion in Road Works, 2010

The guidelines main objective is to benefit all persons engaged in the road works (Engineers, consultants, contractors and supervisors) and is not informed on the extent of damages caused by uncontrolled run-off from the road corridor. It acknowledges that road works potentially result in environmental hazard through the spillage of carbon products, contaminating the surrounding land, dust and noise pollution, interference with the drainage pattern hence extensive soil erosion. The guidelines therefore focus to minimize the damages to the environment through the use of innovative construction methods and procedures which are less damaging to the environment in controlling soil

erosion. The guidelines discuss several issues on the soil and water conservation principles which entail;

i) The design and construction of water ways and soil erosion control measures in road drainage systems;

ii) Soil erosion control measures needed in upper and lower catchment areas;

iii) Soil erosion and their mitigation measures against anticipated damages from the road drainage discharge;

iv) Use of vetiver grass to stabilize and heal erosion damages; and

v) Indicative cost of soil and water conservation measures for planning purposes.

The said guidelines will apply directly in the mitigation of soil erosion occasioned by road construction activity.

(iv) Environmental Guidelines for Roads and Bridges, 2010

The guideline for roads and bridges provides detailed analysis of environmental issues arising from road works along with mitigation measures that have been used in the national and the international contexts. The main focus is on simply, fulfilling the law that requires assessing the state of environment before and after the road construction period hence achieving sound environmental management for the road transportation system. It also addresses environmental practices to be followed during the development stages starting from tender, feasibility, design, construction, operation and maintenance phase. The guidelines recommend;

i) Preparation of full EIA study to be completed at feasibility and updated at the design stage,

ii) The certificate for environmental compliance should be issued prior to the issuance of certificate of road completion,

iii) The guidelines are expected to be used in conjunction with existing and future regulations and guidelines developed by the government in particular NEMA,

iv) Emphasizes on the environmental sustainable guidelines that calls for health and Environmental quality objectives (ecosystem protection, clean air, avoiding mobility and mortality)

Preparation of this ESIA report is meant to partly address requirements of this policy guideline.

4.4.5: National legal provisions on gender equity and mainstreaming

Gender issues in the country are institutionalized through: -

(i) The National Constitution of August 2010

In the New Constitution, Chapter Four—The Bill Of Rights, Section 21 (3) All State organs and all public officers have the duty to address the needs of vulnerable groups within society, including women, older members of society, persons with disabilities, children, youth, members of minority or marginalized communities, and members of particular ethnic, religious or cultural communities Section 27 (3) Women and men have the right to equal treatment, including the right to equal opportunities in political, economic, cultural and social spheres.

Part 2 on the Composition and Membership of Parliament, Section 97 (1) The National Assembly

consists of, a) two hundred and ninety members, each elected by the registered voters of single member constituencies; (b) forty-seven women, each elected by the registered voters of the counties, each county constituting a single member constituency;

Section 98. (1) The Senate consists of— (a) forty-seven members each elected by the registered voters of the counties, each county constituting a single member constituency; (b) sixteen women members who shall be nominated by political parties according to their proportion of members of the Senate elected under clause (a) in accordance with Article 90; (c) two members, being one man and one woman, representing the youth; (d) two members, being one man and one woman, representing persons with disabilities;

Section 100: Parliament shall enact legislation to promote the representation in Parliament of— (a) women;

Section 127 (1) Establishes the Parliamentary Service Commission consisting of (2) (a) The Speaker of the National Assembly, as chairperson; (b) A vice-chairperson elected by the Commission from the members appointed under paragraph (c); (c) Seven members appointed by Parliament from among its members of whom, Four shall be nominated equally from both Houses by the party or coalition of parties forming the national government, of whom at least two shall be women;

In Chapter Thirteen, on the Public Service, Part 1—Values and Principles of Public Service
Section 232 (1) The values and principles of public service include—(i) affording adequate and equal opportunities for appointment, training and advancement, at all levels of the public service, of—

(i) Men and women;
(ii) The members of all ethnic groups; and
(iii) Persons with disabilities.

Section 232 (2) the values and principles of public service apply to public service in— (a) All State organs in both levels of government; and (b) All State corporations. (3) Parliament shall enact legislation to give full effect to this Article. In the composition, appointment and terms of office, the new constitution says that the chairperson and vice-chairperson of a commission shall not be of the same gender. In addition clause (8) says that the State shall take legislative and other measures to implement the principle that not more than two-thirds of the members of elective or appointive bodies shall be of the same gender.

The new constitution provides for the elimination of gender discrimination in law, customs and practices related to land and property. Under Kenya's previous law, inheritance was governed by customary law, often preventing women from inheriting property from their parents or laying claim to joint assets when their husbands died. In summary, the New Constitution provides as follows-

- The New Kenyan Constitution ensures that women will be able to pass on citizen ship to their children regardless of whether or not they are married to Kenyans.
- Article 14 (1)
- The New Kenyan Constitution provides that parties to a marriage will be entitled to equal rights at the time of marriage, during the marriage and at its dissolution. Article 45 (3)
- The New Kenyan Constitution assures that parental responsibility shall be shared between parents regardless of marital status. Article 53 (1) (e).
- The New Kenyan Constitution eliminates gender discrimination in relation to land and property and gives everyone including women the right to inheritance and unbiased access to land. Article 60 (1) (f).

- The New Kenyan Constitution provides for the enactment of legislation for the protection of matrimonial property with special interest on the matrimonial home during, and upon the termination of the marriage. Article 68 (c) (iii).
- The New Kenyan Constitution maintains a one third requirement for either gender in elective bodies giving women of Kenya at least 1/3 minimum in elective public bodies. Article 81 (b).
- The New Kenyan Constitution ensures that gender equality is maintained in political parties providing a basic requirement for political parties as amongst other to respect and promote gender equality. Article 91 (f)
- The New Kenyan Constitution provides that Parliament shall formulate law to promote the representation of women, persons of disabilities, ethnic and other minorities and marginalized communities in Parliament. Article 100.
- The New Kenyan Constitution ensures that women and men will have the right to equal treatment and opportunities in political, economic, cultural and social spheres without discrimination. Article 27 (3).
- The New Kenyan Constitution accords the right to health including reproductive health to all. Article 43 (1) (a).
- The New Kenyan Constitution affords adequate and equal opportunities for appointment, training and advancement for women and men at all levels within the Public Service Commission. Article 232 (i).

(ii) National Gender and Development Policy (2000):

The National Gender and Development Policy provide a framework for advancement of women and an approach that would lead to greater efficiency in resource allocation and utilisation to ensure empowerment of women. The National Policy on Gender and Development is consistent with the Government's efforts of spurring economic growth and thereby reducing poverty and unemployment, by considering the needs and aspirations of all Kenyan men, women, boys and girls across economic, social and cultural lines. The policy is also consistent with the Environmental and Social Impact Assessment ESIA Study Report Government's commitment to implementing the National Plan of Action based on the Beijing Platform for Action (PFA). The overall objective of the Gender and Development 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.

The Policy's concerns cover the following critical areas: -

i) The Economy; -To enable men and women to have equal access to economic and employment opportunities.

ii) Poverty and Sustainable Livelihoods; - To remove obstacles to women's access to and control over productive assets, wealth and economic opportunities, shelter, safe drinking water, and promote measures for conserving the environment.

iii) Law; - To guarantee Kenyan men and women equality before the law, as provided for in the Constitution and under the obligations of the Kenyan State in international law.

iv) Political Participation and Decision- Making; - To enhance gender parity in political participation and decision – making

v) Education and Training; - To enhance and sustain measures to eliminate gender disparities in access, retention, transition and performance in education for both boys and girls

vi) Health and Population; - To achieve the highest attainable standard of health for both men

and women through addressing gender inequalities pertaining to access and use of basic health services and facilities at an affordable cost.

vii) The Media; - To increase the participation of women in the media and communications sector and promote gender sensitive portrayal of both men and women in the media

viii) Policy Implementation Framework and Resource Mobilisation- empowering both men and women to be equal partners in development- It focuses on the elimination of existing disparities between the two genders. It also advocates for an affirmative action to address gender disparities.

(iii) The Sexual Offences Act (No. 3 of 2006)

24- Sexual offences relating to position of authority and persons in position of trust.

25- Sexual relationship which pre-date position of authority or trust.

26- Deliberate transmission of HIV or any other life threatening sexually transmitted disease.

(iv) Other Policy/legal provisions for Gender mainstreaming:

Other provisions include:

i) The National Constitution 2010

ii) Vision 2030 Flagship projects

iii) The Presidential Directive of 2006 on 30% women's' appointments to all positions of leadership employment and promotions

iv) MTPs handbook has gender outcome indicators

v) Sessional Paper No.2 of 2006

vi) Gender Department in the Ministry for Gender Children and Social Development.

vii) The National Commission on Gender and Development created through an Act of Parliament in 2003 is mandated to Monitor Government Implementation of its Commitments to Women's Rights and Gender issues:-

- ✓ Employment Act, No. 11 of 2007 : the Act prohibits
- ✓ discrimination in access to employment and in employment
- ✓ security on the basis of sex, among others
- ✓ Guarantees equality of opportunity in employment
- ✓ Provides for equal pay for work of equal value
- ✓ Prohibits sexual harassment which the law defines to include use of language, whether written or spoken, of a sexual nature

(vi) A National Framework on Gender-based Violence:

The government through the National Commission on Gender and Development has developed a National Framework on Gender Based Violence (February 2009) to form that basis of investigation of instances of sexual violence and strengthen coordination of responses to stem the vice Launch of same on 09.11.2009 by Minister for Gender, children and social development

4.5: INTERNATIONAL CONVENTIONS, TREATIES AND AGREEMENTS

4.5.1: General Treaties

According to the Registrar of International Treaties and other Agreements in Environment, there are about 232 treaties which are legally binding to Kenya. A total of 9 such treaties can be triggered in the MGB Project as tabulated in 4.5 below.

Table 4.5: International treaties deemed relevant to the MNBR and BLR Project

No	Convention	Status	Reason
1	Convention on International Trade in Endangered Species of Wild Fauna and Flora	Triggered	Threats to biodiversity largely remain unknown as most of the floral species not assessed for IUCN Red List data. Three tree species are listed as Near Threatened while one is listed as Vulnerable under IUCN Data lists
2	Convention on the Elimination of all forms of Discrimination against Women, 1979.	Triggered	Women form the bulk of poor rural population in Likoni area of Mombasa
3	Convention on the Conservation of Migratory Species of Wild Animals, 1979.	Triggered	Seven CMS and Eight AEWA Bird spp were encountered in the traverse area respectively.
4	The 1985 Vienna Convention on Protection of the Ozone Layer	Not Triggered	There is no likelihood of use on Ozone depleting substances in bridge and road construction.
5	The 1987 United Nations Montreal Protocol on substances that deplete the ozone layer	Not triggered	As above
6	The 1992 United Nations Framework Convention on Climate Change (UNFCCC) which led to the Kyoto Protocol of 1997	Triggered	Any activity that involves heavy use of fossil fuels and importation of materials such as steel in bridge construction has a heavy carbon foot print.
7	Convention on Biological Diversity	Triggered	Sacred shrines within vicinity of traverse are reservoirs of rare, near endemic fauna and flora.
8	Cartagena Protocol on Biosafety to the Convention on Biological Diversity, 2000	Not triggered	
9	International Plant Protection Convention (Revised), 1997	Not triggered	The Project will not involve introduction of Pest Spp
10	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	Not triggered	There no possibility of use of controlled substances in road construction
11	Stockholm Convention on Persistent Organic Pollutants	Not triggered	As above
12	African Convention on the Conservation of Nature and Natural Resources (1968)	Triggered	Exploitation of water resources and rangelands will trigger this convention
13	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972	Triggered	Road construction in close vicinity of marine areas could cause siltation of the sea and creeks
14	The Convention on Wetlands of International Importance (Ramsar 1971)	Triggered	Possible siltation of mangrove wetlands

15	Convention on the Protection of World Cultural and Natural Heritage, 1972, which also protects threatened plants	Triggered	Possibility of threatened plants occurring in the traverse. There are no designated cultural sites.
16	United Nations Convention to Combat Desertification 1994	Triggered	Road construction will convert natural vegetation to a concrete surface
	Total Triggers	9	

4.5.2: Treaties specific to Marine Pollution

Kenya has ratified several conventions in effort to regulate the ship source pollution;

The MARPO 73/78 Convention addresses pollution from ships by oil; by noxious liquid substances carried in bulk; harmful substances carried by sea in packaged form; sewage, garbage; and the prevention of air pollution from ships. The Convention, as modified by the 1978 Protocol, is known as the "International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto", or, in short form, "MARPOL 73/78". Regulations covering the various sources of ship-generated pollution are contained in the five Annexes of the Convention. The Convention has also been modified by the Protocol of 1997, whereby a sixth Annex was added.

The International Convention on Oil Pollution Preparedness, Response and Co-operation 1990 (OPRC 90) is the international instrument that provides a framework designed to facilitate international co-operation and mutual assistance in preparing for and responding to major oil pollution incidents and requires States to plan and prepare by developing national systems for pollution response in their respective countries, and by maintaining adequate capacity and resources to address oil pollution emergencies. Most importantly, OPRC 90 and OPRC-HNS Protocol 2000 provide the mechanism for Parties to request assistance from any other state Party, when faced with a major pollution incident.

International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969 which provides for intervention in the deep sea incase pollution in the high sea is likely to cause pollution in our territorial sea to prevent, mitigate or eliminate grave and imminent danger to the coastline or related interests from pollution or threat of pollution of the sea by oil or substances other than oil, following upon a maritime casualty or acts related to such a casualty, which may reasonably be expected to result in major harmful consequences.

Annex V of Marpol is relevant to the bridge construction stage as it generally prohibits the discharge of all garbage into the sea, except as provided otherwise in regulations 4, 5, and 6 of the Annex, which are related to food waste, cargo residues, cleaning agents and additives and animal carcasses. Under the revised MARPOL Annex V, garbage includes all kinds of food, domestic and operational waste, all plastics, cargo residues, incinerator ashes, cooking oil, fishing gear, and animal carcasses generated during the normal operation of the ship and liable to be disposed of continuously or periodically. Garbage does not include fresh fish and parts thereof generated as a result of fishing activities undertaken during the voyage, or as a result of aquaculture activities.

Convention on the prevention of Marine pollution by Dumping of Wastes and other matter 1972 (London Convention, 72) which aims to prevent, reduce and where practicable, eliminate pollution caused by dumping or incineration at sea of wastes.

4.6: THE INSTITUTIONAL FRAMEWORK

This Study recognizes 2 institutional set-ups that are critical to the successful execution of the EIA

process as outlined below.

4.6.1: Institutional framework under Cap 387

In 2001, the Government established administrative structures to implement EMCA, 1999 (now Cap 387) as follows:-

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

The National Environmental Management Authority: Cap 387 allows for formation of the National Environmental Management Authority (NEMA) as the body charged with overall responsibility of exercising general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of government in the implementation of all policies relating to the environment. Under the Act, NEMA was established in 2001 when the first Director General was appointed by the President.

In order to align to requirements of National Constitution 2010, Cap 387 has devolved functions to Counties. Thus, this ESIA Study recognizes NEMA as the sole regulator of EIA processes in Kenya. Indeed, the second objective of the ESIA Study Report is to facilitate Environmental Licensing of the Mombasa Gate Bridge Project in which case, the Report has to ensure compliance with all standards as set out by NEMA in capacity of Environmental Regulator in Kenya. The ESIA Study process has thus been tied up to the NEMA institutional framework at Head Office and County levels.

Public Complaints Committee*:* Under Cap 387, a Public Complaints Committee has been established to provide an administrative mechanism for addressing environmental harm. The Committee whose membership include representatives from the Law Society of Kenya, NGOs and the business community has the mandate to investigate complaints relating to environmental damage and degradation.

4.6.2: The Kenya National Highways Authority-KeNHA

In the capacity of Employer, KeNHA has administrative jurisdiction over the EIA process and will also act custodian of the ESMP emanating from this study.

CHAPTER FIVE: THE BASELINE ENVIRONMENT

5.1: APPROACH TO BASELINE CHARACTERIZATION

Documentation of the baseline environment for this Study had the objective of providing a firm, clarified profile of the pre-project environment, against which, potential impacts would be analysed and interpreted. As such, comprehensive analysis based on both secondary and empirical data was undertaken for this ESIA Study as unveiled in sections below. Data collection in the ESIA was restricted to unearthing basic facts, trends and processes in the Project's area of influence with the goal of defining potential impact area.

This chapter presents the result of analysis based on the secondary data. In addition to this, Chapters Six, Seven and Eight provide in-depth analysis of key natural resources based on various surveys that were undertaken as part of the detailed ESIA study.

5.2: THE PHYSICAL PROFILE

5.2.1: Relief and physiographic profile

The main physiographic feature in the Mombasa Gate Bridge project area is the Likoni Channel and its tributary, the Mweza Creek (Plates 5.1 and 5.2). Likoni Channel is a shallow depression whose depth upto mean sea level averages 15 metres characterised by gentle slopes on the northern shoreline and a steep rocky cliff on the southern shoreline. Width of the channel varies but us about 1km at the proposed bridge crossing point.

Plate 5.1: The Mweza Creek showing Mombasa town on the northern shoreline of Likoni Channel
Source: This study

Plate 4.2: Horizontal profile of the MGB traverse between Ganjoni (North) and Mtongwe Rd (South)
Source: This Study

5.2.2: Geology, soils and drainage

Soils of Coastal Plain and Foot Plateau were developed on coral sands and alluvial deposits (Limestone and Calcific Mudstones) of the Upper Jurassic series which weather to produce shallow to moderately deep, red to dark reddish brown, friable, rocky, loam to sandy clay loam: LITHOSOLS; with ferralic CAMBISOLS, lithic phase.

The Coastal Plateau is a vast monotonous plain with no distinct drainage pattern in the Island side. However, in the Mainland South area of Likoni, the plateau is broken by the Mweza Creek, a 1.32Km long tidal creek projecting from the Port Reitz creek in a south west direction cutting into Mtongwe location. The creek was possibly created by the cutting action of the Mweza stream into the local stratigraphy (Plate 4.2 above) and has a width varying from 0.3Km and below depending on the local geology.

The catchment for Mweza Creek extends up to the Foot Plateau area at Mbuta in the south west but only forms a distinct drainage at the Kona Mbaya area (Corner Mtongwe) where its channel is crossed by the road. The channel then proceeds as an ephemeral stream only flowing in the wet season to enter the creek in the neighbourhood of the Seamens Barracks.

Towards the proposed interchange with the Mombasa Southern bypass, the traverse enters an internally draining depression containing the seasonal Ziwani Lake.

Plate 5.1: Exposed cliffs of the Mweza Creek
Source: This study

Plate 5.2: The seasonal Ziwani lake and wetland

5.3: CLIMATE AND AGRO-CLIMATOLOGY

5.3.1: Sources of Climatic Data

Climate for the Mombasa Town area and immediate mainland south is best referenced by 2 climatic stations namely;- Moi Port Reitz International Airport (021) and Mombasa Town Met Station (019) based on which, the climatology of the project area has been described. Basic features for both climatic stations which are referenced by the Kenya Meteorological Department are provided in Table 5.1 below following which, the Mombasa Port Reitz Met Station (Table 5.2) was found the

most suitable for climatic analysis for this ESIA on account of having a longer and more comprehensive record in spite of the slightly higher elevation.

Table 5.1: Meteorological Stations within Mombasa Town and vicinity

Station	KMD Reference	Altitude (m)	Length of Record	Annual Mean Rainfall (mm)
Moi Port Reitz International Airport	9439021	57	Since 1959	1049
Mombasa Town Met Station	9439019	16	Since 1931	1210
Msambweni Waa Dispensary	9439038	31		1013
Average				1129.5

Source: Ralph and Jaetzhold, 2006

5.3.2: Seasonal Patterns in Temperature, Wind Run, Relative Humidity and Sunshine

(1) Temperature

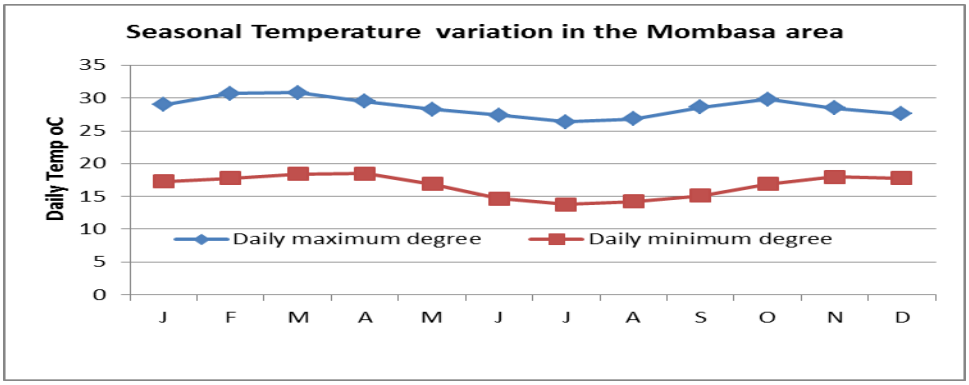
Given the low altitude location, Mombasa remains generally hot throughout the year with mean temperatures averaging 26.3 °C with a range from 22.4 to 30.2 °C. Temperatures are generally highest in February and October and lowest in July (Figure 5.2).

Table 5.2 Climatic Records at Moi Port Reitz International Airport Met Station

Temperatures					Relative Humidity		Daily Sunshine (hrs)	Daily Wind Run (km)[3]	Daily Evaporation (mm)	Monthly Mean Rainfall (mm)	Numbers of wet days
Month	Daily maximum (degree)	Daily Minimum (degree)	Extreme High (degree)	Extreme Low (degree)	Daily Max (%)	Daily Min (%)					
Jan	31.6	24.2	34.8	21.1	76	66	8.3	141.3	210	25	3
Feb	32.3	24.6	34.4	21.9	75	63	8.9	143.2	203	17	1
Mar	32.6	25.2	35.4	22.1	77	63	8.9	138	221	65	5
Apr	31.2	24.7	35.6	22.2	81	71	7.6	158	184	200	13
May	29	23.4	31.8	21.4	85	76	6.5	162.3	155	325	17
Jun	28.3	22.6	31.3	19.7	83	72	7.3	168.6	144	118	12
Jul	27.7	21.8	29.8	19.3	83	72	7	162.2	138	91	9
Aug	27.8	21.6	30	18.9	83	72	8	158.1	158	64	11
Sep	28.4	22	31.7	19.7	80	70	8.4	153.8	178	63	9
Oct	29.5	23	32.2	20	78	69	8.9	148.2	197	85	9
Nov	30.9	23.8	33.6	21.1	77	69	8.9	123	188	98	8
Dec	31.4	24.1	34.1	21.7	78	69	8.7	128.5	191	59	5
Total							97.4	1785.7	2167	1210	102
Max.	32.6	25.2	35.6	22.2	85	76	8.9	168.6	221	325	17
Min.	27.7	21.6	29.8	18.9	75	63	6.5	123	138	17	1
Ave.	30.1	23.4	32.9	20.8	79	69	8.1	148.8	180	100	8

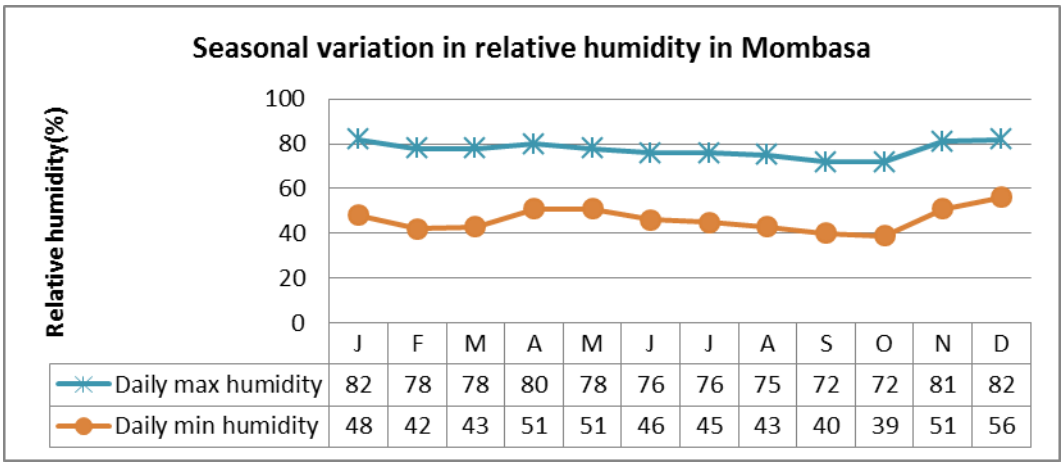
Source: Ralph and Jaetzhold, 2006

[3] A measurement of how much wind has passed a given point in a period of time. A wind blowing at three miles per hour for an entire hour would give a wind run of three miles. Cumulus calculates wind run by noting the average wind speed every minute, and adding in a minute's worth of 'distance' corresponding to that speed. So the wind run for a particular period is effectively an indication of the average wind speed over that period.



Source: Study of the National Water Master Plan, 1992
Fig 5.3: Seasonal Variation of Daily Temperature in the Mombasa Area

Relative HumidityFig 5.4 trace the seasonal variation of relative humidity in Mombasa. Mombasa is generally humid with a long-term (1959-1990) average of 61.5% and a range of 46% to 77%. Relative humidity does not display extreme seasonal variation as the maximum recorded is generally in the range of 72 to 82% with the months of January, April, November and December recording somewhat elevated humidity while February, September and October recording the lowest levels, according to the Study of the National Water Master Plan in 1992.



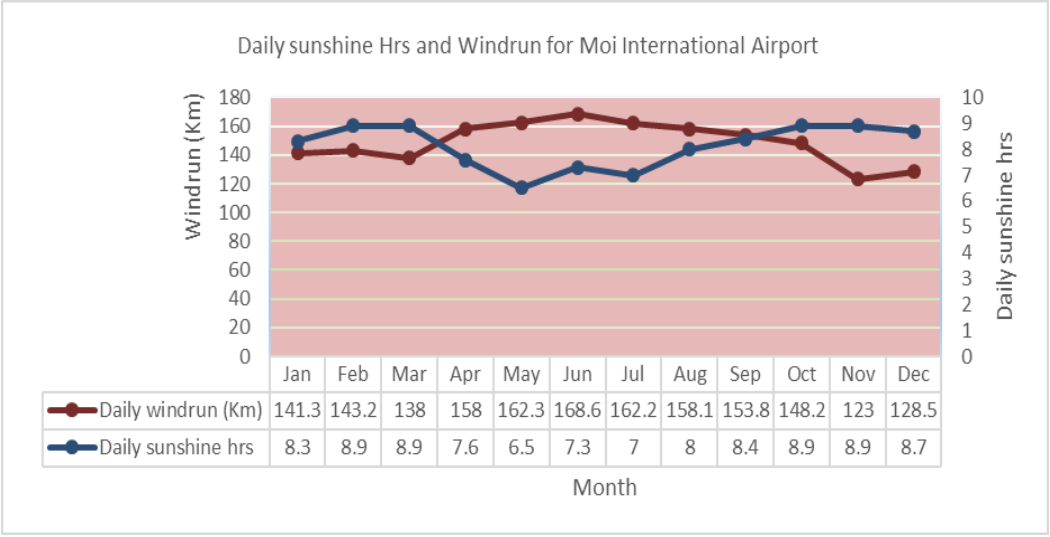
	J	F	M	A	M	J	J	A	S	O	N	D
Daily max humidity	82	78	78	80	78	76	76	75	72	72	81	82
Daily min humidity	48	42	43	51	51	46	45	43	40	39	51	56

Source: Study of the National Water Master Plan, 1992
Fig 5.4: Seasonal Variation of Relative Humidity in the Mombasa Area

(3) Wind run and number of sunshine hours:

Daily wind run displays a very high seasonal variability with a prominent limb building up from July to peak in October then dropping drastically in November and December. Wind run is lowest in April to June.

Daily sunshine in Mombasa ranges from 6.5 to 8.9 hours whose average of 8.1 hours is among the highest recorded in Kenya. The period September to January has the highest stretch of sunshine hours with July and August recording the lowest.

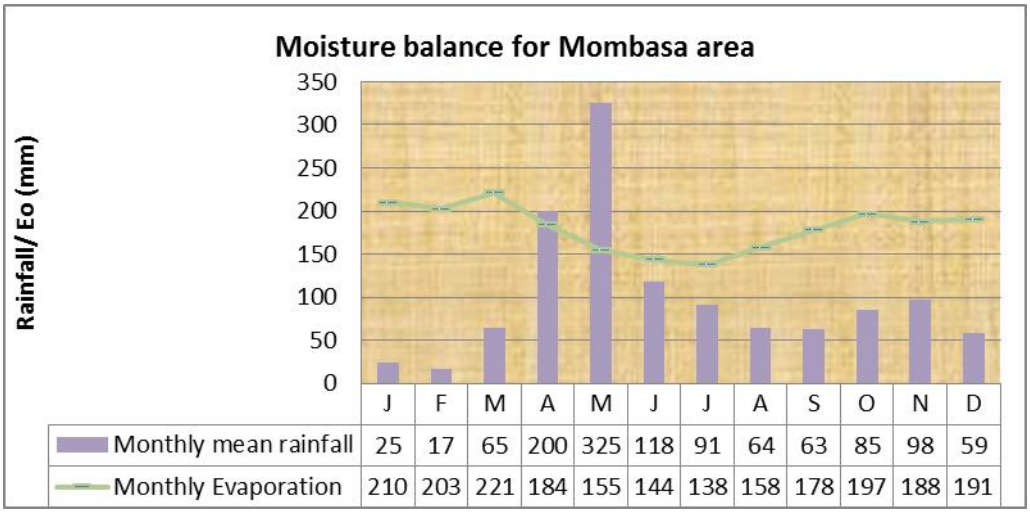


Source: Study of the National Water Master Plan, 1992
Fig 5.5: Seasonal Variation in Daily Wind Run and Sunshine Hours

5.3.3: Rainfall

(1) Seasonal rainfall occurrence and distribution:

Rainfall occurrence in Mombasa is influenced by the semi-annual passage of the inter-tropical convergence zone and the monsoons – the *North Easterly Monsoon (NEM)* from December to March and the *South Easterly Monsoon* from May to October. Most of the rainfall occurs between the monsoons when convection activity is enhanced. Long-term mean annual rainfall is 1210 mm (Table 4.2) delivered in one main wet season lasting from March to July and a minor one in October and November (Figure 4.6). With a long-term average of 299-355 mm, May is the wettest month in traverse area while the period between January and mid-March is the driest.



Source: Ralph and Jaetzhold, 2006
Fig 5.6: Seasonal Moisture Balance for the Mombasa area

(2) Climatic potential of rainfall

Fig 5. provides an analysis of the seasonal moisture balance for the Mombasa area based on comparison of balance between the long-term monthly rainfall catch and the potential evaporative demand. Annual potential evaporation in Mombasa averages 2167 mm (Table 5.2) while annual

rainfall averages 1210 mm. From Fig 5., it is apparent that rainfall substantially exceeds potential evaporative demand in May and thus creates a positive moisture regime which is favourable for both ecological productivity and groundwater recharge; however, this can generate runoff and wreak havoc on infrastructure unless properly harnessed.

The climatic value of rainfall in the traverse has been analysed based on computation of the climatic index as determined by the ratio of rainfall (r) to potential evapo-transpiration (Eo) based on the method of Sombroek et. al, 1982.[4] With an r/Eo ratio of 0.56-0.59, the long-term climate of the traverse area is apparently semi-humid but seasonally ranges from very arid in January and February to very humid in April and May. Such a high variability poses severe challenges in terms of vegetation development and semi-deciduous vegetation adapted to cope with seasonal moisture scarcity dominates the area. A seasonal moisture scarcity building from June to February imposes major limitation to rain-fed crop production and, as will appear in sections below, majority of the traverse area is food insecure on account of poor crop yield associated with inadequacy of soil moisture.

4

CHAPTER SIX: EMPIRICAL CHARACTERIZATION OF THE BASELINE ENVIRONMENT

Characterization of the pre-project baseline for the MGB employed both secondary data (as reported above) and empirical data procured through standalone studies. Four studies were commissioned as part of this ESIA study namely: -

- Ambient air quality
- Noise levels
- Sediment
- Quality of fresh and marine water
- Biodiversity (Flora and Fauna) mapping

Findings from these surveys were further applied in characterizing the pre-project baseline scenario as unveiled in sections below.

6.1: AIR QUALITY AND NOISE MONITORING SURVEYS

6.1.1: Objectives of the Air Quality Survey

The objective of the environmental (ambient air quality and noise) survey is to investigate and document the pre-project status of ambient air quality and noise level in the traverse for the proposed MGB Project. Accruing data provided a useful datum for future monitoring and reference.

6.1.2: Scope of survey

Parameters: The air quality and noise monitoring survey focused on monitoring of 7 parameters (Table 6.1) entailing 6 pollutants (PM_{10}, $PM_{2.5}$, NO_x, So_x, TVOC, CO, P_b) and 2 meteorological factors namely winds seed and direction.

Monitoring sites: The technical specifications for air monitoring identified six sites all falling within the traverse of the MGB in both Mombasa Island and Mombasa Mainland South. All six (6) sampling sites (Fig 6.1) were geo-referenced in GPS and site conditions documented as summarised in table 6.1 below.

Table 6.1: Sites for Ambient Air Monitoring

Parameters	Particulate Matter (PM_{10}, $PM_{2.5}$), Nitrogen Oxides (NO_X), Sulphur Oxides (SO_X), Carbon Monoxide (CO), Ozone (O_3), Lead (Pb) and wind direction and wind speed					
Survey location	Mombasa Island side		Mombasa Mainland South			
	Km 00 on Lumumba Rd	On Archbishop Makarios near junction with Mnazi Mmoja rd	Javi la Wageni near Church	Old Mtongwe Rd near Polytechnic	Mtongwe Rd near A14 junction	Junction with Mombasa Southern Bypass at Ziwani
	4o2'41.448''S 39o39'27.15''E	4o3'50.352''S 39o39'44.988''E	4o5'15.51''S 39o38'35.13''E	4o5'41.568''S 39o38'20.99''E	4o5'44.236'S 39o38'12.05''4E	4o3'51.024"S 39o37'55.896''E
	23masl	20masl	15masl	17masl	19masl	38masl
Survey Method	Continuous measurement with air sampler					
Period/ Schedule	24 hours x 1 day (Dec 2017)					

Source: This study

6.1.3: Methods in measurements

Air sampling: Air sampling basically targeted to generate baseline date on atmospheric air quality. Field extraction of samples including direct monitoring of meteorological parameters was entrusted to the Polucon Laboratories and the SGS for comparability whose staff undertook all the field work under supervision of the EIA Lead Expert. Air samples were extracted at roughly 2 metres above ground level.

Air samples were collected using an electric generator driven suction pump whose flow rate was calibrated to 3.46 litres per minute. The air was scrubbed through appropriate trapping solutions for sulphur dioxide, nitrogen dioxide, lead and ozone for periods of 15 minutes per sample. Sulphur dioxide was trapped in jars containing sodium-tetra-chloro-merculate solution while Carbon monoxide was trapped in silica impregnated with ammonium molybdinate. Nitrogen dioxide was trapped in tri-ethanolamine solution while lead was trapped in dilute sulfuric acid and preserved in nitric acid. Ozone was trapped in potassium iodide solution while suitable pre-weighed and pre-conditioned membrane filters were used to trap inhalable particulate matter (PM_{10}).

Figure 6.1: Location of field monitoring sites (Source: This Study)

Wind Measurement: Wind speed and direction were measured with a portable anemometer mounted at 1.5 m height above ground.

Laboratory Analysis: All sample bottles were maintained in airtight conditions to prevent leakage or contamination. Once in the laboratory, analysis applied standard procedure summarized in Table 6.2 below. Data accruing was analysed against set standards either as recommended by NEMA and the WHO following which, this write-up was prepared.

Table 6.2: Laboratory analysis methods

Parameter	Measurement methods	Detection Limits	Authority
Sulphur dioxide	Pararosaniline method	0.2 -6.6 µg/m^3	NAAQS[1]
Nitrogen dioxide	Modified Griess-Saltzman method	4 to 10,000 µg/m^3 (0.002 to 5 ppm (v)	ASTM[2] D1607-91 (2011)
Particulate matter (PM10)	The Filtration Technique	0.01-0.25 mg/m^3	NAAQS
Carbon Monoxide	Spectrophotometric method	0-100 ppm	NAAQS
Lead	Atomic Absorption Spectrophotometry	1.05 µg/m^3	VDI[3] 2267 (12): 2008
Ozone	Spectrophotometric methods	10 µg/m^3	VDI 2468 (4)

[(1)] National Ambient Air Quality Standards (NAAQS)*:* www.epa.gov/air/criteria
[(2)] *ASTM (*American So*ciety for Testing and Materials)* Standard Test Method for Nitrogen Dioxide Content of the Atmosphere (Griess-Saltzman Reaction)*:* www.astm.org/Standards/D1607
[(3)] *VDI (Verein Deutscher Ingenieure-The Association of German Engineers) Guidelines:* www.vdi.de*;* www.umweltbundesamt.de/luft/messeinrichtungen/4Appendix2.pdf

6.1.4: Findings of the Study

(a) Overview

A detailed description of the outcome of laboratory analysis will be available as Appendix 6.1 when data analysis is fully harmonised since as at the release of this report, available data from lab analysis is inconclusive and data from repeat sampling is yet to be released. In this section, an overview of the core observations is provided based on which, monitoring of future impacts of the project on ambient air quality has been modelled. Data for the 6 sites is summarized in Table 6.3 and Fig 6.2 and has also been compared with the tolerance limits specified by NEMA or the World Health Organization. Units of measure for the standards are either in milligrams per cubic meter (mg/m^3) for carbon monoxide and micrograms per cubic meter of air (µg/m^3) respectively. Brief comments on the prevalence of each parameter are provided below.

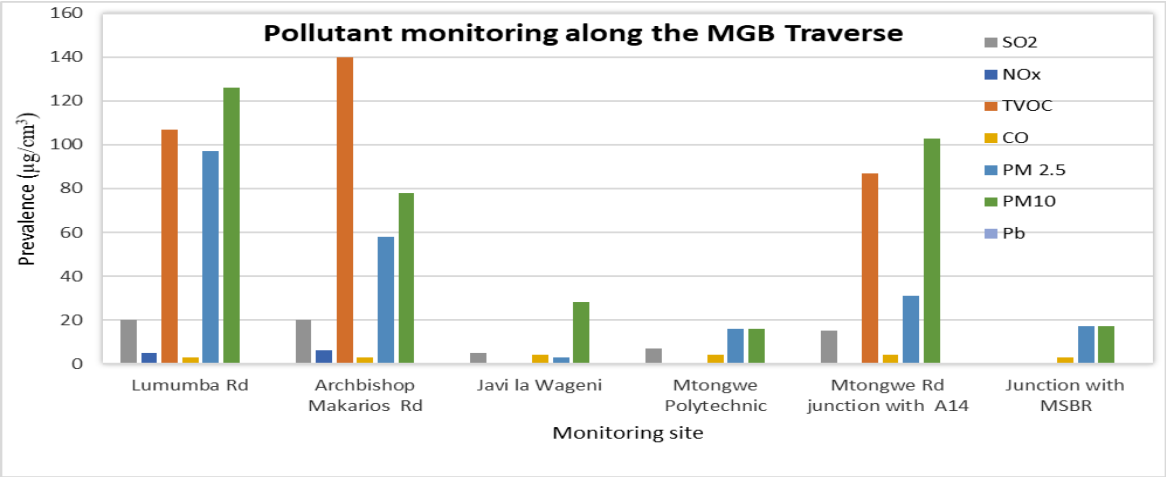
Table 6.3: Preliminary data from air monitoring along the MGB traverse

Monitoring site			**Laboratory outcome (µg/m3)**						
Name	*GPS coordinates*	*Limits*	*SO_2*	*NO_x*	*TVOC*	*CO (mg/M^3)*	*$PM_{2.5}$*	*PM_{10}*	*Pb*
Lumumba Rd	4°2'41.448''S		20	5	107	3	97	126	0.003
Archbishop Makarios Rd	4°3'50.352''S 39o39'44.988''E		20	6	140	3	58	78	0.003
Javi la Wageni	4°5'15.51''S 39o38'35.13''E		5	BDL	BDL	4	3	28	0.0001
Mtongwe Polytechnic	4°5'41.568''S		7	BDL	BDL	4	16	16	0.0014
Mtongwe Rd junction with A14	4°5'44.236'S 39°38'12.05''E		15	BDL	87	4	31	103	0.0001
Junction with MSBR	4°3'51.024"S 39°37'55.896''E		BDL	BDL	BDL	3	17	17	0.0001
NEMA limits for controlled areas		µg/m^3 (24hrs)	150	125	600			75	0.75
		I hr				2			
		8hrs				1			
		24hrs						50	0.5
WHO Limits		µg/m^3 10 min	500			100			
		µg/m^3 1 hr	350			35			
		µg/m^3 8hrs		120		10			
		µg/m^3 24hrs	125			7	25	70	
		µg/m^3 1yr	60	40					0.5-1

Source: This Study

(b) General prevalence of pollutants along the traverse

Fig. 6.2 traces prevalence of pollutants along the traverse of the MGB Project. Essentially, pollutant levels are highest at Lumumba Rd, Archbishop Makarios and the A14 junction with Mtongwe Road which are all busy urban roads. PM_{10}, $PM_{2.5}$, lead and carbon monoxide were detected in all the six sites and therefore are the most prevalent amongst all pollutants monitored. The Mombasa Island sites of Archbishop Makarios and Lumumba Roads have the highest mix of pollutants all of which were detected followed by the A14 junction with Mtongwe Rd. Prevalence of the main pollutants was exceptionally low in all the non-highway sites namely;- Javi la wageni, Mtongwe Polytechnic and Junction with MSBR (Kiteje) which are all removed from heavily motorised roads possibly indicating absence of emissions from motor vehicles.



Source: This Study

Fig 6.2: General prevalence of pollutants along the MGB traverse

(c) Trends in prevalence of specific pollutants

Total Volatile Organic Compounds (TVOCs): Volatile organic compounds (VOC) refer to any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate, whose composition makes it possible for them to evaporate under normal atmospheric conditions of temperature and pressure and can therefore participate in atmospheric photochemical reactions namely smog formation. Total VOC therefore are important as compounds that contribute to smog formation and mainly originate from storage and use of liquid and gaseous fuels, the storage and use of solvents and the combustion of fuels.

Within the traverse of the MGB, TVOC was recorded in only 3 sites of Lumumba and Makarios roads in Mombasa Island and at the A14 junction with Mtongwe road which are all busy road sections used by both light and heavy vehicles. Makarios road has the highest level of TVOC possibly reflecting contribution from nearby industries and engineering workshops situated along the northern shoreline of Port Reitz Channel. Absence of this pollutant along the rural non-motorised section of the traverse seems to suggest that TVOC is an emission from MVs and is therefore likely to increase with build-up of motorised traffic during both construction and operation phase of MGB.

Particulate Matter: Corse Particulate Matter (PM_{10}) is the dominant pollutant within the traverse recorded in all sites and showing the highest concentration. Highest concentrations were recorded at

Lumumba and Makarios roads followed by the A14 junction with Mtongwe road. The fact that PM is least common in the semi-rural sections of the traverse which have lowest county of motorised traffic and is exceptionally high along the busy roads leads to the conclusion that this pollutant is largely an emission from motor vehicles. Particulate Matter, particularly PM_{10} was recorded in levels far exceeding both the NEMA and WHO limits for tolerance particularly at the three sites of Lumumba, Archbishop Makarios and Mtongwe Rd junction with the A14 all of which are busy road sections implying that PM_{10} originates from motor vehicle emissions.

Sulphur dioxide: Sulphur dioxide was detected at five sites inclusive of the three busy road sections of Lumumba Rd, Makarios and A14 junction with Mtongwe Road which recorded the highest levels of SO_2 possibly reflecting high emission levels from motor vehicles.

Carbon monoxide: This pollutant was detected at rates of 3 to 4 milligrams per kilogramme of air in all six sites monitored. Further, this rate is way above the 1 and 2 mg/kg tolerance limit stipulated by NEMA for both 8 and 1hr exposures which makes CO to be one of the most severe pollutants within the traverse area. Carbon monoxide (CO) gas is generated mainly from incomplete combustion of carbonaceous fuels such as wood, petrol, coal, natural gas and kerosene. Consequently, high concentrations of CO generally occur in areas with heavy traffic congestion and in cities, as much as 95 percent of all CO emissions may come from motor vehicle exhaust (U.S. EPA, 2008). The scenario observed for the MGB traverse where busy road sections were observed to record lower concentration of CO while sites such as Javi la wageni with relatively little or no traffic recorded higher levels of the same is a misnomer. However, given that CO mixes freely with air in any proportion and moves with air via bulk transport, it is probable that observed trends in this pollutant is a result of redistribution by wind movement.

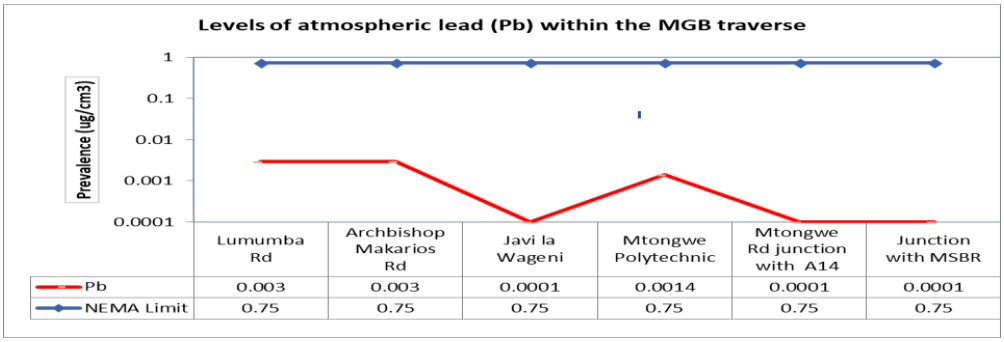
Carbon monoxide is not detectible by humans either by sight, taste or smell. Carbon monoxide primarily causes adverse effects by combining with haemoglobin to form carboxyhaemoglobin (**COHb** or **HbCO**) which is a stable complex of carbon monoxide and hemoglobin (Hb) that forms in red blood cells upon contact with carbon monoxide (CO). Exposure to small concentrations of CO hinder the ability of Hb to deliver oxygen to the body, because carboxyhaemoglobin forms more readily than does oxyhaemoglobin (HbO_2). As such, observed levels of CO, generally above the stipulated NEMA limit for tolerance is a cause for concern. However, observed levels of this pollutant and the NEMA tolerance limits are way below the WHO and European Commission's INDEX guidelines for both short and long-term exposures (Table 6.3) which are considered more representative. It is a situation that however requires intensive monitoring.

Nitrogen oxides (NO_x): Nitrogen oxides were only detected within Mombasa Island (Lumumba and Archbishop Makarios roads) but in quantities far below the NEMA stipulated limits. Non-detection of Nitrogen oxides within the largely rural southern mainland sites (Javi la wageni, Mtongwe Polytechnic, A14 Junction with Mtongwe Road and Junction with MSBR) largely rules out motor vehicle emissions as the source of this pollutant.

Nitrogen oxides (NO_x) in the ambient air consist primarily of nitric oxide (NO) and nitrogen dioxide (NO_2) both of which are significant pollutants of the lower atmosphere while another form, nitrous oxide (N_2O), is a greenhouse gas. At the point of discharge from man-made sources, nitric oxide is the predominant form of nitrogen oxide and it readily reacts with atmospheric ozone to form the much more harmful nitrogen dioxide which easily dissolves in atmospheric humidity to form nitric acid and associated acid rain.

Atmospheric lead: Fig 6.3 traces prevalence of atmospheric lead (Pb) within MGB traverse based on the six (6) monitoring sites. Lead levels at Lumumba, Makarios Roads and the Mtongwe

Polytechnic sites are generally high but are all far below the NEMA stipulated limit of 0.5 to 0.75 micro grams per cubic meter (µg/m^3). Lead levels observed for the Mtongwe Rd Junction with A14 are not representative of actual conditions given that, monitoring took place during a heavy downpour that probably washed off atmospheric dust.



Source: This Study

Fig 6.3: Level of atmospheric lead within the MGB traverse

Use of leaded fuel was discontinued in Kenya early 2006 in line with the Dakar Declaration of 2005 and the observed low levels of this pollutant along busy roads in Mombasa is manifest of the positive effects of the ban. Additionally, lead prevalence levels detected in the current study are much low compared to the 0.45 µg/m^3 (range of 0.051 to 1.106 µg/m^3) observed within Nairobi CBD (Odhiambo, et al 2010); the 3.8 and 4 µg/m^3 observed in 2010 for 2 out of 5 Mombasa sites monitored under auspices of the MSBR EIA Study (Table 6.4 below); the 0.75-1.1 µg/m^3 measured in Bombay, India (UNEP, 1987) among others.

(d): Comparison with other data sets

Patterns of air quality observed in this study seem partially comparable with those determined during monitoring under auspices of the ESIA Study for Mombasa Southern Bypass Road in 2011 (Table 6.4). The MSBR monitoring sites of Kibudandi, Mwangala and Tsunza resemble the MGB's junction with MSBR at Ziwani, Port Reitz site is peri-urban just like Javi la Wageni and Old Mtongwe Rd sites of MGB while Miritini on the A109 is similar to the MGB site of A14 junction with Mtogwe Rd. Comparison has been made as follows:-

Sulphur oxides: Sulphur dioxide concentrations of 5-20 µg/m^3 measured under this study are similar to the 18 µg/m^3 observed at Port Reitz under the ESIA for MSBR. While sulphur oxides were not detected for rural sites under MSBR, the same pattern repeated under this Study where the pollutant was not picked at the MGB site of junction with MSBR. Sulphur dioxide is therefore essentially an urban pollutant possibly associated with motor vehicle emissions.

Nitrogen oxides (NO_x): Nitrogen oxides under MGB were only detected in the two most urban sites of Lumumba and Makarios roads within Mombasa Island while those under MSBR Study did not follow a distinct pattern and showed slightly higher concentrations.

Carbon monoxide: This was the most prevalent pollutant under the MSBR Study detected in all sites and at relatively high concentration compared to the MGB where it was detected only in Mombasa Island and in very low concentrations.

Table 6.4: Air quality data for sites within the MSBR Traverse

Pollutant	Unit	Location					Kenya*1	WHO*2	Time weighted average
		Miritini	Port Reitz	Tsunza	Mwangala	Kibundani			
Particulate Matter PM_{10}	$\mu g/m^3$	11	12	17	15	14	100	50	24 hours
							50	20	1year
SO_x (SO_2)	$\mu g/m^3$	ND	18	ND	ND	ND	80	20	24 hours
							60	500	10 min
NO_x (NO_2)	$\mu g/m^3$	ND	26	18	ND	8	80	200	24 hours
							60	40	1year
CO	$\mu g/m^3$	379	510	427	381	404	4,000	30 (mg/kg)	1 hour
							2,000	10 (mg/kg)	8 hours
O_3	$\mu g/m^3$	ND	ND	ND	ND	ND	0.12	NV	1 hour
							1.25	100	8 hours
Lead	$\mu g/m^3$	ND	ND	4.4	ND	3.8	2	NV	24 hours
							0.75	0.5	1 year

Source: ESIA Study for Mombasa Southern Bypass Road (2011)

Note: NV- No Value given; ND- Not detected (less than the quantification limits); *1: The Environmental Management and Coordination (Air Quality) Regulations, 2008 (Draft); *2: WHO Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulphur Dioxide, Global Update 2005

(d) Other observed trends in airborne pollutants

In the Environmental Review (http://www.worldbank.org/html/pic/aboutinfo.html), for the Kipevu 2 Power Plant, the estimated background SO_2 ambient levels for 24-hour maximum was 180 ug/m^3 and therefore close to double the Kenyan guideline for 24 hr exposure and far above the WHO guideline. The NO_2 24-hour average levels were estimated to be 50 ug/m^3 (background of 40 ug/m^3, plus Kipevu I and II impacts of 10 ug/m^3) with an annual equivalent of 12 ug/m^3 (background of 10 ug/m3, plus Kipevu I and II impacts of 2 ug/m^3) both of which are within both the Kenyan and WHO limits. Similar data were obtained from measurements made by the Kenya Meteorological Department (KMD) in six Mombasa sites namely; Mwembe Tayari, Saba saba, Kongowea, Likoni Ferry, Miritini and Digo road (Table 6.5) whereby PM_{10} level was found to exceed both the Kenyan and WHO limits for 24 hr and annual exposures.

Table 6.5: November 2008 data for Pm_{10} in Mombasa

Site	PM $_{10}$ ($\mu g/m^3$)	Remarks
Mwembe Tayari	123	All exceed the Kenyan and WHO limits for 24 hrs and annual exposure
Saba Saba	366	
Kongowea	285	
Likoni Ferry	339	
Miritini	218	
Digo Road	117	

Source: Kenya Meteorological Department, Urban Air Pollution Programme, www.unep.org/transport/pcfv/PDF/KenyaCleanFuels Report.pdf

6.2: MONITORING NOISE LEVELS

6.2.1: Basis for noise monitoring

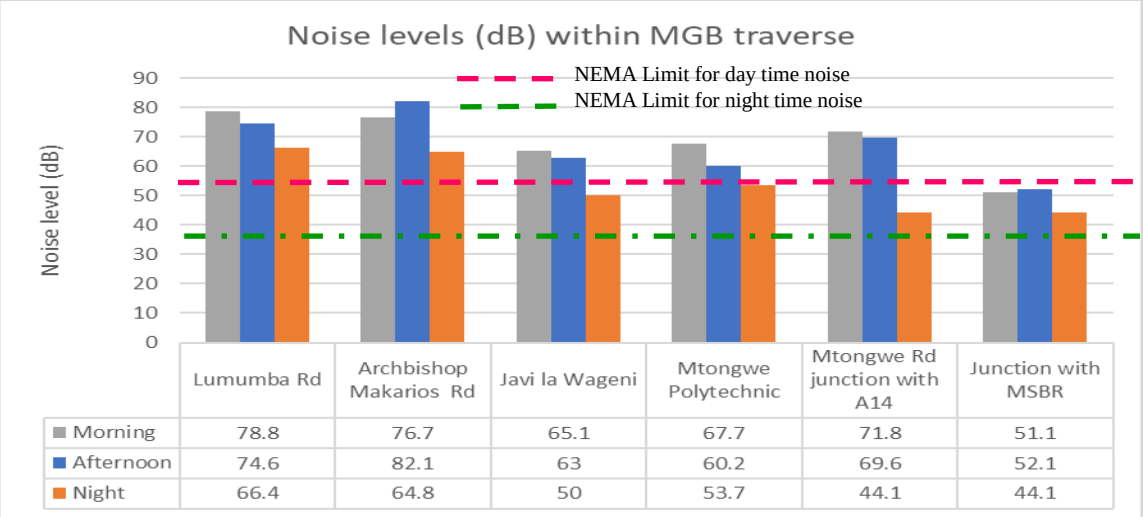
Noise monitoring is based on measurements conducted on the six designated six point transect along the MGB traverse. This data is supplemented by monitoring conducted at 2 sites namely Moi Avenue at Canon Towers and Mtongwe road near the Post office both falling within the MGB traverse. Twenty four hour (24hr) noise levels at all sites were determined using a Sound analyser Meter with a built-in ϖoctave / octave band filter, which does real time 1/1 and 1/3 octave analysis. It is also fitted with a ½" electret condenser microphone with a measurement range of between 30 - 130dB and a frequency range and weighting of 25Hz–10KHz and A,C,&Z respectively. The sound level

meter was calibrated in accordance with applicable centre calibration procedures during manufacturing. For all measurements taken to establish the ambient noise levels, the equivalent noise level (LAeq), the maximum sound pressure level (LAmax) and the minimum sound pressure level (LA min) during that measurement period were recorded. Raw data for noise measurement is provided in Appendix 6.2 and briefly highlighted in sections below.

6.2.2: Outcome of noise monitoring

General patterns:

Fig 6.4 traces day and night-time noise levels within the MGB traverse. Essentially, Mombasa is suffering elevated noise levels as both the NEMA limits for day and night time noise are exceeded at all monitoring sites with the exception of the site no. six (junction with MSB). Day and night noise is highest within Mombasa Town (Lumumba and Archbishop Makarios roads) and lowest at the Junction with MSBR.



	Lumumba Rd	Archbishop Makarios Rd	Javi la Wageni	Mtongwe Polytechnic	Mtongwe Rd junction with A14	Junction with MSBR
Morning	78.8	76.7	65.1	67.7	71.8	51.1
Afternoon	74.6	82.1	63	60.2	69.6	52.1
Night	66.4	64.8	50	53.7	44.1	44.1

Source: This Study

Fig 6.4: Day and night-time noise levels for sites within the MGB traverse

Mombasa Island Noise levels:

Fig 6.5 traces the 24hr (9.07 to 10.01 am following day) movement of noise levels (LAeq) at the Canon Towers junction of Moi Avenue and Makarios road which will also be intersected by the MGB. Observed noise levels have also be compared with the NEMA limits for commercial zones for both day and night. Noise levels at Moi Avenue site were observed to be generally above the NEMA-stipulated limits of 60 and 35 Leq for both day and night times.5 Indeed, night-time noise at Moi Avenue exceeds the NEMA limits for Commercial Zones by between 86 and 105%.

[5] NEMA standards for Noise (Legal Notice No 61)

Zone		Sound Level Limit dB(A) (Leq, 14h)		Noise levels (NR)(Leq,14h)	Rating
Time Frame		Day	Night	Day	Night
Day: 6:01am- 8:00 pm (Leq. 14h)					
Night: 8:01pm-6:00 am (Leq. 10h)					
A	Silent Zone	40	35	30	25
B	Places of Worship	40	35	30	25
C	Residential: Indoor	45	35	35	25
	Outdoor	50	35	40	25
D	Mixed Residential (with some commercial and places of entertainment)	55	35	50	25
E	Commercial	60	35	55	25

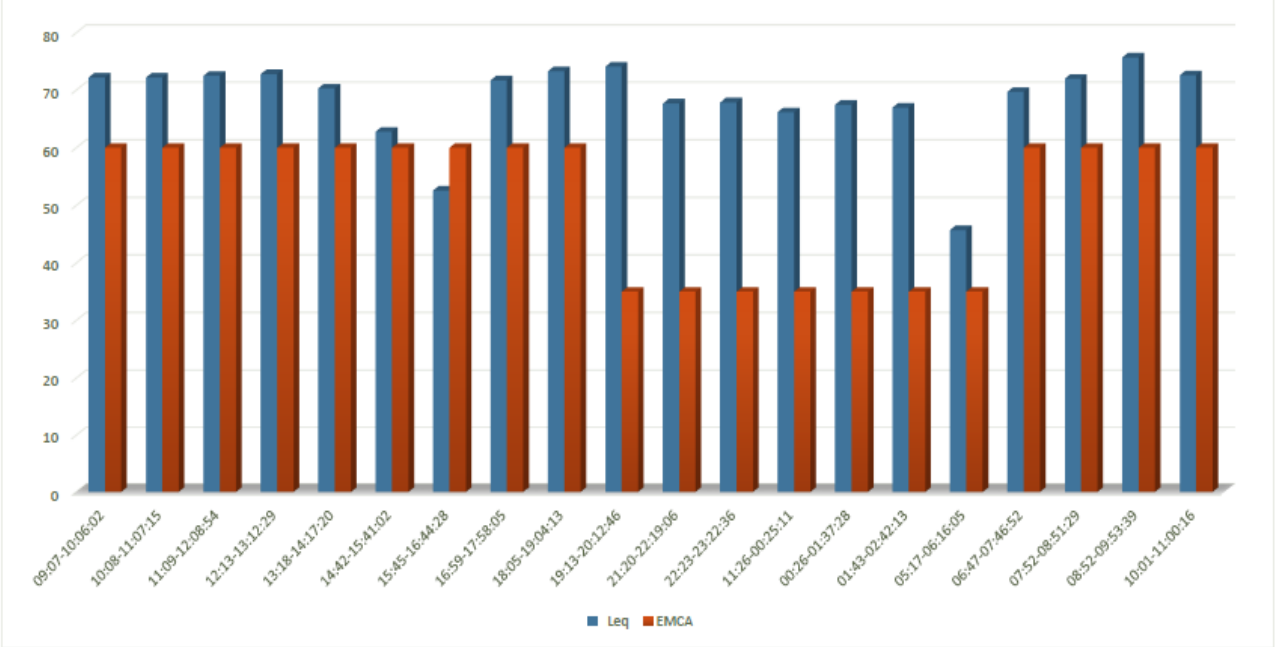
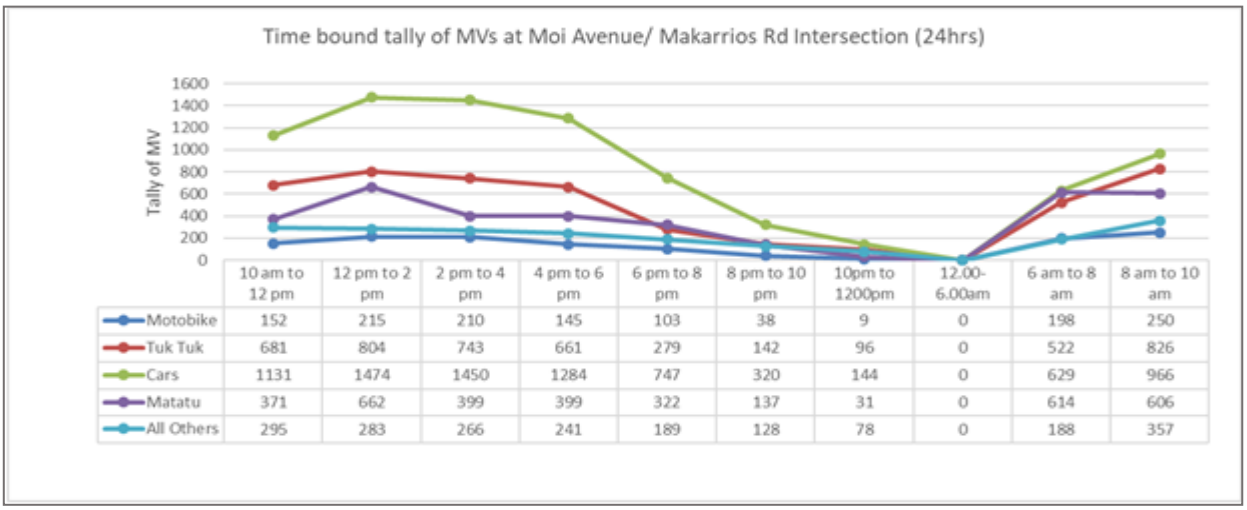


Fig 6.5: Diurnal pattern of noise level (Leq) at Moi Avenue/Makarios Rd intersection

Possible sources of noise in Mombasa Island:

Towards explaining noise levels in Mombasa Island, Noise monitoring was coupled with traffic surveys conducted simultaneously at the same point. Fig 6.6 below traces the outcome of the traffic survey based on counts at the intersection of Moi Avenue and Makarios Road. Clearly, saloon vehicles form the bulk of motor vehicles at this survey point which is possibly on of the busiest points in Mombasa Island. Traffic at this survey point progressively builds up from 8.00am picking at midday then dropping sharply from 4.00pm to almost no traffic at midnight. Such pattern reflects the commercial nature of Mombasa at Moi Avenue whereby, all activity and life starts slowing after 17.00hrs.



	10 am to 12 pm	12 pm to 2 pm	2 pm to 4 pm	4 pm to 6 pm	6 pm to 8 pm	8 pm to 10 pm	10pm to 1200pm	12.00-6.00am	6 am to 8 am	8 am to 10 am
Motobike	152	215	210	145	103	38	9	0	198	250
Tuk Tuk	681	804	743	661	279	142	96	0	522	826
Cars	1131	1474	1450	1284	747	320	144	0	629	966
Matatu	371	662	399	399	322	137	31	0	614	606
All Others	295	283	266	241	189	128	78	0	188	357

Fig 6.6: Diurnal traffic dynamics at Mombasa Island
Source: This Study

Correlation of noise levels to traffic volume at Moi Avenue/ Makarios Road intersection:

This study observed a sharp contrast between patterns in noise level and traffic volume in Mombasa at Moi Avenue. Essentially, traffic volume is dynamic, being high between 10.00am and 12.00 pm,

then drastically dropping from 4.00 pm to almost zero at midnight while in contrast, noise level remains high, generally above 60dB the entire day. The implication here is that, traffic is not the only source of noise in Mombasa.

6.2.3: Outcome of noise monitoring in Mombasa Mainland South

Patterns in noise level in Mombasa Mainland South:

Fig 6.7 presents noise patterns observed at the Mtongwe Post Office between 4th and 5th February 2018. Daytime noise levels at Mtongwe Post Office display a boundary effect, only exceeding the limits in the hours between 15.00 to 17.00hrs. Nigh time noise however, largely exceeds the stipulated limits and is especially severe between 19.00 to 24.00hrs. The source of the noise is largely tuk-tuks and motorcycles, which form the bulk of traffic during the peak noise levels.

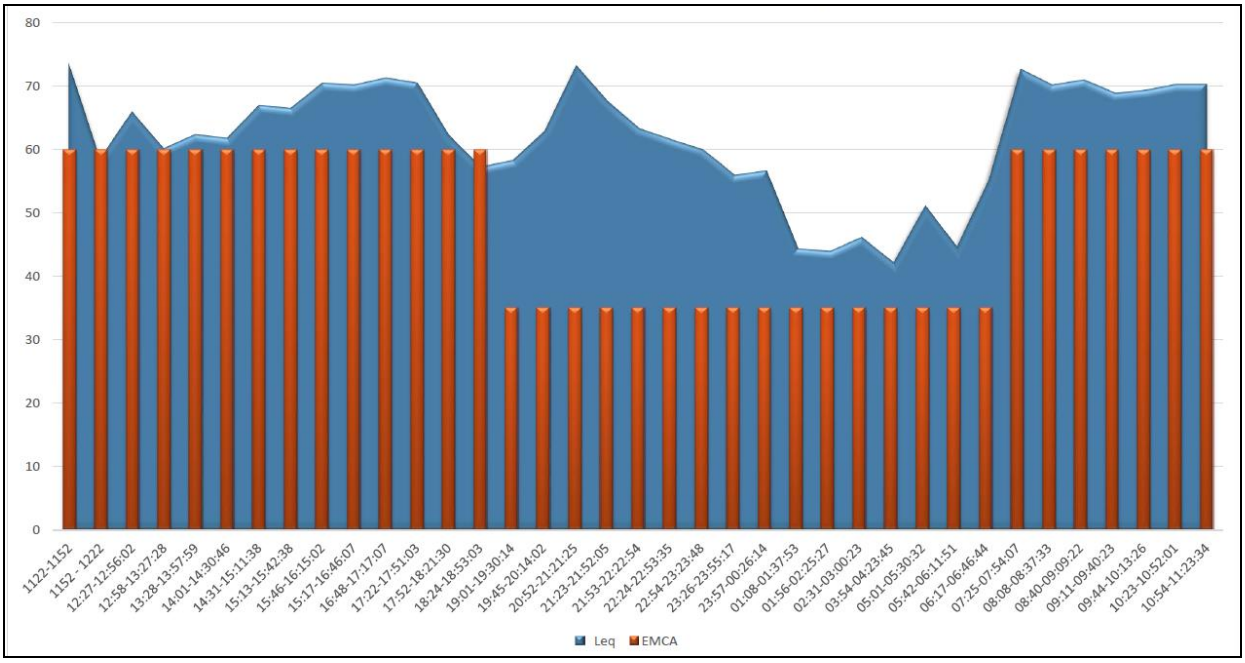
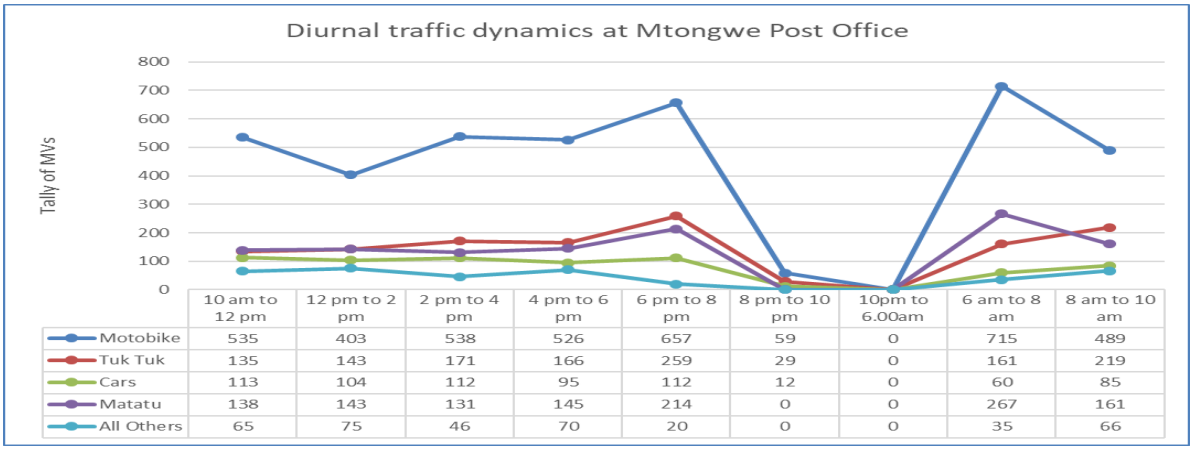


Fig 6.7: Diurnal pattern of noise level (Leq) at Mtongwe Post Office

Mombasa is generally suffering elevated noise levels with night-time noise level being generally above statutory limits for mixed commercial zones as defined by NEMA.

Possible sources of noise in Mombasa mainland south:

Fig 6.8 provides an analysis of daily traffic volume in Mombasa Mainland south based on data generated at the Mtongwe Post Office on the Mtongwe Road. Traffic in Mtongwe area is largely dominated by motorcycles (boda boda), Tuk tuks and then Matatu vans all of which are passenger transport vehicles. Further, Mtongwe traffic displays two peaks; - a major one at 6.00 to 8.00am and a minor one at 6.00 to 8.00 pm reflecting the rush hour pattern of people going to and from work at both peaks.



	10 am to 12 pm	12 pm to 2 pm	2 pm to 4 pm	4 pm to 6 pm	6 pm to 8 pm	8 pm to 10 pm	10pm to 6.00am	6 am to 8 am	8 am to 10 am
Motobike	535	403	538	526	657	59	0	715	489
Tuk Tuk	135	143	171	166	259	29	0	161	219
Cars	113	104	112	95	112	12	0	60	85
Matatu	138	143	131	145	214	0	0	267	161
All Others	65	75	46	70	20	0	0	35	66

Fig 6.8: Diurnal dynamics in traffic volume at Mtongwe Post Office
Source: This Study

Correlation between noise level and traffic volume at Mtongwe post office:

Though regression analysis is yet to be conducted, noise levels at Mtongwe display some correlation with traffic volume. Noise pattern traced in Fig 6.7 displays 4 peaks at between 6.00 and 8.00am, 11.00am, 16.00 pm and between 6.00 to 8.00 pm and the same pattern is reflected in the volume of Motorcycles and Tuk tuks plying this road. This is also reflected by the general decline in noise levels after 8.00pm in tandem with decline in traffic (boda boda) volume. There is strong chance that boda bodas are the single most important source of noise in the Mtongwe area.

6.3: QUALITY MONITORING FOR MARINE WATER

6.3.1: The sampling area

Water quality monitoring was conducted for marine water samples from the Likoni Channel on the Island and Mainland south shorelines. Four samples, 2 from each site were collected as shown in Table 6.6 and analysed in the SGS laboratories in Mombasa. Results are provided in Appendix 6.3 and highlighted in sections below.

Table 6.6: Marine water sampling points

SN	Name of Sample	Total samples	Source area	Geographical Reference
1	MI	2	Mombasa Island shoreline near new Grain Bulk Handlers facility	4°04'28.83'' S 39°39'12.99''E
2	MMS	2	Mombasa Mainland South shoreline in front of the Sultan of Zanzibar Palace	4°04'07.34''S 39°39'23.33E

Source: This Study

6.3.2: Outcome of the Marine water testing and analysis

Table 6.7 and Fig 6.9 provide a summary of results from marine water quality analysis. Salient findings as follows: -

Total coliform: Water samples from both side of the Likoni Channel have exceptionally high coliform count in excess of 1800 MPN per 250mls sample. This is indicative of heavy interaction with human waste.

Colour and turbidity: The MI sample has more colour implying presence of more impurities when compared to the MMS sample. The MI sample has significantly higher turbidity which indicates higher presence of suspended matter and more pollution as compared to the MMS sample.

Dissolved Oxygen: Dissolved oxygen refers to the state of aeration of a water body and is a strong indicator of the capacity of an aquatic ecosystem to support life. Capacity of water bodies to dissolve oxygen is depressed by many factors, among them, elevated temperatures and presence of impurities. As such, the markedly lower level of Dissolved Oxygen in the MI sample as compared to the MMS water sample can only imply reduced capacity to support life on account of presence of pollutants. By extension, presence of higher levels of DO in the MMS sample signifies less pollution.

Oil and Grease: This parameter was not detected in any of the samples implying that, in spite of the Likoni Channel hosting a Marine Port which handles bulk oil imports and dispensing, oil and grease is currently not a pollutant.

Conductivity: Both samples displayed high electrical conductivity because of the high salinity typical of marine water. Conductivity of the MI sample is however slightly elevated implying presence of additional salinity which possibly also explains the higher Chemical Oxygen Demand in this sample.

Table 6.7: Outcome of the Marine water analysis

Analysis		**Sample Source**		**NEMA standard**	**Remarks**
Parameter	*Units*	*MI*	*MMS*		
Total coliform	MPN/ 250ml	>1800 (>720/100ml)	>1800 (>720/100ml)	500	Both samples seem contaminated
pH		8.94	7.99	06-Jan	No pattern
Temperature		NA	NA	30	
Colour	u hazen	15	10	100	MI sample has heavy color hence more impurities
Dissolved Oxygen	mg/l	8.7	9.3	NA	MMS has higher DO on account of having lesser salinity because of the lower COD.
Turbidity	NTU	3.88	3.27	50	MI water is more turbid indicating presence of more dissolved and suspended matter.
Oil & Grease	mg/l	<0.1	<0.1	5	Oil and Grease currently not a concern
Conductivity	µS/cm	54600	54400	NA	Conductivity of MI sample is slightly elevated on account of heavy dissolved solids
TSS	mg/l	5	<5.00	NA	MI sample has a higher TSS which possibly explains the low Dissolved Oxygen
COD	Mg/l	409.8	358.5	NA	High COD for Mi reflects higher presence of chemical polutants

Source: This Study

Total suspended solids: Suspended matter was detected in significantly high amounts in the Mombasa Island sample and is possibly associated with in-wash of sediments through urban runoff. This side is therefore, more polluted.

Chemical Oxygen Demand: COD is a measure of the oxygen required to neutralize soluble pollutants in water. Thus, a very high COD for the Mombasa samples signifies high levels of soluble and particulate matter, which will require correspondingly higher amounts of oxygen to remove. High COD therefore, is another indicator that the MI sample is more polluted relative to the MMS sample.

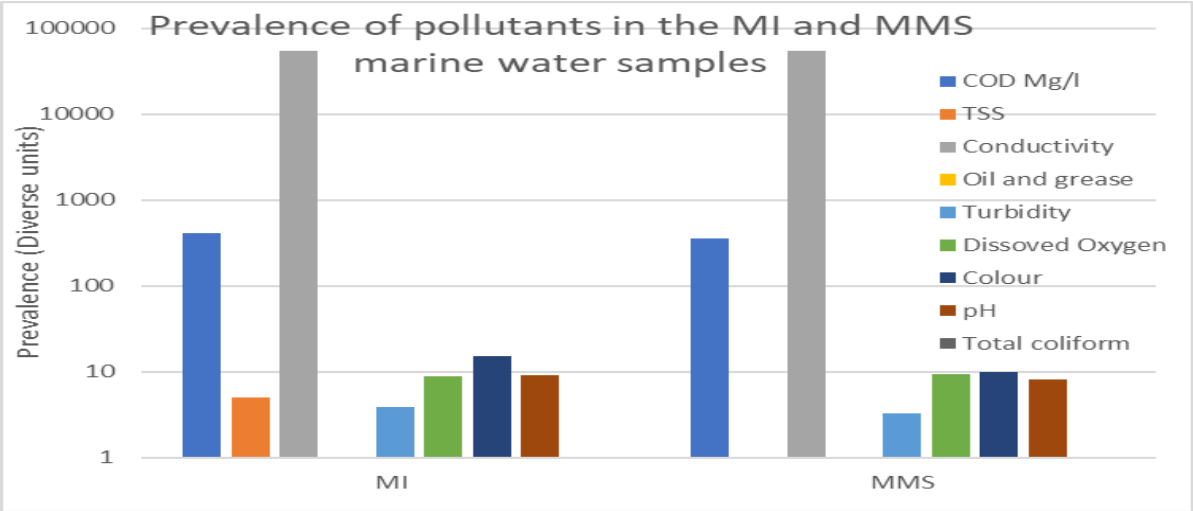


Fig 6.9: Illustration of the results of water quality monitoring
Source: This Study

Overall impression on pollution patters: The picture emerging from observations made in section above, is that the Mombasa Island side of the Likoni Channel is apparently more polluted than the Mainland South shoreline where human and industrial activity is very low as compared. The MI shoreline therefore is apparently receiving more sediment and pollutant input from Mombasa Town with increasingly higher pollution. Thus, in proceeding with development of the proposed bridge, the factor of elevated pollution on the northern shoreline of the Channel should inform decisions especially for road runoff disposal.

The northern and southern shorelines are only about 700m apart yet display different scenarios of quality in a continuous water body, which implies very limited mixing in spite of the high wave activity generated by passing vessels and other port craft. The implication here is that input of point source pollutants at one point is likely to trigger detrimental-isolated accumulation of pollutants at the receiving point.

6.4: MARINE SEDIMENT ANALYSIS

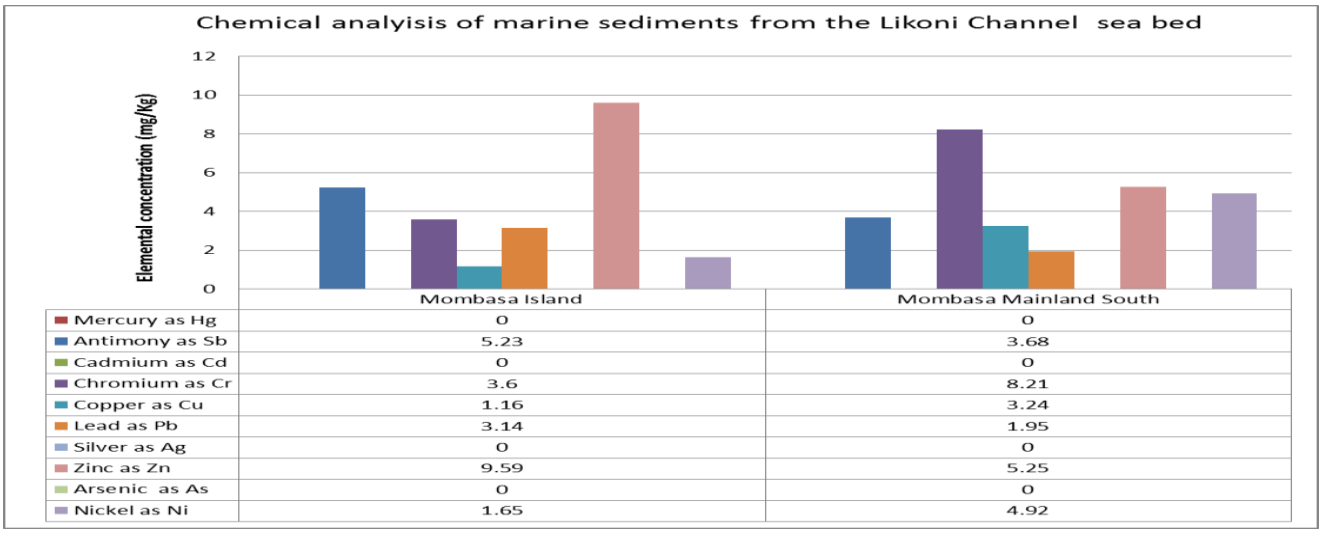
6.4.1: Basis of marine sediment analysis

Monitoring of marine sediment pollution for the MGB was based on two samples extracted from the Likoni Channel seabed at the same locations as marine water samples (Table 6.4) for analysis at SGS.

6.4.2: Outcome of the marine sediment analysis

Appendix 6.4 provides results of marine sediment analysis. Fig 6.10 combines tabular and graphic presentation of data from marine sediment analysis for heavy metals. Inference can be made as follows;-

Prevalence of heavy metal in the Likoni channel seabed: Results of marine sediment analysis don not display any discernible pattern unlike those of the marine water samples. However, the sediment analysis confirms presence of heavy metals within the Likoni channel sediments. Zinc, Chromium, Antimony and Nickel have a leading prevalence while Mercury, Silver and Arsenic were not detected.



	Mombasa Island	Mombasa Mainland South
Mercury as Hg	0	0
Antimony as Sb	5.23	3.68
Cadmium as Cd	0	0
Chromium as Cr	3.6	8.21
Copper as Cu	1.16	3.24
Lead as Pb	3.14	1.95
Silver as Ag	0	0
Zinc as Zn	9.59	5.25
Arsenic as As	0	0
Nickel as Ni	1.65	4.92

Source: This Study

Fig 6.10: Comparative analysis of pollutants in marine sediments of the Likoni Channel

Severity analysis for heavy metal pollutants in the Likoni Channel sediments:

Kenya has no standards for marine sediment quality in which case, to interpret implications of observed levels of pollution for Likoni Channel samples, the data had to be compared with observations from previous monitoring against the background of Canadian guidelines for sediment quality supplemented by the Interim Sediment Quality Guidelines (ISQG) developed for Australia and New Zealand with outcome being tabulated in Table 6.8 below. Data accruing from the MGB Study was also compared with observation made under auspices of the Mombasa Southern Bypass ESIA Study and others.

Table 6.8: Evaluation of recorded pollutant levels

Parameter	Unit	This Study		Past Studies			Canadian		ANZECC	
		MI	MMS	Mwache conc.	Mteza conc.	Kamau, 2002	ISQG	PEL	ISQG Low	ISQG High
Copper as Cu	mg/Kg	1.16	3.24	6.98	15.83	5.5-87.2	35.7	197	65	270
Lead as Pb	mg/Kg	3.14	1.19	ND	13.93	No data	35	91.3	50	220
Chromium as Cr	mg/Kg	3.6	8.21	3.94	23.55	No data	37.3	90	80	370
Nickel as Ni	mg/Kg	1.65	4.92	0.89	16.21	No data	NGV	NGV	21	52
Silver as Ag	mg/Kg	0	0	ND	168.54	No data	NGV	NGV	1	3.7
Zinc as Zn	mg/Kg	9.59	5.25	9.14	29.12	6.5 -84.7	123	315	200	410

Source: Diverse Studies

Notes:

* Joseph Nyingi Kamau, 2002: Heavy Metal Distribution and Enrichment at Port-Reitz Creek, Mombasa. Western Indian Journal of marine Science Vol. 1, No. 1 pp65-70.

**Extracted from Australian and New Zealand (ANZECC)/Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

1. Interim Sediment Quality Guidelines-Low (ISQG-Low) Probable-effects concentrations below which biological effects would rarely occur.
2. Interim Sediment Quality Guidelines-High (ISQG-High) Probable-effects concentrations below which biological effects would possibly occur. Concentrations at or above the ISQG-High represent a probable-effects range within which effects would be expected to frequently occur.
3. PEL / Probable Effect Level: Concentration beyond which effects will be felt.

From results as summarized in Table 6.8, inference can be made as follows:-

Data accruing from analysis of heavy metals in this study indicates that concentrations of heavy metals in Likoni sediments (Mombasa Island and Mainland South) is certainly lower than that observed for the Mteza Channel upstream of Likoni Channel and is comparable to that for Mwache still in the upstream. The same analysis however reveals that heavy metal presence within Likoni Channel is quite low as compared to Canadian and Australian standards.

All heavy metals detected in the study area share one feature in that, they are all applied in the electroplating industry- a surprise find given that, the Port Reitz area has never hosted an electroplating facility. Surprisingly, Silver which, other studies observed to be excessively high, was not detected in the current study.

In a 2002 study of heavy metal occurrence within the Port Reitz creek (Kamau, 2002), a very high spatial variability in occurrence and concentration was observed for Iron, Cadmium, Copper and Zinc all of which showed a lateral decline towards the sea. The same study also found high enrichment factors for Cadmium, Copper and Zinc implying possible contribution from anthropogenic sources.

6.5: MONITORING OF FRESH WATER QUALITY

Surface water is not readily available within the MGB traverse area and, as the time of the Study, surface water was only available at the Ziwani Lake where a sample was extracted and analyzed yielding the results summarized in Table 6.7 below.

6.5.1: Status of management of the Ziwani Lake resource

Ziwani is an isolated seasonal lake cum swamp formed in an internally draining depression within the Kiteje sub location of Ngombeni in Kwale County and is fed by both surface and subterranean water from the Kiteje Ridge. The size of the lake therefore changes seasonally depending on state of water supply and, on account of being the only fresh water body around, is heavily exploited for domestic and livestock watering while the surrounding grasses provide dry season grazing. Thus, as expected, waters of this lake are heavily contaminated with anthropogenic pollutants as briefly highlighted in sections below.

6.5.2: Quality Status for the Ziwani Lake Sample

Ziwani Lake waters are used for both domestic supply and recreation and were therefore analyzed against NEMA standards for both target uses with an outcome as summarized in Table 6.9 below. Despite the waters being apparently polluted, they are within the limits of all parameters for which NEMA has given a value,

Table 6.9: Surface water quality in the MGB Traverse

Parameter	Test Method	Unit	Finding	NEMA Limit	
				Domestic use	Recreation
Suspended matter	ALPHA Method 2540D	mg/l	6.80	30	NVG
Turbidity	ALPHA Method 4500-PHB^{+}	NTU	43.0	NVG	50
pH	ALPHA Method 2540D		7.20@ 26.3 ^{o}C	6.5-8.5	6-9
Temperature	ALPHA Method 2550	^{o}C	+3	NVG	30
Colour	ALPHA Method 2120B	Hazen Units	9	NVG	100
Dissolved Oxygen	AOAC Method 973.45	mg/l	3.48	NVG	NVG
Chemical Oxygen Demand	AOAC Method 5520D	mg/l	30.72	NVG	NVG
Oil & Grease	ALPHA Method 5520D	mg/l	Nil	NVG	5
Total Coliforms	KS 05-459	Cfu/100ml	24	Nil	500

Source: This Study

6.6: RESULTS OF THE FLORA AND FAUNA MAPPING SURVEY

6.6.1: Objective of the Flora and Fauna Survey

The objective of the survey was to facilitate understanding of the status of biodiversity in the vicinity of proposed MGB Project area for purposes of determining the current status of both ecosystem and species conservation and secondly, to provide a datum against which, future monitoring will take place. This required a study design targeting mapping for flora and fauna (marine and terrestrial) species based on pre-selected criteria as follows:-

- General occurrence of fauna species
- Protected species declared as endangered or threatened species under the Wildlife (Conservation and Management) Act;
- Threatened species (grouped as EN, CR, VU) in the IUCN Red List; and
- Avian species which may occur within the AEWA (Agreement on the Conservation of African-Eurasian Migratory Water birds) List
- Locally important flora and fauna species for the livelihood of local residents

6.6.2: Study Methodology

The Survey essentially traced the traverse area for the bridge approach roads in mainland south (Fig 6.1) but with special focus on the marine and terrestrial ecosystems. For purposes of determining trends in ecosystems and species diversity, sampling was conducted along a transect running from the mouth of the Mweza creek going backwards to the proposed interchange with the Mombasa Southern Bypass.

(i) Literature survey: In spite of close proximity to the Port Reitz Creek, the Mweza creek and its associated catchment in mainland south are inadequately studied as a result of which, there is a dearth of data on the conservation status. The flora and fauna surveys conducted under auspices of this ESIA Study were therefore pioneering in terms of biodiversity mapping.

(ii) Flora Surveys: The flora survey used an ex-poste approach, and mainly a walk-over through the vegetation to establish community assemblies, principal floral components present, the floral history

of the area, and presence of rare/threatened plant species. The survey was partly guided by topographic map sheets, past aerial photographs and information available in the public to make a thorough investigation along the alignment. In the field a sampling area within the alignment was selected, and its physiognomic vegetation type was described (location details). The general phyto-sociology of the locality was noted and the major floral components were recorded. A list of rare and threatened plant taxa based on IUCN Red list or local user perspectives was developed from the flora listed in the area, and these species were highlighted for further discussion. On completion, a new location was chosen and the process repeated. This process continued with sampling areas representing their physiognomic vegetation types, even though some were close together.

Plant species that were difficult to identify in the field were collected as voucher specimens and were identified through cross-referencing at the NMK-CFCU Herbarium in Ukunda and Nairobi (East African Herbarium) which maintain floral data and specimens through the published Floras. Data components collected included; Vegetation types description, Species inventory for the area, GPS locations for sites of special interesting, Digital graphics (photographs), Rarity/threats of plant species at local, national and global perspective were considered, Historical trends of the vegetation communities was also considered where possible among others.

(iii) Faunal Surveys: Diverse methodologies were adopted depending on the site targeted for investigations.

Herpetofauna: Herpetofauna survey was conducted using identification of habitats and microhabitats, literature survey, among others. Sampling of the reptiles and amphibians was conducted using standardized time limited search and with visual encounter and interviews with the local residents. Under the Timed Limited Searches, a 30 minute sampling period making up one time limited search (TLS) by two observers was carried out in different parts of the study site. Searches took place in all possible and amphibian micro-habitats such as wetlands, tree barks, under stones, decomposing logs, tree stumps, holes, shrubs, bushes including digging within loose soils, etc . Visual encounter surveys is non- standardized but was used for qualitative and semi-quantitative data mainly for presence or absence of species. The approach is important because it contributes immensely in inventory of species.

Interviews with local residents targeted accounts of the common reptiles and amphibian species normally encountered. Through their description and use of images of the animals in guides, the species were identified.

Bird survey: Survey was conducted between 5th and 25th January 2018 and would proceed very early in the morning between 6.30 to 8.30 am when birds are active. Physical observation was done to identify birds; binoculars were used to improve on sight. Bird calls was also handy in identification. A transect of approximately 1.5 km was used for surveying bird diversity in the study areas using both Point Count (PC) and Time Species Counts (TSC) methods with minor adoptions to suit rapid assessment.

- Point counts (PCs): PCs were set at every 200m along 1km transect running along the proposed bypass road. Variable that was recorded was cue i.e. observed or species heard calling. This method was used in grassland/bushland and open shrublands.
- Timed species counts (TSCs): TSC was used because it is ideal for building complete species lists quickly. About 30 minutes TSC was conducted mainly in the forests. Sights and calls are used in the approach.

- Vantage point observations: Vantage point observations were used in wetlands (e.g. estuaries) where the raised landscape around provide platform for wider view of the wetland.

Insect Pollinator Survey: The survey sites had various habitat types that provided options for sampling by habitat characteristics. Habitat characteristic included vegetable gardens, hedges, shrubs, bushes, agro-forests, woodlands. Sweep nets were used to catch butterflies and bees on flights. Canopy traps for trapping butterflies (Plate 6.3) were set high up in the tree canopies with baits of fermented bananas. Physical observation was also conducted for species that were not caught by the traps.

Aquatic Invertebrates: Efforts here were focused on marine crustaceans and molluscs. Observation was conducted along the shoreline that comprised of mangrove swamps, tidal and mud flats. In addition to this, catch landings were assessed to find out the diversity of species of commercial value.

Fish survey: Fish landing at Port Reitz was strategically used to assess the diversity of fish species. Focused discussions on fishery diversity and fishery resources were held with the local fishers.

Plate 6.1: Survey methods- Study at Fish landing sites

Verbal accounts from local people: Various discussions were held with the local communities on the species diversity and their local value to the community for various taxa. Focused group discussion was employed in order to acquire further information from the local people.

6.6.3: Analysis of Conservation Status

Application of the IUCN Criteria:

The IUCN Red List data Search Engine (http://www.iucnredlist.org/) was applied to screen species for conservation status;- Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Lower Risk, Data Deficient and Not Evaluated in line with IUCN categorization;-

- EXTINCT (EX) when there is no reasonable doubt that the last individual has died, or;

- EXTINCT IN THE WILD (EW) when it is extinct in the wild and it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range;
- CRITICALLY ENDANGERED (CR) when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the criteria (A to E in the IUCN Red List Categories);
- ENDANGERED (EN) when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the criteria (A to E in the IUCN Red List Categories);
- VULNERABLE (VU) when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the criteria (A to E in the IUCN Red List Categories), and;

- LOWER RISK (LR) when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Species included in the Lower Risk category are separated into three subcategories:

    i. Conservation Dependent (CD): Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
    ii. Near Threatened (NT): Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.
    iii. Least Concern (LC): Taxa which do not qualify for Conservation Dependent or Near Threatened.

- A species is DATA DEFICIENT (DD) when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.
- Lastly, a species is NOT EVALUATED (NE) when it is has not yet been assessed against the criteria.

Requirements of the Convention on Migratory Species of Wild Animals

The Bonn Convention is a non-governmental treaty concluded under the aegis of the United Nations Environment Programme, and aims to conserve terrestrial, aquatic and avian migratory species throughout their range of habitats on a global scale. Kenya became a party to this convention in May 1999.

As the only global convention specializing in the conservation of migratory species, their habitats and migration routes, CMS complements and co-operates with a number of other international organizations, NGOs and partners in the media as well as in the corporate sector. Migratory species threatened with extinction are listed on Appendix I of the Convention. CMS Parties strive towards strictly protecting these animals, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Besides establishing obligations for each State joining the Convention, CMS promotes concerted action among the Range States of many of these species.

Migratory species that need or would significantly benefit from international co-operation are listed in Appendix II of the Convention of which, Kenya is identified as a Range State for 44 of these. In this respect, CMS acts as a Framework Convention. The Agreements may range from legally binding treaties (called Agreements) to less formal instruments, such as Memoranda of Understanding, and can be adapted to the requirements of particular regions. Kenya is a party to four MOUs namely;- AEWA (African Eurasian Water Bird Agreement) Marine Turtles Africa MOU, Marine Turtles-IOSEA and the African Elephant MOU. Under the Bonn Convention, Kenya is recognised as a Range State for 50 bird species out of which 4 namely, the *Ardoela idea, Larus saundersi, Hirundo atrocaerulea, Acrocephalus griseldis and Zoothera guttat* are Bonn Convention Appendix 1 species. As part of the Survey for flora and Fauna, all birds occurring within the MGB Traverse were screened for occurrence in Appendix I& II of the Bonn Convention including Kenya Country Reports on the same.

The African-Eurasian Migratory Water-bird Agreement (AEWA)

This agreement was negotiated under the provisions of Article IV of the Bonn Convention and concluded on 16 June 1995 in The Hague, the Netherlands subsequently coming into force on 1 November 1999. The Aim of AEWA is to create a legal basis for concerted conservation and management policy by the Range States for migratory water bird species in pursuit of the mission to maintain migratory water bird species and their populations at a favourable conservation status or to restore them to such a status throughout their flyways, over a range of 118 countries.

Screening for local importance as per Kenyan Law

Conservation of biodiversity in Kenya basically vests under three laws namely:

- The National Constitution
- The Forests Act 2005
- The Environmental Management Coordination Act (EMCA) 1999
- The Wildlife Management and Conservation Act, 2013

Flora and fauna recorded were screened against requirements of each tool.

6.6.4: Findings of the Flora Survey

Ecosystems within the MGB Traverse:

Findings on floral biodiversity are presented at two levels namely; - occurrence of floral formations and conservation status of individual trees. The area investigated notably consisted of varied vegetation types that were identifiable basically on grounds of dominant use. Although some floral plants were generalists (found in more than one vegetation type) othersmaintained presence only in given vegetation areas. The vegetation types were arbitrarily distributed through the entire alignment, in varied sizes that ranged from a few square meters to a couple of hectares. A comprehensive botanical inventory within the traverse of MGB is provided in Appendix 6.1. A total of 6 ecosystems/land use systems have been identified as tabulated in Table 6.1 below based on which, an analysis of the floral and faunal diversity within the project area has been undertaken. Brief highlights on each ecosystem are provided in sections below.

Table 6.10: Occurrence of ecosystems within the traverse

Category of Ecosystem	No.	Classification of Ecosystem	Traverse of interest

Ecosystems within traverse	1	Open Water Ecosystem	Port Reitz and Mweza Creek
	2	Mangrove formations	Mweza Creek Shoreline
	3	Secondary Thickets	Mweza Creek Cliffs
	4	Urban/Peri-urban Ecosystems	Mombasa City and Likoni-Mtongwe-Shika Adabu settlements
	5	Farmlands	Sections in Mombasa Mainland South
Ecosystems adjacent to the traverse	6	Marshlands	Ziwani Lake at the Inter-change with Mombasa Southern Bypass

(i) Open water ecosystem:

This ecosystem is represented by the section of Port Reitz Creek crossed by the overhead bridge and the mweza Creek alongside which the southern section of the project is aligned. Apart from Port Reitz being an important navigation artery for vessels calling in and out of the Kilindini Harbour, it is also a fairly natural ecological system which, alongside its Mwenza tributary supports subsistence fishing based livelihoods. Numerous fish-landing sites will be encountered wherever communities have access to the shoreline.

(ii) Mangrove and inter-tidal flats ecosystems

Occurrence: Small isolated pockets of mangrove stands are encountered along the eastern shoreline of the Mweza creek. Of the seven species of mangroves recorded in Kenya, only three namely;- *Avicenia marina, Ceriops tegal* and *Rhizophora mucronata* were recorded at Mweza Creek. Figure 6.2 traces change in general mangrove density in Mweza creek based on sampling points recorded from the Mouth of the creek: T1 is at Ras Bofu; T2 to T3 between Ras Bofu to Puma Primary; T4 to T8 between Puma Primary and Peleleza Primary School; T9 to T13 between Peleleza to Jamvi la Wageni; T13 to T19 between Jamvi la Wageni to Kimaru Estate.

Mangrove density at Mweza Creek displays high variability in distribution but is generally low within the creek mouth, peaks midway within the creek and then stabilises towards the tail end (Fig 6.11). The highest density encountered is 2000 stems per hectare recorded near the Navy Barracks site and this can be can be attributed to the increase in sediment depth in upper sections of the creek, which are more sheltered from ocean waves compared to lower exposed shores. At the creek mouth in Ras Bofu, the substrate is essentially very rocky which discourages rooting whereas further upstream, the sediment is characterised of soft mud that is easily penetrated by mangrove roots and provides a favourable ground for the mangrove seedlings to take root.

Few individuals of *Avicenia marina* and *Ceriops tagal* were observed between Bofu and Kimaru Estate, whereas *Rhizophora mucronata* individuals were only recorded in sections between Peleleza and Jamvi section. This unique and expected mangrove zonation (dominance) can be explained by variation in tidal inundation patterns which usually result to formation of pure or mixed mangrove forest bands (see plate 6.3). For instance, a pure stand of *Avicennia marina* was recorded upstream, adjacent to Kimaru Estate (Plate 6.4). The ecological success of *Avicennia marina* species is attributed to its unique ability to withstand very high levels of salinity variation resulting from infrequent spring tide inundation in this zone.

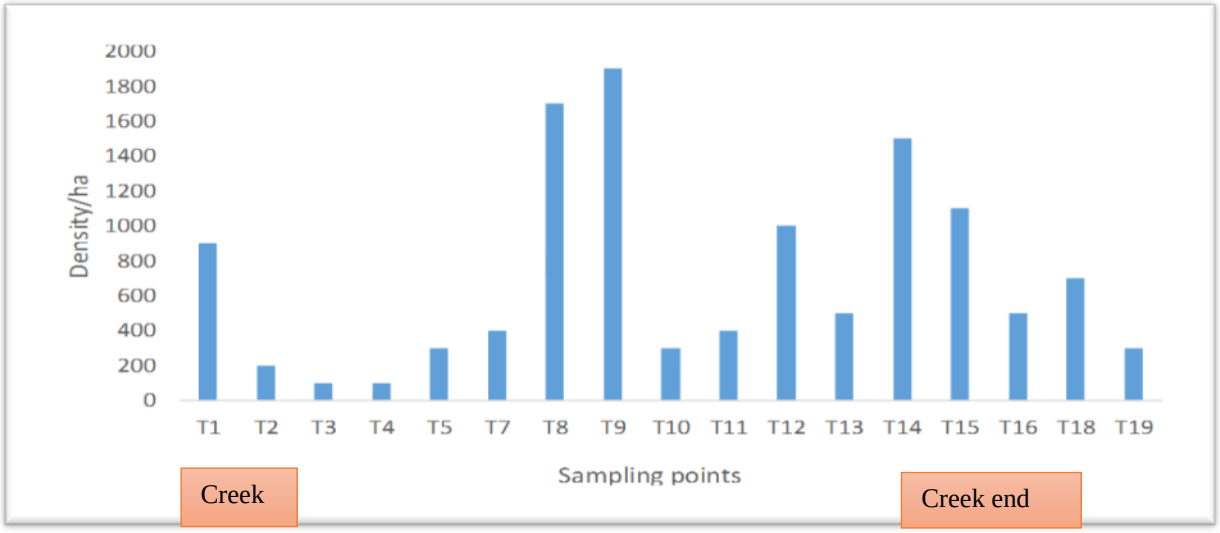


Figure 6.11: Change in general mangrove density in Mweza creek.

Plate 6.3: Typical/ expected zonation of mangrove forests in East Africa (Farid, 2008).

Ecology and economic importance: On account of occupying shallow areas, mangrove formations trap silt, sediments and accumulate litter which makes them very suitable breeding and foraging grounds supporting complex food chains and are marked by very high ecological productivity and species diversity. They are among some of the most productive and biologically important ecosystems of the world because they provide important and unique ecosystem goods and services to human society and coastal and marine systems (FAO 2007). The forests help stabilize shorelines and reduce the devastating impact of natural disasters such as tsunamis and hurricanes. They also provide breeding and nursing grounds for marine and pelagic species, and food, medicine, fuel and building materials for local communities (Giri et al. 2010).

Mangroves, including associated soils could sequester approximately 22.8 million metric tons of carbon each year. Covering only 0.1% of the earth's continental surface, the forests account for 11% of the total input of terrestrial carbon into the ocean (Jennerjahn & Ittekot, 2002) and 10% of the terrestrial dissolved organic carbon (DOC) exported to the ocean (Dittmar et al., 2006). The rapid disappearance and degradation of mangroves could have negative consequences for transfer of materials into the marine systems and influence the atmospheric composition and climate.

Plate 6.4: Rocky substrate at the creek mouth

Plate 6.5: A continuous pure stand of *Avicenia marina* adjacent to the Seamens barracks

Mangroves support the conservation of biological diversity by providing habitats, spawning grounds, nurseries and nutrients for several animals. These include several endangered species and range from reptiles (e.g. crocodiles, iguanas and snakes) and amphibians to mammals and birds (herons, egrets, pelicans and eagles). A wide range of commercial and non-commercial fish and shellfish also depends on these coastal forests. Mangrove organic productivity (Odum and Heald, 1972) has been suggested to support near shore fisheries production (Lee, 1999).Mangrove ecosystems are also used for aquaculture, both as open-water estuarine mariculture (e.g. oysters and mussels) and as pond culture (mainly for shrimps). At the Kenyan coast, mangrove forests are exploited for timber, fuel wood, poles, fodder and fisheries resources by 70% of the population living in the Kenyan coastal villages.

Threats to mangrove ecosystems: Mangrove forests in Kenya are under extreme anthropogenic pressure. Over exploitation, especially of peri-urban mangrove forests (Port Reitz, Tudor, Mtwapa) for building material by adjacent communities is a major threat which has led to a dramatic reduction in their areal coverage. For instance in Tudor Creek, only 215.3ha of mangroves are remaining from

a cover of 1642.3ha in a span of less than 20 years. At Mtwapa, annual loss is much lower, estimate at 0.04%, between 1994 and 2000 but the absence of the highly preferred pole sizes, boriti and pau particularly in Kidongo is indicative of higher consumptive extraction of mangrove wood Kenyan mangroves also face the problem of pollution from direct discharge of domestic sewage from point sources into the mangrove forest especially at Tudor and Mtwapa creek (Government of Kenya, 2009) though the impact of such threat is not fully understood. In addition, conversion of peri-urban mangrove areas for other uses including creation of salt ponds and diversion of fresh water has also contributed to great loss of mangroves. Between 1983 and 1993 Mombasa port and surrounding waters experienced 391,680 tons of oil spills that affected mangroves of Port Reitz and Makupa creeks.

(iii) Secondary thickets

Within the MGB traverse area, secondary thickets predominantly occur in the terrestrial zone of Mweza creek namely the upper cliffs and upstream ephemeral channel and are characterized by a higher species count (48 indigenous spp) in addition to hosting majority of special conservation need species (those near threatened and vulnerable). Some of the thickets along the eastern cliffs of Mweza Creek host sacred sites/shrines that serve diverse roles in the local Miji Kenda traditional religious order. A total of 4 shrines namely; - Makame in Bofu , Pangawazi in Jamvi , Mkwajuni and Gandini (Plate 6.5) in Mtongwe area were encountered. Tally of woody plants identified in vicinity of sacred shrines was relatively high (22, 32, 15 and 16 respectively) compared to the surrounding sampling points.

Plate 6.6: Location of Shrines along the Mweza Cliffs

(iv) Freshwater marshlands

A seasonal swamp/marsh was encountered near the site of the proposed interchange between of the MGB southern approach road and Mombasa Southern Bypass. This swamp hosts the seasonal Ziwani lake and is dominated by mesophytic leed species such papyrus and diverse wood species dominated by *Ficus sycamorus* and supports diverse species of water birds. The lake is an important source of local water supply for both domestic and livestock use and an important dry season grazing ground.

Plate 6.6(a): Secondary thickets on then non-inundated cliffs of the Mweza Creek; (b) Riparian marshland at Ziwani

(v) Urban/peri-urban settlements

Urban and peri-urban ecosystems form the dominant land use within the traverse in both Mombasa Island and mainland south in Likoni, Mtongwe and Shika Adabu. They are mainly characterized by land use change whereby the original natural vegetation has been replaced by urban settlements for business and residential use accompanied by introduction of largely exotic tree and shrub species.

(vi) Farmlands

This vegetation type is derived largely from what could be referred to as shift cultivation where cultivated land is left fallow for several years after exhaustion. Such lands are usually turned into grazing fields and may remain so for many years depending on demand for new farmlands or other prevailing conditions. In this vegetation type are scattered indigenous trees usually left on-farm or planted. These are mainly trees with use and/or value to the community and include various indigenous and exotic fruit trees like *Sclerocarya birrea, Vitex payos, Tamarindus indica, Mangifera indica, Adansonia digitata* and the coconut- *Cocos nucifera.* A total of 152 plant species representing 122 genera in 58 families were recorded in the dry bushed grassland vegetation type.

6.6.5: Status of floral diversity within the Traverse

Species occurrence and richness: Appendix 6.1 below provides the comprehensive inventory of floral biodiversity within the traverse. A total of 124 plant species were recorded within the 10.4 Km traverse of the Mombasa Gate Bridge. Out of these, trees form the majority at 56.5% followed by shrubs at 30.6% (Table 6.11 below). As well, and in what is indicative of non -disturbed ecosystem, indigenous plants form the bulk (77.4%) of the total count.

Table 6.11: Analysis of plant occurrence in the MGB Project Traverse

Plant Form	Trees	%	Shrubs	%	Climbers	%	Grasses	%	Total count (%)	
Indigenous	52	74.3	28	73.7	7	100	9	100	96	77.4
Exotic	18	25.7	10	26.3	0	100	0	100	28	22.6
Count (%)	70	56.5	38	30.6	7	5.6	9	7.3	124	100

Species variation with land use: Species diversity along the traverse is largely a function of prevailing land use (Fig 6.12). Within Mombasa Island, 17 out of 21 species counted were exotic while at Bofu

along the secondary thickets on the Mweza Creek cliffs, only 8 of the 51-species counted were exotic implying relatively little human influence and the same situation obtain for the rest of traverse. The starting section of the southern traverse between Bofu and Javi la wageni accounts for over 81% of the species count largely on account of non disturbed condition while Mombasa island had the lowest.

Plate 6.7: Remnant floral biodiversity within Mombasa City

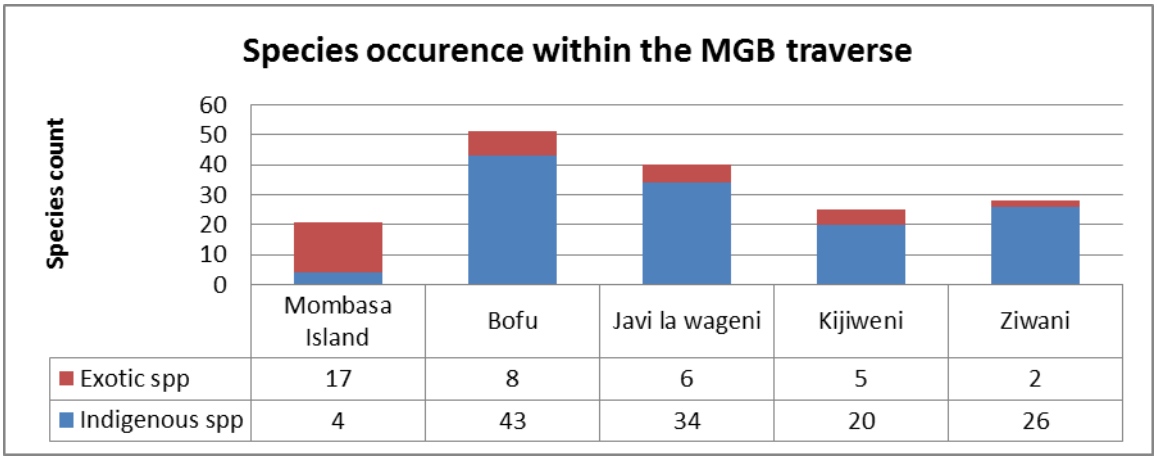


Fig 6.12: Tree species variation with land use along the traverse

Status of species conservation: All 124 plant species were screened for conservation status based on the IUCN RED List Data with outcome as follows: -

- *Status of mapping:* Most of the floral species have not been assessed for IUCN Red List data in which case, threats to their conservation remain largely unknown.
- *Status of conservation:* Of the 124 plant species counted, none of the shrubs, climbers and grasses are listed under IUCN Red Data List. Six tree species are listed as Near Threatened (4) and Vulnerable (2) respectively (Table 6.12below). This list of special concern species is

probably higher given that, this study came across several species such as *Lasiodiscus ferrugineus* which, though not assessed for the IUCN RED Data are reported in other literature as being vulnerable.

- As well, apparently the area has never been assessed for endemism but one species- *Ochna thomasiana* which is reportedly endemic to Kenya's south coast was recorded in the inventory.
- In total, twelve (12) species reported to be of special conservation concern were recorded in the southern section of the MGB traverse thus calling for great caution during project development.

Table 6.12: Analysis of conservation status for plants within the MGB traverse

SN	Tree Species	Common name	Site location	Status	GPS locations
1	*Dalbergia melanoxylon*	African blackwood	Bofu	Near Threatened	4° 4'57.42"S 39°38'58.89"E
2	*Dialium orientale*		Bofu	Near Threatened	4° 4'57.42"S 39°38'58.89"E
3	*Pseudobersama mossambicensis*	False white ash	Kijiweni	Near Threatened	4° 5'27.71"S 39°38'33.55"E
4	*Erythrina sacleuxii*	No Common Name	Kijiweni	Near Threatened	4° 5'27.71"S 39°38'33.55"E
5	*Lasiodiscus ferrugineus*	*Lasiodiscus pervillei sub spp ferrugineus*	Ziwani	Vulnerable	4° 6'29.50"S 39°37'19.74"E
6	*Psychotria punctata*	Dotted wild Coffee	Javi la wageni	(Endangered)	4° 5'28.17"S 39°38'31.07"E
7	*Premna chrysoclada*	Premna	Kijiweni	Ditto	4° 5'27.71"S 39°38'33.55"E
8	*Pavetta mangallana*	Pavetta	Javi la wageni	Ditto	4° 5'28.17"S 39°38'31.07"E
9	*Pavetta crebrifolia*		Javi la wageni	Ditto	4° 5'28.17"S 39°38'31.07"E
10	*Pavetta subacana*		Ziwani	Ditto	4° 5'28.17"S 39°37'19.74"E
11	*Ochna thomasiana*	Mickey mouse plant	Javi la wageni	Endemic to Kenya coast	4° 5'28.17"S 39°38'31.07"E

Source: This Study

6.7: STATUS OF FAUNA CONSERVATION

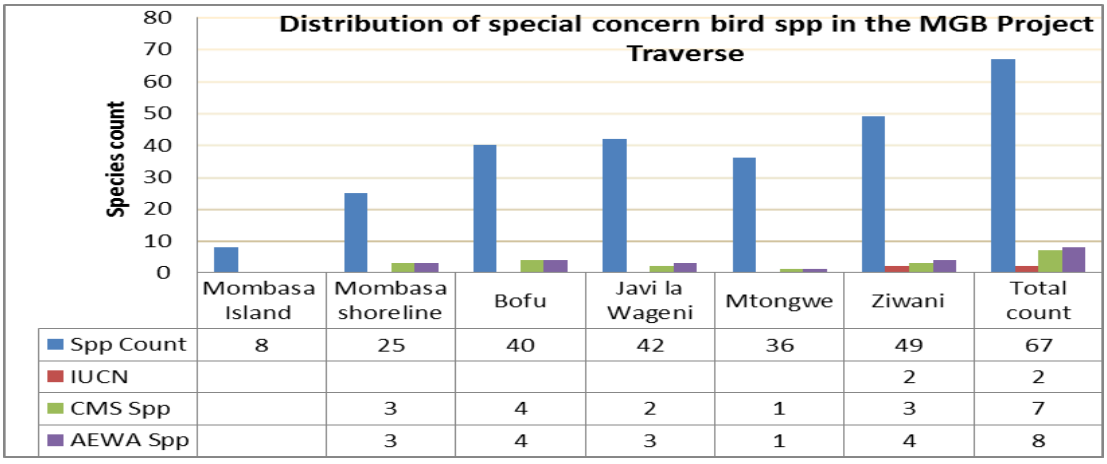
6.7.1: Status of conservation of mammalian species

None of the habitats screened for this study were found to harbor any special concern mammals. Instead mammalian species namely small bucks (bushbuck, duiker, suni), genet and civet cats, mongoose, giant rats, squirrels, hares, vervet monkey, bush babies etc have taken refuge in the bushlands to escape pressure associated with urbanization of surrounding woodlands.

Plate 6.9: The Vervet monkey is common along the Mweza Creek slopes

6.7.2: Conservation status for Avian Fauna-Birds

Total bird count: Appendix 6.2 provides a list of all birds recorded within the MGB traverse based on a bird survey conducted continuously between 7th and 20th January 2018. Bird counts ranged between 8 species for Mombasa town to 49 within vicinity of the seasonal marsh/lake at Ziwani (Fig. 6.13) with a total of 67 species being recorded within the entire traverse.



	Mombasa Island	Mombasa shoreline	Bofu	Javi la Wageni	Mtongwe	Ziwani	Total count
Spp Count	8	25	40	42	36	49	67
IUCN						2	2
CMS Spp		3	4	2	1	3	7
AEWA Spp		3	4	3	1	4	8

Fig 6.13: Occurrence of bird species within the traverse

Conservation status: All the 67 avian species recorded were screened for conservation status against the IUCN RED LIST data and AEWA checklist with outcome that 12 birds are of concern in that 7 feature in the IUCN RED List Data (Table 6.4) either on account of being near threatened or vulnerable while another 8 species are listed in the Agreement on the Conservation of African-

Eurasian Migratory Water Birds-AEWA. Another 2 species are reflected in the IUCN Red List data under CITES.

Nine out of the 12 special concern bird species, including the two IUCN Red List Spp were recorded in the neighbourhood of Ziwani seasonal marsh.

Table 6.13: Special concern birds in the MGB traverse

SN	Migratory Species		Relevant convention			GPS Coordinates
1	Eurasian honey buzard	*Buteo buteo*	CMS		IUCN	
2	Roseat tern	*Sterna dougallii*	CMS	AEWA		
3	Greater crested tern	*Thalasseus bergii*	CMS	AEWA		
4	Sooty gull	*Larus hemprichii*	CMS	AEWA		
5	Black headed heron	*Ardea melanocephala*		AEWA		
6	Grey heron	*Ardea cinerea*		AEWA		
7	Cattle egret	*Bubulcus ibis*		AEWA		
8	Black kite	*Milvus migrans*	CMS			
9	Senegal lapwing	*Vanellus lugubris*	CMS	AEWA		
10	Scred ibis	*Threskiornis aethiopicus*	CMS	AEWA		
11	Woolly necked stork	*Ciconia episcopus*	Vulnerable		IUCN Red List data	4°5'28.17"S 39°37'19.74"E
12	African darter	*Anhinga melanogaster*	Near Threatened			4°5'28.17"S 39°37'19.74"E

Source: This Study

6.7.3: Insects

The most common insects occurring in literally all habitats are butterflies namely;- African emigrant (*Catopsilia florella*), African Clouded (*Colias electa*), Natal Pansy (*Junonia natalica*), Common Leopard Fritillary (*Phalanta phalanta*), Friar (*Amauris niavius*) and Small Spotted Sailer (*Neptis saclava*). Others include;- Gold-Banded Forester (*Euphaedra neophron*), Danaid Eggfly (*Hypolimnas misippus*), *Byblia ilithyia, Tirumala petiverana, Eurema regularis, E. floricola, Colotis danae* (Crimson tip), Orange Acraea (*Acraea eponina*) among others.

6.7.4: Heperto fauna

Diverse reptile species will be found within the traverse. Red-headed Rock Agama (*Agama agama*), Yellow-throated Plated Lizard (*Gerrhosaurus flavigularis*), Speke's Lizzard were observed mainly in rocky areas while snakes such as the White-lipped Snake (*Crotaphopeltis hotamboeia*), green and black mambas, puff udders were reported to be common.

Plate 6.10: White-lipped Snake (*Crotaphopeltis hotamboeia*)

Plate 6.11: Speke's Sand Lizard (*Heliobolus spekii*)

6.7.5: Results of the Fish Survey

Fishing activities around Mweza creek are artisanal, with most fishers using pen (fence) traps. The traps are normally set at a perpendicular or oblique angle to trap fish in ebbing tides especially during spring tides (Samoilys, 2011). They target sardines and other fish swimming close to the beach. In total, six pen traps were recorded along the creek and 30 species of fish were recorded by local names, based on the landed catch and lists derived from interviews with fishermen. The fish was then identified to species level using fish base database system (http://www.fishbase.org). See Table 6.14 3 below.

Table 6.14 Fish species landed at Mweza creek

Family	English name	Local name	Scientific name
Sphyranidae	Barracuda	Tengezi	*Sphyraena jello*
Chanidae	Milk Fish	Mwatiko	*Chanos chanos*
Scombridae	King Fish	Nguru	*Acanthocybium solandri*
Chronimustol	Queen Fish	Pandu	*Scomberoides lysan*
Istiophoridae	Sail Fish	Sulisuli	*Istiophorus platypterus*
Arangidae	Bonito/ Tuna	Jodari	*Katsuwonus pelamis*
Colyphaenidae	Dorado	Falusi	*Coryphaena hippurus*
	Octopus	Pweza	*Octopus vulgaris*
Squimosae	Squids	Ngisi	*Loligo vulgaris*
Lenthridae	Rabbit fish	Changu	*Siganus sutor*
Lutjanidae	Snappers	Tembo	*Lutjanus monostigma*
Scaridae	Parrot fish	Pono	*Leptoscarus vaigiensis*
Acanthuridae	Surgeon	Karazanga	*Acanthurus nigrofuscus*
Acanthuridae	Unicorn	Puju	*Naso brevirosyris*
Haemuridae	Grunter	Pamamba	*Plectorhinchus gaterinus*
Serranidae	Pouter	Chaa	*Cephalopholis argus*
Haemulidae	Black skin	Fute/Makoe	*Gaterin sordidus*
Mulidae	Goat fish	Mkundaji	*Parupeneus spilurus*
Lutjanidae	Streaker	Pali	*Aprion virescens*
Serranidae	Rock Cod	Tewa/ Kivungwi	*Pseudophycis barbata*

Aridae	Cat Fish	Fumi	*Bagre marinus*
Palinuridae	Lobsters	Kamba-mawe	*Penulirus spp*
Penaeidae	Prawns	Kamba-wadogo	*Paenus spp*

Source: This Study

The high number of fish species in such a small setting reflects the species richness along the entire East African Coast. The region's high fish species diversity is an issue that attracts immense scientific endeavour and pose enormous challenges to protect biological diversity and sustainable development. These two are inextricably linked. Additionally, this problem is compounded by the low capacity to report landings in artisanal and subsistence fisheries is frequently lacking in most parts of the Kenya coast, partly because of infrastructure problems. In Mweza creek for instance, there is no designated landing site, often identified by a shed (Banda), nor an fisheries department office, to record daily catch. Therefore, chances are that lots of information on the fisheries is not captured.

6.8: CULTURAL AND HERITAGE IMPACT ASSESSMENT FOR THE MGB PROJECT

Coastal Kenya is characterised by a rich cultural heritage deriving from past occupation by diverse groups including Portugueese, Arabs, English and the local communities. As such, right from the onset of the pre-feasibility and now ESIA Study, the need to for the MGB Project development to project to remain sensitive to the cultural heritage of the host community has been kept alive and has been the subject of discussion in diverse fora.

6.8.1: Approach to CIA for the MGB Project

For purposes of this ESIA, diverse approaches were adopted conducting Cultural Impact Assessment as follows: -

Consultation with Kaya Elders: Once presence of sacred shrines within the traverse of MGB was established for fact, the ESIA team made contact and held working sessions with Elders who subscribe to the Kaya Culture. From such meetings, a full picture of the depth and significance of the Kaya culture to the community including specific location and nature of each shrine was obtained.

Discussions with the National Museum staff in Mombasa: Two major meetings were held with the NMK Coast Regional Office led by the Assistant Director in charge of Sites and Monuments. The meetings investigated the statutory standards in mainstreaming cultural heritage issues in project development, concerns for specific sites such as Mama Ngina Park and the mandate of the NMK in protection of the Cultural Heritage. It was from such meetings that a decision was made for a team from the NMK to conduct a preliminary Cultural Impact Assessment for the MGB in both Mombasa Island and Likoni.

The NMK Coast Regional Office was also regularly represented in the Coordination Meetings for the MGB and always took opportunity to clarify specific questions mainly on the requirement of CIA, conservation status for Mama Ngina Park among others. Follow up meetings have also been held with the Curator of the Mama Ngina Park

Cultural Impact Assessment by the NMK Team: A Team of three Researchers from the NMK were facilitated to conduct site surveys in the project area in both Mombasa Island and Mombasa

Mainland South. From the field analysis conducted, the team issued a report (Appendix 6.3) which ruled out occurrence of major heritage resources within the route of traverse in Msa Island and Likoni, with the exception of Mama Ngina Park. The team however indicated that a similar activity would be extended to Mtiongwe if the bridge were to traverse that area. Mtongwe has since been ruled out as an option in the bridge.

Working session with the Curator's Office for Mama Ngina Park: Working sessions were held with the Curator for Mama Ngina Park who among others, provided a history for the Park and reasons behind gazettement as a National Monument. The Curator staff also conducted guided tours to the various historical resources in the Park;- ruins and caves from British and Portuguese occupation, alleged tunnels linking Mama Ngina coastline to Fort Jesus, the ancient Baobab trees and their history among others. A full documentation of resources at Mama Ngina Park is provided as Appendix 6.4.

6.8.2: Outcome of the Cultural and Heritage Impact Assessment Study

From investigations documented in 6.8.2 above, information which major influence on the MGB Project accrued as follows:-

(i) The legally protected Mama Ngina Park is not available for development:
Mama Ngina Park is a national monument gazetted in 1991 and later re-gazetted in 1993 under GN 3651. A further gazette Notice of 2004 amalgamated all previously allocated plots. It is currently under management of the sites and monuments Department of the national Museums of Kenya whose Curator has an office at the park.

Mama Ngina Drive Public Park has a lot of both cultural and natural importance and the idea of turning the site to a public park dates back to former president arap Moi's time. This site was the Ancient settlement of Waswahili of Tauca or Wakilindini. By the 15th Century the inhabitants had divided themselves into three communities, known as Wa changmwe, Wakilindini and Watangana. The three communities were the first inhabitants to occupy the town of Tauca known now as Mama Ngina Drive Public Park. In 1593, the Portuguese began to build a fortress in Mombasa at its present location that was to be called Fort Jesus, Mombasa. Fort Jesus, Mombasa became the new Portuguese Headquarters on the East African Coast and had a permanent garrison of a hundred soldiers. Other supporting forts of less magnitude were built on the island of Mombasa. Ruins of some of them are still visible around Mama Ngina Drive Heritage Site located about 1.5 kilometres south of the Fort and Makupa 3 kilometres to the west. The Portuguese started using Mama Ngina area as a defensive embankment against other conquerors. The whole area became a military landscape with a number of underground tunnels. This area was also used as an access to Fort Jesus, which was built more than 500 years ago. But spiritually, the three local communities are attached to this site because of the human remains buried beneath the giant baobab trees (Jewel, 1976:120).

Within the site, there are more than 400 years old giant baobab trees, which offer a breeding ground for rare species of grey herons. These trees were used as grave markers as well as by traditional healers for medicinal purposes. The founder president gave the people of Mombasa the site. Mama Ngina Drive Public Park is an exotic sport in Mombasa and hundreds of people congregate there every day to relax and picnic with their families. The physical condition of the site is a shared concern of many people from different traditions, custodians, archaeologists and the general public. Therefore, with its historic significance, it should be conserved for future generations as well as research purposes.

In consideration of the immense cultural value of Mama Ngina Park, a decision was made to abandon original proposed alignments on the MGB (A0, A1 and A2) which would have traversed the Park.

(ii) Fort Jesus is inscribed in the UNESCO List of World Heritage Sites

There are 6 UNESCO World Heritage Sites in Kenya namely; - (i) Fort Jesus, Mombasa (2011), (ii) Lamu Old Town (2001), (iii) Sacred Mijikenda Kaya Forests (2008), (iv) Kenya Lake System in the Great Rift Valley (2011), (iv) Lake Turkana National Parks (1997) and (vi) Mount Kenya National Park/Natural Forest (1997). The Fort (Plate 6.1.4) was inscribed into the UNESCO List of World Heritage Sites in 2011 as a Cultural Site under criteria ii and iv. [6] The Fort in all respects is an outstanding example of the style of fortification developed in Europe and introduced by the Portuguese to Africa and to the East. Fort Jesus, Mombasa, the latest of the 16th Century fortress, illustrates a new style of a remarkable fortress that apart from being a meritorious work of fortification remains an unsurpassed exceptional example of the philosophical debate underlying the architectural theory of the High Renaissance. Its superior design was subsequently used to improve other forts in Africa. Throughout= its history, Fort Jesus, Mombasa has been at the centre of complex human relations that resulted from the quest for economic supremacy, political domination and the struggle against such domination.

Plate 6.12: Fort Jesus

Fort Jesus, Mombasa also represents a landmark of human spirit of courage and endurance during periods of uncertainty; a representation of not only human achievements but the past turbulence that has come to shape the present societies in the region. Its universal significance is further demonstrated by, the unsurpassed interest shown by the various powers in its control such as the Portuguese, the Turkish, the Omani Arabs, the Dutch, the British as well as the African (Swahili) and others.

Mombasa Old Town, which houses Fort Jesus comprises on a 72 hectare block to the north of Mombasa Island inhabited by a richly diverse group of communities: locals, Arabs, Asians,

[6] Criteria (ii) Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning or landscape design. Criteria (iv), as an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates significant stages in human history ethnology, monumental arts.

Portuguese and the British which have co-existed for hundreds of years. The various social, political, religious and economic activities of these groups have created a distinct character and culture which together has come to define this old town.

The Fort Jesus and Mombasa Old Town are nowhere near the traverse for the MGB. However, given that the Fort is often the main reference point for Mombasa because of the rich cultural and historical heritage represented, there are fears that its cultural impact could be diluted by construction of the Mega Bridge which will now be the main reference point. In a discussion with the Mombasa County Government, this matter was raised with a recommendation for the bridge design to inbuild as much of the coastal architecture as possible as a means on enhancing the cultural heritage.

(iii) There is need for the NMK to undertake recovery surveys during construction

Upon consideration of the rich cultural heritage including shipwrecks within the MGB traverse, the possibility of encountering chance finds especially during seabed excavation is probably low quite high. However, the NMK should be involved at all stages of excavation for purposes of undertaking recovery of all artefacts encountered.

CHAPTER SEVEN: THE SOCIAL ECONOMIC PROFILE

7.1: FOCUS OF THE SOCIO-ECONOMIC SURVEY

The purpose of the socio-economic survey was to facilitate documentation of the baseline characteristics of the individuals along the traverse but was also used to facilitate social stratification of the potentially affected people and to document social features including wellbeing and levels of vulnerability.

7.1.1: Administrative profile

Two parallel administrative systems are operational in Kenya namely, the Central Government and County Government and both will be found within the traverse for the MGB Project thus:-

National Government set-up

Table 7.1 shows the national government system at play within the traverse area. The MGB Project traverses the two coastal Kenyan Counties of Mombasa and Kwale. Within Mombasa, the Project traverses five administrative locations of Majengo within the Mombasa Island sub county then crosses over to Likoni Sub County where it traverses the three locations of Likoni, Mtongwe and Shika Adabu, then crosses over into Kwale County where it terminates within the Ngombeni Location of Matuga Sub County. A total of six sub-locations are traversed.

Table 7.1: Distribution of PAPs by administrative jurisdiction

Central Government					County Government
County	**Sub county**	**Admin Locations**		Parliamentary Constituencies	Electoral wards
Mombasa	Mombasa Island	*Name of location*	*Sub locations*		
		Majengo	1	Mvita	Shimanzi/ Ganjoni
					Majengo
	Likoni Sub County	Likoni	2	Likoni	Bofu
		Mtongwe	1		Mtongwe
		Shika Adabu	1		Shika Adabu
Kwale	Matuga	Ng'ombeni	1	Matuga	Ngombeni

Source: This Study

Parliamentary system: The Project will traverse Three Constituencies;- Mvita and Likoni in Mombasa County and matuga Constituency in Kwale County.

County Government Set Up: Under the devolved system of government, the project will traverse both County 001 and County 002, Mombasa and Kwale respectively. Within Mombasa, the Project fall under four electoral Wards ;- Shimanazi- Ganjoni, Majengo, Bofu, Mtongwe , Shika Adabu and Ngombeni which also serve administrative sub units under develoved government.

7.1.2: Population and settlement

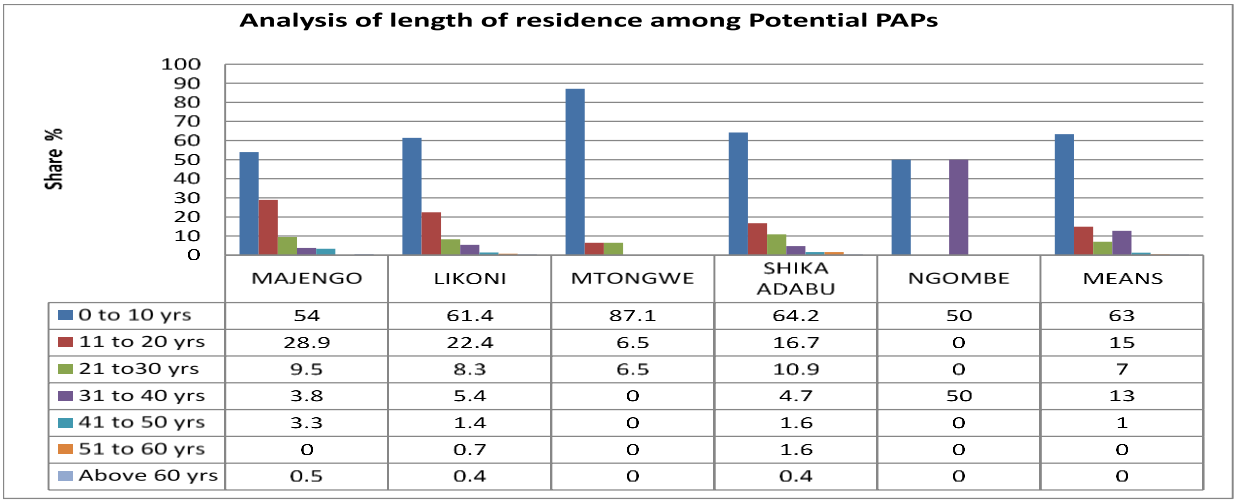
The people:

The MGB project traverse is both urban and cosmopolitan bringing together Kenyans from all tribes and races. Further, given that Mombasa Mainland South functions as a dormitory area for Mombasa

Island, the population is largely multi-ethnic but with a strong showing of Kenyans of the Miji Kenda Group.

Length of residence among respondents:

A time line analysis for the MGB traverse based on recorded length of residence for heads of households is presented in Fig 7.1 below. At 63%, majority of potential MGB PAPs are newly settled with less than 10 years of residence. Both Mtongwe and Ng'ombeni are newly settled with none of the residents reporting more than 20 years of residence in comparison with Majengo (Mombasa Island), Likoni and Shika Adabu where some respondents reported length of stay in excess of 60 years.



	MAJENGO	LIKONI	MTONGWE	SHIKA ADABU	NGOMBE	MEANS
0 to 10 yrs	54	61.4	87.1	64.2	50	63
11 to 20 yrs	28.9	22.4	6.5	16.7	0	15
21 to30 yrs	9.5	8.3	6.5	10.9	0	7
31 to 40 yrs	3.8	5.4	0	4.7	50	13
41 to 50 yrs	3.3	1.4	0	1.6	0	1
51 to 60 yrs	0	0.7	0	1.6	0	0
Above 60 yrs	0.5	0.4	0	0.4	0	0

Fig. 7.1: Analysis of length of residence among PAPs

Land-use patterns:-

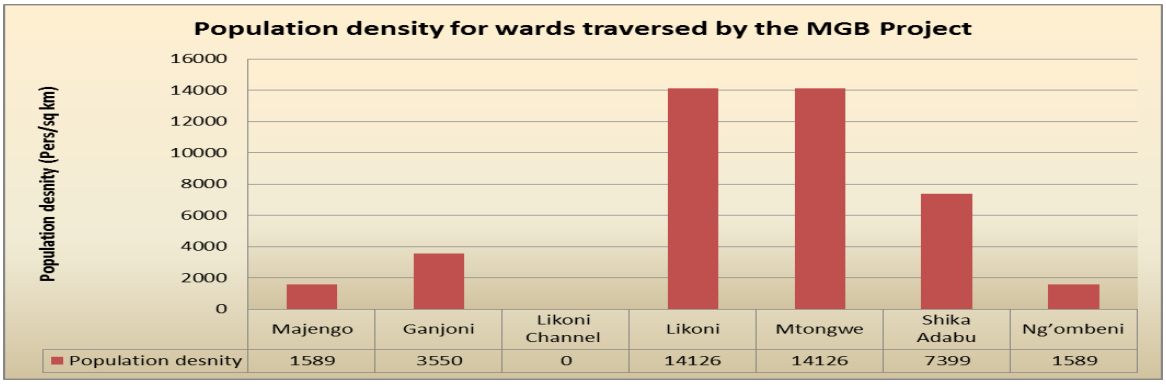
Land use within the MI section of the traverse is largely commercial with some pockets of mixed residential in the Liwatoni area. The same traverse is dominated by privately owned land. The Channel is open water, property of the republic of Kenya by mainly exploited for commercial marine transport and trade. The Mainland South area between Bofu and Mtongwe was originally GoK (Cap 280) land which was invaded and is under diverse stages of conversion to private land. The place is under very high-density settlement. Across the Mtongwe Road, land is privately owned but under lessors who pay rent to local prominent families and is under very high settlement density. This density thins out as residential land use gives way to agriculture towards Ng'ombeni. Towards the Project end at Ziwani, grazing land use gives way to mining of sedimentary sands.

Table 7.1: Analysis of land-use along the MGB traverse

Section	Core features of sections within the MGB Traverse						
	Kingorani prison to Moi	Mackarrios Road to Ganjoni Liwatoni	Northern shoreline	Likoni Channel-open water	Bofu -Mtongwe to Shika Adabu	Shika Adabu-Vyemani	Shika Adabu-Ziwani
Administrative location	Majengo	Majengo	Majengo	Majengo-Likoni	Likoni-Mtongwe	Shika Adabu-Vyemani	Shika Adabu-Ngombeni
Tenure system	Private	Private	Private	Open Water-GoK reserve	Trasnitional Government land	Private	Private
Dominant land use	Commercial	Mixed commercial	Commercial	Marine transport and nature conservation	Residentail	Residential	Farming -Grazing and sand harvesting
Settlement	Low	Medium	Medium	None	Very High	Very High	Medium to low

Source: This Study

Population density:
Fig 7.2 traces population density within the MGB traverse based on year 2017 projections for the County Integrated Development Plans. The Majengo part of the traverse is largely commercial and hence has a low residential population compared to Ganjoni, which is largely a medium density settlement. However, across the Likoni Channel in Mombasa Mainland South where high-density residential land use is dominant, very high population densities in excess of 12,000 persons per square kilometre are encountered. Beyond Shika Adabu towards Ng'ombeni, agricultural land use is dominant leading to the very low density encountered.



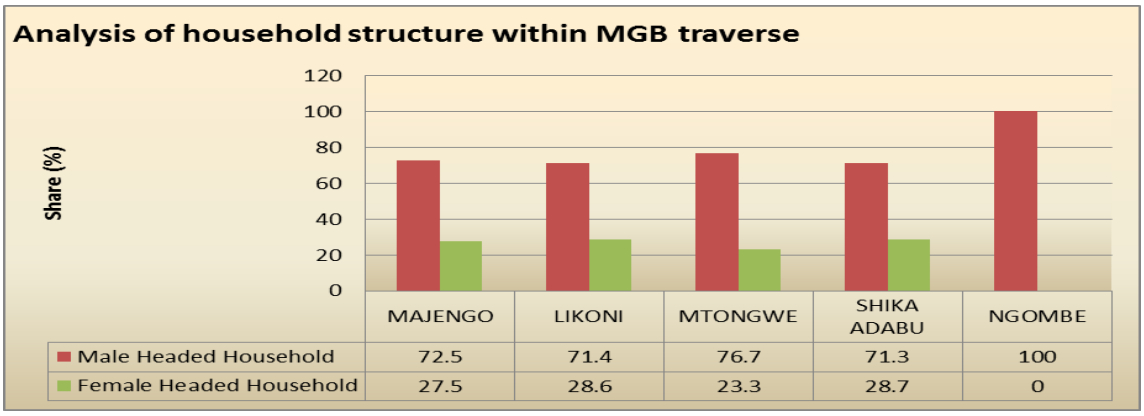
Source CIDP(s) for Mombasa and Kwale
Fig 7.2: Settlement density within the MGB traverse

7.2: SOCIO-ECONOMIC PATTERNS

7.2.1: Structure of households

Size of households: Households vary in size but average at 6.0 persons for all locations of traverse with a range of 5.7 to 6.5.

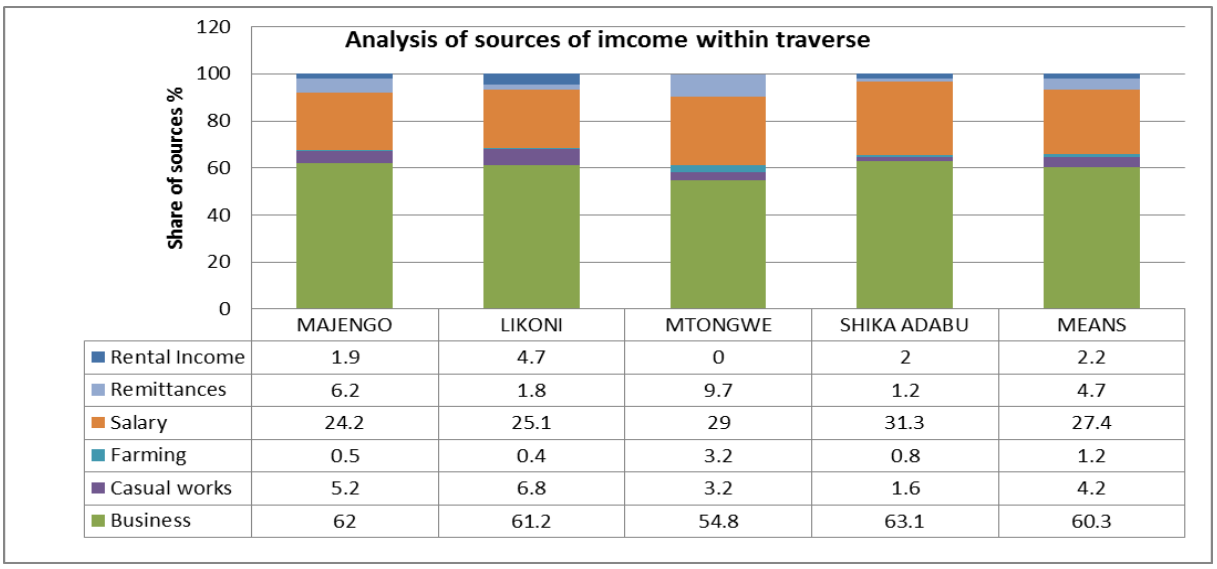
Gender of Head of Household: The gender of Head of Household normally has a strong influence on family income and well being with female headed households normally falling within poverty brackets. Within the traverse area, the male gender is dominant at over 70% of head of household (Fig 7.3). A share of between 23 to 28.6% by Female Headed Households is significant and requires monitoring for capacity to fuel poverty.



Source: This Study
Fig 7.3: Gender of Head of Household

7.2.2: Analysis of sources of income:

Trading is the most predominant means to livelihood within the MGB traverse where it commands a share of 60.3%. Employment (both formal and informal) follows at 31.6% (Fig 7.4).



	MAJENGO	LIKONI	MTONGWE	SHIKA ADABU	MEANS
Rental Income	1.9	4.7	0	2	2.2
Remittances	6.2	1.8	9.7	1.2	4.7
Salary	24.2	25.1	29	31.3	27.4
Farming	0.5	0.4	3.2	0.8	1.2
Casual works	5.2	6.8	3.2	1.6	4.2
Business	62	61.2	54.8	63.1	60.3

Fig 7.4: Analysis of income patterns along the MGB traverse

7.2.3: Income patterns and status of well being

Income levels for the MGB traverses for the base year 2015 are analyzed below. Outcome of analysis of the status of wellbeing for PAPs is summarized in Table 7.2 below based on comparison on computed monthly and daily per capita incomes with the national poverty cutoff lines. An monthly income in the range of Ksh 20,000 translates into a per capita monthly income of Ksh3333 which is above the official monthly poverty threshold of KSh 2,913 per adult equivalent in urban areas as published in 2005/6. This further translates into a daily per capita income of Ksh 111 which is above the poverty cut off one dollar (Ksh 100 per day). Going by this cutoff, any PAP with a monthly income of below Ksh 20,000 is considered below the poverty line and is therefore income poor. Applying this cutoff, 23.5% of MGB PAPs are considered poor with poverty prevalence being highest in Likoni and Mtongwe at 32 and 26.7%. By extension, 76.5% of MGB PAPs subsist above the poverty line.

Table 7.2: Analysis of wellbeing within MGB traverse

Monthly household income (Ksh)	Majengo	Likoni	Mtongwe	Shika Adabu	Pa capita monthly income (Ksh)	Pa capita daily income (Ksh)	Position on poverty line	Share %
Below 10,000	4.2	11.4	20	9.1	1667	56	Below poverty line	23.5
11,000 to 20,000	5.2	20.6	6.7	15.7	3333	111		
Proportion below poverty line	*9.2*	*32*	*26.7*	*24.4*	Poverty Line			
21,000 to 30,000	18.2	18.9	16.7	19.3	5000	167	Above poverty line	76.5
31,000 to 40,000	11.5	8.9	13.3	11	6667	222		
41,000 to 50,000	10.4	12.1	16.7	11.4	8333	278		
51,000 to 60,000	13	7.5	23.3	10.6	10000	333		
61,000 to 70,000	4.2	4.6	0	3.1	11667	389		
71,000 to 80,000	3.1	2.8	0	4.7	13333	444		
81,000 to 90,000	5.2	4.6	0	4.3	15000	500		
Above 90,000	25	8.5	3.3	10.6	16667	556		

Source: This Study

7. 3: VULNERABILITY MAPPING

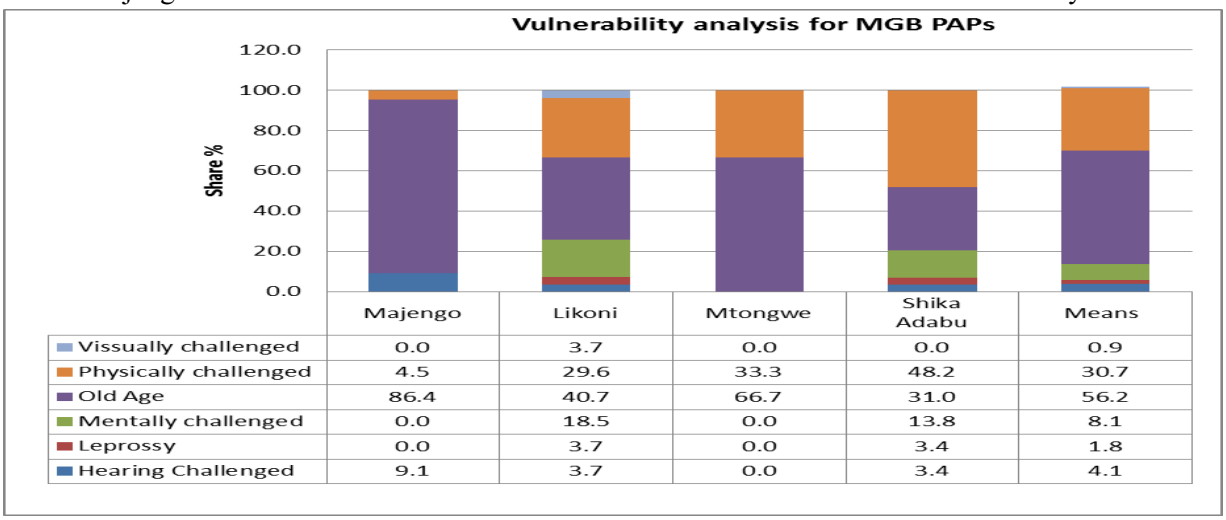
7.3.1: Criteria for vulnerability mapping

A PAP was considered vulnerable if they displayed any of the following traits; - old age, terminal diseases, other diseases, orphans, physical disability, mental disability and others.

7.3.2: Outcome of the vulnerability mapping

Total vulnerability: Fig 7.5 provides an analysis of the scope of vulnerability in the MGB Project. In addition to the 23.5% of PAPs who are considered vulnerable on account of poverty another 82 cases of vulnerability were encountered within 72 PAP households in the MGB traverse.

Causes of vulnerability: Essentially, old age is the predominant cause accounting for 56.2% of all vulnerability within the MGB traverse followed by physical disability at 30.7%. Old age is most severely felt within Majengo location in Mombasa Town where it accounts for 86.4% of all vulnerability.



	Majengo	Likoni	Mtongwe	Shika Adabu	Means
Vissually challenged	0.0	3.7	0.0	0.0	0.9
Physically challenged	4.5	29.6	33.3	48.2	30.7
Old Age	86.4	40.7	66.7	31.0	56.2
Mentally challenged	0.0	18.5	0.0	13.8	8.1
Leprossy	0.0	3.7	0.0	3.4	1.8
Hearing Challenged	9.1	3.7	0.0	3.4	4.1

Fig 7.5: Vulnerability mapping within the MGB

CHAPTER EIGHT: CONSULTATIVE PUBLIC PARTICIPATION

This Chapter outlines the progress and outcome of Stakeholder engagement under auspices of the ESIA for the Mombasa Gate Bridge s Project.

8.1: LEGAL FOUNDATION FOR STAKEHOLDER CONSULTATION IN KENYA

8.1.1: Provisions of the National Constitution

Section 35 of the National Constitution 2010 provides for access to information as follows: *35. (1) Every citizen has the right of access to (a) information held by the State; and (b) information held by another person and required for the exercise or protection of any right or fundamental freedom.* Further, Section 69 (1) (d) requires the State to encourage public participation in the management, protection and conservation of the environment, thereby giving legal foundation for stakeholder consultation in environmental assessment process. Stakeholder consultation as conducted for this ESIA was partly in fulfilment to above stated legal obligations.

8.1.2: Requirements of EMCA 1999 (Cap 387)

Legal Notice 101 of June 2003 requires that all environmental assessment process in Kenya to incorporate public consultation. This is a requirement informed by the awareness that stakeholders are largely in the constituency likely to be impacted by proposed developments and it is imperative that they be informed of the project following which they can make informed comments and reactions to the proposed development. It is also important to ensure that all stakeholder concerns as well as aspirations are identified and incorporated in project development, implementation and operation. Against such background, a number of consultations have been undertaken with cross sections of stakeholders to the Mombasa Gate Bridge with objectives as follows:-

i. To inform primary, secondary and other stakeholders of the proposed development;
ii. To clarify stakeholder interests and concerns in the project area;
iii. To better define scope and magnitude of potential impacts of implementing the project based on stakeholders' feedback.

8.2: APPROACH TO STAKEHOLDER ANALYSIS

8.2.1: Criteria for Stakeholder Identification/Stratification

Diverse categories of stakeholders are encountered within the traverse of the MGB and access roads. For ease of treatment and study, stakeholders were lumped into three broad categories as follows:-

- Fundamental Rights Holders
- Legal Mandate Holders
- Marine Trade Stakeholders
- Third Party Interests

Core features and groups within each broad category are highlighted in sections below.

(i) Fundamental Rights Holders (FRH):

A total of 11 groups which hold fundamental rights in the traverse area for MGB Project were identified as summarised in Table 8.1 below. The fundamental rights extend far beyond national borders and are shared by generations yet to be born who have an inherent entitlement to a healthy, functional environment.

Table 8.1: Analysis of Fundamental Rights Holders in the MGB Traverse

SN	Stakeholder category	Stake in the Mombasa Gate Bridge Project
1.	Kenyan citizens present and in future	Constitutional /inherent right to a clean health environment
2.	Global community	Inherent right to a preserved functional global ecosystem
3.	Residents of Kenya's Mainland South	Inherent right to a reliable and efficient means for accessing Mombasa Island
4.	Stakeholders to land	This category includes individual, corporate and other categories of owners and occupants to land and land-based resources in the traverse area.
5.	Investors within the traverse	This category includes all persons who have invested in property, trade, utilities and other ventures within the traverse in both Mombasa Island and Mainland south.
6.	Residents along the traverse	These is the category who will have their lives changed either on account of displacement from private or common property (schools, medicare centers, places of worship, cemeteries, etc), intensified pressure from land speculators, exposure to traffic accidents, imposition of barriers to movement and access to resources, among others.
7.	Ancestral/ sentimental heritage holders	They hold special sentimental value to the property /business on account of many years of residence
8.	Traditional religious heritage holders	This category includes subscribers of the Kaya culture based on traditional religious sites/ shrines that could be displaced
9.	Vulnerable Groups	This category comprises individuals or groups who are disadvantaged in life either on account of advanced age, physical, mental, illness or other challenges.
10.	Nature-based livelihood systems	People operating livelihood systems such as traditional artisanal fishing, extraction, etc are likely to suffer displacement or blockage from resources that sustain livelihoods systems.
11.	Operators of capital resources	This category includes utility providers owning water, power supply and oil pipelines which may be affected by the project

(ii) Legal Mandate Holders (LMH) within target jurisdiction:

Stakeholders identified under this category include those in National Government, County Government and State Corporations whose mandates confer jurisdiction over areas traversed by MGB Project. From analysis of the legal framework as documented in Chapter Four, 20 Statutes are deemed to have over-bearing influence on the area to be traversed by the Mombasa Gate Bridge while simultaneously conferring specific mandates to 21 respective institutions (
Table 8.) as the *bona fide* Legal Mandate Holders for the area.

Table 8.2: Analysis of Legal Planning Mandates covering the MGB traverse area

SN	Legal Tool	Custodian	Legal mandate	Relevance to MGB Project
1	Schedule 4 to National Constitution 2010	Allocates non devolved functions for National Government	Coordination of National Government	Administrative oversight, security functions in bridge development and operation
2		KDF	National Security	KN relies on the Likoni channel in delivering national obligations
3	Kenya Roads Act 2007	KeNHA	Development and maintenance of classified roads in Kenya	KeNHA is proponent in the Mombasa Gate Bridge Project
		Same Act creates KeRRA and KURA	Jurisdiction over rural and urban non-classified roads	Such roads will be displaced by proposed bridge project
4	The Physical Planning Act Cap 286	State Department of Physical Planning	Coordinate all spatial planning at National and county level	Proposed development of MGB has to harmonize with both National and County Spatial Plans
5	County Government Act of 2012	County Government of Mombasa and Kilifi	Have planning jurisdiction for Mombasa County	Planning for MGB has to harmonize with Mombasa County CIDP and CSP
6	KMA Act 1978	Kenya Maritime Authority-KMA	Planning Jurisdiction over maritime areas in Kenya	Questions of maritime safety during bridge construction and operation.
7	CDA Act Cap 446	CDA	Coordinate all development Planning in the Coast region	Has undertaken spatial planning for the area under jurisdiction
8	KPA Act	Kenya Ports Authority	Has mandate in developing Marine Transport in Kenya	Impacts of bridge construction and operation on navigation within the Likoni Channel Assets within traverse will be displaced.
9	KRC Act	Kenya Railways Corporation	Has mandate to develop and operate the national railway network	Assets of KRC in MMS will be displaced by proposed bridge
10	WMCA 2013	KWS	Manage and preserve the national wildlife heritage	Bridge will traverse habitat for special concern bird spp
11	Museums and Heritage Act of 2006	NMK	Protection of the cultural and archaeological heritage	Excavation for Bridge Piers could interfere with archeological heritage
12	Water Act 2002	WRMA	Management of the National water resource base	Construction in riparian areas requires WRMA approval
13	Forests Act 2005	KFS	National custodian for all vegetation including	Mangrove formations fall under Jurisdiction of KFS.
14	National Land Commission Act 2012	National Land Commission	NLC is designated Land Acquiring Authority in Kenya	NLC will acquire land for the proposed Bridge and approach roads
15	OSHA 2007	Directorate of Occupational safety and Health Services	Has regulatory mandate on Occupational Safety and Health matters.	Bridge Construction will comprise working places under jurisdiction of the DOSHS

SN	Legal Tool	Custodian	Legal mandate	Relevance to MGB Project
16	EMCA 1999/2015	NEMA	Has national mandate for environmental regulation.	Need for MGB to conform to environmental regulatory standards set by NEMA.
17	Fisheries Act	State Dept of Fisheries	Management of the fisheries resource base	Has jurisdiction over the Kilindini Channel fisheries and its BMU
18	Electric Power Act No 11 of 1997	Kenya Power Transmission Company Ltd (KETRACO)	To build and operate power transmission lines	Road will displace several power transmission lines
19	Kenya Ferry Services Act	Kenya Ferry Service	Mandate to operate ferry transport	KFS will loose revenue base once MVs are diverted to new bridge upon commissioning.
20	Kenya Civil Aviation Act, Cap 394	KCAA	Develop and operate a safe, economically sustainable and efficient civil aviation system	Proposed bridge falls within radius of aeronautical height limits imposed by the KCAA

Source: ESIA Study Team

iii) Maritime Trade Stakeholders

In recognition of the critically important role played by Mombasa Port handling imports and exports which drive the economy of bot Kenya and the region (Uganda, Northern Tanzania, DR Congo, South Sudan, Rwanda and Burundi), Maritime Trade Stakeholders have been flagged out as a stand alone category. Up to 12 categories of stakeholders spread out in both Mombasa Port and its hinterland have been identified as summarised in Table 8.3 below.

Table 8.3: Analysis of Marine Trade Stakeholders

SN	Stakeholder Category	Stake	Relevance to the MGB Project
1.	Kenya Ports Authority	Trade in Ship handling, Piloting, etc	Reduced trade if ship calling is delayed
2.	GoK Treasury	Tax Revenue from cargo handling	Reduced cash flow in cargo flow is affected
3.	Ship owners	Trade in cargo transport	Increased operating costs if channel operation is interfered with
4.	Maritime service providers	Trade in provision of services (fuel and food supply, waste handling, etc) to shipping lines	Loss of business if frequency of ship calling in is reduced
5.	Cargo owners	Cargo trade	Losses if cargo handling is delayed
6.	Cargo handlers including ICDs and warehouses	Trade in cargo handling	Loss of business if ship calling in is reduced
7.	Cargo Transporters	Cargo transport trade	Reduced business if cargo flow is affected
8.	Service providers along Northern Transport Corridor	Trade in servicing the transport industry	Reduced business if cargo volume goes down
9.	Manufacturers and traders in hinterland	Trade in processing of imported inputs eg Iron and Steel, Chemicals etc	Reduced production upon delays in delivery of imported inputs
10.	Services sector	Trade in banking, money transfer, insurance for the cargo handling sector	Reduced business volume

11.	Relief service providers	Provision of relief support to distressed groups in hinterland	Delays in service delivery to victims of strive
12.	Consumers in hinterland	They rely on goods supplied through the port of Mombasa	Delayed access to essential supplies from designated suppliers.

Source: This Study

iv) Other interested parties

Stakeholders here include any interests outside categories (i), (ii) and (iii) above and could include groups listed in Table 8.4 below.

Table 8.4: Other stakeholders to the Mombasa Gate Bridge Project

SN	Stakeholder Category	Mandate/ Mission	Stake in MGB Project
1.	Strategic Partners to MGB	Collaborating with GoK Agencies in development programmes	Timely delivery of the project as per agreed timeframes
2.	Economies in the hinterland	They are driven by import/export trade through Mombasa Port.	Likely to suffer if Port operations are interfered.
3.	Employees and their dependants	This category derives livelihoods from employment from all other stakeholder categories above.	Reduced cash inflow on account of reduced port business
4.	Community based groups eg churches, self help groups, etc	Community level service delivery	Destabilization associated with loss of asset and operating bases.
5.	Transporters and service providers along the A14 (Mombasa-Lungalunga-Tanga-Dar-es salaam) route	Trade in passenger and cargo transport along this route	Will benefit from provision of a functional all road connection to Mombasa CBD
6.	Property markets in Mombasa Mainland South	Profitable investment in land	Would benefit from an expanded market for land and real estate associated with

8.2.2: Modalities Stages in Stakeholder Consultations

Stakeholder Consultation in the ESIA process for the MGB took place in 2 stages as follows:-

- **Prefeasibility Stage Consultations:** This targeted sensitisation aimed at building consensus on selection of alternative by pass alignments.
- **Feasibility Stage Consultations:** Activities at design stage built on consultations already undertaken at prefeasibility with the aim of consolidating broader stakeholder input in the process.

A highlight of strategies adopted for each phase of consultations is highlighted in sections below.

8.3: PROGRESS AND OUTCOME FROM PRE-FEASIBILITY STAGE CONSULTATIONS

8.3.1: Approach to Stakeholder engagement

Focus: Prefeasibility stage activity largely focussed at project identification and conceptualization whereby the main outcome was a preliminary design clear on type of bridge, approach roads and their alignment. Consultations at this stage aimed at selling the project concept to diverse stakeholders and allowing them an opportunity to participate in the Project Screening.

Appendix 8.1 provides a full report on Prefeasibility Stage Consultations, data on which is summarised in Table 8.1 below. Pre-feasibility Phase consultations applied diverse approaches as reported in sections below.

(i) **Leaders Meetings:-** A total of 3 Leaders meetings were held at Royal Court Hotel and ACK Guest House for purposes of sensitising leaders in both Mombasa Island and Mombasa Mainland South on the evolving MGB Project. Through this method, 93 Leaders in both Likoni and Mombasa Island were accessed while others were met during on the ground traversing. Proceedings are provided in Appendix 8.1.1 below.

(ii) **Focus Group Discussions:** Numerous Focus Group Discussions were held between the prefeasibility Team and Lead Agencies for purposes of further investigating diverse issues pertaining to bridge alignment. Meetings were held with the KPA, KMA, MCG (Departments of Transport and Infrastructure, Lands and Planning, etc), NMK, KDF- Mtongwe Barracks, among others. Records of discussion with diverse agencies are available in Appendix 8.1.2

Table 8.5: Summary of Leaders Meetings at Pre-feasibility Stage

Meeting	Date	Target	Attendance
ACK Guest Hse One	Saturday, 25th October, 2014	Leaders in Likoni Sub County	31
ACK Guest Hse Two	21st January 2015	Leaders in Likoni Sub County	40
Royal Court Meeting	28th April 2016	Leaders for Mombasa Island SC	23
ACK Guest Hse Three	29th April, 2016	Leaders in Likoni Sub County	30
Total			**93**

iii) **Coordination Meetings:** The prefeasibility Study in Kenya was largely directed by a Coordination Forum comprised of about 30 members drawn from JICA Nairobi Office, JICA Study Team and GoK Agencies (Legal Mandate Holders identified in Table 8.2 above) among others. The Forum held a total of Six meetings chaired by KeNHA with the ESIA Team Leader as Secretary through which, among others, diverse alignments of the Gate Bridge were screened to arrive at the most optimum option currently undergoing feasibility Study. Among the screening criteria applied were environmental and social concerns as elaborated in Chapter Nine below. A record of all six coordination meetings is presented in Appendix 8.1.3 below.

iv) **Debriefing Meeting with the Principal Secretary for Infrastructure-Ministry of Transport and Infrastructure:** At the conclusion of the Field Phase of the Prefeasibility Study, a debriefing meeting was held to report interim findings to the Ministry of Transport and Infrastructure. The meeting was held on 2nd May, 2016 in the Ministry of Transport and Infrastructure Boardroom

and attracted a total of 18 participants mainly from Agencies associated with MOTI. Appendix 8.1.4 provides a record of the proceedings.

v) **Working sessions with Lead Agencies:** Working sessions were held with the NMK as reported earlier in sections 6.8 above. Other groups met include Kaya Elders reported in sections below.

vi) **Total reached**

Table 8.6 provides a summary of SH numbers reached at the pre-feasibility stage consultations. Essentially, at total of 23 forums were held at prefeasibility stage through which, a total of 194 stakeholders were accessed, sometimes on multiple occasions. Essentially, through such forums, the bulk of Legal Mandate Holders were accorded an opportunity to influence choice of bridge structure and alignment.

Table 8.6: Summary of prefeasibility study SH events

SN	Forum	Total held	Total met
1	ACK Guest House Meetings	3	101
2	Royal Court Meetings	1	23
3	Focus Group Discussions :		
	• KPA	3	3
	• KMA	2	4
	• Kenya Navy	1	1
	• NMK	2	8
	• KCAA	1	1
	• MCG	4	5
4	Coordination Forums	6	33
5	Debriefing Meetings	1	18
Total meetings/ participants		**23**	**197**

8.3.2: Outcome of Prefeasibility Study Stakeholder engagement process

The core output from the Pre-feasibility Study was the packaging of a preliminary design of bridge and associated access roads in an alignment that was largely approved by diverse stakeholders. Table 8.7 provides a summary of core issues that emerged in course of screening diverse bridge design options by stakeholders groups.

Table 8.7: Summary outcome from pre-feasibility stage meetings

SN	Forum	Core concerns/ outcome
1	ACK Guest House Meetings	i) I fully support the project and I further agree with the comparison methods that identification of Route D. But I am afraid the fishermen and fishing activities will be disrupted. Will the fishermen be compensated? After this, there will be an Environmental Social Management Plan study. The ESMP will incorporate all the concerns of the PAPs and possible cause of action or mitigation and possible benefits. (KeNHA) ii) 30m width of the bridge is a raw deal. The bridge should be made wider. I welcome the idea of retaining the Kenya ferry services but wondering of its sustainability when the bridge toll is phased out. Road reserve at 60m will displace a large population hence requires time for resettlements. It is complicated because we are traversing already developed plots and also cutting costs on compensation. On bridge toll, a sustainable system will be

SN	Forum	Core concerns/ outcome
		put in place to ensure sustainability of the Kenya ferry services. (KeNHA) iii) I have great confidence that the displaced individuals will be given a better future. My concern is that your developments are focused on one side shadowing other areas. On development, there are a lot of projects including the northern and southern bypass. No area will be left behind in development. (KeNHA) iv) How is disability covered in these developments? (Disability group) Regarding disability, the issue will be discussed in design phase. (KeNHA) v) In Mombasa Island the bridge will start at Lumumba road. Where exactly is it starting from our side? (Area Member of County Assembly) The bridge connects to Likoni Ukunda road near the mosque with a green roof. The road commences at Kitaruni and goes for 5 km. (Survey Team) vi) Navy rejected a proposed alignment that passes near their naval base. They have nothing to do with our bridge? Security is a national issue and we should not take the matter lightly. Kenya Navy had proposed to patrol the bridge full time and provide its security against terror attacks that you all know. Employing security (civil) may not be a convenient approach. What we can agree on is that the community be given free access without restrictions. (District Office) vii) Whether people with disability have the capacity to walk and approach the bridge. Most people with disability are currently using the ferry services. What will happen when ferry is phased out? Kenya ferry gets a lot of money from vehicles levy. In case that the vehicles are using the bridge, will we be asked to pay the lost cost? (Disability group) There will be a toll station for collection of revenue that will be used to maintain ferry and road. (Survey Team) viii) Will the payment at the toll station be continued or withdrawn after the recovery period is attained? There is no other way to run and maintain both the ferry and bridge. The KeNHA's intention is to maintain the toll throughout but this will be confirmed and communicated. (KeNHA) ix) What measure are you taking to control the earthquake effects of the bridge? (Women reps' office) The bridge designs meat international recognition and the bridge cannot be affected by earthquake. (KeNHA) x) How many lanes will the bridge have? (Sub County Peace and Cohesion) The bridge will have 4 lanes based on further demand projection. (Survey Team)
2	Royal Court Meetings	i) There is a plan of cable car by Kenya Ferry. Will it have a remarkable effect on the proposed bridge construction? (Residence) Cable car will not affect the project in any way. We are in touch with the Kenya Ferry and more information will be provided once the design details are available. (KeNHA) ii) It is clear that no decision has been made on the final alignment. We will be willing to sensitize people but we don't know the final route. This is a preliminary stage of the study. As a result of consultation with the Kenya Navy, Ports Authority and the Museums of Kenya, Route D is the most appropriate route. These findings will be taken to the Government for final approval. (Survey Team) iii) Initial idea holds that it was to connect at Port-reize; it has today shifted to this side. Kindly be clear on the final alignment and when will it be officially communicated to us? The Port-reize project is on process but for this study, the survey team has settled and recommended Route D as its final alignment. (KeNHA)

SN	Forum	Core concerns/ outcome
		iv) You are saying that Route D is the favourable. Did you consult stakeholders in Route D? (Enterprise) This is the reason why we are here today. To disclose the best route possible for the Mombasa Gate Bridge; to collect your views and concerns and to integrate them in the design process. (Study Team) v) What is the impact of the overhead bridge to our factory? (Enterprise) The bridge height will be 60 m high from the sea level and approach viaducts will be between 20 to 30 m high from the factory ground level. (Survey Team) vi) Our investments comprise of warehouses, offices and other structural developments will be affected. We are asking you to shift the road. (Enterprise) Upon consultations, a map of the proposed bridge was given to your representatives and they deduced that their activities will not be affected. The consultant further assured them that extra care has been taken to ensure minimal impact of all the affected places. (Survey Team) vii) What is the expected duration of the bridge construction? (Area chief) It will take four to five years. (Survey Team) viii) During construction of the bridge, what will happen to our houses and land underneath the overhead bridge? The land underneath will be acquired even though the bridge will be overhead. (Survey Team)
3	Focus Group Discussions :	
	• KPA	(i)Bridge aighnment through the PA property should avaoid land targeted for immediate development (ii) KPA is uncomfortable with a bridge design that threatens to limit future access to the port by taller vessels inspite of all investiments made in upgrading the Port KPA operations require a navigation clearance of 69m above highest water level
	• KMA	(i) KMA supports the bridge but arranged to to issue a written report on their requirements on aeronautical and navigation clearance requirements.
	• Kenya Navy	(i) KN are objected to any strucuture on the Mtongwe side as it would expose them unnecessarily. KN are in favour of option D and issued a letter (Appendix 8.1.6) to this effect. (ii) KN have appointed a representative to the Coordination Meetings.
	• NMK	Bridge alignment should avoid mama ngina park which is a gazette national monument on account of historical and Archaeological heritage There is need for a more comprehensive CIA to precede bridge development for purposes of identifying and recovering cultural heritage.
	• KCAA	KCAA demanded to field a mission to the site to investigate applicability of navigation clearance for the MGB.
	• MCG	(i) MCG are clear on the need for a pedestrian passage within bridge design.
4	Coordination Forums	i) The great need to harmonize Bridge alignment to the masterplan for Mombasa Gate City particularly on decongesting Mombasa was adopted as policy ii) Option D was adopted as the preferred bridge alignment to be approached from both Lumumba Rd and Archbishop Makarios roads iii) A steel cable stayed bridge supported on 4 piers was adopted iv) The KPA requirement of 69m above highest water level for navigation clearance was accepted and adopted. v) Need for bridge design to allow for better connection to the Port to enhance flow of cargo trucks vi) The aeronautical height limit of 210m asl requires to be observed in bridge design vii) The Kenya railways indicated that FS for Mombasa Light Rail was ongoing and wished for the bridge to accommodate light rail to Likoni.

SN	Forum	Core concerns/ outcome
		viii) The NMK reiterated that development should avoid Mama Ngina Park and still required that a CIA precede bridge development. ix) On cost recovery, it was explained that pedestrians cannot pay for using the bridge and the idea of a Toll Station requires clarification in GoK Policy
5	Debriefing Meetings	i) Eng Mosonik started by acknowledging presence of Mr. Julius Korir, the PS for Ministry of Industrialization and Enterprise Development. Eng Mosonik then observed as follows: ii) The presentation shows commendable achievement by the Stud Team as expected. A lot of work had been covered. iii) He appreciated the proposed inter-linkage between the proposed bridge and planning initiatives by the Mombasa County Government mainly the Masterplan for Mombasa Gate City and has avoided duplication on on-going projects in Mombasa. iv) The proposed MGB will address decongestion which is a core concern in the Masterplan for MGC. v) On Security concerns, the PS observed that Mombasa area is prone to insecurity and hence the need to factor in security measures as proposed by the JST. vi) The PS fully supports idea of tolling the bridge in-spite of challenges faced in tolling KFS. vii) The PS hoped that the Kenya Nave had been consulted in the matter and was assured of the same. viii) The PS observed that he has no critical issue hence he opened the floor for discussion ix) Mr. Julius Korir, PS MOIED: He observed the need to emphasise security concerns especially over the bridge. There is need to secure all bridge users. He is overall happy with the project. x) Eng Samatar of KPA: He observed that position of bridge is away from Port and KN hence its acceptable and option D is most suitable. Other comments as follows:- • KPA is however concerned on the restrictions posed by an overhead bridge to future development given the maximum height adopted could restrict entry og bigger ships into the port in future. • KPA is not yet convinced that they can issue a No Objection given that the bridge will not solve problem of pedestrians considering that the capacity of the KFS is already saturated to the limit. Bridge will pose navigation problems as the 500m width given is not convincing. • The has been huge investment to increase capacity of port hence restriction by bridge will be contrary to the objectives in the port expansion. • Priority of the bridge viz a viz the port is not clear. Bridge will only address issues of traffic which will be resolved by the Mombasa Southern Bypass Road. xi) DR. Steve Mogere of JICA made 2 comments: • On Slide 3: What is the link between bridge with the SEZ. Instead of the bridge joining A109 at Kitaruni, why not proceed to join the SEZ directly. IN any case, support to the SEZ was listed as criteria in route selection. • On Island side, the concern is on positioning of new Nyali bridge. Option D will push the traffic westwards while Nyali bridge targets eastwards. Is it possible for Nyali to realign westwards in harmony with the MGB proposal. xii) PS reaction to Dr Mogere: Aim is to optimise on best options considering all impacts. Any issue emerging will be discussed to chart way forward. Need to always see the bigger picture by factoring in impacts of other proposed projects.

8.4: ROUND ONE CONSULTATION PROCESS UNDER ESIA STUDY

8.4.1: The Focus

Activities of the Feasibility Study Phase were aimed at assessing the viability and feasibility fio the proposed bridge project and this involved detailed assessment of environmental and social impacts. Consultations at this stage were aimed at interrogating specific concerns and issues emergent from the prefeasibility study.

8.4.2: The Strategy

Feasibility Stage/ detailed ESIA Stage consultations essentially employed Leaders Meetings as entry points to access both target communities and special interest groups. Issues emerging from this stage have essentially informed the impact prediction process and by extension, the ESMP prepared to resolve environmental and social concerns.

8.4.3: The Statistics

Appendix 8.2 provides a documentation of the Stakeholder Engagement Process during Feasibility Study/ Detailed ESIA Stage. A total of 29 formal meetings were held essentially to gather views form diverse stakeholders and when interviews held with over 2300 residents during Asset Inventory for RAP are compounded (Table 8.8), then over 2800 people (stakeholders) were easily met during the detailed ESIA and RAP Process. In sections, below, a synthesis of emergent issues is provided.

Table 8.8: Summary of Feasibility Study/ Detailed ESIA Stage meetings

Category of meeting	Details of meeting		Breakdown of attendance by gender		
	Date	*Venue*	*M*	*F*	*Total*
Leaders Meetings	07th Dec 2017	Royal Castle Hotel	59	27	86
	08th Dec 2017	A.C.K guest house	40	8	48
	14th Feb 2018	Mombasa County Government Senior Staff	5	2	7
Public Hearing meetings	09th Dec 2017	Peleleza primary school	76	18	94
	13th Dec 2017	Kibaki estate	53	19	72
	19th Dec 2017	Mtongwe polytechnic	45	24	69
Focus Group Discussions	9th Oct 2017	Kenya Ferry Service	0	0	6
	24th Jan	Meeting with KPA Operations	9	0	9
	26t Jan 2018	Dept of Transport and Infrastructure-MCG	10	0	10
	26th Jan	KeNHA-CRO	8	1	9
Meeting with Special Interest Groups	05th Jan 2017	Meeting with Fishermen at Bofu Maskani	39	0	39
	14th Feb 2018	Meeting with Kaya Elders at Bofu Maskani	5	0	5
		Security Meeting at Hon Mwahima compound	8	2	10
		Site Survey of MMS with JST/ Hon MM matter	4	2	6
		Meeting with JICA Nbi Office at KeNHA followed by site survey	4	1	5
Key Informant Interviews		14 Key Informant Interviews held in both Mombsa island and Mainland South	12	5	17
		Encounters with residents during Asset Inventory for RAP	932	1398	2330
Total by gender		**29 Formal meetings; over 2300 private encounters**	**1309**	**1513**	**2822**
Breakdown (%)			**46.4**	**53.6**	**100**

Source: This Study

8.4.4: Core issues arising from Design Stage Stakeholder Engagement

(i) Comments from the leaders Meeting at Castel Royal: From Mombasa Town, Leaders raised a total of 10 concerns as recorded in Table 8.9.1 below. Concerns were cantered on the following issues:-

i) Possibility of MGB Project being realised and time frames

ii) Security concerns in bridge operation

iii) Compensation for genuine land owners and squatters

iv) The fate of the KFS and pedestrian crossing

v) Modalities for information flow

Table 8.9.1: Summary of concerns from the Mombasa Island Leaders Meeting

Name	Organization	Question	Answers
Salim Mutiye	Property Owner	i) If Feasibility study goes to the final stage and it turns out to be every expensive route what will happen. Will the government abandon the project due to high cost of implementation?	You question is very important, seem you are warried that at the final stage the cost of implementation will go beyond the projected amount of 80 billion. However, the Gok is not saying that the project is costly;
		ii) Clarify on the term continuous engagement	Continuous consensus building: Continues consultation to come up to with the very best product
		iii) Are individual encroaching on existing road reserves eligible for compensation?	Most of the land targeted for acquisition is titled, except for the mainland south. But section 40 article 4 of the 2010 constitution allows for NLC to pay compensation for non-titled individuals.
Ben Agoye	Komako	iv) The highest point of the bridge is 69 meters and no building underneath the bridge; what measure have you put in place to enhance security of the bridge against terrorism?	Yes. There will be no building underneath as you have stated. However, there will be high security installations. Currently there are proposals for entry and exit control points. Additionally, bridges of this nature (Nyali and Mtwapa) are always considered for security. There will be constant security surveillance of the bridge. Consequently, construction underneath the bridge is highly discouraged due safety issues.
Ali Tongeresh	-	v) What will happen if the vehicles no longer use ferry, will there be a toll station? And will the bridge replace/abolish ferry services?	Ferry operates with levy fees collected from vehicles. Proposal is to establish a toll station for paying. A study was conducted and the findings revealed that people are willing to pay for the bridge to enable ferry to operate though only for pedestrian and also for maintenances. This bridge will be very high -69 meters- some transport means like Tuk-Tuk will not be allowed to use it because the wind speed and strength at the apex come disrupt cyclists and Tuk-Tuk. People and other disadvantaged category will continue enjoying free services as currently

Name	Organization	Question	Answers
			offered by Kenya Ferry Services.
Said Juma	Kenya Prisons – King'orani	vi) I need a clarification. Is prison/station going to be affected now that the area already have a dual carriage way?	The road starts at the Mosque. The prison wall will be affected. But we are quite aware that for prison, it is the wall and the towers that make the difference. In such, adequate mitigation measures will be put in place to maintain the prison environment.
Fatuma Mwidadi	Ganjoni Health Centre – University of Washington	vii) From the presentation its difficulty to identify the impact. My concern is on how future communications will be done. If affected can we start planning to move soon? We depend on research grants from the US and there is no any other clinic in the county offering similar Medicare as we do. All our plans are long term based.	The clinic is not affected by the project but in any case it is, then the county government will ensure that your activities are not interrupted. Only part of Bishop Makarios is affected but the bridge development will concentrate in the road reserve. There is going to be very small impact on the premise. More specifically, the team will come GPS to identify the corridor, measure the ROW and conduct inventory of all impacted assets. With this, we are able to know impact on land and what development exists on land/road reserve. A cut-off date will be declared and not only individual assets are going to be inventoried but also corporate PAPs. 100% inventory must be taken.
		viii) How soon should we plan to move?	Inventory will go up to end of January; KeNHA and public reviews to verify the findings; Detailed designs to take 2 years. In reality, do not start to panic. In any case you can only be asked to move your property after compensation. But as stated earlier, a lot of caution has been taken to minimize impacts.
Ben Agoye	COMARCO	ix) Do you have the list of the affected people? Can it be availed?	No we don't have the list of the affected persons. The team will move around to establish the extent of the corridor on ground and enumerate the affected land and properties. That is the only way we can generate the list.

Source: Thus Study

(ii) Comments from the Likoni Leaders' (ACK Guest House) Meeting

A total of 15 concerns (Table 8.9.2) were raised cantered on the following issues:-

- Arrangements for pedestrian accommodation on the bridge including physically challenged
- Modalities of accessing the bridge from Likoni
- Possibility of accommodating a light train on the bridge
- Security concerns on the bridge
- The question of price recovery and toll station
- Modalities and time frame in compensating for acquired land
- Modalities for conflict resolution in land acquisition
- Impact of bridge on fishermen and fishing based livelihoods

Table 8.9.2: Concerns from ACK Guest House Leaders' meeting

Name	Organization	Question	Answer provided
Walter	Truth Justice and Reconciliation Commission/TJRC	You have talked of a pedestrian lane fixed on the Eastern part of the bridge but this will be a long stretch definitely. Can there be elevators in the bridge to reduce on the height concerns for pedestrians?	The issue of elevator across the bridge is a good idea that is currently under discussion with JICA. Also under consultation is the issue of toll station.
Fatuma	Konza Sub location Assistant Chief	You said the bridge can be accessed from Jela Baridi and Ziwani; how will those living in Likoni connect to the bridge or they will have to go to Jela Baridi or Ziwani?	The bridge has several approaching bridges or lanes. Jela Baridi, Mombasa Sports Club, and Corner Mpya in Mtongwe road. Also about 2 Kms from Puma Primary near Mtongwe Barracks, the road will be a normal highway
Omari Raisi	Representative of Likoni Business Community	30 years to come, the population will be massive and the ferry will not be enough even for pedestrian, can there by an electric train over the bridge? or what will happen if the carrying capacity of ferry is over stretched?	Unfortunately the weight of the train cannot be supported by the bridge. Also train cannot go climb beyond 2% elevation gradient. Demand at the ferry will reduce with the bridge because commuters will go through town using the bridge.
No name	No organization	Weighbridge and box culverts are always ideal crime zones, How are you going to ensure security of these points?	Protection of the bridge will be of security concern to the government and even all of us. The area under the bridge will be under security surveillance and with constant monitoring at entrances and exits.
Mtinda	Representing People Living With Disability	Ferry services are currently maintained by income from vehicles, how will it be sustained when vehicles will be using the bridge? If the wind speed at the highest point of the bridge can blow off a tuk-tuk, what about wheel chairs in the pedestrian lane?	As noted before, the pedestrian lane will be closed with glass to protect against the wind strength and any suicidal missions among the public. The wheel chairs ramp will also be closed with glasses.
Salim mboga	Community Member	How are you going to handle dispute on land and structure?	Disputes on properties and land are anticipated and is a normal occurrence. However, the RAP team will not be solving any dispute but will take inventory of all assets and all the interested parties, The disputes or points of conflicts will be noted and transferred to NLC. The NLC will only listen to the complaints. If the complains are already

Name	Organization	Question	Answer provided
			registered with a court of law, the due process must be concluded and this will be out of NLC jurisdiction.
Walter	Truth Justice and Reconciliation Commission/ TJRC	Time frame, heard from a friend that people are kept waiting for a long time before the compensation is done. On the 40% employment of locals, in most cases the locals are always ignored.	The time frame for the entire project period has been discussed. On compensation, we hope that by the end of December 2018, the process will have commenced. However, even if we have inventoried your plot, no one stops you from continuing with your development until you are given notice to stop. Compensation depends on several issues. The 40% local participation is a requirement by the government. This can be achieved through supply of local materials and labour. Tender can be given to local firms or youth groups but the groups should be well organized and recognized.
A/C Fatuma		The huge support pillars may affect the activities of fishermen denying them access to their livelihood.	Impact on the fishermen is eminent but their interest will be covered in another forum that involves the entire BMU members.
Henry Kago	Business Man	Toll station payment will disrupt business at the ferry point. We also fear that ferry will start charging pedestrians.	Ferry charging on people is the most feared even among politicians. If you introduce charges to the people you are sure of even losing your political seat. It is a government policy that no one is charged when crossing the channel as a pedestrian.

Source: This Study

(iii) Comments from Public Hearing Meetings:

Peleleza primary: Comments from the Peleleza Primary Sch meeting are summarised in table 8.9.3. Core issues emerged as follows:-

- Community support the proposed bridge
- Modalities for payment of compensation for displacement and other risks in bridge construction
- Timeframes in project development including identification of PAPs
- Modalities oof accommodating physically disabled in the pedestrian passage
- Concerns that locals may not access jpobs in bridge construction
- Compensation of assets within riparian reserve
- Compensation for public owned assets
- Modalities of determining the road reserve of 60m

Table 8.9.3: Comments from Peleleza Primary Sch Meeting

SNo	Name	Question/ remark	Answer
1	Juma Manuari	i) The idea to construct a bridge connecting the island and Main land is a good idea, we appreciate the planned development. But when is the compensation going to take place, before or after construction?	i) Compensation will take place before the project begins after which a three month notice will be given to allow for peaceful relocate. ii) Before compensation, two committees will be formed: PAPs committee and Grievances Redress Committee. iii) Vulnerable individuals will also be identified. The constituted committee will assist the vulnerable to ensure justice is delivered. The Vulnerable include orphans with less than 18 years, people living with disability and the elderly. iv) If land and assets have disputed ownership and court process is underway, the final verdict from the courts shall prevail. However, we are advising for early arbitrations to mitigate compensation delays.
2	Juma kizuri	ii) When will the project start and end? iii) How are you going to compensate other impacts eg the risks, will there be a risk analysis in your work?	v) The research period is expected to take two years after which the construction period will take four years; vi) By the end of next year all compensation process will have been concluded; vii) Three months' notice to move/relocate with all important materials salvaged will be issued to all PAPs viii) Baseline surveys on Air quality, Vibrations, Marine ecology, noise levels among other will be conducted to manage risks and monitor change overtime.
3	Musa Omwanda	iv) How will you consider the disabled and other human traffic when developing the pedestrian lane?	ix) The pedestrian lane will be spiral to allow for wheelchair movement. x) Ferry services will also still be operational.
		v) The 40% required for local participation may not be realistic. Most local companies (Base Titanium was cited) to not provide opportunity for the youths; not even supporting activities such as football clubs. Also, local employment to incorporate companies owned by local people and first priority to be given to local people.	xi) It is a government policy that 40% of all labour (semi-skilled and skilled if available) should be sourced from the local community and that 40% of all contracts should be awarded to the locals. However, a clear line should be drawn between Corporate Social Responsibility (CSR) and local participation in projects. Your question has mixed views. CSR is percentage given back to the community at operation phase of a company eg Bamburi Cement can decide to build schools and roads from the benefits the company has received. The 40% requirement in reference is local participation at construction period.
4	Amedi Hamisi Mwanga	vi) We are fishermen and our homes and assets are in the riparian reserve owned by KPA – Kenya Ports Authority, how will compensation of such be	xii) Riparian land belongs to the government. But the constitution under article 40/4 provides the guidelines for negotiations and compensation under such circumstances. The government will not compensate for affected assets and leave you without land.

			done noting that we don't own any other land elsewhere?		
5	Japheri wa Insaka	vii)	What is the way forward on land owned by the community?	iii)	Any community project will be compensated but proof of community ownership must be demonstrated. Records of registrations of community group, minutes and other statutory documents will be required for ease of enumeration.
6	Juma Bakari	iii)	When will you identify Persons Affected by the Project? Because following your explanation, it apparent that the PAPs should be Identified first.	iv)	The team is ready to undertake full inventory even today. What we need is an agreeable date. We will also require two village elders to guide the RAP team in identification of land owners. We will also need 4 youths to assist as in enumeration. The enumerators will be trained but must have at least diploma certificate in any field of study.
7	Mohamed Juma Kawingo	ix)	Where will the 60 meters start at?	xv)	From the age of the water mark, a Centre line/middle of the road will be established by the RAP team, them from this middle line, 30 meters both sides will be measured physical to provide limits of our inventory. Everything falling within the corridor will be documented.

Source: This Study

Kibaki Estate Meeting: This meeting was called for residents of the Shika Adabu Section of the traverse. Concerns are summarised in Table 8.9.4 with core issues raised as follows:-

- Modalities for processing compensation monies
- Procedures for utilising land already inventories for RAP
- Timeframes in Project Development
- Modalities for benefitting communities traversed
- Modalities for compensating public properties
- Modalities for compensating for mosques, churches
- Certainity that compensation will be paid given past experience

Table 8.9.4: Comments emergent from Kibaki Estate (Shika Adabu Meeting)

SN	Name	Question/ comment	Answer
1	Mwakodza wa Kodza	i) Is there a custodian to the amounts paid by the NLC or its solemnly the owners?	i) The government has put in place measures where compensation monies go directly to the affected persons. ii) The national lands commission advises that accounts where such amounts are to be transferred be opened together with the spouses for accountability purposes.
2	Mohamed Athman	ii) How will people get information on the RAP	ii) Was advised that the whole group attending the meeting gives a specific

		process will be underway?	day in which they would all set aside for the exercise to take place in their area.
3	Malumba	ii) For those with ongoing developments, should they stop?	iv) Construction and any development on the piece of land should continue until the day when NLC compensates, then it can stop and a three month notice is issued to relocate.
4		iv) When is the construction due to start and how long will it take?	v) The designing stage is set to take two years up until end of 2019. vi) Construction process to start in 2020 and will take four years. vii) The project will cost 80 billion.
		v) What are the measures put in place to ensure that the project benefits the locals?	iii) It is a requirement that 40% of the participation goes to the locals, eg the supply of raw materials and also that of skilled and unskilled labour. ix) During the implementation, committees should be formed by the locals to ensure they front the suitable personnel's for the job.
		vi) How will the public facilities affected be compensated?	x) Such can be paid cash wise to the relevant authorities, but if the committees formed can agree that such facilities be moved to a different place and be constructed there.
5	Mohamed Ali Mwawito	vii) How are mosques, churches and schools handled?	xi) In most cases such amenities are avoided during alignment but if inevitable, committees are formed to give a way forward on the compensation of such.
6	Bwana Mwingi Mwabibi	iii) Complained of being man handled by the NLC commissioners and that he was not compensated for his open field on another project (southern by-pass)	xii) He was convinced that the compensation on the said project had not begun.

Source: This Study

Mtongwe Polytechnic Meeting: The meeting was called for Mtongwe Location residents whose comments are summarised in Table 8.9.4. Core issues include:-

- Fears that the project is a scheme by individuals to grab land
- On width of the road reserve to be acquired
- Modalities for compensation including to non-displaced roadside neighbours
- Modalities for mitigating pollution
- Modalities for preparing communities for relocation upon displacement

- Modalities for compensating non property owners eg tenants

Table 8.9.5: Comments from Mtongwe meeting

SNo	Name	Question/ comment	Answer
1	Geoffrey Adans	How sure are you that the project will be implemented?	This is a GOK Project with very high priority.
		Can we continue with more developments on our properties?	The only organization to stop developments on such properties will be NLC and that will be after full compensation has been done.
2	Eric Amollo	He noted it is a good project but with challenges such as land grabbing from the community. What will stop people from building on the road reserve to avoid displacement? Is it possible to stop the project with a court order?	The environmental expert stated clearly that he had not been sent by anyone to look for land to grab. Highways are wide thus requiring more land. When there is no agreement with the NLC, one is free to go to the environmental court.
3	Reuben Nderitu	Is the 90 Meters total area of acquisition?	Yes the 90 meters acquired is the total area and the contractor is limited to work from that area during implementation. The acquisitions done for highways by the government is done on the higher side to avoid future acquisitions in the future.
3	Stephen Mwakisla	What form of compensation will be used? Is it land for land resettlement or compensation? What will happen to the non-impacted homes next to the road? How to deal with the pollution during implementation like water at the creek and other forms of pollution like noise and dust?	Compensation will be done as either land for land or cash compensation. The amounts compensated will beat the then market price such that the affected can comfortably acquire land close to where they were living. There will also be a 15% disturbance fee. Each home next to the road will get an entry to their compound. the road construction is being done away from the creek, also a lot of research is being undertaken so as to come up with a solution to Mitigate all forms of pollution experienced during the implementation stage.
4	Rashid Salim Shame	How will you prepare members psychologically before displacement?	The NLC will prepare people and also give guidance on the resettlement project.
5	Elizabeth Mwayala Cose	How will they relocate before compensation?	Relocation cannot be before compensation is done by the NLC. After compensation, a notice of at least four months is given for members to look for new places to relocate to.
6	Triza Awour	In case of families employed and the property of the employer is the one being affected, how such will be treated?	There is always a provision for other persons affected other than the property owner.

(iv) Comments from Focus Group Discussions

Diverse Groups were met for purposes investigating specific aspects of the Gate Bridge Project. Appendix 8.2.5 provides a record of proceedings with brief summarise provided in Table 8.9.6 below. The main issues emerging included:-

- Possible impact of bridge development of the KFS operations
- The growing traffic of passengers and vehicles daily relying on the Ferry Service ro cross Likoni Channel
- Possible interference with navigation and port operations during bridge construction
- Security threats posed by bridge construction
- Security threats posed by bridge structures to vessels operating in the channel

Table 8.9.6: Summary proceedings from Focus Group Discussions

Group	Meeting date and Venue	Matters discussed
Kenya Ferry Service:- AM Washenga Operations manager; Morris Kai-Projects Manager	9th October 2017 at KFS Likoni	Meeting had been called by the JST to obtain data about ferry operations. KFS informed JST that current ferry traffic is 320, 000 passengers and 6000 vehicles daily. Each Ferry has a capacity of 60 cars and 1400-1500 passengers. New ferries have capacity of 2500-3000pax. KFS operations are 65% funded by GoK with revenue accounting for reminder 35% mainly through charging of MVs. KFS will loose this revenue once bridge is operational but can divest to other areas given its national mandate. KFS advised that a cable was being planned for at Likoni for mass transport. Decision was awaiting cabinet approval.
Meeting with KMA: Capt. Muli	9th Oct 2017, KMA head office- Msa.	KMA is concerned about security threats posed by the Inshore Pillar for Mombasa Gate Bridge. It was explained that the Pillar would be located outside the main navigation channel and an allowance of 150m would be maintained giving a 600m wide channel for navigation. The Pier would be covered with rubber venders to protect small vessels navigating within vicinity of the pier.
Kenya Ports Authority:- Cap Namadoa, Capt Abdule Ali, Capt Onyango, David Onyango	24th Jan, KPA-Control Tower	Meeting had been called by the JST to request for modalities for partial closure of the channel during bridge construction. JST reported that construction of Center Span would require closure of the channel by buoys which would reduce the navigation width to 150 for a continuous 8

Group	Meeting date and Venue	Matters discussed
		months. A daily closure of 8 hours continually for 8 days would be required. i) KPA observed that closure of the Channel would disastrously affect economic activity in the hinterland as far spread as Rwanda, Burundi and DR Congo and is thus not acceptable. ii) It was suggested that nighttime construction when big vessels are fewer be considered. KPA could arrange for convoy movement of vessels to optimize on time and safe on costs especially for European, liquid and gas bearing vessels whose charter rates are quite high. iii) During the convey movement, buoys will be temporarily moved to create room for vessels to pass. iv) Other stakeholders such as the Kenya Navy and all international carriers will be notified (pre-warned) of the ongoing construction so as to observe caution. v) During construction, all vessel movement will be authorized and coordinated by the KPA Contro, Tower. All floating vessels will have appropriate lighting during day and night and working area will have flashing red lights will maintain contact.

(v) Comments from Special Interest Groups

Appendix 8.2.6/7 provides documentation of meetings held with fishermen and Kaya Elders operating in the mainland south area. A summary is provided in Table 8.9.7 below but core issues were raised as follows:-

i) Impact on fishing based livelihoods and assets

ii) Impact of physical cultural resources including sacred shrines

iii) Impact on ancestral properties including graveyards

Table 8.9.7: Comments from Special interest groups

Group	Date and venue	Concerns raised
Fishermen/ Likoni Beach Management Unit	5th Jan at Bofu Maskani	Group will lose two fish landing site;- Mvumoni and Mkokoni next to the bridge Fishery breeding grounds along Mweza creek will be displaced by bridge pillar Some fishing sites including pen traps will be displaced by both construction and construction area Mwenza Creek is usually the only fishing ground when sea is hostile in May, June, July and August Kuzi season when fish

Group	Date and venue	Concerns raised
		also migrates to the creek. Mweza creek mangroves are a breeding ground for fish and baits (chambo).
Kaya Elders	14th Feb 2018 at Bofu Maskani Self Help Group	Meeting was convened through the Likoni Chief for purposes of explaining entitlements for cultural assets when encroached. Six Jaya Elders were met as documented in Appendix 8.2.7 with issues raised as follows:- • Kaya Elders appreciated their being recognized by the ESIA Team • All are in support of the Project. • Group oversees four community shrines;- Kaya Makame (includes the baobab next to the main pier in mainland south), Mgadini, panga Wazi and Vijiweni all of whih serve diverse purposes in traditional religious worship • Elders are concerned that part of Kaya Makame which is the main Kaya will be displaced by the bridge and this can only if preceded by local rituals. A quotation in items required towards this including pacifying all the other shrines was provided (Appendix 8.2.7). • Access routes to Shrines could be blocked by propose bridge in which case, access routes should be provided.
Meetings with Hon Mwalimu Mwahima	Diverse dates in Dec 2017/Jan 2018	Meetings were held to understand Hon Mwahima's opposition to the route traversing through his compound. He explained that his hse is over 300yrs old and hence ancestral and the adjoining family graveyard dates back several centuries (his great grandparents) as well.

Source: This Study

(v) Comments from Key Informant Interviews

Documentation of Key Informant Interviews held under auspices of detailed ESIA Study is provided in Appendix 8.2.8. Core issues emerged as follows;-

8.4.5: Summary of outcome from Stakeholder Engagement

From SH engagement conducted during detailed ESIA Stage, core issues were documented which went to inform impact analysis as documented in Chapter Ten below. A total of 16 comments emerged from the stakeholder engagement process and the same were analysed in further stages of the Study. Core issues include:-

i) Possibility of MGB Project being realised and time frames

ii) Security concerns in bridge operation

iii) Compensation for land owners, squatters, public assets and squatters in public reserves

iv) The fate of the KFS

v) Modalities for information flow

vi) Arrangements for pedestrian accommodation on the bridge including physically challenged

vii) Possibility of accommodating a light train on the bridge

viii) The question of price recovery and toll station

ix) Impact of bridge on fishermen and fishing based livelihoods

x) Community support the proposed bridge

xi) Concerns that locals may not access jobs in bridge construction

xii) Modalities of determining the road reserve of 60m and fears that the project is a scheme by individuals to grab land

xiii) Modalities for mitigating pollution and other impacts

xiv) Modalities for preparing communities for relocation upon displacement

xv) Impact on physical cultural resources including sacred shrines

xvi) Impact on ancestral properties including graveyards

8.5: ROUND TWO CONSULTATIONS UNDER ESIA STUDY

8.5.1: The focus and nature of meetings

The Second Round of Stakeholder meetings was held in conformity with JICA requirements to meet the following objectives:-

- To disclose findings of the ESIA and RAP Reports to all PAPs and Stakeholders
- To disclose the Entitlement Matrix to PAPs
- To afford all PAPs an opportunity to inspect the Assets Register and ascertain correct capture of their interests.

A total of 5 meetings through which 850 stakeholders comprising leaders, PAPs and residents in both Mombasa Island and Mombasa Mainland South sections of the MGB traverse were held as summarised in Table 8.9.8 below. The meeting with Likoni Beach management Unit (BMU) members who comprise fishermen and fishmongers was preceded by a meeting with the fisheries department who guided on the approach to disclosure with fishermen.

Table 8.9.8: Summary data for the Second Round Stakeholder Meetings

SN	Target of Meeting	Site	Date	Attendance
1	Mombasa Mainland South Leaders	ACK Guest Hse	28th May 2018	72
2	Mombasa Island Leaders and PAPs	Castle Royal Hotel	29th May2018	174
3	Shika Adabu and Ngombeni Location PAPs/ Villagers	Kibaki Estate	22nd May 2018	265
4	Likoni and Mtongwe PAPs /Villagers	Bofu Maskani	20th May 2018	221
5	Likoni/Mweza Creek Fishermen	Bofu Maskani	30th May 2018	118
		Total		**850**

Source: This Study

8.5.2: Outcome of the Leaders Meetings

Appendix 8.2.9 provides a full documentation of the outcome of the Round Two Stage Consultations with core issues being summarised in table 8.9.9 and briefly highlighted in sections below. Essentially, 36 of the 44 comments received touch om matters of compensation and only 4 relate to environmental and social impacts. The implication is clear, displacement from property, shelter and livelihood is the most critical concern in developing the Mombasa gate Bridge Project.

Table 8.9.9: Summary of issues form Second Round Stakeholder Meetings

Target of Meeting	Core concerns
Mombasa Mainland South Leaders	1. 40% local participation in labour and supplies of local materials before, and during construction of the bridge to favor local community. 2. Provide clear timelines to help PAPs plan adequately for relocation. Only relocate people when the project is ready to start. 3. Compensation to be adequate, fair with family set up consideration. 4. During planning, involve all institutions to avoid duplication of other projects and destruction of newly expanded infrastructures. 5. Update asset register few months before project commencements to capture real business tenants and new businesses. 6. Besides plants species, document impact of project on marine life and capture those that are critically endangered. 7. The proposed Bridge construction will highly improve likoni but also bring in new speculators 8. The Cut Off Date proclaimed during entry meetings to remain in force and all should guard against influx of new commers. Land owners to however continue developing their land until otherwise communicated by NLC. 9. Training of PAPs in financial management prior to compensation; and 10. No relocation until all upfront and full payments is made to PAPs.
Mombasa Island Leaders and PAPs	11. Do you have an online presence where one can get all this presented information for more details? 12. Can the asset/PAPs register be shared on email? 13. What was the outcome of EIA study on Mangrove biodiversity? 14. Are their provision for matatu terminus at the end of the Bridge in Jela Baridi 15. How is the cultural diversity of Mombasa reflected in the architectural design of the Bridge 16. Mombasa has a Swahili Cultural Centre, consider consultation with the organisation 17. Valuation process. Who is going to do the valuation? Is it NLC, Government valuer, property owners or KeNHA 18. Are there provisions of light rail in the bridge? 19. Noise levels are already escalated based on the findings of your study; Liwatoni residents do not want further noise. This will cause people to relocate far from the area 20. You talked of encountering some challenges during the inventory process, we as KAR A –Kenya Residents Association would want to know what challenges you faced in the cause of your work. 21. When is the construction/or ground breaking likely to start 22. What is the fate of those that were not inventoried due to absence during the study period 23. How are you going to approach compensation on impacted graves 24. Does your asset register have entries of affected plot numbers and affected areas?

Target of Meeting	Core concerns
Shika Adabu and Ngombeni Location PAPs/ Villagers	25. What is the fate of properties in Honorable Mwahimas' plots- the plots were not inventoried due to constant resistance from Mwahima neighbours. 26. 100% and 15 % Compensation as outlined in the entitlement matrix is far from adequate. What guided the matrix on 115% (100% and 15% top up) replacement value? Raise total compensation to 150%. 27. Loss of rental income to be compensated beyond 3 months. Most rental houses have new tenants every time. Tenants that are documented today may be missing next month. 28. During compensation, outstanding loans attached to properties to be cleared by the government without reducing the compensation package for an individual.
Likoni and Mtongwe PAPs /Villagers	29. Business tenants and residential tenants to be compensated by the government not landlord; 30. Bridge academy should be compensated and relocated because teachers will not teach with construction ongoing. 31. How will compensation be done: in-kind, cash or through cheque. 32. What mechanism does you in place to ensure that non-titled landowners are also compensated?
Likoni/Mweza Creek Fishermen	33. Genuine list of fishermen to be generated in the BMU and harmonized with that of fisheries department in Likoni. We request that the list of beneficiary to be generated here in the meeting because all fishermen are here. List generated by fisheries cannot be trusted. We had experienced this during dredging of the channel by KPA recently. List from the fisheries was populated by non-fishermen particularly motorbike owners who have nothing to loss. 34. We are operating in the same area (fish sellers, traders' boat owners, net owners etc) Impact on a fisherman extends to all others. As such fair compensation for all at equal costs regardless of category. We have to be treated alike. 35. All fishermen to be compensated and given a boat for fishing away from bridge construction area. Fishermen to be compensated following their categories, landing sites to be improved and if possible let the affected fishermen to be given employment during construction of the bridge as an alternative means of raising livelihood. Contractor to sign MOU with the fishermen on employment of fishermen during project construction. 36. Improve the remaining 4 landing sites with capacity to handle all our docking needs. At least every landing site must have a vessel for fishing if compensation is fair. Do not include Mwangala BMU in our compensation package. If given fishing equipments as compensation for livelihoods restoration, the equipments to be at our landing sites not county fisheries because even the boats that were procured by county government is not helping us. 37. Compensation to be monthly or yearly or a lump sum amount given once and for all. Because if possible let it be by monthly installments for ease of sustainability. 38. The fishermen need to be trained and capacity build. Likoni BMU to have a boat manufacturing factory to enable fishermen to buy their own boats at a reduced cost. 39. Provide compensation for 6 years advance payments before start of construction. The government to sign MOU with the fishermen indicating when to get receive fair compensation.

Target of Meeting	Core concerns
County Government Chief Fisheries Officer	40. Even though Likoni BMU is severely affected, other BMUs are most likely to have impacts on reduced fish catch because the Mwenza creek is the breeding area for all marine fish found in the near shore and adjacent areas. 41. Conduct studies to assess directly and indirect loss of livelihoods. 42. As a matter of policy, each BMU is constituted by 160 fishermen and includes all categories that is boat owners, fishmongers, food vendors etc. 43. Compensation package to include the six listed BMUs because impact on marine fish has no defined boundaries; Likoni BMU, Shikaadaba BMU, Timbwini BMU, Mtongwe BMU, Mwangala BMU, and Old town BMU.

Source: This Study

Opening Statements by KeNHA:

Both Leaders Meetings were presided over by an officer from KeNHA Coast Regional Office. In her remarks, Petronilla elaborated on the role of KeNHA as the GoK mandate holder in developing and maintaining the national trunk roads network including the Mombasa Gate Bridge. KeNHA would therefore be responsible for implementing all recommendations made from the RAP and ESIA Studies. She then gave an overview of the proposed MGB, it objectives and role in national and regional development.

With regard to the disclosure meetings, she welcome all to make objective remarks noting that this meeting is just one in a series of many others planned for the future. At the Mombasa Island Meeting, she was categorical that the Assets Register will only be discussed with individual PAPs and by the NLC.

Presentation by the ESIA Team:

Discussion in both the Leaders meetings was based on a presentation made by the Team Leader for both ESIA and RAP Studies. The presentation was structures as follows:-

- A disclosure of the design and alignment of the MGB Project
- Discussion of the alignment of MGB in both MI and MMS
- Overview of the ESIA and RAP Process including the role of local enumerators and village elders in the Studies
- Overview of the findings from the ESIA and RAP Studies
- Overview of core Environmental and Social Impacts during construction operation of the Project
- Overview of the scope of displacement impacts in both MI and MMS
- Overview of the ESMP
- Overview of the RAP inclusive of the Entitlement Matrix
- Way forward with both the RAP and ESIA Studies

The Mombasa Leaders meeting was also used to disclose the Assets Register which was availed for scrutiny by all PAPs present.

Reaction from participants in the Mombasa Mainland South Leaders Meeting:

The ACK Guest House brought participation of many leaders among them the Local Member of Parliament-Hon Mishi Mboko and two Members of the County Assembly representing wards in Likoni Constituency. The local MP expressed full support for the MGB but emphasised that fairness has to be observed especially with regard to:-

- Compensation for displacement

- Allocation of opportunities such as skilled and semi-skilled employment and business contracts emanating from the Project

The MP also lamented the common trend of delays in effecting compensation for lands targeted for acquisition. Being unsure of when they shall be required to relocate, such property owners are unable to make decisions on whether to develop their properties and this denies them opportunities to earn their livelihoods thus contributing to poverty build up. Her appeal is for prompt payment for all properties targeted for displacement to allow for PAPs to easily rebuild livelihoods.

Comments from Mombasa Island Leaders Meeting:

The Mombasa Island meeting was presided over by the Deputy County Commissioner for Mombasa Island who welcomed all to contribute positively to the deliberations. He observed that Public Participation is a requirement of both the National Constitution and other laws. The meeting progressed well and recorded an attendance of 174 participants, mainly potential PAPs which was way above the target of 80. The meeting was orderly and there was no recorded incidence of opposition to the project.

In addition to reactions as captured in Table 8.99 above, other core observations were made as follows:-

Impact of bridge on the cultural landscape: Concern was raised by 2 participants that the bridge would irreversibly change the cultural landscape of Mombasa and wondered how this could be mitigated. Their recommendation was for the bridge design to consult widely on the question of culture so as to inbuild as cultural heritage as possible into the new landscape. The work already started by the NMK should be continued.

The question of noise pollution: Given the already observed high noise level in Mombasa, it was feared that, concentration of traffic by the bridge in Ganjoni area would further aggravate noise levels and make the area non-habitable. Bridge design would look into ways of mitigating threat of new noise levels.

Impact on mangroves: To the participant who enquired on the potential impact of the MGB on mangroves and associated biodiversity, it was clarified that the bridge will have limited impact on mangroves whose main colony in the Mweza creek is not impacted directly. However, other biodiversity is affected.

On traffic congestion in Mombasa Town: It was observed that opening of the bridge would make it possible for public service vehicles from MMS to enter Mombasa Town thus aggravating traffic congestion and noise levels. It was further enquired whether bridge planning has made provision for BRT, Light rail or ample modalities for traffic management. In reply, the meeting was informed that while the MCG will put in place modalities for traffic management, alignment of the MGB to the west of Mombasa was an intervention in rerouting traffic away from the CBD hence decongesting the town. Bridge design however cannot accommodate a light rail because of weight considerations.

8.5.3: Outcome of the Public Disclosure Meetings

Both Public Hearing Meetings at Likoni and Shika Adabu were used to disclose the Entitlement Matrix for all displacement impacts while pointing out potential environmental and social impacts. In

keeping with the general pattern, most reaction centred on displacement impacts anticipated from the project. Other pertinent issues emerged as follows:-

On the question of residential tenants: It was observed that this category of PAPs are highly mobile and rarely stay in one premises beyond six months. As such, the list of tenants at compensation stage will be drastically different from that prepared during inventory for RAP and the same case could extend to business Tenants and all other PAP categories. This will necessitate a revalidation of the Assets Register before compensation.

Fate of Hon. Mwahima and his neighbours: Some residents of Shika Adabu enquired on the fate of Hon Mwahima and his neighbours who had stubbornly resisted efforts to inventory their property. The RAP Team had no ready answer at this stage only responding that engagement with Hon Mwahima at higher levels of government will be intensified.

Disruption of village life including schools: A representative of the bridge Academy situated neat the proposed weigh bridge observed that construction activity will greatly disrupt village life and interfere with operation of the school because of noise, dust, danger to children etc. This is indeed a core concern for the entire traverse which will require careful management through participatory regulation of the Contract for Works to ensure minimal disruption of life.

8.5.4: Outcome of the Public Disclosure to Fishermen

This meeting was attended by 118 fishermen who are members of the 500-member strong Likoni BMU. It was explained that compensation would only target replacement on two landing sites to be displaced by the bridge and income replacement during days when fishermen will not access the sea due to bridge construction. Core issues emerged as follows:-

Genuine list of BMU members: This list is contended. While the fisheries department insisted on providing the genuine list of BMU members, the meeting insisted on preparing their own which is also contended on claims of being infiltrated by non-members. The RAP team was guided by a revalidated list for the two landing sites of Bofu and Kokotoni whose membership totals 61.

The compensation package: The compensation package demanded by fishermen is wide but to cover loss of livelihood, capacity building for deep sea fishing, boat manufacturing, complete buyoff from fishing etc.

8.5.5: Proceedings of the meeting with the Fisheries Department

This meeting was held sat he request of the County Executive Member in charge of Fisheries at Mombasa County Government. His position that only his office should produce the genuine list of BMU members who should be registered and paid up however goes contra to the policy of this RAP which is to rehabilitate all livelihoods likely to be displaced by the Project. As well, the requirement for the project to compensate all other BMUs operating in Likoni Channel may not be tenable given that the RAP only makes provision for livelihoods that are directly displaced by the proposed bridge. As such, other BMUs whose landing sites and access to sea are not affected are not genuine foundation for compensation.

8.6: WAY FORWARD WITH THE STAKEHOLDER ENAGAGEMENT PROCESS

Stakeholder engagement is a continuous process. With the ESIA process now proceeding to the

Public Review Stage, it is expected that more stakeholder comments will be received to further shape and inform project development.

CHAPTER NINE: ALTERNATIVES TO THE PROJECT

9.1: OVERVIEW

In this section, alternative approaches and options towards securing project alternatives have been explored to ensure rationalized selection of the most optimal investment package. Such analysis is a statutory requirement for all ESIA Studies under Legal Notice 101 of EMCA 1999 whose Regulation 18(1-i&j) requires an analysis of alternatives including project site, design and technologies and reasons for preferring the proposed site, design and technologies. In line with this requirement, an extensive analysis of alternatives was undertaken in respect of the Mombasa Gate Bridge Project as outlined in sections below.

9.2: BASIS FOR ANALYSIS OF ALTERNATIVES

9.2.1: Levels in Analysis of Alternatives considered

In the analysis of alternatives in respect to the MGB, several criteria including the three specified in Regulation 18(1) (i) & (j) of LN 101 were further amplified as follows:-

Criteria One: Merits of alternatives alignments

- Does the site optimize on net economic benefits
- Does site selection minimize on social, economic and environmental impacts
- Does site selection harmonize with land-use plans as influenced by the physical layout of the land among other factors
- Does site selection resonate with local felt needs

Criteria Two: Alternatives to the preferred design: Issues considered included,

- Alternatives to the entire projection of MGB Project as currently proposed
- Alternatives to bridge type as proposed
- Alternatives in the provision of ancillary facilities

Criteria Three: Analysis of the Zero Option

- Past, current and future effect/ impacts of the road as currently existing
- Anticipated benefits of proposed upgrading.
- Any other considerations

In sections below, reasons behind decisions made in respect of the Roads are rationalized under specific headings below:-

9.2.2: Approach to the Analysis of Alternatives

Assessment of alternative alignments largely applied to the Mombasa Northern Bypass component of the project which will involve creation of a new reserve where none exists currently. A total of 9 alignments lumped in four categories; A, B, C&D were were considered as illustrated in Fig. 9.1 and tabulated below.

(i) Preliminary analysis:-

Table 9.1 provides a description of all the four (A, B, C,&D) groups of alignments considered. The alignments underwent preliminary screening based on fundamental criteria namely;- (i) Potential impacts on Mama Ngina Park and, (ii) Threat to encroach on military privacy at Mtongwe Barracks based on which six options;- A0, A1, B1, B2, B3 and C were eliminated leaving 3 options to undergo detailed screening.

Table 9.1: Core features of the nine alignments for the MGB

Alignment Group	Options	Core Feature	Preliminary Screening
A	A0, A1, A2, A3	A1, A2 and A3 all start from the Mombasa Southern Bypass Alignment in Ziwani lake area of Kwale, traverse Shika Adabu to cross the Mtongwe Rd at the Post Office, thereafter tracing the channel of Mweza Creek in Mtongwe, turning right at Javi ka Wageni area, and attempt to cross the channel near the current ferry ramp area namely near Base Titanium complex for A3, Ferry Terminus for A2, YWCA compound for A1 and further East of A1 for A0. Both A) and A1 traverse Mama Ngina Park which is a gazetted National Monument	A0 and A1 traverse Mama Ngina Park and were thus rejected. A2 and A3 were subjected to level two screening.
B	B1, B2, B3	The B options, also called the Mtongwe option originate from the Mtongwe area of MMS with B2 and B3 passing overhead the Mtongwe Ferry Terminus near Bandari College on Island side. B1 passes overhead the Kenya Navy barracks at Mtongwe to join the other B options at the Shimanzi corner on Moi Avenue	Development of options under B category was considered prejudicial to operations of the KDF at Mtongwe Barracks and all options were rejected.
C	C	Option C is a variation of option D below. The bridges turn to the Northwest at Puma Primary and then proceeds along the B2 and B3 alignment from Bandari College.	The C option crosses the creek at an angle implying that vessels navigating would also approach at an angle and this was considered unsuitable for navigation purposes
D	D	Options D is a variation of the A options in that, at Javi la Wageni, the Bridge takes a straight northward trajectory to cross the channel overhead Puma Primary, crossing overhead COMARCO, Ganjoni, Moi Avenue (immediate west of Canon Towers), Railway Station to tiouch down on Lumumba Road at Kingorani Prison.	Option D was found viable and hence proceeded to further investigations.

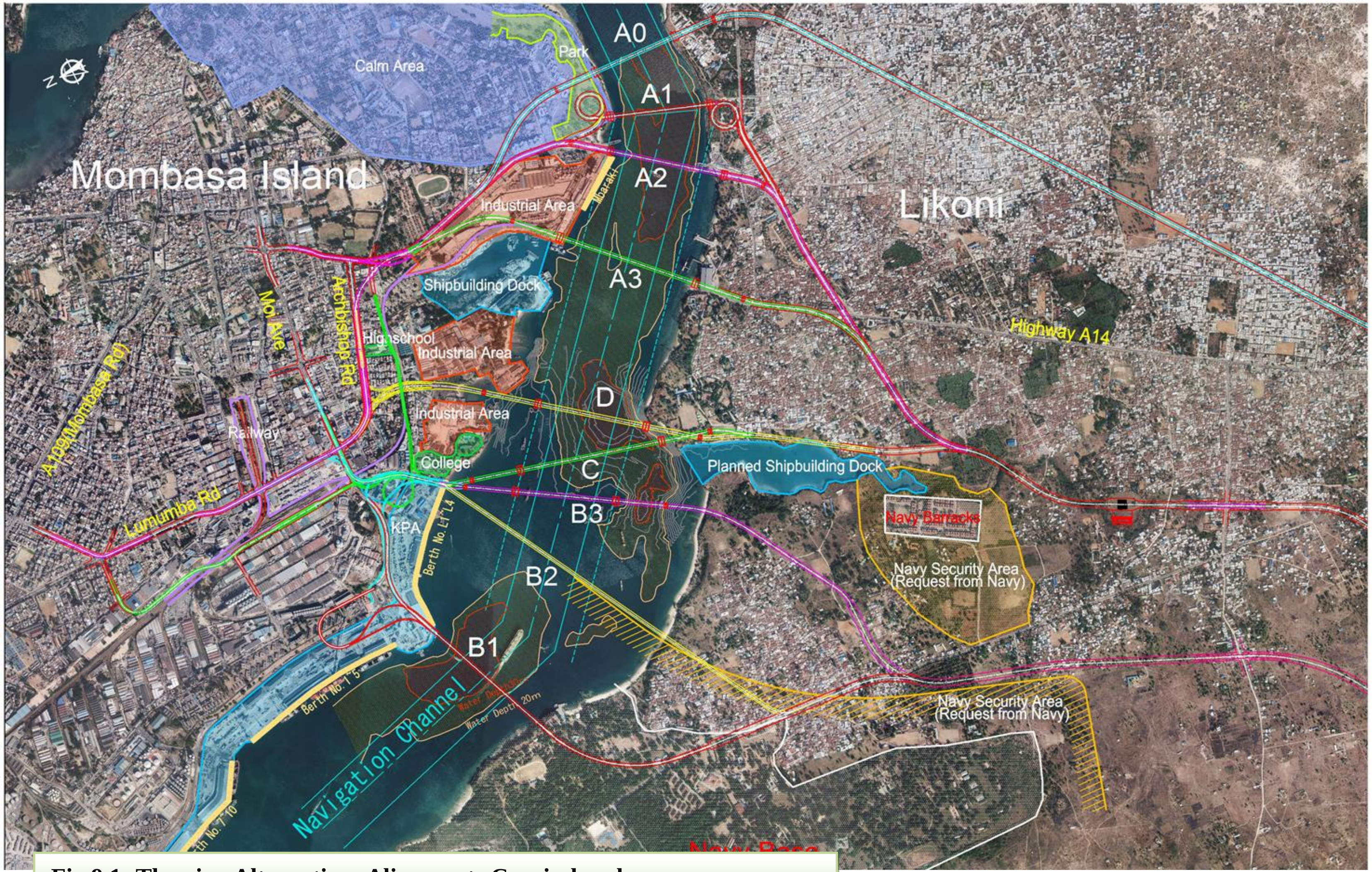


Fig 9.1: The nine Alternatives Alignments Consindered

Table 9.2: Level two analysis of alternatives

(ii) Technical level analysis:-

The process and outcome of the technical evaluation of options A2, A3 and D for suitability is documented in Appendix 9.1. A highlight of the criteria and process adopted in analysing the four options is provided in Table 9.2 below. A total of four broad criteria broken down into 11 sub-criteria (evaluation fields) deemed to have critical influence on project realization and optimization of impacts (Table 10.2) were applied and used to rank each of the four options.

Table 9.2: Criteria applied in technical level analysis of alternatives

Core Criteria	Sub-Criteria	
Conformity with Project Objectives	1	Efficiency as the commuting route between Likoni/Mtongwe and the Island
	2	Potential impact of the bridge in decongesting Mombasa CBD
	3	Provision of an *efficient* freight transportation route between Kilindini Port and Nairobi
	4	Potential to support Dongo Kundu (SEZ) driven development in Mainland South
Project Cost factor	5	Total project cost (construction cost, compensation cost, etc)
	6	Bridge maintenance costs
Environmental and Social Costs	7	Potential environmental and social impacts
	8	Potential impact on land-use and ease of land acquisition
	9	Buildings / facilities in target ROW
Other factors	10	Aesthetic harmony of bridge and approach viaducts with surrounding landscape
	11	Disturbance on traffic flow including navigation during construction

Source: This study

(iii) Outcome of the technical level evaluation:

Table 9.3 is the self explanatory outcome of the scoring process including notes to explain the scores. Ultimately, the route D which achieved the highest total weighted score (WS) was considered the best route. Route D was recommended with the following main reasons:

- Total score of Route D is the highest.
- Social impact of Route D is minimal.; potential displacement costs (number of affected houses by Route D is almost half that of of Route A2 and A3.)
- Route A2 requires temporary relocation of the ferry terminals during construction. Relocation of the ferry terminals is inconvenient for ferry users. Securing land for the temporary ferry terminals might be difficult because the vicinity area (Mama Ngina Drive) is a historical heritage site.
- Route A3 requires land acquisition of the industrial area and demolition of factories/warehouses, which might take long time for negotiation.

Route D was subjected to a full cycle ESIA Study which is the subject of this report.

(iv) Concurrence by Coordination meeting

The outcome of analysis of alternatives was subjected to further screening by the Technical Coordination Forum which made the final decision.

Table 9.3: Outcome of the Scoring System

Evaluation Item		Weight (W)	ROUTE A2			ROUTE A3			ROUTE D		
			Result	Score	SW	Result	Score	SW	Result	Score	SW
PROJECT OBJECTIVES	**1. Decongestion of Mombasa island**	4	0.49	2.6	**10.4**	0.48	2.6	10.4	0.47	2.7	**10.8**
	2. Efficiency of harbor crossing	5	10.7	3.2	**16**	9.8	3.4	17	10.5 Min	3.3	**16.5**
	3. Efficiency of freight transport	4	13.5	1.6	**6.4**	13	1.8	7.2	11.8 Km	2.1	**8.4**
	4. Contribution to development of mainland south	4	Good	4	**16**	Good	4	16	Good	4	**16**
COSTS	**5. Rough construction costs**	5	**KES 66 B**	**2.8**	**14**	**KES 70 B**	**2.5**	**12.5**	**KES 69 B**	**2.6**	**13**
	6. **Operation and maintenance cost** (rough O & M cost for 100 years)	3	**KES 33 B**	**2.8**	8.4	**KES 33 B**	**2.8**	**8.4**	**KES 33 B**	**2.8**	**8.4**
Environmental and social impacts	**7. Environmental impact** (Road length in residential area)	5	7.5 Km	2.5	12.5	7.1 Km	2.6	13	6.2 Km	2.9	**14.5**
	8. **Social Impact** (number of affected houses and compensation cost)	5	**359 nos** **KES 7.1B**	1.4	7	**322 nos** **KES 8.0**	1.4	7	**181 nos** **KES 5.6B**	2.6	**13**
	9. Aesthetic Harmony with surrounding landscape (Viaduct length with consideration of height)	3	5.9Km	3	9	5.2 Km	3.3	9.9	3.9 Km	3.7	**11.1**
Others	**10. Impact of construction**	3	Relocation of ferry Construction is inconvenient Construction of viaducts along existing roads is inconvenient Score=1		3	Construction of viaducts along existing roads is inconvenient Score=5		9	Construction of viaducts long existing roads is inconvenient. Score=3		9
	11. Impact of Navigation	5	**No impact on navigation because no pier is located in the harbor** **Score=5**		25	**No impact on navigation because no pier is located in the harbor** **Score= 5**		25	**Navigational safety is secured because pier is located 200m away from navigational area.** **Score = 4**		20
Total score			127.7			135.4			140.7 (Recommended)		

Score (S) ranged from 5: Superior, 4: Relatively superior, 3: Fair, 2: Relatively inferior, 1: Inferior and x : Not adoptable as a Bridge route was accorded to each route. The score was then weighted (W) from 5 (very urgent) to 1 (No action needed) depending on the urgency / importance of the field considering the Project objectives.

Source: Pre-feasibility Study for Mombasa Bridge Project

9.3: ANALYSIS OF THE NO-GO OPTION

The 'do nothing' or 'without project' option is not really an alternative since the objective of the Project is to construct bypass roads to divert the traffic from already congested roads in the CBD of Mombasa city. There has been significant increase in congestion on the existing roads thus necessitating the need. The without project scenario will continue to increase the negative impacts

generated by increased traffic loads on insufficient capacity of the existing roads (traffic congestion, noise, low speed, higher emissions, accidents, etc).

CHAPTER TEN: POTENTIAL IMPACTS AND MITIGATION MEASURES

10.1: BACKGROUND

Chapters 4 through to 8 above have documented the environmental and social baseline preceding development of the MGB to set the background for impact analysis - the most critical outcome of an Integrated Impact Assessment Process including ESIA Studies. It is the outcome of impact assessment that informs decision making on the future direction in project development in which case, a full-proof system for impact prediction and analysis is fundamental to the integrity of an ESIA process.

This chapter provides an analysis of the potential impacts likely to ensue from implementation of the MGB Project as currently packaged. Impact analysis as unveiled in this Chapter was approached from different directions, applying diverse diagnostic tools and processes leading a a build up of core issues that constitute potential impacts from the Bridge Project. Tools applied include:-

- Baseline characterization to identify pre-existing environmental and social concerns including sensitive resources
- Review of requirements of policy/legal requirements of the Gok
- Screening against international standards for sustainable development; and
- Screening against stated stakeholder concerns and interests.

Potential environmental and social impacts from different phases of project development (pre-construction, construction and operation stages have been identified and interpreted as summarised in Table 10.1.

10.2: DESIGN PHASE IMPACTS

10.2.1: Positive Impacts of FS/DD Stage

Generally, the design phase is associated with positive impacts mainly manifested through creation of business opportunities for professionals involved in the design work, support staff hired in the enumeration survey, etc, while the country benefits from generation of additional planning data which will influence policy decisions within long time frames. Certainly, the database compiled from design report will find consumption far beyond the confines of this project. A finding of this ESIA study is the poor state of documentation of the Mweza creek in terms of morphology, biodiversity and socio-cultural concerns. Specifically, baseline mapping conducted for the ESIA study generated new data as follows:-

- Comprehensive list of the flora and fauna of the Mweza Creek up to Ziwani seasonal marsh
- Documentation of the poor status of local biodiversity for conservation needs/status
- Existence of four (4) sacred sites (shrines) on the eastern shoreline of Mweza Creek
- Existence of IUCN Red List, CMS and AEWA relevant biodiversity within the traverse
- The conservation importance of the Ziwani Lake

Table 10.1: Schedule of anticipated impacts at Design and Construction stages

Project Phase	Source of Impact	Serial	Potential Impact	Severity	Persistence		Potential for secondary impacts
Design Stage (1)	Design Studies, field surveys and inventories	1.1	Creation of temporary opportunities for gainful employment	P	Short-term		
		1.2	Generation of new/ additional site-specific data and documentation of local concerns	2P	Long-term		
		1.3	Capacity building for staff employed in enumeration and field surveys	P	Long-term		
		1.4	Minor site disturbances from dredging, bush clearing etc. during survey work	N	Short-term	Reversible	None
		1.5	Minor accidents during survey work	N	Short-term	Reversible	Minor
Construction Phase (2)	Supply of materials	2.1	Business opportunities in supply and transport of construction materials	2P	Short term		
		2.2	Opening access to remote areas through construction of access routes	2P	Long-term		
		2.3	Generation of GHG in the transportation of construction materials	N	Short-term	Reversible	Climate change and impacts
		2.4	Road hazards in material transportation	N	Short-term	Reversible	Irreversible impacts
		2.5	Degradation along material sourcing and transport	N	Long-term	Reversible	Social and economic costs
	Construction	2.6	Business and employment opportunities in the 4yr construction period	2P	Long-term		
		2.7	Revenue to GoK, GoK Agencies and County Government through levies and taxes	P	Short-term		

Project Phase	Source of Impact	Serial	Potential Impact	Severity	Persistence		Potential for secondary impacts
		2.8	Interference with Port operations during partial closure of the Likoni Channel	2N	Short term		Economic shocks in the hinterland
		2.9	Economic shocks associated with interference with port operations	2N	Short term		
		2.10	OHS concerns in marine construction	2N	Short term		
		2.11	Likelihood of marine pollution during construction	N	Short term		
		2.12	Potential for illegal activity in construction	N	Short term		
		2.13	Geotechnical impacts of heavy drilling in a sea bed	N	Unknown		
		2.14	Displacement of people, from land, investments and livelihood from ROW corridor	2N	Long term	Reversible	Escalating poverty
		2.15	Loss of business/livelihoods from decommissioning of city roads	N	Long-term	Reversible	
		2.16	Traffic congestion from diversion/closure of city roads	N	Long-term	Reversible	
		2.17	Disruption of village life and social dynamics by construction activity	2N	Short-term	Reversible	Social costs
		2.18	Disruption of existing infrastructure for water and power supply	N	Short-term	Reversible	Economic costs
		2.17	Displacement of public assets and service providers	N	Long-term	Reversible	Reduced access to services
		2.18	Loss of ancestral roots and heritage upon displacement from land and family business	N	Long-term	Irreversible	Deprived lives
		2.19	Opportunity costs on land taken by ROW	N	Long-term	Reversible	Food insecurity
		2.20	Disturbance to shrines and sacred sites and marine heritage	N	Long-term	Irreversible	Loss of

Project Phase	Source of Impact	Serial	Potential Impact	Severity	Persistence		Potential for secondary impacts
			resources				heritage
		2.21	Slope destabilization in riparian areas	N	Long-term	Reversible	Economic costs
		2.22	Alteration of the physical landscape through visual intrusion	2N	Long-term	Irreversible	Loss of identity
		2.23	Costs to marine and terrestrial biodiversity including introduction of alien species in construction material and ballast water	2N	Short-term	Reversible	Weakened ecological control
		2.24	Loss of carbon sinks in destroyed cover vegetation	N	Long-term	Reversible	GHG concerns
		2.25	Risk of fire hazards from construction equipment	N	Short-term reversible		
		2.26	Potential siltation into the Port Reitz and Mweza creeks	N	Long-term	Reversible	Economic costs
		2.27	Nuisances-dust, fumes, vibrations from operation of plant and equipment	N	Short-term	Reversible	Health risks
		2.28	Emission of noise and atmospheric pollutants;- dust, lead, PM_{10}, others	2N	Short-term	Reversible	Health Risks
		2.29	Socio-impacts of construction crew and labour camps	N	Short-term	Reversible	Hazards to public health
		2.30	Sanitation concerns from construction crew	N	Short-term	Reversible	
		2.30	Pressure on water resources	N	Short-term	Reversible	
		2.33	Pollution from construction waste, waste oils and spares	N	Short-term	Reversible	
		2.31	Carbon footprint in transport of construction materials and equipment	N	Short-term	Reversible	

10.3: CONSTRUCTION PHASE IMPACTS

Construction is the phase where the bulk of impacts manifest. A total of 39 impacts are likely to manifest during construction activity out of which, only seven are likely to be positive.

10.3.1: Positive impacts

Positive impacts at construction stage will manifest as follows:-

Benefits associated with cash injection into the national and local economies:
The bulk of investment of the MGB c will go into procurement of construction material and hiring of the contractor. Construction will thus open up extensive trade opportunities while other economic benefits will accrue through creation of employment opportunities for both skilled and semi-skilled labour engaged in construction and supervision. At local level, communities will benefit from short-term employment opportunities in the construction activity.

Creation of opportunity for change: Relocation of buildings and property from the new road reserve has destabilizing effects to PAPs. However, the same process provides opportunity to occasion changes such as the need to regularize land and property subdivisions and transfers, the need to settle boundary disputes, the need to formalize inheritance etc which in the long-run provides a stronger foundation for economic growth.

Opportunity to earn cash income: Compensation for land taken by the ROW and any properties so displaced will occasion opportunities opportunity to earn cash income whose prudent investment in other ventures enhances the economic wellbeing of the affected family. Indeed, investment of over Kshs 5 billion within 10 km long route of traverse equivalent to Ksh 500 million per kilometer of ROW will occasion major economic impact on affected families and livelihoods.

Opportunity for technology transfer: Construction will expose local participants to expatriates in both construction and supervision and thus accord them opportunities to acquire new skills, technologies and approach to doing things all of which amount to enhancing the local technical capacity. Along the traverse, potential PAPs will also be organised into groups and will receive training both of which will find consumption even outside the project sphere and time frame.

10.3.2: Impacts in material sourcing and transport:

Material sourcing areas: Opening up of borrow areas to reach quality stone or marram involves stripping off cover vegetation and top soil with attendant loss of biodiversity and, depending on the depth of quarrying, shallow groundwater pathways can be impacted. Non-rehabilitated quarry spoils also pose a danger people, livestock, and wildlife and can form breeding grounds for mosquitoes.

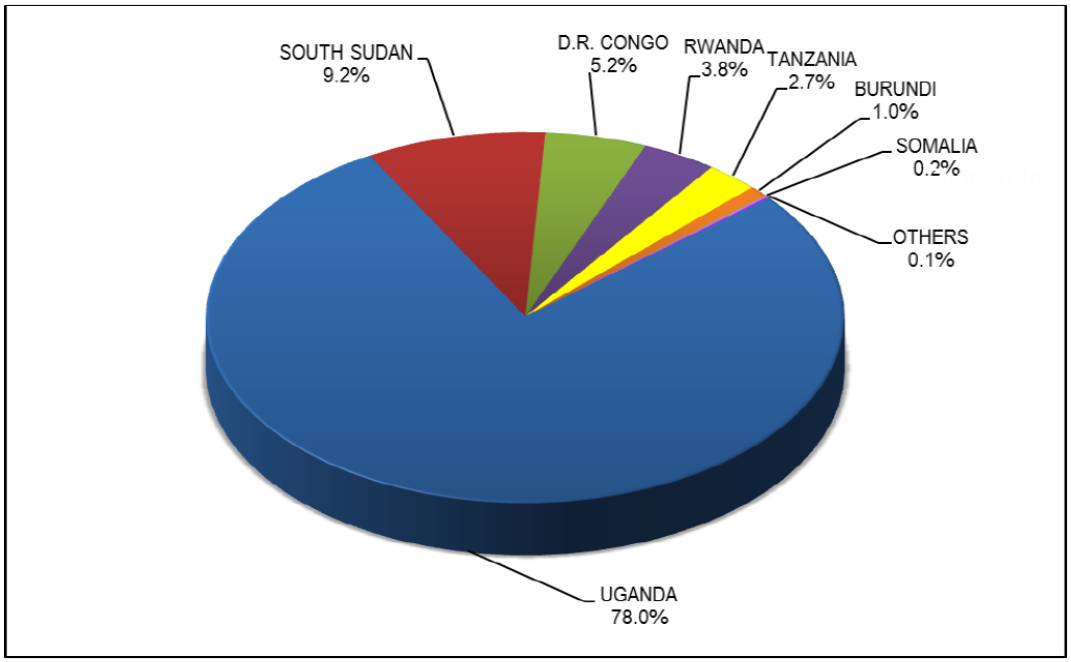
Blasting and use of explosives: The project has no blasting and use of explosives. However, there is a possibility of the work on quarrel and borrow pits. Hazards associated with blasting include accidents to people and livestock, damage to properties, dewatering of springs through earth faulting, nuisances to neighbourhood, among others.

Material transport routes: As indicated elsewhere above, some sections of the proposed bridge have no functional roads and construction will entail opening up new ground. Further, in places like Shika Adabu where there is no road network, inevitable opening up of new feeder roads for delivering labour and materials to the construction site has potential to cause degradation of productive land. If new transport routes will be opened up, these should follow designated reserves to ensure continued use even after road construction is completed.

Material bulking sites: Main concerns include potential spillage and secondary erosion into waterways in case of soil spoils and sand, dust emission and safety hazards to people and property in-case of mass wasting, among others.

10.3.3: Potential Interference with operations of Mombasa Port

Bridge construction will require partial closure of Likoni Channel for extended time periods which is likely to interfere with smooth operations of Mombasa Port- the largest sea port in East Africa whose handling of imports drives the economies of Kenya and the region. Without these imports, the economies of Kenya and the EAC which are powered largely by imported oil, would grind to a halt. Imports comprise 87 per cent of the total weight of goods handled by Mombasa Port with 78% mainly comprised of oil and industrial raw materials being destined for the Kenyan market, with the remainder transiting to the region. (Fig 10.1). Uganda remains the largest of the hinterland destinations, accounting for 81.9 per cent of the transit traffic (equivalent to 6.34 million tonnes) followed by South Sudan, Tanzania, Democratic Republic of Congo, Rwanda, Somalia, Burundi and Ethiopia in that order. Cargo handling is also a multi-billion trade bringing together many stakeholders including shipping lines, merchants, cargo handlers and transporters, service providers etc all of whom are likely to suffer economic shocks any interference with port operations. The JST for the MGB project has spent numerous hours negotiating with the KPA on modalities of managing the construction process so as to minimize impact on port operations but, this threat remains real.



Source: KPA Annual Report 2015

Fig 10.1: Share of transit cargo handled by the Mombasa Port

10.3.4: Hazards associated with bridge construction in a marine area:

Occupational health and safety concerns for construction crew: Construction of a 200m high structure above an ocean creek poses huge safety and health risks to both professional and non professional staff deployed on account of fatalities associated with accidental fall, injury from plant and equipment or chronic ailment from exposure to cold winds, ocean floor conditions among others.

Traffic hazards to other road users: Construction of close to 13.4 km of bridge and access roads will require huge quantities of material to be routinely delivered by numerous via heavy trucks plying the local roads. Construction vehicles in Kenya are notorious for their wanting respect for traffic rules and the rights of other road users. On numerous occasions, such attitude is a precursor for traffic accidents.

Concerns on possible seismic instability associated with excavation in the sea bed: Concerns were raised by stakeholders that past drilling attempts in the Likoni Channel occasioned seismic instability and its feared that drilling for bridge construction could trigger similar reaction whose impacts are not clearly understood.

Marine pollution threats: Pollution threats are likely to emanate from spillage of concrete mix, chemicals, sewage, waste water, oils and fuels from construction vessels and buoys deployed in the construction area. In Kenya, a pollution incident in 1998 resulted in the spilling of 5,000 tonnes of fuel into a mangrove creek.

Generation of construction waste: Waste from construction comprises surplus soil, packaging, debris, waste spares and oils, scrap from workshops etc all of which has potential to pose environmental challenges unless appropriately disposed.

Sanitation concerns for construction crews: The massive sea of humanity to be engaged in road construction have specific sanitation needs whose inadequate supply would see any available bush, gully, etc turned into a toilet with attendant threats to public health.

10.3.5: Concerns from the contractors camp

Concerns from Contractors camps are many and diverse causing NEMA to demand stand-alone ESIA studies. Common issues to expect include:-

Generation of liquid effluent including sewage: Cases of effluent water from Contractors' kitchens and bathroom areas being released into nature in raw form in-spite of reigning legislation are increasingly common and this has potential to compromise quality of water supply for downstream communities.

Waste oils and spares from motor vehicle maintenance yards: Where oil and spares are poorly harnessed, the same are likely to compromise aesthetic quality with potential wash off into water resources. Further, soil already contaminated by oil immediately becomes hydrophobic and can no longer attract or hold water hence rendering it agriculturally inert.

Solid and organic waste: Thus takes the form of waste food, paper, plastic wrapping, and obsolete computer spares among others. While organic stuff rapidly degenerations naturally,

other waste have longer persistence hence posing the growing problem of solid waste accumulation.

Safety hazards: These include fire hazards posed by fuel bulking, use of fire in maintenance workshops, accidents in the workplace, build-up of serpents and rodents from poorly stacked stores, etc.

10.3.6: Social concerns

The whole question of basic rights at the workplace: A trend is emerging in Kenya whereby most construction contracts are won by oriental based companies better known for cost effective delivery on contracts but with huge attendant environmental and social costs including contempt for contractual obligations sealed in law, deployment of language challenged supervisors, poor community integration, poor respect for workers' rights inclusive of basic pay, working hours, grievance procedures among others. It is becoming increasingly common to read of violent confrontations between communities and foreign oriental workers, labour disputes, worker grievances etc, largely traceable to poor work ethics.

Social vices associated with construction crews: Construction activity will engage and deploy numerous people on a daily basis to villages which have otherwise been culturally isolated from the rest of the world. Such exposure is likely to occasion cultural shocks and tendencies associated with multitudes to the detriment of local residents. Core hazards would include proliferation of social vices key among them commercial sex, drug and alcohol abuse, juvenile delinquency, among others whose pressure points would express in explosion of teenage motherhoods, breakdown of homes, escalation of sexually transmitted diseases including HIV and AIDs, social disorders, among others which would rapidly erode gains associated with cash injection from road construction activity.

Disruption of village life: Construction activity will set in motion many activities running simultaneously in villages that have known nothing but sheer laid back lifestyles. Activities such as relocation of shelters, stripping of the ground together with trees, roads, boundary fences by strange looking machines and people, amidst influx of job speculators and cash windfall from compensation are likely to challenge even the most sober and level headed of villagers. Before people can reorganize and settle to new routines, reorient to the new way of doing things and getting around, a lot of time may be wasted and this could even turn costly in terms of rural economic activity.

Impact on existing infrastructure and services: The project is likely to interface with several service lines such as an oil pipeline, water pipelines, power transmission and distribution lines, national highways etc all of which serve vital functions in the local, national and regional economies and whose disruption is likely to occasion massive suffering.

Pressure on fresh water resources: Freshwater is not easy to come by within Mombasa inclusive of MMS where the main supply is from private boreholes, wells and the seasonal Ziwani lake. The design process must allow for alternative source of water such as borehole drilling supplying road construction thus averting pressure on community water sources. The option of sinking boreholes that can later on revert to communities should be explored.

10.3.7: Emission of atmospheric pollutants

Operation of moving plant and equipment: Baseline monitoring of air quality undertaken as part of this ESIA indicated worrisome levels of atmospheric lead (Pb) and daytime noise

levels generally exceeding statutory limits set by NEMA. As such, generation of fumes, dust and noise in road and bridge construction activity is likely to aggravate already strained scenario which could expose people to health hazards. Elevated noise and dust levels are not desired anywhere near human settlements and will require mitigation.

Emissions from the Crusher and Asphalt Plants: Crusher and Asphalt Plants pose the most drastic of environmental impacts through emission of smoke, fumes, dusts, noise, noxious smell, heat and vibrations thus posing dangers to both operators and neighbourhood residents and their properties. Indeed, dust from crusher plants has been observed to choke and kill crop fields while aggravating respiratory complaints in the neighbourhood.

10.3.8: Generation of soil sediments

Impacts from cutting and spoiling: Release of sediments into marine waters from drilling and excavation for bridge piers has potential to interfere with marine aquatic ecosystems through reduction in light penetration or sedimentation of the ocean floor both of which have consequences to fauna and flora. Given the siltation threats currently faced by the Port Reitz Creek including sediment inputs from the Mwache and Mteza rivers, a comprehensive system for managing the earthworks to mitigate against soil deposition into the shoreline will have to be developed by the engineering team (Legal Notice No. 19 of EMCA 1999-The Environmental Management and Co-ordination (Wetlands, Riverbanks, Lake Shores and Sea Shore Management) Regulations, 2009).

Plate 10.2: The Mteza Creek is in near pristine state

10.3.9: Displacement from land and assets

Displacement from Land: By far, the most drastic impact of developing the MGB is the potential to displace human settlements through land acquisition. From inventory undertaken as part of the RAP, hereby summarised in Table 10.2 below, development of the 13.2 km road corridor inclusive of interchanges is likely to affect 759 land parcels accounting for 62.6 hectares of land. The bulk of parcels (86%) are within the Likoni sub County which also accounts for of the target.

Table 10.2: Distribution of landed PAPs by administrative location

Road section by sub county	Admin Locations		Total land acquired				
	Name	Sub locations	Total parcels	% distribution by location	Total area (Ha)	% acquisition by location	% acquisition by sub-county
Mombasa Island	Majengo	1	146	19.2	3.19	5.1	5
Likoni Sub County	Likoni	2	292	38.5	28.2	45	86
	Mtongwe	1	49	6.46	2.78	4	
	Shika Adabu	1	263	34.7	22.9	37	
Matuga / Kwale County	Ng'ombeni	1	9	1.19	5.5	9	9
Subtotals	5	6	759	100	62.6	100	100
Totals	5	6			62.6		

Total structures: The entire road project will displace a total of 1201 structures (Table 10.3) of which, the Mombasa Island accounts for 19.2% equivalent to 230 structures with the other 81.8% (901) structures falling within the Mombasa Mainland South. Non storied and temporary structures form the bulk of displacement at 93.6% respectively.

Table 10.3: Inventory of potentially displaced buildings

Admin Location	Main structures (masonry)								Temporary Structures (wooden)	Total Structures	
	NS	*1S*	*2S*	*3S*	*4S*	*5S*	*6S*	*7S*		*Tally*	*%*
Majengo	47	27	24	15	0	1	1	3	112	230	19.2
Likoni	298	1	0	1	0	0	0	0	124	424	35.3
Mtongwe	48	0	0	0	0	0	0	0	0	48	4.0
Shika Adabu	221	4	0	0	0	0	0	0	274	499	41.5
Ng'ombeni	0	0	0	0	0	0	0	0	0	0	0
Totals	**614**	**32**	**24**	**16**	**0**	**1**	**1**	**3**	**510**	**1,201**	**100**
Allocation (%)	*51.1*	*2.7*	*2.0*	*1.3*	*0.0*	*0.1*	*0.1*	*0.2*	*42.5*	*100.0*	
	(691) 57.5%								*42.5%*	*100%*	

Source: This Study

Key: NS-Non-storied, 1-7S-Total Storeys

Gross displacement: The comprehensive inventory of PAPs is provided in Appendix 3.1 with a summary in Table 10.4 below. The MGB will potentially displace 4439 PAUs bringing together Households, CBEs, landowners and wage earners. Similarly, a total of 2347 PAPs will potentially be displaced. This number is based on inventory of those that reside within the traverse exclusive of those working there. Commercial and Business Enterprise operators totalling 809 will also be displaced.

Displacement of livelihoods: Project development will displace livelihoods which, though not dependent on the land, actually rely on resources along the proposed MGB Project. These include businesses, shop and hotel owners, roadside traders, petty farmers, etc who will lose access to means to livelihoods. For Mombasa Island, a total of 122 petty traders were found to derive employment within the traverse.

Opportunity costs in acquired land: Essentially, the bulk of land to be acquired for the MGB project comprises of informal residential and agricultural settlements (though most is followed by commercial land whose opportunity cost is mainly from anticipated loss 3of business, lost production and loss of residential capacity.

Table 10.4: Distribution of PAUs and PAPs by category

	Type of loss	No of PAUs			Number of PAPs		
	Nature of displacement	Legal	Non-legal	Total	Legal	Non-legal	Total
1	HH (Structure Owner on Gov Land)	944	3	947	1367	13	1380
2	HH (Structure Owner on Private land	9	0	9	51	0	51
3	HH (Tenants)	758	0	758	916	0	916
4	CBEs (Structure owner on Gov land)	0	122	122	0	0	0
5	CBE (Structure owner on Private land)	226	0	226	0	0	0
6	CBEs (Tenant)	347	114	461	0	0	0
7	Community owned structures & PCRs	25	0	25	0	0	0
	Non-displaced						
8	Land owners	725	0	725	0	0	0
9	Wage earners	439	227	666	0	0	0
10	Fishermen	500	0	500			
	Grand Total (1-10)	3973	466	4439	2334	13	2347

Source: This Study

Displacement from ancestral assets: Occurrence of business ventures and properties that have been passed down several generations within a family is a common feature within Mombasa, the best example being the Kilindini Bar on Mwakilingo Street, which has been operated by a family of Goan descent since 1908. The cost of losing such a property goes far beyond the financial loss involved.

Plate 10.1: The Kilindini Bar (and current proprietors) on Mwkilingo Street is more of a Goan Cultural Center than a business venture

10.3.10: Displacement of communal assets

Road construction is likely to impact on community assets as outlined in Table 10.5 below.

Graves: Development of the MGB is likely to displace Two Cemeteries in Mombasa Mainland South. Location of the Main Cemetery right underneath the bridge and behind the

proposed pier at Bofu Maskani implies that it will not be displaced and will hence continue being used even after bridge is commissioned. However, closing of the site during construction may block access of the cemetery to public use and this requires management. The second cemetery which is family owned is located within ROW of the bridge access road at Shika adabu right on the Center-line and will therefore be displaced, thus attracting mitigation through compensation and other management.

Within Mombasa Island, part of the perimeter wall of the Baraki Cemetery at the end of Makarios road will be displaced but without impacting any of the graves.

Shrines: Great care was taken to align the MGB away from major shrines and kayas in line with requirements of OP 4.11. However, as currently aligned, the MGB will partly traverse the extended grounds of Makame Shrine and pass in close vicinity of three others all situated on the eastern shoreline of Mweza creek in Likoni/ Mtongwe areas. Elders responsible for the shrines have issued conditions to be fulfilled before grant of entry. The same have been provided for in the Resettlement Action Plan.

Table 10.5: Occurrence of Common Property Resources (CPRs) in the MGB Traverse

Location	Assorted CPRs						
	Cemeteries	Shrine	Sports facilities	Self help groups blds	Public Schools	Churches	Totals
Majengo	1	0	0	0	4	0	4
Likoni	1	1	4	3	4	2	15
Mtongwe	0	0	0	0	0	1	1
Shika Adabu	2	1	1	0	0	1	5
Ng'ombeni	0	0	0	1	0	0	1
Totals	**4**	**2**	**5**	**4**	**8**	**4**	**26**

Source: This Study

Public Schools: A total of 8 public schools occur within the traverse of the MGB and its access roads and are likely to be affected as follows:-

Table 10.6: Potentially impacted schools

Location	Name of School	Nature of impacts
Majengo	Gabra School (Moslem)	3 metres of store clipped
	Sacred Heart Primary and Secondary (Catholic Archdiocese of Mombasa)	Frontage wall, veranda and water reservoir affected by Archbishop Makarios Rd expansion
	Ganjoni Integrated Primary School	Perimeter wall, ewer line and kitchen affected
Likoni	Puma Primary	Bridge passes overhead
	Bridge Primary	Part of classrooms clipped
	Peleleza Primary	Part of the Classroom clipped
	Consolota Primary along A14 Road	Perimeter wall and classrooms clipped 1.8 metres by expansion of A14 road

Water Projects: A total of 3 water projects mainly fed by boreholes and wells currently used for community water supply are likely to be displaced in developing both the MGB.

Displacement of Infrastructure: Transport and other infrastructure will be displaced as summarised in tabular form below.

Table 10.7: Potentially impacted infrastructure

Admin Location	Transport system	Others
Majengo	Lumumba Road, Mwakiringo Street, Machakos Road, Moi Avenue, Archbishop Makarios Rd, Mnazi Mmoja Street	Power distribution infrastructure, Telecommunication ducts and wires, sewer lines , storm drainage lines
	Railway infrastructure	
Likoni	Shoreline road through Jamvi la Wageni,	Bridge passes overhead
Mtongwe	Old Mtongwe Rd and bridges	Power lines
Shika Adabu	New Mtongwe Road	Power lines
Ng,ombeni	None	None

Source: This Study

10.3.11: Displacement of Trees and crops

From the RAP survey, a total of 16,713 assorted trees are likely to be displaced in the development of the MGB and associated roads (Table 10.8), 63.4% of which occur in Shika Adabu. Timber trees alone account for 51.22% of the trees followed by Fruit trees accounting for 46.8%.

Table 10.8: Distribution of trees likely to be displaced

Admin Location	Type of trees by age category						Total by location	
	Fruits		*Timber*		*Ornamental*		*Tally*	*Share (%)*
	M	*J*	*M*	*J*	*M*	*J*		
Majengo	119	36	141	19	248	35	598	3.6
Likoni	1435	26	3008	44	16	7	4536	27.1
Mtongwe	50	0	217	0	0	0	267	1.6
Shika Adabu	4046	2032	3844	666	14	0	10602	63.4
Ng'ombeni	72	5	613	9	11	0	710	4.2
Totals	**5722**	**2099**	**7823**	**738**	**289**	**42**	**16713**	**100.0**
Breakdown	*7821*		*8561*		*331*			
Share (%)	*46.80*		*51.22*		*1.98*			

Source: This Study

M-Mature; J-Juvenile

10.3.12:Concerns on biodiversity

Issues here include:-

Introduction of alien species in ballast water: Mobilization and delivery of marine construction equipment will most likely entail use of ballast water whose disposal has previously been associated with introduction of alien species. Though the extent of introduction of alien species at Mombasa Port from the more that 100 vessels that call into the port remains unknown, this threat remains real given that the contractor will import marine construction plants from offshore and the Convention on Ballast Water (MARPOL 73/78) requires to be adhered to.

Potential for introduction of invasive species from constriction material: One of the most common adverse impacts of construction activity in Kenya is the introduction of invasive species brought in mainly in contaminated building material- stones, sand, ballast, etc. Once introduced, the species spreads quickly to colonize the area and become a noxious weed, of which the best example is the *Prosopis chilensis* (Mathenge) tree. In case of the proposed MGB, there is fear that introduction of the Mathenge weed close to the intertidal areas has potential to completely colonize and destroy the mangrove ecosystem with very costly impacts even to local livelihoods and against this background, sites targeted for sourcing of river sand at both Voi and Magarini were investigated.

Without exception, both the Magarini and Voi river sources were found to be heavily infected by the Prosopis (Mathenge) weed and this would render them unsuitable for use in the road construction. However, given that the Magarini sand deposits at Mjana Heri and Timboni are very thick, they can be safely exploited on condition that the top organic layer is isolated in favour of the underlying non-contaminated layers. The environmental specialist at Construction Stage will require monitoring sand sourcing very strictly and undertake surveillance for emergence of Prosopis seedlings all along the new road.

Impact on endangered floral species: A total of 11 tree species of conservation interest on account of being either Neither Threatened or Vulnerable while an additional one is endemic to Mombasa were recorded in the section between Bofu Maskani (Port Reitz Shoreline) and Ziwani of MMS. While development of the bridge and approach roads may not affect each of the said species, increased pressure on land anticipated from commissioning of the new bridge will completely change their habitats leading to increased threats to their existence.

Loss of biodiversity in undisturbed sites: Undisturbed sites such as sacred and isolated groves are known to be reservoirs of floral biodiversity including germplasm stored in the soil gene reserve. While efforts were made to map standing biodiversity along the traverse, the same was not done for soil gene reserves in which case, their reservoirs are not fully appreciated more so, given the long period of viability dispelled by seed of some indigenous species. Stripping of top soil in such sites could amount to major loss of gene banks of unknown value.

Impact on habitat for birds: Clearing of trees and vegetation for the bridge and roads has potential to fragment farmlands and grasslands which are most preferred habitat for the 67 avian species recorded along the traverse. Some birds are insectivorous feeding on insects, seeds and fruits; others predate on other birds. Road construction will have potential impact on their habitats/shelter, cover from prey, shelter from sun-heat, and foraging grounds. Birds that were covered in the survey were terrestrial and coastal/marine bird species.

Common characteristics with the birds are that they move from one place to another looking for food. As they move they rely on connectivity of vegetation mosaic for local movement, foraging and cover. Construction of the road will therefore create breaks to the connected habitat for the birds. Bird preys may be made vulnerable to predators due to limited vegetation cover.

Clearance of vegetation might reduce foraging grounds for some species of birds. The area for the bypass comprises of grass areas, bushes and woodlands, mangrove swamps that provide different food types to different bird species. Construction of the road and indirect development will considerably affect; for instance the ground feeding birds that depend on seeds from grasses and insects, canopy feeding birds, and birds that derive their food from swamps. Associated to development of the bridge such as expansion of settlements and

trading centers will potentially favour growth of predator birds such as the Indian Crow that will predate on others.

Impact on birds of concern: Twelve (12) special concern birds;- IUCN Red LIST Data (2), Convention for Migratory Species –CMS (7) and AEWA(8) were recorded in the MMS section between Bofu and Ziwani with nine (9) of them being recorded in the Ziwani area and, by disrupting established food chains and nesting grounds, clearing will further reduce the habitat required by species to maintain minimum viable populations. It will be imperative that modalities for minimizing damage to their habitats be explored.

Impact on Mammals: Most of the mammals occurring in the area are rodents. These include rats, elephant shrew, hedgehog, porcupine, squirrels, moles, African hare. Other include mammal species is monkey. Monkey and squirrel prefers areas with trees, while others prefers grass areas, woodland and near farm areas. The construction has potential of destroying habitats for the mammals. The various groups will be affected in varying magnitude depending on the habitat affected most.

Ground movements of ground moles across the land will be prevented by the hard strata and compressed layers of the road. Populations will potentially be separated by the road. This might make one or all separated populations vulnerable to extinction.

During the operation of the road, rats, elephant shrew, hedgehog, porcupine, African hare that would be crossing roads will be prone to road kills. This would be so since the road could be on the ranging areas of the animals. Clearance of trees and shrub species might reduce habitat ranges and foraging areas for the monkeys and squirrels.

10.3.13: The carbon footprint factor

GHG emissions in construction activity: This ESIA Study assumes that all material to be used in road construction will be sourced locally as a way of cutting down on carbon miles. Irrespective of this, transportation to the point of construction will involve burning of fossil fuels and attendant release of GHG gases into the atmosphere. The greater the distance travelled, the more the GHG released. Though carbon emission will be greatly reduced through local sourcing of materials, importation of oil-based products such as fuels, lubricants, bitumen and the steel required in drainage structures has a huge impact on carbon emissions. A study by the World Bank[7] estimated carbon emissions in national highway construction at 793.81 tons CO_2 per kilometre of which materials sourcing and supply accounted for 66% of all emissions. Applying this model to the Mombasa Gate Bridge totalling 10.3 kilometres inclusive of 1.4 Km of massive bridge, a potential GHG yield of 15,000 tons is anticipated from construction activity alone out of which, the bulk will emit from material sourcing and fabricating activities.

10.4: OPERATION PHASE IMPACTS

Provision of a functional road connection between Mombasa Island and Mombasa Mainland South is economically and politically strategic as it will enhance connectivity of Mombasa to the southern markets inclusive of Tanzania and entire COMESA region. These are briefly highlighted in sections below.

[7] The World Bank, 2010: Greenhouse Gas Emissions Mitigation in Road Construction and Rehabilitation -A Toolkit for Developing Countries. iteresources.worldbank.org/INTEAPASTAE/Resources/GHG-ExecSummary.pdf

10.4.1: Overall strategic impacts

Re-alignment in land-use: By far, the most drastic physical impact of the MGB is the likely re-alignment of land use within the corridor. It is expected that the commercial developments attracted by the bridge will buy out and displace local subsistence cultivators and informal setters thus entirely changing land use and settlement patterns. Other strategic impacts will be felt as follows:-

Population explosion and increased pressure on infrastructure: One of the stated goals for MGB is to anchor development of MMS area especially through support to the proposed Mombasa Special Economic Zone (SEZ). Once the bridge is commissioned, land use in the MMS area which is currently dominated by informal settlement is likely to see an upsurge in Highrise residential and commercial estates with attendant increase in population, pressure on infrastructure and services. Thus, for a place that currently lacks basic services such as organised/ centralised water supply, sewerage system etc, unless the new demand is properly managed, non-mitigable pressure on environmental resources on account of increased solid and liquid effluent, non-planned settlements, encroachment on fragile areas are likely to ensue.

The whole development of a functional road connecting Mombasa Island and the MMS inclusive of the proposed special economic zone presents a new planning opportunity whose exploitation can help achieve the proposed economic transformation in the south coast area.

Other impacts likely to be occasioned by commissioning and operation of the Bridge are highlighted under Table 10.5 and section 10.4.2 below.

10.4.2: Positive impacts from bridge commissioning and operation

(i) Provision of a functional road connection to Mombasa Mainland South:

Plans to provide a bridge connection between Mombasa island and mainland south have been mooted since 1980s and their realization through the proposed Mombasa Gate Bridge will be an achievement on its own. It will be a major and historic leap towards enhancing political integration of the South Coast Region which has always felt alienated from the rest of country and will affirmative in expanding the economic based of Mombasa County.

(ii) A new landmark for Mombasa

Upon commissioning, the MGB which is reputed to be the biggest bridge on the African Continent will, without doubt, be the most imposing and domineering structure within Mombasa and the neighbourhood, towering high over the Likoni Channel and in the process, provide a new reference point and landmark for Mombasa. This essentially will redefine the Mombasa landscape.

(iii) Provision of a second southern exit for Mombasa

Mombasa currently relies on the Likoni Ferry Service to cross traffic (pedestrians and motorists) to and from the Mainland South which is a precarious arrangement in case of failure. From traffic counts on ferry users conducted as part of the pre-Feasibility Study (Fig 10.1), it was observed firstly, Mombasa bound traffic is dominant in the morning while in the evening, the reverse is true which implies that Likoni is essentially a dormitory town which accommodates the Mombasa Town Labour force. Thus, delays in moving this traffic volume to work must be costly to the Mombasa economy and the proposed re-routing of motor vehicles to the bridge while civilians cross to the CBD either on board public transport

or through the ferry will both eliminate traffic conflict on the ferry and greatly relief pressure on the service. Elimination of traffic conflict on the Ferry Service will also greatly reduce incidence of accidents on pedestrians. Past suspension of ferry services forced commuters to wait for hours to get to their homes while emergency evacuation suffers a similar fate. Provision of a second crossing option in form of the bridge will indeed come as a big relief to both planners and commuters.

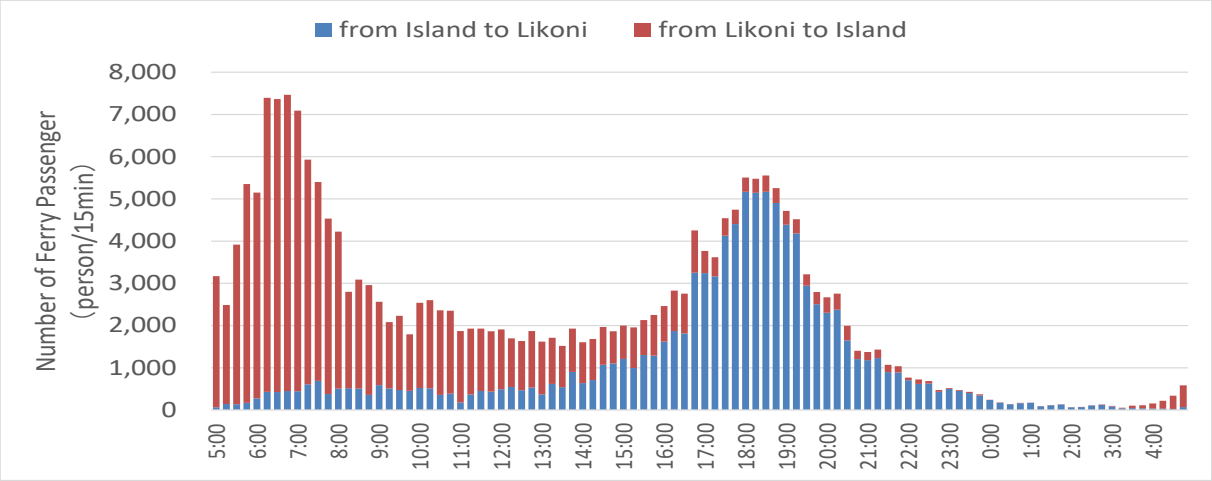


Fig 10.1: Diurnal frequency and dynamics of pedestrian users of the Kenys Ferry Service

(v) Provision of new growth centres for Mombasa

The 13.2Km long corridor which will connect Mombasa CBD to the proposed Mombasa Southern Bypass and by extension, Mombasa Special Economic Zone will stimulate development through creation of new growth canters. Thus, the entire traverse in MMS which is essentially comprised of informal and rural settlements will attract investment in commercial buildings, Highrise residential etc all of which will attract service providers.

Ultimately, Mombasa Town will shift southwards to the benefit of property markets which are currently moribund.

(vi) An opportunity for social and political integration

During stakeholder engagements under auspices of diverse projects, the feeling that Mombasa South Coast is a forgotten territory is quite openly expressed and the same is thought to foment political discontent. As such, the proposed bridge is a major intervention of eliminating the physical and mental divide that creates this feeling of alienation. Through this enhanced connectivity, south coast now has an opportunity to access services at par with rest of Mombasa residents.

(vii) Enhanced trade with Mombasa's southern hinterland:

Removal of transport bottlenecks posed by the ferry crossing point will facilitate trade between Kenya and the COMESA Region down to Zambia. As well, the slump in sectors such as tourism, mining, agriculture etc in the south coast will ease on account of the improved operating environment.

(viii) Enhanced quality of life for MMS residents:

The Mombasa hinterland in Likoni and beyond will greatly benefit from functional road connection to the CBD which will henceforth enhance service delivery including response to medical emergencies.

Table 10.4: Analysis of Operation Phase Impacts

Project Phase	Source of Impact	Serial	Potential Impact	Severity	Persistence	
Bridge Operation Phase (3.0)	Strategic impacts Strategic impacts	3.1	Increased demand for infrastructure and services due to pop explosion in MMS	N	Long-term	Irreversible
		3.2	Increased pollution in MMS	N	long-term	
		3.3	Proliferation of non-planned development	N	Long-term	
		3.4	Realignment in land use along project traverse	N	Long-term	
		3.5	Increased hazard of cultural dilution	N	Longterm	Irreversible
		3.6	Increased demand for infrastructure and services due to pop explosion in MMS	N	Longterm	Irreversible
	Completion of the bridge	3.7	Provision of a functional road connection to Mombasa Mainland South	2P	long-term	Irreversible
		3.8	Provision of a second southern exit for Mombasa	2P		
		3.9	Creation of a new growth centers for Mombasa	2P	Long-term	Irreversible
		3.10	Opportunities for political and social integration	2P	Long-term	
		3.11	Opening up of Mombasa Mainland South and COMESA region markets	2P	Long-term	
		3.12	Improved quality of life form enhanced delivery of services	2P	Long-term	Irreversible
		3.13	New planning opportunity for Mombasa	2P	Long-term	Irreversible
		3.14	Reinvention of Mombasa landscape	2P	Long-term	Irreversible
		3.15	Revival of economic growth in MMS	2P	Long-term	Irreversible
		3.16	Enhanced value of property prices in MMS	2P	Long-term	Irreversible
		3.17	Removal of bottlenecks associated with ferry delays	2P	Longterm	
		3.18	Reduced congestion at Mombasa CDB	2P	Long-term,	Reversible
		3.19	Reduced marine traffic congestion at Ferry site	2P	Long-term	Reversible
		3.20	Height capping for vessels calling into Mombasa Port	2N	Long-term	Irreversible
		3.21	Visual intrusion/ Physical land and airborne barrier	2N	Long-term	Irreversible

		3.22	Hazards of marine accidents at the bridge Pier	N	Long-term	Irreversible
		3.23	Cumulative loss of Port Reitz Channel to reclamation	N	Long-term	Irreversible
		3.24	Loss of revenue income source for KFS	N	Longterm	Reversible
		3.25	Pollution into Mweza and Port Reitz Creeks from road runoff	2N	Long-term	Irreversible
		3.26	Imposition of physical barrier across settlements by embankment road	2N	Long-term	Irreversible
		3.27	The hazard of traffic accidents on the bridge	2N	Long-term	Irreversible
		3.28	Increased atmospheric pollutants and noise from motor vehicles on the elevated bridge and approach roads within the town and residential areas	2N	Long-term	Irreversible
		3.29	Alteration of local hydrology and drainage through construction of impervious paved surfaces	2N	Long-term	Irreversible
		3.30	Possible loss of the Ziwani seasonal lake and swamp	2N	Long-term	Irreversible
		3.31	Threat of cultural dilution	N	Long-term	Irreversible
		3.32	Creation of a new frontier for crime	2N	Long-term	Reversible
Net environmental worth of the project pre-mitigation			33P(33 positive outputs, mainly long-term), 67N (67N adverse outputs, 22 long-term, 19 irreversible), Net score=34N (Overwhelming net negative impact before mitigation)			

(x) Decongestion of the Likoni Channel

The KFS currently deploys 4 vessels to transport passengers and vehicles during peak demand hours. However, Ferry service is often discontinued to allow passage for vessels and pilot boats destined to and from Mombasa Port which often leads to congestion of the channel. Indeed, the KFS are convinced that deploying additional ferries to expand capacity would only further congest the channel and increase chances for marine accidents.

Reduced demand for ferries as expected from traffic diversion to the bridge is a step towards mitigating marine congestion and attendant hazards.

10.4.4: Adverse impacts associated with bridge operation

Adverse impacts from the operation phase have been identified as follows: -

(i) Visual intrusion/ barrier into Mombasa skyline

Mombasa skyline is largely dominated by low buildings with the tallest building- Bima towers being only 67 metre tall. Within the travers, the 45.6m high Cannon Towers is the highest building while at the Port Reitz Shoreline, the KPA Control Tower cuts into the skyline at 90 metres. South of the KPA Tower and across the Channel, all buildings are essentially single storied and hardly ever emerging beyond the general tree canopy height. The proposed bridge structure will therefore comprise a drastic, irreversible intrusion into the Mombasa skyline especially overhead the Likoni Channel.

(ii) Hazards of Marine accidents around the Bridge Pier:

The main northern pier will be erected in the shallow end of the Creek normally navigated by vessels and barges approaching marine engineering workshops such as COMACO. Introduction of a bridge pier will create a major physical obstacle which could impede navigation with possibility of accident occurrence. This incidence is considered severe given that this zone is frequented by light vessels approaching the engineering workshops.

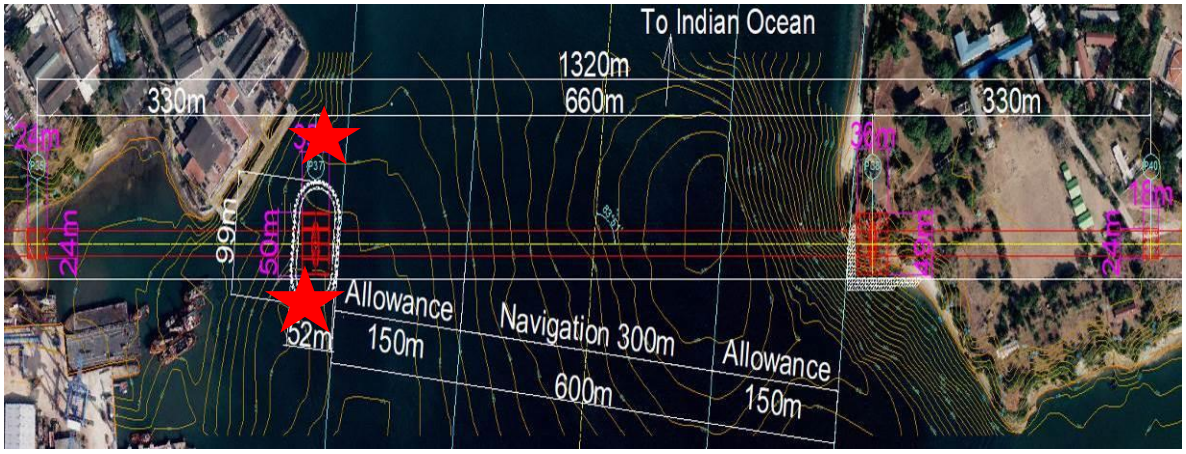


Plate 10.1: The new hazard zone (starred red)

(iii) Loss of revenue base for Kenya Ferry Service

Operations of the Kenya Ferry Service are financed by the National Government to the tune of 65% with only 35% being financed from own revenue estimated at Ksh 1 million daily and mainly accruing from levies charged on motor vehicles using the Ferry. With the proposed diversion of motor vehicles to the bridge, the KFS is likely will loose this revenue stream and may become entirely reliant on GoK for budgetary support.

(iv) Hazards associated with oil and chemical spills into the Mweza and Port Reitz Creeks: A bridge overhead the Mteza and Port Reitz Creeks area will heighten the risk of oil and chemical spills. Vehicles contribute a number of pollutants to urban storm water in addition to metals and volatile organic compounds. Engine coolants and antifreeze containing ethylene glycol and propylene glycol can be toxic and contribute to water quality impairments. Oil, grease, and other hydrocarbons related to vehicle use and maintenance also pollute urban runoff. They come from disposal of used oil and other fluids on the ground or into storm drains, spills of gasoline or oil, and leaks of oil and other fluids from vehicles. In addition, hydraulic oil is ubiquitous at industrial sites and is difficult for facilities to control at the source, contributing these hydrocarbons to storm water. Runoff from residential car washing also contributes oil and grease to the storm water system. The vehicle exhaust that is deposited on roads also contributes dioxins and polycyclic aromatic hydrocarbons (PAHs), highly toxic chemicals that persist in the environment. PAHs also leach from coal tar-based sealants used on paved roads and parking lots. Requirements of The Prevention of Pollution in Coastal Zone and other Segments of the Environment Regulations (EMCA 1999), 2003 are quite clear on this.

(v) Increased atmospheric emissions and noise from motor vehicles: From baseline surveys undertaken as part of this study, levels of atmospheric pollutants-Lead (Pb) and Noise in the

project area currently exceed statutory limits while particulate matter is also quite high. Thus upon commissioning of the new bridge and access roads and diversion of traffic, there is likely to be a sharp increase in noise levels beyond the tolerance limits. The problem is likely to be more severe in the Mombasa Island where the viaduct will bring the noise source close to neighbouring offices and Highrise residential areas.

(vi) Imposition of a physical barrier to movement in villages: Once commissioned, the new approach roads will place an irreversible physical barrier to movement of people and their flocks across villages. People will be challenged accessing water supply, schools, social facilities, shopping centers, neighbours, friends, etc. As such, the road will create a physical barrier right through villages in which case, people will be cut off from their property while the majority will be cut off from public facilities such as the school, water supply, shopping center, churches, mosques, cemeteries etc. The worst affected will be the physically challenged and children who may find it difficult to adjust to new lifestyles.

(vii) Traffic accidents: Associated with curtailed movement in villages is the issue of hazards of traffic accidents posed by the road. A major highway traversing through rural villages has potential to occasion a disaster in form of traffic accidents involving people-more so, children, their flocks, etc. This fear was repeated in all public consultations held with villagers.

(viii)Alteration of local hydrology: Majority of sites in the proposed route of traverse is dominated by sandy loam soils which are deeply porous and even where under cultivation, still enjoy good rainfall harnessing capacities. However once these soils are stripped and replaced with a 10kilometer long, 24 meter wide impervious road service, the rainfall harnessing ability will be lost as all rainfall inputs will be converted to surface runoff and storm flow which has to subsequently be evacuated from the road. This is the water that becomes an agent of destruction wreaking havoc on lands and infrastructure across its path to natural drainage. This is the pollutant laden runoff which will discharge into the Creek ecosystems to the detriment of local biodiversity.

(ix) Threat of cultural dilution: Life within parts of the traverse is still under tight cultural control with absolute power vesting with elders. This system which is credited with sustaining Kaya Forests and sacred sites to date is under increasing threat from forces of modernity and the same could be accelerated by the influx of foreigners anticipated from the opening up of rural Mainland South. Within Mombasa Town, imposition of a huge mega engineering structure cutting right through the Town will completely alter a impressive architectural landscape which has cumulatively derived from Portuguese, Arabic and Swahili influences.

(x) Possible loss of Ziwani and other ecologically sensitive sites: Ziwani recorded the highest daily bird count and also accounts for nine of the 12 special case birds (IUCN Red List Data, CMS and AEWA) species identified within the traverse. However, its location at the interchange between the proposed Mombasa Southern Bypass road and the Approach road to MGB makes its survival perilous given the intensity of activity that will be attracted by both construction and operation phases of both projects.

(xi) The new base for crime:
Certain section of the bridge will be both lonely and isolated which makes them conducive points for both petty and organised crime. Indeed, given worrying trends of escalating cases

of sabotage, which saw the tourism industry almost but collapse in Mombasa, fears that the bridge would become an easy soft target are not misplaced. This is a concern that has been raised in both stakeholder engagement and the Technical Coordination Forums. AS well, fears that the bridge will create suicide friendly facilities are not farfetched given occasional reports of suicide from the Nyali bridge.

10.5 SALIENT IMPACTS

Born of the impact analysis highlighted in 10.2-10,4 above, salient observations emerge as follows:-

- The bulk of adverse impacts will manifest at the construction stage while benefits will mainly accrue from commissioning and operation of the bridge and associated infrastructure.
- Creation of business opportunities during design and construction activity for both foreign and local contractors remains the most salient positive impact at construction stage
- Interference with operations of Mombasa Port and attendant economic shocks on account of closure of the Likoni Channel during bridge construction emerged the most drastic adverse effect whose impact is likely to be felt in the entire hinterland spreading into rest of Kenya, Uganda, South Sudan, Rwanda, Burundi, DR Congo and northern Tanzania.
- General displacement from cultural and economic resources (land, investments, livelihoods and ancestral property) emerges as the most drastic socio-economic concern in developing the MGB.
- Hazards (pollution, illegal activity, accidents) associated with bridge construction in a marine area are a major concern at construction stage.
- Uprooting of the rural life of villages traversed by both civil works and operation of a busy highway are likely to trigger social shocks that could erode gains to accrue from provision of a road connection.
- Upon commissioning, the new bridge will connect the mainland south to the island and by extension, to the rest of Kenya thus bridging a physical barrier that has previously hindered socio-economic and political integration of the south. The bridge will enhance access to markets as far south as the COMESA Region and in the process, stimulate greatly needed economic recovery in Kenya's South Coast.
- Operation of the bridge and its linkage to the proposed Mombasa Southern Bypass Road and the Special Economic Zone are both likely to open up the Likoni and adjoining Kwale County for economic development which will attract investment in real estate and commercial ventures with attendant influx of population of both investors and speculators, Unless proper planning is adopted, especially with regard to land zoning and provision of infrastructure and services, Non sustainable development is likely to ensue leading to resource and environmental degradation.

CHAPTER ELEVEN: THE ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

11.1: OVERVIEW

This chapter outlines the Environmental and Social Management Plan (ESMP) proposed for the MGB Project comprising of four core elements namely: - the Impact Mitigation Plan (unveiled in Tables 11.1), the Monitoring Plan (Table 11.2), a budget for implementation (Table 11.3) and modalities for institutional coordination and role play as summarised in Table 11.4 below.

11.2: THE MITIGATION STRATEGY

Review of the chronology of events towards development of the MGB (Chapter Nine) revealed the tortuous path previously taken in evaluating diverse options to fine-tune a package that delivers on project goals within optimal financial, social and environmental costs. Thus, the core mitigation strategy in the project was to review and adopt a route alignment that served to avoid, reduce and manage environmental and social concerns as follows:-

- Avoiding a design option which would disorganise operations of the Kenya Ferry Service as this would disastrously shut down Mombasa with attendant economic and political costs.
- Selecting an alignment for the MGB that avoided pouring traffic into Mombasa CBD as a strategy to mitigate traffic congestion.
- Avoiding alignments with potential to impact on heritage resources such as the Mama Ngina Park.
- Selection of an alignment that avoided traversing through current Likoni settlement so as to avoid massive displacement of people from property, shelter and livelihoods.
- Efforts to link bridge design to the Masterplan for Mombasa Gate City especially in favouring of the Western Express Corridor for enhanced traffic management.

As such, to the largest extent possible, the strategy and action plan in formulating this ESMP is to prevent impact occurrence, then move to mitigate inevitable occurrence-a position secured by ensuring that recommendations made here-in are incorporated into and influence final outcome of the project design process in which case, the latter process also becomes part of the mitigation programme. In pursuit of this strategy, all mitigation will be sealed at Detailed Design Stage by adopting measures as follows:-

- ✓ The Environmental and Social Management Plan unveiled in Chapter Twelve below will be integrated into the Final Design Report- as a standalone chapter and also to moderate design decisions
- ✓ The same will be provided for in the BOQs to ensure funding allocation for environmental and social mitigation
- ✓ Clauses binding parties to affirmative action on the ESMP will be integrated into Contracts for Construction to ensure that the contractor is legally bound to implement impact mitigation. The full specification is provided in Appendix 11.1.

11.3: MITIGATION OF DESIGN STAGE IMPACTS:

The Impact Mitigation Plan summarised in Table 11.1 below reflects respective action at the design, construction and operation phases of the Mombasa Gate Bridge Project. Site disturbance during field surveys have been minimized through use of existing tracks to access sites of interest and always to avoid crop damage. As well, for field work, sober and serious minded survey teams were selected and sensitized on the need to observe safety requirements during enumeration and site surveys and this has greatly mitigated incidence of accidents.

11.4: MITIGATION AT CONSTRUCTION STAGE (1)- SOCIAL REHABILITATION PLAN

11.4.1: Mitigation of displacement impacts

A full Resettlement Action Plan (RAP) has been prepared to guide resolution of all displacement impacts. The same will be implemented in full before ground-breaking and as follows:-

Compensation for acquired land: Valuation of acquired land should factor in inflation of land prices occasioned by the current influx of speculators. A case in point is the interchange /Dongo Kundu area where most land along the Bypass has already sold out. There are fears that, unless this is factored in approaching land valuation, displaced people may not be able to afford land in the neighbourhood and will be forced to go settle in the interior far away from the bypass road. The new road will therefore end up benefitting the wealthy other than those originally targeted.

Compensation for standing assets: The aim here should be to adopt a valuation method that rewards personal initiative and effort. Currently available rates only end up impoverishing people. In the case of commercial trees, valuation should factor in the investment cost of brining and nurturing trees to maturity and the income to be forfeited once the trees are displaced by the road.

Compensation for graves: A package that would facilitate transfer of the remains to a new site should be adopted towards removing graves hit by the pavement. Otherwise, graves falling in the general road reserve should just be marked and left intact.

Compensation for loss of ancestral roots upon displacement from family business: Such loss is quite difficult to mitigate. However, prompt payment of just compensation (factoring in the vendors goodwill) will facilitate faster coping and recovering from the loss.

Compensation for loss of livelihoods: Compensation will aim at enabling LAPs to re-establish displaced livelihoods and cover them for the duration spent away from work. This should include all business that will close down on account of decommissioning of roads.

11.4.2: Safeguarding normalcy of village live during construction

To ensure systematic introduction and progress of civil works within villages, the contractor will hire a social liaison team led by a qualified sociologist. This team will mobilise communities to form teams which will be liaising with the contractor on all issues of concern. Once the teams are in place, the contractor will develop an action plan to guide systematic entry and actions in each village with specific timelines. The same will be discussed and adopted with villagers who will then be prepared to cope with the change. Paramount to this strategy is the following issues:-

i) All compensation will be paid upfront of implementation of resettlement

ii) PAP and Locational Elders Committees will be in place long before ground breaking to handle and resolve disputes emanating from displacement
iii) PAPs will be given adequate notice to relocate property including harvesting of food crops
iv) At all times, the Contractor will identify and provide alternative access routes to replace those consumed by the road. All such measures will require prior consultation with villagers and, at no time will a village be left marooned without any means of access to essential facilities.
v) Where some facility such as water will be blocked entirely, the Contractor will provide alternatives.
vi) The Contractor will set up a liaison office within close vicinity of villages traversed where villagers can file complaints.
vii) All construction crew will bear badges with full identification inclusive of photographs.
viii) The contractor will pick and employ security scouts to provide pedestrian access through construction sites.

11.4.3: Disruption of existing infrastructure and service lines

Two major pipelines lie across the path of the MGB in both MI and MMS while the entire MI has an intensive network of water supply and drainage lines. The contractor will provide alternative connections prior to displacement of target sections. As well, where sections of the pipeline will be replaced, the aim should be to always replace with better.

11.4.4: Resolution of the physical barrier in Likoni, Mtongwe and Shika Adabu

Once commissioned, the road will impose huge barriers to free movement and access in villages. Appropriate and adequate crossing for people and their livestock should be provided both for high and low-density settlements. A total of 18 crossings will be provided at all road intersections and for intervals where such intersections are more than 250m apart. Plate 11.1 provides a rough guide to the location of proposed crossing points in Likoni and Mtongwe sections of the traverse.

Plate 11.1: Proposed location of underpasses in the Likoni-Mtongwe section of MGB

11.4: MITIGATION AT CONSTRUCTION STAGE (2)- CONSTRCUTION MANAGEMENT PLAN

The Contractor will put in place a Construction Management P;lan to guide orderly scheduling, phasing and conduct of construction activity

11.4.5: Mitigation of impacts associated with material sourcing and transport

Material sourcing will seek to exploit existing quarries rather than open new ones. Any new quarries opened will require meeting all statutory requirements including an environmental license issued by NEMA. Local sourcing of quality material will cut down on both financial and environmental costs associated with emissions. In all cases, preference will be given to material from quarries operated from grid power supply. As well, the Contractor will be bound to deploy a serviceable fleet to ensure minimum emission levels.

Material supply to construction sites will seek to utilise existing road network where possible while any new opening should target sites earmarked for pavement development. In the event that new access routes will require to be opened especially at MMS, the same should target areas reserved for rural roads so that, the same will be graded and serve the community both during and after road construction.

11.4.6: Mitigation of Traffic Impacts during Construction

Construction activity along Lumumba and archbishop Makarios roads will impose severe restrictions to traffic movement, which will be felt in the entire city. Towards mitigation, both KeNHA and the Transport and Infrastructure Department of MCG will require to develop and implement a Traffic Management Plan previously disclosed to all stakeholders to the City Roads.

11.4.7: Mitigating interference with Mombasa Port Operations

Through consultation with the KPA's Operations Department, strategies for forestalling pro-longed closure of the Likoni Channel during bridge construction have been identified as follows:-

- Bridge construction will be approached from the periphery (shoreline) and will always leave on navigable channel available for use by vessels
- KPA will adopt convoy method where many vessels are held in the waiting area, then cleared to enter or leave the port in convoy to optimise on time,
- Coordination of all operations/movements of buoys with the Control Tower to avoid conflict with vessels
- All construction craft will flash the red hazard light at all times when in motion so as to warn all other users of the channel.

Despite all measures identified, conflict between bridge construction and port operations remains a major concern whose effective management will require, among others, a very management of the Contract for Works.

11.4: MITIGATION AT CONSTRUCTION STAGE (3)-THE LANDSCAPE CONSERVATION PLAN

11.4.8: Mitigation of impacts on biodiversity and carbon sink

Measures will be taken as follows:-

Conservation of sensitive flora: Flora and fauna mapping and screening against the IUCN Red List undertaken as part of this ESIA indicated that no species considered endemic,

threatened, endangered or locally important are found within the route of traverse. Secondly, all habitats that could be displaced by the road occur extensively in the area which allows room for affected populations to re-establish and recover but this notwithstanding, measures will be taken as follows:-

(i) All trees located in the road reserve but outside of pavement area will be left intact,

(ii) **Preservation of the biodiversity of shrines:** Given that Kaya forests have been maintained intact over generations, they are important reservoirs of biodiversity-more so, soil gene banks. Thus, in the extreme case where non disturbed sites will be displaced by the road, the above-ground genetic resource will require to be mapped for re-introduction elsewhere. More critically, all top soil from such sites will be recovered and re-deposited at designated undisturbed sites (possibly other kaya sites) where the gene bank can be preserved and recovered through natural germination. Requirements of the Environmental Management and Co-ordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006 shall apply.

(iii) **Protection of the Endangered Spp:** Ten tree species which are registered by the IUCN as Near Threatened, Vulnerable and Endangered were recorded in the slopes of the Mweza Creek but further investigation revealed that all species occur commonly in areas outside of the proposed road reserve in which case, road construction does not further endanger the same. Towards protection, seedlings of the same species will be propagated and used in re-afforestation of sites disturbed by the road. As well, a community outreach programme will be undertaken to promote conservation of biodiversity including the two species.

(iv) A reforestation plan will be implemented to replace the 16.713 trees to be displaced by the road and to cater for those to be lost to intensified settlement. Reforestation will aim to replace lost trees as documented in section 6.6.6 above and Appendix 6.1 giving priority to the special concern trees (Table 6.12) above. Locally active conservation groups will be strengthened to bulk seedlings of locally important trees some of which will be used in road side reforestation and planting on communal sites.

(v) **Mitigation against introduction of alien species:** All requirements of MARPOL 73/78 will be observed by the Contractor under close monitoring by the KMA in capacity of designated MARPOL Focal Point in Kenya.

Insurance against possible introduction of colonising species: Associated with material sourcing is the question of alien species of which *Prosopis chilensis* and *Leceana lucocephala* are the worst culprits in the coastal region. Both weeds establish from seeds ferried in construction material as is the case currently along the AGOL pipeline area where a road was recently cut and graded. Thereafter, the weeds form aggressive colonies which turn impossible to control especially where roots can access sub-surface saline water. Mitigation of this occurrence will require that sand be source only from fluvial coastal deposits exploited fresh without bulking and provided that the organic layer is stripped and isolated. The Magarini Cooperative society site is recommended for this purpose.

11.4.9: Mitigation of impacts on habitat for avian fauna:

None of the sites traversed by the MGB is a designated Important Bird Area (IBA)- the nearest being the Shimba Hills Forest. However, Kenya is a signatory to CITES (Convention on International Trade in Endangered Species of Fauna and Flora), the Bon

Convention- Convention on Conservation of Migratory Species and its daughter Agreement- the AEWA (Afro-Eurasian Water Birds Agreement) all of which are deemed relevant to the MGB where two (2) of the 67 birds occurring within the traverse are featured in the IUCN RED List Data on account of being near threatened or vulnerable, 8 are AEWA species with another seven (7) being CMS species. 9 of the 12 special case birds occur in the seasonal Ziwani lake and marsh. This marsh and other habitats will be fragmented and partly displaced by road construction thus further affecting the habitat for water birds.

One of the 12 special concern birds is endemic to the Kenyan Coast let but, this not withstanding, all birds occur extensively elsewhere in Kenya and the region and given that this habitat range is extensive, development of the proposed MGB has no chance of significantly affecting the habitat of these species. However, intensive monitoring of populations is recommended.

11.4.10: Mitigation of slope destabilization in the catchment of the Mweza Creek:

All cut and fill areas will require stabilization with both grass and masonry structures. Soil stabilisation measures will be put in to prevent soil wash into the creek areas. Towards this,

- ✓ Clearing and stripping will be restricted to the pavement area and all downstream vegetation will be retained intact.
- ✓ Stuffed gunny bags or other appropriate technology will be deployed to stabilize soil downstream of cut and fill sites.
- ✓ Stockpiling of soil and building material will avoid slunting ground and all riparian areas,
- ✓ All stockpiled soil will be ring-guarded from intrusion by runoff

Towards mitigating impacts of excavation and construction immediately upstream of the creek areas, the following actions are prohibited:-

- ✓ Use of any chemical banned from use in Kenya,
- ✓ Use of any chemical that is harmful to marine life,
- ✓ Use of any chemical that persists in the environment or turns harmful upon contact with water,
- ✓ Use of equipment that spill oils into the water.

Use of any chemical within the creek areas will require approval by NEMA in consultation with the Kenya Maritime Authority in capacity of Lead Agency. Additionally, movement of construction equipment into the Port area will require approval by the KPA, KMA and obtain requisite permits.

11.4.11: The Question of landscape change

Landscape change within the traverse will be irreversible and the same will be aggravated by the aerial projection of the design, which militates against reforestation to tone down the contrast. Initial consultations conducted for this ESIA have identified this impact as being a major concern for many people and the recommendation is for stakeholder participation to be expanded at the DD so as to allow as much public and professional input on the bridge design as possible.

Table 11.1: Measures towards Mitigation of Construction Stage Impacts

Project Phase	Serial	Potential Impact	Severity	Mitigation	Legal provision	Post mitigation severity
Design Stage (1)	1.1	Creation of temporary opportunities for gainful employment	P			
	1.2	Generation of new/ additional site-specific data and documentation of local concerns	2P			
	1.3	Capacity building for staff employed in enumeration and field surveys	P			
	1.4	Minor site disturbances from dredging, bush clearing etc. during survey work	N	Observe safety Code of Conduct	Cap 387	N
	1.5	Minor accidents during survey work	N	Observe safety code of conduct	Cap 387	N
Construction Phase (2)	2.1	Business opportunities in supply and transport of construction materials	2P			
	2.2	Opening access to remote areas through construction of access routes	2P			
	2.3	Generation of GHG in the transportation of construction materials	N	Local sourcing	Cap 387	N
	2.4	Road hazards in material transportation	N	Follow Traffic Code	Traffic Code	N
	2.5	Degradation along material sourcing and transport	N	Source from NEMA audited sources	Cap 387	0
	2.6	Business and employment opportunities in the 4yr construction period	2P			
	2.7	Revenue to GoK, GoK Agencies and County Government through levies and taxes	P			
	2.8	Interference with Mombasa Port operations during construction at Port entry point	2N	Negotiated workplan to minimize interference		N
	2.9	OHS concerns in construction of an elevated bridge overhead a sea creek	2N	Develop and implement Health and Safety Plan	OSHA 1997, Cap 382, Cap 370	N
	2.10	Hazards of marine pollution during construction	N	Ensure safe waste disposal (see narrative)	Cap 387	0
	2.11	Potential for illegal activity in construction	N	Regular monitoring by all agencies	Diverse	N
	2.12	Geotechnical impacts of heavy drilling in the Likoni Channel	N	A full geotechnical investigation at DD stage	Cap 387	0
	2.13	Displacement of people, from land, investments and livelihood from ROW corridor	2N	Implement RAP recommendations	National Constitution 2010	N

Project Phase	Serial	Potential Impact	Severity	Mitigation	Legal provision	Post mitigation severity
	2.14	Loss of business/livelihoods from decommissioning of city roads	N	Ditto	Ditto	N
	2.15	Traffic congestion from diversion/closure of city roads	N	Implement a Traffic Management Plan	Cap 387/Traffic Code	N
	2.16	Disruption of village life and social dynamics by construction activity	2N	Sensitization campaigns at all levels	Cap 387	N
	2.17	Disruption of existing infrastructure for water and power supply	N	Replace all assets before ground breaking		0
	2.18	Potential loss of heritage resources	N	NMK to implement Chance Find Procedures at Construction	Cap 261	N
	2.19	Loss of ancestral roots and heritage upon displacement from land and family business	N	Comprehensive RAP to address all displacement	OP 4.12	N
	2.20	Disturbance to shrines and sacred sites and marine heritage resources	N	Survey before displacement	Cap 387	0
	2.21	Potential sediment input into creek waters	N	Prepare a soil stabilization plan in construction plan	Cap 387	N
	2.22	Alteration of the physical landscape through visual intrusion	2N	Incorporate local architecture into the design on D/D stage	Cap 261	N
	2.23	Costs to marine and terrestrial biodiversity including introduction of alien species in construction material and ballast water	2N	Prepare contingency plans for all sectors at DD Stage	MARPOL 73/78; Schedule 7 to WMCA 2016	N
	2.24	Loss of carbon sinks in destroyed cover vegetation	N	Partner with local groups to reforests with all special concern trees	Cap 387/ Agric Act-FF Rules	P
	2.25	Risk of fire hazards from construction equipment	N	As for 2.23 above		
	2.26	Escalation of noise levels	N	Forward planning to reduce period of disturbance.	Cap 387	N
	2.27	Emission of pollutants, dust, fumes, vibrations from operation of plant and equipment	N	As for 2.23 above	Cap 387	N
	2.28	Socio-impacts of construction crew and labour camps	N	Local sourcing for labour and personnel		0
	2.29	Sanitation concerns from	N	Provide for adequate	OSHA 1997	0

Project Phase	Serial	Potential Impact	Severity	Mitigation	Legal provision	Post mitigation severity
		construction crew		gender segregated facilities		
	2.30	Pressure on water resources	N	Contractor to develop own water source	Cap 387	P
	2.33	Pollution from construction waste, debri, waste oils and spares	N	Apply 3R rule	Cap 387	P
	2.31	Carbon footprint in transport of construction materials and equipment	N	Preference to already mobilized TSPs		N
Post mitigation severity		Post Mitigation Status		10N, 13P, Net 3P		

N=low negative impact; 2N=moderately severe impact; 0= no impact; P= positive impact, 2P= significantly positive impact

11.4.12: Mitigation of loss and damage to cultural and heritage resources

Loss of Cultural Heritage will be mitigated thus:-

Zoning out of Cultural Heritage sites for preservation: The Preliminarily CIA conducted by the NMK had the effect of identifying and locking out culturally sensitive sites for preservation against bridge development. Under this category were identified sites such as mama Ngina gardens and surrounding areas. The same study should be expanded at Detailed Design to map out all resources and clarify status of the Sultan of Zanzibar Palace for which information is not currently available.

Incorporation of Chance Find and Recovery Procedures: In line with requirements of OP 4.11, the services of the NMK will be retained during construction stage to facilitate monitoring for chance finds which will then be recovered as appropriate.

Zoning out shrines and groves for protection: Selection of the bridge location and alignment of approach roads took care to avoid traversing all known shrines and minor groves. Where any grounds will be traversed, respective elders and leadership were contacted for guidance on mode of reparation and concurrence.

11.4: MITIGATION AT CONSTRUCTION STAGE (4)- THE HEALTH AND SAFETY PLAN

11.4.13: Environmental, Health and Safety Measures in the Construction area

Contingency plans will be prepared covering all aspects of Occupational Health and safety during construction. Key among this is the need to deploy sober staff under supervision, enforcement of a code of operations backed up be insurance cover for all staff. A strict system for ensuring observation of a drug, alcohol, violence free working environment should be enforced. Measures have been identified as follows:-

(a) Mitigation of impacts in General Health and Safety:

The Contractor shall comply with all standard and legally required health and safety regulations as promulgated by Occupational Health and Safety Act and the Factories and Other Places of Work Regulations.

- The Contractor shall provide a standard first aid kit to field staff;
- A comprehensive code of operations will be developed, implemented and supervised to ensure that Likoni Channel remains clear for vessels to pass. Economic sanctions should be imposed under contract to discourage non-compliance.
- The Contractor shall ensure that staff are made aware of the risks of contracting or spreading sexually transmitted diseases, particularly HIV/AIDS and how to prevent or minimize such risks;
- The Contractor shall be responsible for the protection of the public and public property from any dangers associated with construction activities, and for the safe and easy passage of pedestrians and traffic in areas affected by the construction activities;
- All works which may pose a hazard to humans and domestic animals are to be protected, fenced, demarcated or cordoned off as instructed by the RE. If appropriate, symbolic warning signs must be erected;
- Speed limits appropriate to the vehicles driven are to be observed at all times on access and haul roads. Operators and drivers are to ensure that they limit their potential to endanger humans and animals at all times by observing strict safety precautions;
- No unauthorized firearms are permitted on site;
- The Contractor shall provide the appropriate Personal Protective Equipment for staff.

(b) Fire Prevention and control: The Contractor shall take all reasonable and precautionary steps to ensure that fires are not started as a consequence of his activities on site;

i) The Contractor shall ensure that there is basic fire-fighting equipment available on site;

ii) Flammable materials should be stored under conditions that will limit the potential for ignition and the spread of fires;

iii) 'Hot' work activities shall be restricted to a site approved by the RE;

iv) Smoking shall not be permitted in fire hazard areas.

v) The Contractor shall ensure that all site personnel are aware of the fire risks and how to deal with any fires that occur. This shall include, but not be limited to regular fire prevention talks and drills and, posting of regular reminders to staff.

vi) Any fires that occur shall be reported to the RE immediately and then to the relevant authorities;

vii) In the event of a fire, the Contractor shall immediately employ such plant and personnel as is at his disposal and take all necessary action to prevent the spread of the fire and bring the fire under control;

viii) Costs incurred through fire damage will be the responsibility of the Contractor, should the Contractor's staff be proven responsible for such a fire.

(c) Emergency Procedures: The Contractor shall submit a Method Statement/ Comprehensive Health and Safety Plan covering the procedures for the main activities which could generate emergency situations through accidents or neglect of responsibilities. These situations include, but are not limited to accidents at the work place including falling of the platforms, accidental fires; accidental leaks and spillages and vehicle and plant accidents. Specific to accidents at work place:

- The Contractor shall ensure that his employees are drilled in the procedure for working in sensitive areas including marine areas
- He shall comply with all safety conditions imposed by the Kenya Maritime Authority and other Agencies to ensure safety of workers at all times.
- The Contractor shall also ensure that the necessary equipment for work in hazardous area –protective boots, PPEs, helmets, etc., are provided.
- The Contractor will continuously train employees on safety procedures including use of PPEs.

(d) Mitigation of HIV/AIDS: The contractor in consultation with implementing agencies responsible for HIV/AIDS will mount educational campaigns to keep workers sensitized on the reality of this pandemic. He shall monitor activities regularly to assess effectiveness and impact. This should include an initial, interim and final assessment of basic knowledge, attitude and practices taking account of existing data sources and recognizing the limitations due to the short timeframe to show behaviour change. The assessment will be supported by qualitative information from observations on workers behaviour.

(e) Mitigation of Solid Waste: All storage and construction sites are to be kept clean, neat and tidy at all times. No burying or dumping of any waste materials, metallic waste, litter or refuse shall be permitted. The Contractor must adhere to Environmental Management and Co-ordination (Waste Management) Regulations 2006.

The Contractor shall implement measures to minimize waste and develop a waste management plan to include the following:-

i) All personnel shall be instructed to dispose of all waste in a proper manner;

ii) At all places of work the contractor shall provide litter collection facilities;

iii) The final disposal of the site waste shall be done at the location that shall be approved by the RE, after consultation with local administration and local leaders;

iv) The provision of sufficient bins (preferably vermin and weatherproof) at the camp and work sites to store the solid waste produced on a daily basis;

v) Wherever possible, materials used or generated by construction shall be recovered at the conclusion of each task for safe disposal including recycling.

vi) Provision for responsible management of any hazardous waste generated during the construction works.

(f) Wastewater and contaminated water management: No grey water runoff or uncontrolled discharges from any site or working areas (including wash-down areas) to adjacent watercourses and/or water bodies shall be permitted;

- Water containing such pollutants as cements, concrete, lime, chemicals and fuels shall be discharged into a conservancy tank for removal from site. This particularly applies to water emanating from concrete batching plants and concrete swills;
- The Contractor shall also prevent runoff loaded with sediment and other suspended materials from the site/working areas from discharging to adjacent watercourses including the creek areas;
- Potential pollutants of any kind and in any form shall be kept, stored and used in such a manner that any escape can be contained and the water table not endangered;
- Wash areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas (including groundwater) are not polluted;
- The Contractor shall notify the RE of any pollution incidents on site.

(g) General materials handling, use and storage: All materials shall be stored within the Contractor's camp unless otherwise approved by the RE;

- Stockpile areas shall be approved by the RE;
- All imported fill, soil and/or sand materials shall be free of weeds, litter and contaminants. Sources of imported materials shall be listed and approved by the RE;
- The Contractor shall ensure that delivery drivers are informed of all procedures and restrictions (including 'No go' areas) required;
- Any electrical or petrol driven pumps shall be equipped and positioned so as not to cause any danger of ignition of the stored product;
- Collection containers (e.g. drip trays) shall be placed under all dispensing mechanisms for hydrocarbons or hazardous liquid substances to ensure no contamination from any leaks is reduced;
- Regular checks shall be conducted by the Contractor on the dispensing mechanisms for all above ground storage tanks to ensure faulty equipment is identified and replaced in timely manner;
- Only empty and externally clean tanks may be stored on bare ground. All empty and externally dirty tanks shall be sealed and stored on an area where the ground has been protected.

(h) Control of criminal activity: The Contract for Construction will criminalize any activity prohibited under Kenyan Law. This will include smuggling, drug and substance abuse,

illegal fishing, all forms of violence, discriminatory practices among others. The RE Staff will conduct regular monitoring to track all complaints.

11.4: MITIGATION AT CONSTRUCTION STAGE (5)- THE COMMUNICATION PLAN

A Communication Plan will be put in place for purposes of ensuring timely dissemination of project related information to all stakeholders.

11.5 MITIGATION OF IMPACTS AT OPERATION STAGE

Proposed mitigation activities at this stage are focused on minimizing hazards associated with presence of a modern bridge and access roads.

11.5.1: Management of strategic impacts of bridge provision

County Governments of Mombasa and Kwale will require to undertake development control for the Interchange area upfront of Project development. Such planning should factor the anticipated growth in population and attendant demand for services and infrastructure which should then be put in place in tandem with bridge development. Planning should also zone out and create green areas to serve as reservoirs for biodiversity.

11.5.2: Mitigation of height capping

The prospect of a vessel with a draft height in excess of 69 m above the HWM trying to access the Mombasa Port in future is real though remote, given that the highest draft vessels - the Super Panamax category have a draft height of 54 m and the tendency in marine vessels size growth favours lateral extension. However, given the dynamic and non predictable nature of innovation, a vertical projection in vessel size growth could also be explored in future in which case, a 69m high bridge across the Likoni entrance will render Mombasa unsuitable for such ocean craft. All is not lost though given that, both the Mbaraki area and the new Lamu Port do not suffer height limitations and are therefore accessible to vessels of any size category.

11.5.3: Mitigation of Visual Intrusion into the Mombasa airspace

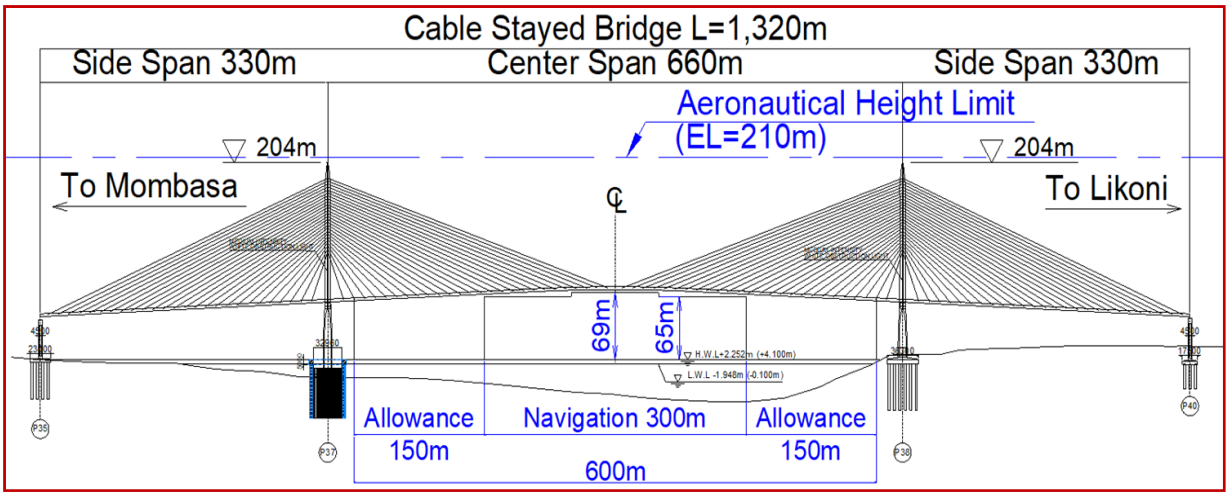
Construction of the bridge will permanently and irreversibly change the Mombasa skyline and this has no known mitigation. It however presents an opportunity for change and for marking a new milestone and landmark for Mombasa trending the path blazed by the Statue of Liberty in the USA, Canadian National Tower in Canada, the London Bridge in UK, Tower of Paris and other major international landmarks that went on to become major earners of tourist revenue. To enhance this esteemed status, development and design of the bridge should borrow and incorporate as much detail of the local heritage as possible which requires extensive consultation in the process.

11.5.4: Mitigation of accidents around the Northern Pier

A lot of time and effort have been invested in identifying strategies for minimising occurrence of accidents around the bridge structures:-

Only one pier will be located in the Channel: Adoption of a 600m long Center Span has made it possible to reduce the number of piers to be located within the channel to only one -the northern pier thus minimising incidence of collision.

Provision of allowance for lateral navigation clearance: Use of a 660m long Centre Span has made provision of a 600m navigation area underneath the bridge structure (Fig 11.1) out of which, 300m in the middle is reserved for navigation by vessels while 150m zone on either side has been maintained as navigation allowance in case of vessels loosing control. Towards the pier however, the channel is shallow and not navigable by big vessels which are consequently likely to run aground before hitting the pier. It is not possible therefore for any big vessel to ever collide against this pier.



Source: JST for MGB

Fig 11.1: Provision for lateral navigation clearance in design of the MGB

Design of the Pier insures against damage by small marine craft: The marine area proposed for location of the Northern Pier is also plied by small marine craft approaching the marine engineering workshops along the shoreline and these are likely to collide against the Pier. The pier is however designed with a Structural Safety capacity to withstand collision.

Rubber fenders will be used to protect the small craft: Towards protecting small vessels from collision damage, the Northern Pier will be covered with appropriate rubber fenders to bounce off any vessel loosing control and hitting the pier.

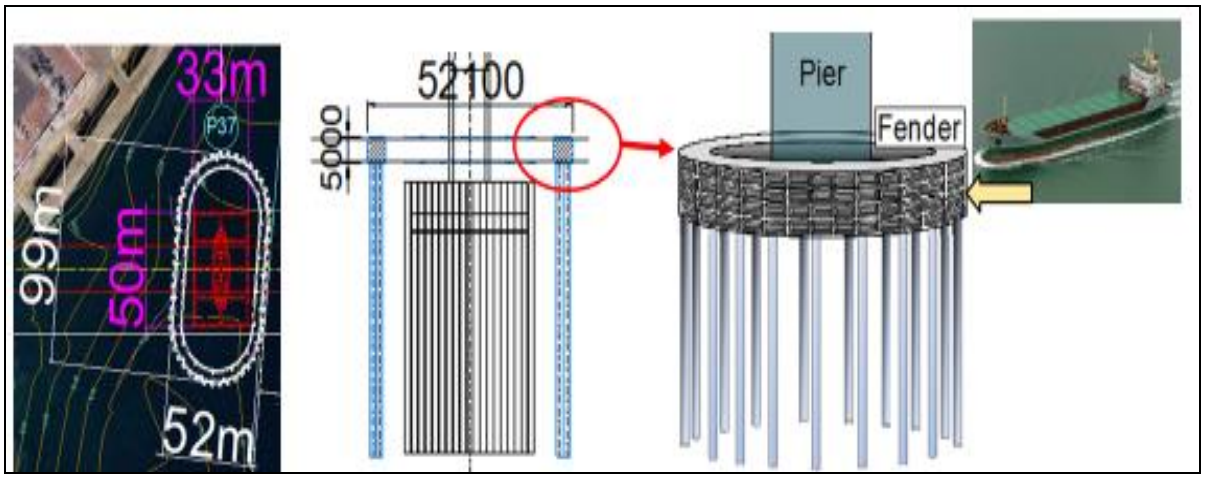


Fig 11.2: Provision of rubber fender around the Mombasa side pier

Table 11.2: Mitigation of Operation Phase Impacts

Project Phase	Source of Impact	Serial	Potential Impact	Severity	Mitigation	Legal provision	Post mitigation severity
Bridge Operation Phase (3.0)	Strategic impacts Strategic impacts	3.1	Increased demand for infrastructure and services due to population explosion in MMS	N	Planning and zoning for development	Cap 286; County Govnt Act of 2012	2P
		3.2	Increased pollution in MMS	N			
		3.3	Proliferation of non-planned development	N			
		3.4	Realignment in land use along project traverse	N			
		3.5	Increased hazard of cultural dilution	N			
		3.6	Further fragmentation of habitat for biodiversity	N			
	Completion of the bridge	3.7	Provision of a functional road connection to Mombasa Mainland South	2P			
		3.8	Provision of a second southern exit for Mombasa	2P			
		3.9	Creation of a new growth centers for Mombasa	2P			
		3.10	Opportunities for political and social integration	2P			
		3.11	Opening up of Mombasa Mainland South and COMESA region markets	2P			
		3.12	Improved quality of life form	2P			

Project Phase	Source of Impact	Serial	Potential Impact	Severity	Mitigation	Legal provision	Post mitigation severity
			enhanced delivery of services				
		3.13	New planning opportunity for Mombasa	2P			
		3.14	Reinvention of Mombasa landscape	2P			
		3.15	Revival of economic growth in MMS	2P			
		3.16	Enhanced value of property prices in MMS	2P			
		3.17	Removal of bottlenecks associated with ferry delays	2P			
		3.18	Reduced congestion at Mombasa CDB	2P			
		3.19	Reduced marine traffic congestion at Ferry site	2P			
		3.20	Height capping for vessels in future	2N	Option for vessels to dock at Mbaraki and the new Lamu Port		
		3.21	Visual intrusion/ Physical land and airborne barrier	2N	Wide consultation at design stage	Cap 286	N
		3.22	Hazards of marine accidents at the bridge Pier	N	Provide adequate navigation clearance; Use of Rubber vendors on the Northern Pier	Cap 370	
		3.24	Loss of revenue income source for KFS due to diversion of motor vehicles	N	Explore other income streams	KFS Act	P
		3.25	Input of polluted road runoff into Mweza and Port Reitz Creeks due to altered hydrology	2N	Filter runoff discharging into the creeks	Cap 387	N
		3.26	Imposition of physical barrier across settlements by embankment road	2N	Allow adequate access for people and livestock	Constitutio nal right	N
		3.27	Increased atmospheric pollutants and noise from bridge through the town and residential areas	2N	Keep clearance between road and boundary Installation of noise barrier		N
		3.28	Possible loss of the Ziwani seasonal	2N	Zoning for	CGK	P

Project Phase	Source of Impact	Serial	Potential Impact	Severity	Mitigation	Legal provision	Post mitigation severity
			lake and swamp		conservation by the Kwale County Government		
		3.29	Creation of a new frontier for crime	2N	Enhanced inter agency and community monitoring		N
			Post Mitigation Status		**33P, 7N, Net 26 P Overall: 29P**		

11.5.5: Revenue loss to Kenya Ferry Service

Proposed tolling of the bridge will create an additional income stream where KFS could be accommodated. Alternatively, KFS can explore other income streams including the proposed Water Bus, Ferry Service to other destinations etc.

11.5.6: Resolution of the physical barrier in Likoni, Mtongwe and Shika Adabu

Once commissioned, the road will impose huge barriers to free movement and access in villages. Appropriate and adequate crossing for people and their livestock should be provided both for high and low-density settlements. A total of 18 crossings will be provided at all road intersections and for intervals where such intersections are more than 250m apart. Plate 11.1 provides a rough guide to the location of proposed crossing points in Likoni and Mtongwe sections of the traverse.

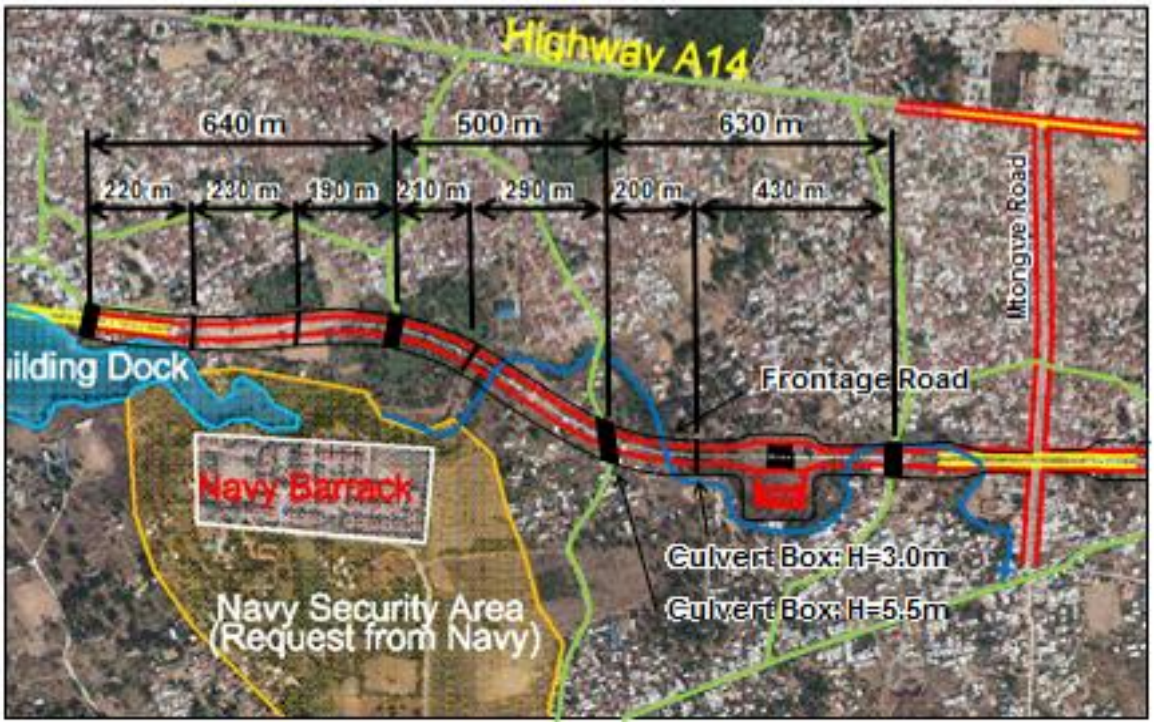


Plate 11.1: Proposed location of underpasses in the Likoni-Mtongwe section of MGB

11.5.7: Exposure to airborne pollutants and noise

According to the Kenyan noise regulations, the noise levels during the day at three sites exceeded the maximum permissible noise level of 50 dB(A) for a residential zone. The noise levels at all sites during the night exceeded the maximum permissible noise level of 35 dB(A) for a residence zone. The future noise levels were calculated based on the projected traffic volume of 35000 vehicles per day on MGB by year 2030. The prediction point was set at the edge of ROW. The horizontal distance from the centre of the road to the prediction point is 23 meters since ROW is 46 meters at the widest point. The predicted noise levels at the edge of ROW based on the projected traffic volume all exceed the Kenyan and WHO guidelines for all zones, therefore, abatement measures should be implemented along the roads close to the residential areas, especially schools, hospitals and religious facilities as follows:-

- Install noise barriers and low noise pavement

- Attach noise absorbing panels under elevated road sections
- Set environmental facility zones such as green belt
- Install warning signs on road for horn ban, speed control and lane restriction
- Regular maintenance on road to keep road surface good condition
- Develop a mechanism to record and respond to monitoring results and complaints

11.5.8: Pollution of Mweza Creek from road runoff

This EIA study has consulted extensively on the question of pollution threat posed to the Creeks by vehicles using the proposed bridge over Mweza and Port Reitz Creeks whereby the common opinion is that oil leaks from moving vehicles are quite limited in extent. Further, given that the longest span of bridge will be 600metres, the amount of oil leak correcting from such a small correction area will be quite limited as to pause any real pollution threats. Thus, so long as vehicles will not be allowed to stall and undergo repairs over the bridges, this threat can be ignored. The exception however is the weighbridge where on account of long residency time taken by vehicles queuing to weigh, threats of oil leaks are real and the same will require mitigation through filtration of any runoff emergent from the weighbridge station.

11.5.9: Possible loss of Ziwani seasonal swamp and lake

Zoning of the ecosystem for conservation: The Ziwani Lake Ecosystem comprising of the seasonal lake and wetland is locally important as a reservoir for floral and fauna biodiversity and also provides dry season fall back for water supply and livestock grazing. However, proposed location of the interchange between MGB and the MSBR Projects in close vicinity of the ecosystem is likely trigger land use change including development of commercial and housing estates around all with potential to encroach on and degrade the lake's vital catchment. As well, non-planned extracted of the lake waters to feed domestic and institutional needs is likely to impair ecological functioning with disastrous consequences whose avoidance will require focused effort at conserving the lake. One option is for the Kwale County Government to Gazette the Ziwani Lake into a Conservation Site and put in place a Management Plan.

11.6 MANAGEMENT OF DECOMMISSIONING

Several levels of decommissioning are anticipated;-

11.6.1 Decommissioning of Contractor/ Resident Engineer's Camps

This will take place upon completion and hand over of the road to KeNHA. The proposal by communities for the camps to be handed over to them for alternative use is recommended.

11.6.2 Decommissioning of the Bridge

Design of roads assumes an economic life of over 50 years which imply that, at some point, the system will require to be decommissioned either in whole or by components. Concerns associated with decommissioning would include occupational health and safety hazards, accumulation of scrap metal waste, which apart from taking up productive space would also pose diverse hazards (health and safety, harbouring of vermin, etc) to local

inhabitants and their property. Other impacts would emanate from failure to rehabilitate the concrete foundations of concrete bases back to economic use. The ESMP unveiled in chapter eight has explicit requirements for management of decommissioning phase impacts.

11.7: EFFECTIVENESS OF THE MITIGATION PROGRAMME

11.7.1 Viability of Mitigation

Effectiveness of the proposed mitigation programme has been assessed based on analysis of impact prevalence before and after mitigation (Table 11.2) based on this analysis, this Environmental and Social Impact Assessment Study observes that, there is a great potential to mitigate adverse impacts and hence improve the net worth of the proposed road. From Table 11.2, it is apparent that application of mitigation measures as identified and recommended has potential to reduce tally of adverse impacts (Ns) from 67 to 7 while simultaneously increasing the positive ones (Ps) from 33 to 40. Thus, subtracting the Ns from the Ps gives an overall net tally of 33P implying a very positive net impact after mitigation. Additionally, the mitigation programme has potential to reduce long-term hazards introduced by the project from 17 to 7 after mitigation, in acknowledgment of the fact that some impacts are irreversible and persist even after mitigation.

Table 11.2: Analysis of impacts scenario before and after mitigation

Nature of impact	Pre-mitigation tally	Post-mitigation tally
Positives	33P	40P
Negatives	67N	7N
Net	34N	33P
Residue impacts		7N
Irreversible adverse impacts	17	7

11.7.2 Prevalence of residue impacts

This study observes that 7 of the 51 adverse impacts associated with the project will persist even after mitigation. These are the impacts whose probability can be reduced substantially through mitigation but cannot be eliminated entirely. Their management requires implementation of a strict monitoring programme as outlined elsewhere below.

11.7.3 Net worth of the Project

Overall, the proposed project enjoys a highly positive benefits profile as it strongly supports policy aspirations towards a just, cohesive society living in a newly industrialised, globally competitive Kenya as envisaged in Vision 2030. This Study recommends that project development should proceed but factor in the mitigation measures recommended herein. Implementation of this ESMP will however require close follow-up and scrutiny to ensure achievement and sustenance of this esteemed net positive profile of the project. Requirements for monitoring are explored below.

11.8: THE ENVIRONMENTAL AND SOCIAL MONITORING PLAN

11.8.1 Overview of the ESMP

Modalities for mitigation of impacts and their phasing are presented in the Environmental Mitigation and Management Plan provided in Table 11.3 below. From Table 11.3, it is

apparent that most of the mitigation activity will take place during the construction phase. However, planning for the mitigation will take place at design stage (this stage) to ensure that such mitigation is incorporated and allocated for in the project design. Thus, the first action in mitigation will be a thorough scrutiny of the Design Report to ensure that the ESMP provided in this report has been fully incorporated and allocated for. Further, all mitigation to be implemented during civil works will be allocated for in the Bills of Quantities and captured in the Contract for Construction. The General Manager (Design & Construction) will hire a qualified Supervision of Works (SOW) Engineer to ensure full implementation of contractual tasks in mitigation.

11.8.2: Feasibility of impact mitigation

Majority of impacts have readily available means for mitigation while some of the negative impacts will acquire positive effects after mitigation. Thus, upon application of the Impact Mitigation Programme, majority of the impacts are dispensed with and the project is likely to achieve an overwhelming net positive effect. It is expected that there will be no land acquisition within the scope of the proposed work.

11.8.3: Phasing of mitigation action

Mitigation of impacts associated with civil works has been planned in the design and allowance has been made in the Bills of Quantities (BOQs). Also the contract for civil works bears several relevant clauses binding the contractor to implement environmental and social mitigation as outlined in Table 11.3 below.

11.8.4: Responsibility for mitigation

As per the ESMP below, responsibility for mitigating impacts of civil works falls on the contractor under the supervision of the Director (Development) or his appointed representative.

11.9: ENVIRONMENTAL AND SOCIAL MONITORING REQUIREMENTS

11.9.1: Terminologies

Environmental monitoring refers to the systematic collection, analysis and interpretation of data on environmental parameters through periodic measurements. Accruing information would facilitate tracking of levels of anticipated impacts and to monitor compliance in implementation of mitigation measures. Through periodic observations, it is possible to detect and remedy previously non-anticipated impacts before they turn catastrophic. Further, through continuous assessment of both the negative and positive benefits of a project, it is possible to determine the net impact (change) emanating from a project and thus determine its worth. Environmental monitoring falls in three categories as follows:-

- Baseline studies to document local environmental conditions of the project site. Since project impacts are generated by interaction between local environmental conditions and project activities, a study of baseline conditions facilitates prediction of impacts as already undertaken in Chapter Seven of this EA study. The documented baseline environment also provides a permanent benchmark against which long-term changes due to project activities can be monitored.

- Routine measurement of effects through measurements on environmental parameters is undertaken during project implementation and operation so as to detect changes attributed to the project.
- Compliance monitoring is effected through regular review of monitoring returns coupled with independent periodic sampling of environmental parameters and indicators. By evaluating the level of parameters against previously agreed standards, the supervising authority is able to monitor compliance with regulatory requirements. Surveillance and routine inspections also form part of compliance monitoring.

To be successful, monitoring and evaluation begins with clear project design followed by identification and elaboration of appropriate criteria and indicators. This document provides guidance about incorporating monitoring and evaluation elements in each stage of the project cycle.

11.9.2 Requirements of the 'Impacts monitoring' programme

Table 11.3 provides the framework proposed for biophysical monitoring. At construction stage, the Contractor will conduct biannual monitoring for all parameters specified mainly through sampling (pollutants) and counts in case of flora and fauna. In case of pollutants, samples will be analysed at the SGS Laboratories.

Table 11.3 Framework for environmental monitoring

Parameter and method	Specific location	Monitoring criteria
Ambient air quality through sampling and laboratory analysis	Lumumba Rd, Makarios road, Jamvi la Wageni, Mtongwe Polytechnic, Mtongwe Rd/A7 junction, MSBR junction	Particulate Matter (PM), Carbon Monoxide (CO), Nitrogen Oxides (NO/NO_2), Sulphur Oxides (SO_2), Lead (Pb), Ozone(O_3)
Noise through onsite measurement		Equivalent sound Level (Leq: dB), Vibration level (dB), Traffic volume
Coastal water quality through sampling and laboratory analysis	Start of Mweza Creek, Mouth of Mweza Creek, Mombasa Island Shoreline	Color, Water Temperature, pH, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Turbidity, Oil/Grease (Petroleum Ether Extracts), Suspended solids (SS), Total Coliforms
Marine sediment quality (same)		METALS: Antimony, Cadmium, Chromium Copper, Lead, Mercury, Nickel, Silver, Zinc, Arsenic,
Surface water quality (same)	Zina lake and Mtongwe Polytechnic bridge	Suspended matter, Turbidity, pH, temperature Colour, Dissolved Oxygen, Chemical Oxygen Demand, Oil & Grease, Total Coliforms
Floral monitoring and counts	Entire corridor	Dalbergia melanoxylon, Dialium orientale, Pseudobersama mossambicensis, Erythrina sacleuxii, Lasiodiscus ferrugineus, Psychotria punctate, Premna chrysoclada, Pavetta mangallana, Pavetta crebrifolia, Pavetta subacana, Ochna thomasiana
Bird monitoring and counts		Eurasian honey buzzard, Roseat tern, Greater crested tern, Sooty gull, Black headed heron, Grey heron, Cattle egret, Black kite, Senegal lapwing, Sacred ibis, Woolly necked stork,

		African darter

11.9.3: The Compliance Monitoring Strategy

This activity is essential to ensure implementation of recommended mitigation measures and to thus secure the overall environmental quality of any project. The monitoring activities should primarily target implementation of recommended mitigation measures in addition to surveillance for new impacts. Table 11.4 provides an M&E matrix for the MGB Project with a full complement of criteria and indicators. In addition to specification of impacts and required mitigation activities, the plan also identifies key players in each activity and the recommended timing of interventions. The Environmental and Social Action Plan for the Bridge Project also essentially constitutes its compliance monitoring program. Key features of the compliance monitoring programme are as follows:-

The Monitoring Authority: The burden of implementing impact mitigation will fall on the Project Contractor under supervision by KeNHA in the capacity of Employer. Through the Supervisor of Works (SOW), KeNHA will monitor activities of the Contractor to ensure compliance with contractual requirements including implementation of this EMP. Where issues not anticipated in this report do arise, the SOW will notify KeNHA for action.

Need for NEMA to participate in Monthly Site Meetings: NEMA is the body charged under Cap 387 with overall coordination of environmental management in Kenya. While NEMA coordinates this by regulating the EIA process for projects, there is need for NEMA to follow-up further on implementations of ESMPs as prepared for this project. This ESMP therefore, recommends that the County Environmental Officers for Mombasa and Kwale be invited to all monthly site meetings on this project and are facilitated to attend the same under the project. By being represented in site meetings, NEMA will enjoy an excellent opportunity to monitor implementation of the ESMP and to keep track on any emerging issues.

11.9.4: Monitoring Reports

A number of monitoring reports will be developed as follows:

(i) **ESIA Study Report under Cap 387:** This ESIA Study Report as currently prepared provides a documentation of the baseline environment of the area traversed by the proposed road to be upgraded and the adjoining areas, and thus provides a useful datum against which future monitoring can take place. The ESIA Study Report also includes a project-specific ESMP detailing the means for mitigating identified impacts. It therefore lays the basis for monitoring.

(ii) **Annual Audit Reports:** The Project Road will be subjected to an annual environmental audit in line with Cap 387. The report will include a summary of the environmental performance of the facility/enterprise vis-à-vis the Environmental Management Plan prepared and, a synthesis of Emergent Concerns.

(iii) **Signed minutes of Monthly Site Meetings**: Following every site meeting, minutes of deliberations will be produced by the SOW, confirmed, signed and adopted as a basis for following up on Contractor's activity.

Table 11.4: The Environmental and Social Monitoring Plan

Project Phase	Serial	Potential Impact	Mitigation	Budget (Ksh million)	Cost head	Objectively verifiable indicators	Monitoring Authority
Design Stage (1)	1.1	Creation of temporary opportunities for gainful employment					
	1.2	Generation of new/ additional site-specific data and documentation of local concerns					
	1.3	Capacity building for staff employed in enumeration and field surveys					
	1.4	Minor site disturbances from dredging, bush clearing etc. during survey work	Observe safety Code of Conduct	0.00			
	1.5	Minor accidents during survey work	Observe safety code of conduct	0.00			
Construction Phase (2)	2.1	Business opportunities in supply and transport of construction materials					
	2.2	Opening access to remote areas through construction of access routes					
	2.3	Generation of GHG in the transportation of construction materials	Local sourcing	0.00	CfW	Clauses in CfW	Employer
	2.4	Road hazards in material transportation	Implement a Traffic/ Transport Safety Code	0.00	Ditto	Ditto	Ditto
	2.5	Degradation along material sourcing and transport	Source from NEMA audited suppliers	0.00	Ditto	Ditto	Ditto
	2.6	Business and employment opportunities in the 4yr construction period					
	2.7	Revenue to GoK, GoK Agencies and County Government through levies and taxes					
	2.8	Interference with Mombasa Port operations during construction at Port entry point	Negotiated workplan to minimize interference	0.00	Ditto	Ditto	Ditto
	2.9	OHS concerns in construction of an elevated bridge overhead a sea creek	Develop and implement Health and Safety Plan	20.0	Ditto	Ditto	Ditto
	2.10	Hazards of marine pollution during construction	Ensure safe waste disposal (see narrative)	0.5	Ditto	Ditto	Ditto
	2.11	Potential for illegal activity in construction	Regular monitoring by all agencies	0.3	Ditto	Ditto	Ditto
	2.12	Geotechnical impacts of heavy drilling in the Likoni Channel	A full geotechnical investigation at DD	16.0	CfS	Clauses in CfS	Employer

Project Phase	Serial	Potential Impact	Mitigation	Budget (Ksh million)	Cost head	Objectively verifiable indicators	Monitoring Authority
			stage				
	2.13	Displacement of people, from land, investments and livelihood from ROW corridor	Implement RAP recommendations	8,741	NLC	Signed, returned offer forms	PSC
	2.14	Loss of business/livelihoods from decommissioning of city roads	Ditto	Ditto	Ditto	Ditto	Ditto
	2.15	Traffic congestion from diversion/closure of city roads	Traffic and implement a Traffic Management Plan	2.0	CfS	Clauses in CfS	Employer
	2.16	Disruption of village life and social dynamics by construction activity	Sensitization campaigns at all levels	2.0	CfS	Clauses in CfS	Employer
	2.17	Disruption of existing infrastructure for water and power supply	Replace all assets before ground breaking	200	CfW	Clauses in CfW	Employer
	2.18	Potential loss of heritage resources	NMK to implement Chance Find Procedures at Construction	3.0	CfW	Clauses in CfW	Employer
	2.19	Loss of ancestral roots and heritage upon displacement from land and family business	Comprehensive RAP to address all displacement	0.00	Ditto for 2.13 above		
	2.20	Disturbance to shrines and sacred sites and marine heritage resources	Avoid displacement	0.00	Ditto for 2.13 above		
	2.21	Potential sediment input into creek waters	Prepare a soil stabilization plan	5.0	Ditto for 2.13 above	Ditto for 2.13 above	Ditto for 2.13 above
	2.22	Alteration of the physical landscape through visual intrusion	Incorporate local architecture into the design	3.0	CfS	Clauses in CfS	Employer
	2.23	Costs to marine and terrestrial biodiversity including introduction of alien species in construction material and ballast water	Prepare contingency plans for all sectors at DD Stage	0.0	CfW	Clauses in CfW	Employer
	2.24	Loss of carbon sinks in destroyed cover vegetation	Partner with local groups to reforest with all special concern trees	10	CfW	Clauses in CfW	Employer
	2.25	Risk of fire hazards from construction equipment	As for 2.23 above	0.0	CfW	Clauses in CfW	Employer
	2.26	Escalation of noise levels	Forward planning to reduce period of disturbance.	10	CfW	Clauses in CfW	Employer
	2.27	Emission of pollutants (Pb), dust, fumes, vibrations from operation of plant and equipment	As for 2.23 above to include supply of PPEs	0.00	CfW	Clauses in CfW	Employer
	2.28	Socio-impacts of construction	Local sourcing for	5.00	CfW	Clauses	Employer

Project Phase	Serial	Potential Impact	Mitigation	Budget (Ksh million)	Cost head	Objectively verifiable indicators	Monitoring Authority
		crew and labour camps	labour and personnel			in CfW	
	2.29	Sanitation concerns from construction crew	Provide for adequate gender segregated facilities	0.3	CfW	Clauses in CfW	Employer
	2.30	Pressure on water resources	Contractor to develop own water source	9.0	CfW	Clauses in CfW	Employer
	2.33	Pollution from construction waste, debri, waste oils and spares	Apply 3R rule	0.5	CfW	Clauses in CfW	Employer
	2.31	Carbon footprint in transport of construction materials and equipment	Preference to already mobilized TSPs	0.0	CfW	Clauses in CfW	Employer
Bridge Operation Phase (3.0)	3.1	Increased demand for infrastructure and services due to population explosion in MMS	Planning and zoning for development	20	CfS	Clauses in CfS	Employer
	3.2	Increased pollution in MMS					
	3.3	Proliferation of non-planned development					
	3.4	Realignment in land use along project traverse					
	3.5	Increased hazard of cultural dilution					
	3.6	Further fragmentation of habitat for biodiversity					
	3.7	Provision of a functional road connection to Mombasa Mainland South					
	3.8	Provision of a second southern exit for Mombasa					
	3.9	Creation of a new growth centers for Mombasa					
	3.10	Opportunities for political and social integration					
	3.11	Opening of Mombasa Mainland South and COMESA region markets					
	3.12	Improved quality of life form enhanced delivery of services					
	3.13	New planning opportunity for Mombasa		0.00	CfS	Clauses in CfS	Employer
	3.14	Reinvention of Mombasa landscape					
	3.15	Revival of economic growth in MMS					
	3.16	Enhanced value of property prices in MMS					
	3.17	Removal of bottlenecks associated with ferry delays					
	3.18	Reduced congestion at Mombasa CDB					

Project Phase	Serial	Potential Impact	Mitigation	Budget (Ksh million)	Cost head	Objectively verifiable indicators	Monitoring Authority
	3.19	Reduced marine traffic congestion at Ferry site					
	3.20	Height capping for vessels in future	Option for vessels to dock at Mbaraki and the new Lamu Port	0.00	CfS	Clauses in CfS	Employer
	3.21	Visual intrusion/ Physical land and airborne barrier	Wide consultation at design stage	2.0	CfS	Clauses in CfS	Employer
	3.22	Hazards of marine accidents at the bridge Pier	Provide adequate navigation clearance; Use of Rubber fenders on the Northern Pier	50	CfW	Clauses in CfW	Employer
	3.24	Loss of revenue income source for KFS due to diversion of motor vehicles	Explore other income streams	0.00			
	3.25	Input of polluted road runoff into Ziwani lake, Mweza and Port Reitz Creeks due to altered hydrology	Filter runoff discharging into the creeks	50	CfW	Clauses in CfW	Employer
	3.26	Imposition of physical barrier across settlements by embankment road	Allow adequate access for people and livestock	0.00	CfW	Clauses in CfW	Employer
	3.27	Increased atmospheric pollutants and noise from bridge through the town and residential areas	Minimize length of residence on the bridge	0.00	CfW	Clauses in CfW	Employer
	3.28	Possible loss of the Ziwani seasonal lake and swamp	Zoning for conservation by the Kwale County Government	0.00	3.1 above		
	3.29	Creation of a new frontier for crime	Enhanced inter agency and community monitoring	0.00			
		Total budget		9149.6			

CfW-Contract for Works; CfS-Contract for Services

11.9.7 Costs in implementing the ESMP

A total of Ksh 9,149.6 Million (9.1496 Billion) will be required in both environmental and social mitigation. An additional Ksh 40 million is provided to cover overhead and monitoring costs giving a total budget of Ksh 9,189.6 million to cover environmental and social mitigation and monitoring in the Project.

CHAPTER TWELVE: CONCLUSION AND RECOMMENDATIONS

12.1: THE REPORT

The Government of the Republic of Kenya, through the Kenya National Highway Authority-KeNHA and support of the Government of Japan through JICA, is developing the Mombasa Gate Bridge Construction Project with the aim of providing a functional road connection between Mombasa Island and Mombasa Mainland South both separated by the Likoni Channel which is currently crossed through ferries operated by the Kenya Ferry Service (KFS). Overtime, increase in volume of passenger and vehicular traffic across the channel have challenged the viability of the ferry service especially during peak demand hours which are characterised by huge backlogs of humanity and motor vehicles traffic waiting to cross. Expansion of the ferry service is constrained by the need to keep the Channel free for use by vessels calling into the Kilindini harbour, and whose movement requires interruption of the Ferry Service thus constraining time-efficient demand management. Provision of a bridge connecting Mombasa Island to the Mainland South Coast as anticipated in the Mombasa Gate Bridge Construction Project is targeted at eliminating this bottleneck and further underpinning on-going initiatives aimed at opening up Kenya's South Coast for economic development.

Following conclusion of a prefeasibility study, that defined the project in terms of site location, engineering scope, social and environmental impacts, physical and economic displacement impacts, the MGB Project is currently undergoing Feasibility Study and Detailed Design under leadership of a Consortium led by Katahira Engineers of Japan. As part of the Feasibility Study, the MGB Project was subjected to an Environmental and Social Impact Assessment covering the design, implementation, commissioning and decommissioning phases.

This Report highlights salient social and environmental issues associated with the design, construction and operational aspects of the Project. The Report has been prepared under contract by Lead Experts from Repcon Associates, an Environmental Firm of Experts duly registered and licensed by NEMA (NEMA Registration No. 0002) and other Government of Kenya (GoK) agencies.

12.2: SCOPE OF THE ESIA STUDY

12.2.1: Legal Scope in the ESIA Study

Conduct of ESIA Studies in Kenya is legally anchored in the Environmental and Coordination Act (EMCA) Cap 387 and its 2015 Amendment. Section 58 of EMCA as amended in 2015 requires all projects proposed for implementation in Kenya be subjected to integrated environmental impact assessment as directed by NEMA. The Second Schedule of EMCA specifies projects that require to be subjected to EIA studies and particularly lists criteria under section 1 (General) as follows:-

(a) an activity out of character with its surrounding;
(b) any structure of a scale not in keeping with its surrounding;
(c) major changes in land use.

Screened against this Schedule and criteria, the proposed Mombasa Gate Bridge Project and approach roads are deemed to require a full cycle ESIA Study in that the 1.4Km long,

200m high bridge structure will intrude into the general skyline of Mombasa in a manner previously unforeseen in the area and in the process displace people from property, shelter and livelihoods. Construction activity is also likely to interfere with operations of the Kilindini Harbour, which is the economic lifeline for hinterlands in both Kenya and the region.

12.2.2: Thematic Scope of the Study

The substantial focus and scope of ESIA Studies is stipulated in the Third Schedule to Legal Notice 101 of EMCA.

12.3: FINDINGS OF THE STUDY

Based on impact prediction and scoping tools, potential impacts from proposed road upgrading and operation have been predicted and analysed with outcome as follows:-

Positive impacts: Positive impacts of the bridge will accrue from provision of a functional road connecting the MMS area to the rest of Kenya through Mombasa, a factor that will greatly mitigate current feeling of isolation and resultant political resentment. The MGB will open up MMS for economic development and enhance access to markets down to COMESA region and thus anchor all pillars to Vision 2030.

Adverse impacts: The most salient observation from this study is that at construction stage, the bridge could interfere with cargo flow into and out of the Port which could have stifling effects on both the nation and Regional economies and can lead Mombasa Port loosing the esteemed position as the Port of Choice in the region. Efforts must be made to mitigate against such loses.

Once completed, the massive engineering structure will permanently intrude into the Mombasa skyline and thus alter the landscape completely while imposing a height capping for vessels with mast heights above the design vertical clearance of 69 m above sea level. However, this Ksh 80billion worth of investment (pa capita cost of Ksh 1.9 million) is likely to be a major attraction to the coastal city and could even replace Fort Jesus as the main attraction while simultaneously decongesting Mombasa CBD to the advantage of both visitors and town inhabitants.

Once completed, the road will irreversibly impose a physical barrier to movement and access within villages and will introduce perpetual threats of accidents to people and their livestock. Heavy traffic along the new road is likely to escalate noise levels which already exceed statutory limits and could introduce polluted runoff into surface water bodies such as the Ziwani Lake and Mweza Creek.

12.4: THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

A core outcome of this EIA process was the formulation of an ESMP to guide resolution of adverse impacts anticipated from construction and operation of the proposed Mombasa Gate Bridge. Core features of the ESMP are as follows:-

12.4.1: Impact Mitigation Strategy and Plan

Design of the MGB was largely guided by the principle of avoidance as the core mitigation strategy. Thus, by analysing alternative alignments of the bridge, it was possible to choose one with minimal impacts on the social and biophysical environment which was in itself, a strategic intervention towards mitigation.

Key observations are that most adverse impacts are short-term and will disappear once civil works ends while residual impacts will require careful monitoring and coordination with relevant Lead Agencies. Towards implementation of the Impact Mitigation Plan, several sub-plans have been proposed to address specific regimes of impacts as follows:-

1) A Resettlement Action Plan to address displacement impacts,
2) A Construction Management Plan to ensure orderly execution of construction activity.
3) An Environmental Mitigation Plan to guide general resolution of environmental concerns
4) A Health and Safety Plan to resolve OHS concerns,
5) A Traffic Management Plan to resolve all traffic related concerns,
6) A Landscape Conservation Plan,
7) A Communication Plan to guide dissemination of project information to stakeholders,

12.4.2: Core players in Impact Mitigation

The burden of mitigation largely lies with the Project Contractor under supervision by KeNHA through the Supervising Consultant. The Contract for Civil Works will bear relevant clauses binding the contractor to institute environmental mitigation as recommended in this study. Thus, in this case, the core monitoring strategy for this project will be through site meetings, in which case, it is recommended that respective County Environmental Coordinators for Mombasa and Kwale be invited to such meetings. Other stakeholders such as the District Labour Officer should also initially attend such meetings to ascertain that measures towards securing the health and safety of workers have been put in place. When completed, the Road Project will be subject to statutory environmental and quality audits during the Defect Liability Period and the Contractor will be liable to repair all defects including those pertaining to environmental mitigation.

Overall, it is the impression of this study that, the proposed road project is a major economic undertaking to which national and regional development targets are tied. It is one of the Vision 2030 flagship projects and, subject to adoption of mitigation measures and proposal made here-in, it should be supported by all.

12.5: RECOMMENDATION

Through this ESIA Study Report, the Kenya National Highway Authority (KeNHA) through the Director General - the proponent - wishes to disclose that the proposed development of the Mombasa gate Bridge has impacts that can readily be mitigated and managed. The majority of adverse impacts identified are of a short-term nature and will cease once the civil works phase is completed. Further, other impacts can be contained through effective planning and management using available means of mitigation. By such disclosure, the prayer of the client to NEMA is for the project to be granted environmental licensing

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APPENDICES (VOLUME TWO)