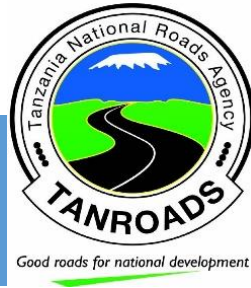


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**MULTINATIONAL: MALINDI – LUNGALUNGA/HOROHORO
- BAGAMOYO – TANGA ROAD PROJECT**

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR
UPGRADING OF MKANGE – TUNGAMAA – PANGANI BRIDGE
ROAD (120.8 KM) IN TANGA AND COAST REGIONS**

VOLUME I: ESIA MAIN REPORT

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EXECUTIVE SUMMARY

Environmental and Social Impact Assessment for Upgrading of Mkange – Tungamaa – Pangani Bridge Road (120.8 Km) in Tanga and Coast Regions

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E1. Introduction

The Government of United Republic of Tanzania (GOT) and the Government of the Republic of Kenya (GOK), with the support of the East Africa Community (EAC), intend to improve the transport infrastructure in order to support economic development programs within the two countries, deepen economic co-operation and foster regional integration within the EAC. EAC had received a grant from the African Development Bank (AfDB) to carry out the Feasibility Studies and Detailed Engineering Design of the Tanga –Pangani –Saadani - Makurunge Road (229km). The African Development Bank (ADB)) has shown interest to collaborate with the Government of Tanzania to finance construction of part of the road project with a total length of 120.8km from Mkange – Tungamaa – Pangani to bitumen standard including the Pangani Bridge.

In order to implement the proposed upgrading works in an environmentally sound manner, East Africa Community (EAC) Secretariat, on behalf of the Governments of Tanzania and Kenya commissioned M/s AURECON Consultants in Association with Inter Consult (I) Ltd and Otieno Odongo and Partners Consulting Engineers (OOP) to carry out Feasibility Study, detailed engineering design and Environmental and Social Impact Assessment. On the Environmental and Social Studies area, M/s Otieno Odongo and Partners Consulting Engineers (OOP) a registered firm of expert was assigned to carry out an Environmental and Social Impact Assessment for the proposed project as part of the detailed engineering design works. The fact that the implementation of the ESIA report was due since 2015, the report has been updated in April and July 2019 by TANROADS experts under TANROADS Engineering Consulting Unit (TECU) to incorporate various changes which have occurred in

the project area as presented in the Terms of Reference (**Annex 1**). The document was again updated in August 2019 to incorporate comments raised by USAID pre approval mission to the proposed project.

E2. Project Description

The Mkange – Tungamaa – Pangani Bridge Road (120.8 Km) is located in Coast and Tanga regions. The road forms part of the Coastal Corridor that connects Dar-Es-Salaam to Tanga and Mombasa in Kenya. The project has a total length of 124.5km which include Tungamaa village located in Pangani District, Tanga Region through Mkwaja and Kwamsisi villages in Handeni District (bypass to Saadani National Park and Zaraninge Forest found along the eastern Coast of Tanzania) and ends at Mkange village in Bagamoyo District, Coast Region (95.2km) and 3.7km spur road to Kipumbwi. The road also includes a total of 25.6km of approach roads to Pangani Bridge and Pangani Bridge with a span of 525m. The main road is majorly located in Tanga region and is built to gravel and earth standard. In the Coast region, the proposed road covers only two villages of Mkange and Manda Mazingara in Bagamoyo district, while in Tanga the road passes in more than 20 villages of Pangani and Handeni Districts. In each side the road passes along various villages and settlements such as Mkange, Kwamsisi, Pangani and Kipumbwi.

The road section is part of Option C (E7) road alignment which starts from Tanga - Pangani - Mkwaja through the villages of Kwamsisi, Zimbiri, Manda Mazingara, Mkange, Gongo, Matipwili, Goma and Makurunge then joins the Bagamoyo – Makofia – Msata road (229 Km).

The existing road is built to gravel and earth standard. The road forms part of the Eastern Corridor that connects Dar-es-Salaam to Tanga and Mombasa in Kenya. The present state of the road requires major rehabilitation and frequent maintenance. The upgrading aims at developing the East African Coastal Corridor Development Project Development Project and revamping its versatility so as to contribute more to the socio economic progression of the Coast and Tanga Regions, and especially Bagamoyo and Pangani Districts.

Major parts of the existing road are in poor conditions making it impassable during the rainy seasons. The lack of a bridge at the Pangani River crossing aggravates the problem further. This condition hinders those leaving along the project road from accessing social services and reliable markets for their agricultural and fishing products. It also frustrates tourism activities in the Saadani National Park.

The road project has been divided in three (3) lots for easy implementation. Lot 1: Tanga – Pangani road section (50km) is 100% financed by the Government of United Republic of Tanzania. The two lots (2 and 3) below will be upgraded under AfDB loan with contribution of the Government:

- Lot 2: Pangani Bridge, Pangani – Tungamaa section and Ushongo beach road (25.6km)
- Lot 3: Tungamaa – Mkwaja – Mkange road section (95.2km) and Kipumbwi spur road (3.7km)

E3. Policy, Legal and Institutional Framework

Important laws that have relevance to the road development in respect of environmental management include:

- Environmental Management Act No. 20 of (2004), Cap. 191.

- The Land Act No. 4 of 1999 and the Village Land Act No. 5 of (1999).
- The Water Resources Management Act No. 11 of 2009.
- Energy and Water Utilities Regulatory Authority Act, 2001.
- Land Valuation and Valuers Registration Act of 2016
- Gravel Removal Act of 1967
- The Road Act, 2007 Protected Places and Areas Act (1969).
- Land Use Planning Act (2007).
- Occupation Health Safety (2003).
- Local Government Acts No.7 & 8 of 1982.
- Forest Act, 1957 (Revised in 2002).
- Explosives Act, 56/63.
- Regional and District Act No 9, 1997.
- Mining Act (1998) T.
- The Land Acquisition Act 1967.
- Employment and Labour Relations Act No. 6 of 2004.
- Engineers Registration Act and its Amendments 1997 and 2007.
- The Contractors Registration Act (1997).
- The HIV and AIDS (Prevention and Control) Act of 2008.

E4. Project Environment

The study area experiences moderate temperatures and rainfall with the average annual temperatures being 32°C. The warm season normally runs from October to February. There are two major rainfall seasons namely the long rains which occur between March and May and short rains which occur between October and December with average annual quantities of 1200mm. However, the average annual rainfall varies from year to year and between the various ecological zones. Moreover, the coastal nature which forms the larger part of the Region affects the patterns of temperature and rainfall. The coastal plains in Pangani and Bagamoyo districts experience moderate high annual rainfall of 800-1,400mm while the dry plains mostly in Handeni and parts of Bagamoyo districts receive low rainfall ranging from 200 to 600mm annually.

The core impact zone includes the area immediately bordering the project (local). In the case of this project, local impacts will include the site of the construction (borrow areas, quarries and the actual road construction site) and the immediate surrounding areas. The influence impact zone includes the area beyond 500m –1000m from the road alignment. Based on the environment surrounding the road the influence impact zone includes areas such as Saadani National Park, the Indian Ocean and the forest.

E5. Project Stakeholders

Stakeholder's analysis for the project was undertaken and the relevant stakeholders identified included: TANROADS Regional Offices, National Environment Management Council (NEMC), Tanzania National Park (TANAPA), Saadani National Park, District Councils, Departmental Heads at Municipal Councils, Tanzania Port Authority (Tanga and Pangani), TARURA regional and District offices, Local leaders among others. All the stakeholders were

consulted regarding the proposed project through one to one interviews and stakeholders meetings.

The following major issues were raised by stakeholders:

- There is a need to choose the alternative route so as to avoid the park and at the same time look for a route that shall serve the locals found in the villages neighbouring the park;
- Increase in traffic will translate to increased road accidents affecting people and wildlife. Possibility of increased in human activities in the park thus leading to poisoning of animals, poaching and forest fires;
- Contractor should use the existing borrow pits, stone quarries and sand pits in order to minimise the land degradation at new sites;
- Possible population influx into the project areas as a result of improved services and possible with spread of communicable diseases (i.e. HIV/AIDS) and competition for the meagre resources;
- Project Affected Persons (PAPs) should be compensated using current rates and Local leaders at Wards, Street/Village levels should be involved during the process of compensation; and
- The public should be made aware of the developments planned at their area in advance
- Dust and noise generation during the construction activities should be controlled.

E6. Potential Environmental and Social Impacts

The development of road infrastructure can cause a wide range of positive and negative impacts on a number of receptors. The significant environmental and social impacts identified for the proposed project included:

Positive Impacts

- Improvement of transportation services;
- Improved community life and services;
- Job creation and improved employment opportunities;
- Reduced production costs of goods and improved market penetration;
- Promote tourism attraction and associated revenues for Saadani National Park and along the coast; and
- Reduce traffic volume passing through the Saadani National Park;
- Implementation of various complementary projects for community benefit

Negative Impacts

- Loss of natural habitat;
- Destruction of spawning grounds for fish thus affecting the fishing industry;
- Attracting high population around the Park that will conflicts with wild life;
- Attracting poaching and related activities;
- Serving relatively small proportion of population (by routing road through the Park).
- Increased accidents due to over speeding vehicles leading to death and injury of wildlife;
- Safety and health risks;
- Landscape modification;
- Immigration/influx of people from other areas;

- Increased spread of HIV/AIDS and other diseases;
- Land expropriation and relocation/resettlement; and
- Linear settlement along the road reserve once the road is operational which lead to several multiplier impacts such as increased accidents, challenges in road maintenance and expansion, traffic congestions among other impacts.

E7: Project Alternative Consideration

During project design and ESIA study different alternatives were considered in order to achieve the project's objectives. A range of systematic methods were used for comparing and evaluating various alternatives. These includes a simple checklist, overlay maps, complex matrices, mathematical models and descriptions of major impacts and reasons for rejection provided. The two cases of project alternative were considered and analysed i.e. **“without project”** case and **“with project”** case.

Considering the “with project”, four (4) alternative routes were identified considered and analysed, namely option A, B, C and D as shown in the project layout found under **Annex 4**. Alignment selection was carried out on the basis of evaluation of various alternatives. The improvement of the existing alignment was included as an alternative. Both qualitatively and quantitatively evaluation has been done for various factors influencing the selection process. These factors can be broadly grouped under main heads such as geometrics, cost, economic benefits and social and environmental impacts. The qualitative evaluation rates the alternative as less desirable, desirable, more desirable and most desirable against each factor.

It was noted that to the large extent the road must follow the existing alignment to avoid destruction of many properties as well as destruction of natural ecosystems and wildlife habitat along the road. Therefore, all the alternatives were based on how to improve the existing alignment and to bypass the Saadani National Park for maintaining the quality of its ecosystem.

The details of the routes alternatives are as follows:

- **The Option A** road starts from Makurunge Junction of Bagamoyo – Makofia- Msata Road. According to the design of this section about 80km of the road earmarked for development was passing through the Saadani National Park which is known to be a natural ecosystem thus.
- In this regard other route options B, C and D were considered with the aim of the alternative route consideration is to eliminate or minimize impacts on the natural ecosystem (Saadani National Park and Zaraninge Forest) associated with the project road namely Option A as described below:
- **The Option B** road starts at Kiwangwa located off the Bagamoyo-Msata road and moves outside the forest northward connecting to Mkange, Kwamsisi then Mkwaja. Despite the fact that the road is longer than Option A namely the status quo, it avoids the Kiono/Zaraninge forest by moving outside its boundaries.
- **The Option C** road which is locally known as the village road starts at Mwakaja and follows the following villages from Kwamsisi, Zimbiri, Mkange, Matipwili and Goma

then joins Makurunge the same starting point as Option A. The road is also longer than Option A by 46km but it is considered to have a lower impact on the forest ecosystem according to TANAPA as it cuts through a small section (about 30km) of the Zaraninge/Kiono forest as compared to Option A which has 80km of its stretch within the forest. The Option C road is also considered viable as it is known to serve a large population in the seven (7) villages it traverses through which a population of 17,472 has. The map showing the layout of the four alternative roads is provided under **Annex 4** of this report.

- **The Option D** was brought in after critical evaluation of the road functions and according to this option the road has been proposed to follow the alignment from Tanga to Kipumbwi, a stretch of about 75km and connect the road to Segera on the Arusha-Dar-es-Salaam highway. This maintains Option A and B as one comes from Tanga then divert the road towards Segera for about 50km. This option shall still join Bagamoyo to Tanga as the Msata- Makofia -Bagamoyo road but it shall not facilitate movement of locals located in the villages around the park and forest and it also cuts through the Msubugwe forest.

It is noted that both alignments of Option B and C cut through a section of the former Mkwaja Ranch (Mkwaja North) via the Mkwaja Road by at least 20km. The area was seen to be highly settled despite the ranch being fully incorporated into the Saadani National Park. Consultation with Saadani National Park Authority (SANAPA) indicated that they have no objection to the proposal as the section traversed is relatively small and that the road shall serve the communities living in the villages found along it.

E7. Environmental and Social Management and Mitigation Plan (ESMP)

The options to minimize or prevent the identified adverse social and environmental impacts as well as a monitoring plan have been proposed in chapter 8 and 9 of this report. Most of the identified mitigation measures are based on good engineering practices. The ESMP describes the implementation schedule of the proposed mitigation measures as well as planning for long-term monitoring activities. It defines roles and responsibility of different actors of the plan. The financial requirement for undertaking the ESMP is estimated at TZS 753 million (USD 321,108.) for the four main phases of the project namely pre-construction, construction, and operation and decommissioning.

E8. Conclusion

The EIA was done in line with the project design. After assessment of alternatives, the best alternative was selected based on the environmental considerations, socio-economic and engineering reason. Three alternative routes were assessed where by the best alternative was selected. The selected alternative is Makurunge – Mkwaja – Kwamsisi - Pangani – Tanga with a total of 229 km.

The report concludes that the proposed project alternatives will help to mitigate the potential project impacts such as pollution, accidents leading to wildlife death and injuries and other unforeseen negative impacts on the natural resource. The proposed alternative route has big potential for agricultural production and tourism development. This route is likely to have substantial contribution towards socio-economic development compared to the Mkwaja - Saadani road, due to a number of people who shall be served by the road and area to be covered, economic activities such as small scale-fishing, subsistence farming and livestock

keeping. The alternative routes are expected to provide services to more than 17,278 people living in the area contrary to Mkwaja - Saadani Road that will serve a small proportion of people.

Implementation of the proposed road projects will entail no detrimental impacts provided the recommended mitigation measures are adequately and timely implemented. The identified adverse impacts shall be managed through the proposed mitigation measures and implementation regime laid down in this ESMP. TANROADS on behalf of EAC is committed in implementing all the recommendations given in this ESMP and further carrying out the environmental auditing and monitoring schedules.

LIST OF ACRONYMS

AC	Asphalt concrete
ARAP	Abbreviated Resettlement Action Plan
AfDB	African Development Bank
CBO	Community Based Organisations
CCD	Convention of Control of Desertification
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CITES	Convention on International Trade in Endangered Species (CITES)
COP	Convention of Parties
CO_x, CO	Carbon Oxides
dBA	Decibels
DoE	Division of Environment
DMOs	District Medical Officers
EAC	East African Community
EAMGRS	Environmental Assessment and Management Guidelines for Road Sector
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMA	Environmental Management Act
EMS	Environmental Management System
EMP	Environmental Management Plan
EISA	Environmental and Social Impact Assessment
ESAP	Environmental and Social Impact Assessment Procedures
ESMP	Environmental and Social Management Plan
FRP	Full Resettlement Plan
GOT	Government of Tanzania
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome.
IBA	Important Bird Areas
IDA	International Development Association
IEE	Initial Environmental Examination
LEA	Limited Environmental Analysis

LGSP	Local Government Support Project
LMO	Living Modified Microorganism
µg/m³	Microgram per cubic metre
NACP	National HIV/AIDS Control Programme
NBS	National Bureau of Statistics
NEMC	National Environment Management Council
NEP	National Environmental Plan
NER	National Enrolment Rate
NGO	Non -Governmental Organization
No_x	Oxides of Nitrogen
NSGRP	The National Strategy for Growth and Reduction of Poverty
NTU	Nephelometric Turbidity Units
OOP	Otieno Odongo and Partners Consulting Engineers
PAPs	Project Affected Persons
PIC	Public Information Centre
PM₁₀	Particulate Matter of ten microns
PMO-RALG	Prime Minister's Office, Regional Administration and Local Government
POPs	Persistent Organic Pollutants
PVC	Polyvinyl Chloride
RCC	Reinforced Cement Concrete
RAP	Resettlement Action Plan
RIA	Road Implementing Agency
RS-ES	Road Sector-Environmental Section
SADC	Southern African Development Community
SANAPA	Saadani National Park Authority
SEA	Strategic Environmental Assessment
SHE	Safety Heath and Environment
SIA	Social Impact Assessment
SMP	Social Management Plan
STD	Sexual Transmitted Diseases
TACAIDS	Tanzania Commission for AIDS
TAC	Technical Advisory Committee

TANESCO	Tanzania Energy Supply Company
TANROADS	Tanzania National Roads Authority
TANAPA	Tanzania National Park Authority
THMIS	Tanzania HIV/AIDS and Malaria Indicator Survey
ToR	Terms of References
TPA	Tanzania Port Authority
TRA	Tanzania Revenue Authority
TSCP	Tanzania Strategic Cities Project
TTCL	Tanzania Telecommunication Company
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention to Climate Change
VEO	Village Executive Officer
WB	World Bank
WHO-GPA	World Health Organization Global Programme on AIDS

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1 INTRODUCTION

1.1 Project Background

The Government of the United Republic of Tanzania (GOT) and the Government of the Republic of Kenya (GOK), with the support of the East Africa Community (EAC), intend to improve the transport infrastructure in order to support economic development programs within the two countries, deepen economic co-operation and foster regional integration within the EAC. The EAC through financial support from African Development Bank (AfDB) coordinated the Feasibility Studies and Detailed Engineering Design of the Tanga – Pangani – Saadani – Makurunge road (229km).

The proposed Tanga - Pangani - Saadani - Makurunge road forms part of the East African Community Regional Road Network Programme. The road is part of the East Africa Coastal corridor, Malindi – Mombasa – Lungalunga/Horohoro – Tanga – Bagamoyo Road (454km) located in the north – eastern part of Tanzania and the South-eastern part of Kenya. It is the among the priority list approved by the EAC Heads of States Retreat on Infrastructure and Health Financing and Development held in Kampala in February 2018 and has been prioritized in the African Development Bank's Eastern Africa Regional Integration Strategy (RISP), 2018-2022. It is also a key inter-regional link between Kenya and Tanzania as a coastal road along the Indian Ocean Coast, and therefore a vital piece for regional Integration in East Africa. The road facilitates cross border trade with Kenya (through Horohoro). The movement of people, goods, including agricultural produce from Tanga and Coast regions will be facilitated at national and international levels. The project road therefore provides an alternative trunk road between Dar es Salaam, Tanga and Mombasa facilitating transport and travel along the road impact areas and beyond. Additionally, the road is of major tourist potential, as it will improve access to Saadani National Park, Pangani and Bagamoyo historical towns. The coastal areas of Tanzania depend to a significant level on marine resources available in the ocean and surrounding areas. Unfortunately, full and sustainable exploitation and development of the marine resources is constrained by lack of accessible all weather road in and out of these areas.

In order to implement the proposed upgrading works, East Africa Community Secretariat on behalf of TANROADS commissioned M/s AURECON Consultants in Association with Inter Consult (T) Ltd and Otieno Odongo and Partners Consulting Engineers (OOP) to carry out Feasibility Study, detailed engineering design and Environmental and Social Impact Assessment. On the Environmental and Social Studies area, M/s Otieno Odongo and Partners Consulting Engineers (OOP) a registered firm of expert was assigned to carry out an Environmental and Social Impact Assessment for the proposed project as part of the detailed engineering design works.

The Environmental Impacts Assessment has been conducted in accordance with the requirements of the Environment Management Act No.20 of 2004 and Environmental Impact Assessment and Audit Regulations (2005) of Tanzania; Environmental and Social Safeguard Policy of African Development Bank (AfDB) Operational Safeguards on Environmental and Social issues. The project has been awarded with the EIA Certificate (**Annex 2**) with the application Reference No. 589 and Registration No. EC/EIA/2019/0287n.

The African Development Bank (AfDB) has shown interest to collaborate with the Government of Tanzania to finance construction of part of the corridor and Pangani Bridge with a length of 120.8 km

1.2 Objectives of the ESIA

In order to fulfil the requirements of the AfDB and cover the specific section of the road to be financed, the ESIA report has been updated by TANROADS through TANROADS Engineering Consulting Unit (TECU) in April, July and August 2019. The report focus specifically on the area of impact of the project which is Tungamaa – Mkwaja – Mkange road section, Kipumbwi spur road, Pangani bridge and its approaches that totals 120.8km.

The overall objective of the proposed project is to develop a reliable road network that shall enhance intra and inter region economic development by integrating trade activities between the districts found

in the project area, the neighbouring Coastal areas in Tanzania, Kenya and the entire East African region which will be achieved by linking the corridor to the Northern Corridor.

The objective of the ESIA was to analyse and evaluate the anticipated impacts of the proposed project road on the physical, biological, socio-cultural and socio-economic environment based on the various project phases namely planning, design, construction and operation and maintenance.

The assessment study was conducted from mid-February 2011 to March 2012 and updated between March, April and July 2019. The update involved studying the whole length of the road to be financed, the Pangani Bridge and its approaches together with the access roads including link roads leading to tourism attraction areas such as Kipumbwi and Ushongo link roads. The specific objectives of this study included the following:

- Identifying and assess all potential environmental and social impacts of the proposed project;
- Identifying all potential significant adverse environmental and social impacts of the project and recommend measures for mitigation;
- Verify compliance with the environmental regulations and relevant standards;
- Identify problems (non-conformity) and recommend measures to improve the environmental management system;
- Generate baseline data that will be used to monitor and evaluate the mitigation measures implemented during the project cycle;
- Recommend cost effective measures to be used to mitigate against the anticipated negative impacts;
- Prepare an Environmental Impact Assessment Report compliant to the Environmental Management Act, 2004 and the Environmental Impact Assessment and Audit Regulations, 2005 and its amendments of 2018; African Development Bank Environmental and Social Safeguard Policy and Guidelines for Environmental and Social Considerations for Development Projects;
- Identify and quantify different categories of project affected people (PAPs) who would require some form of assistance, compensation, rehabilitation or relocation;
- Provide guidelines to stakeholders participating in the mitigation of adverse social impacts of the project; and
- Verify the adherence and compliance of the African Development Bank and Japan International Cooperation Agency safeguard policies.

Based on the TOR of the project, the objectives of the study were to be met at the feasibility study stage of the project but it seems that some key objective such as extent of impact on the bio-physical environment and the project affected people shall be holistically determined at the design stage. This is due to the fact that the project location is still being debated upon and such impacts are normally site specific and depend on the actual alignment to be designed for construction.

1.3 Project Justification

The upgrade of the project road shall revamp the project areas versatility which shall contribute to the socio-economic progression of the Coast and Tanga Regions, and especially Bagamoyo and Pangani Districts. The road will also provide an alternative trunk road between Dar es Salaam, Tanga and Mombasa in neighbouring country of Kenya. This shall ease and enhance communication between Tanzania and Kenya from Dar es Salaam via the touristic and historical town of Bagamoyo, Pangani, Tanga Mombasa to Malindi.

The northern part of the road i.e. Pangani and Saadani via Mkwaja is normally covered in two hours while using a 4x4 vehicle, and becomes impassable after the rains. The problem is even serious in the southern part of the same road (a coastal route to Saadani) because of lack of a bridge at Wami River North of Bagamoyo. This short coming in areas transport infrastructures forces commuters to take a circuitous route from Dar es Salaam via Chalinze to Bagamoyo then further North which translate to takes 4-5 hours of additional travel time. The development of the proposed road from Makurunge with the construction of a bridge at Wami River crossing will attract visitation to the closest wildlife destination to Dar es Salaam located 130km away which offer combination of beach and wildlife viewing opportunity.

The improvement of the road is also intended to facilitate economic growth as it will reduce transportation costs and hence stimulate the movement of agricultural products to markets as well as enable exploitation of potentials fisheries and, minerals resources and, other social and cultural resources in the project regions. Specifically the project will improve transportation within Bagamoyo, Pangani, Handeni and Tanga districts and the respective regions.

It is a known fact that development of road projects often brings significant economic and social improvements. However, if these projects are designed and implemented without adequate integration of social, chemical and bio-physical environmental concerns, they might cause significant adverse impacts on the local communities, the general public and the natural environment. As a part of the larger project, the Environmental and Social Impact Assessment (ESIA) is used for the purpose of guiding the incorporation of the various environmental management considerations in the planning and development process of the project. The implementation of the findings from the ESIA enhances the project proposal to be implemented in sustainable manner.

1.4 *Rationale of ESIA Studies*

Development of new roads and improvement of existing facilities have positive and, potential negative effects to the physical, biological, chemical and socio-economic environments. The social well-being of the communities as well as natural habitats depends on how well these negative impacts are mitigated. The ESIA provides input to the feasibility study and design proposals of the investments. The ESIA findings and recommendations contained in this report will be incorporated in the overall project design, specifically assist in the development of mitigation and enhancement measures of the identified risks, opportunities and impacts.

1.5 *Scope of Work and Limitation of the Study*

The scope of this ESIA study is based on general Terms of Reference for the ESIA study as provided in the Environmental Impact Assessment and Audit Regulations 2005 and its amendments of 2018 as well as the AfDB's Integrated Safeguards System: Operational Safeguards (2013) and other international provisions. The ToR requires the ESIA study to encompass undertaking the following:

- Consultation with Government agencies, local communities and the private sector operating in the villages affected by the project road;
- Review of policies, legislation and administrative framework including the African Development Bank Environmental and Social Assessment Procedures (ESAP) 2001 and International Environmental Conventions ratified by the country;
- To establish an environmental baseline for the project area and description of the proposed road works;
- To assess the potential environmental and socio-economic impacts resulting from the road development, especially within the zone of influence of the project;
- To assess resettlement issues (Resettlement Impact Analysis);
- To identify key stakeholders and review on the adequacy of participatory approaches suggested;
- To assess and quantify the potential social impacts resulting from the development of the road and assess the target groups to be affected; and
- To develop an Environmental and Social Management Plan (ESMP) detailing actions and responsibilities for impacts mitigation and monitoring.

The main limiting factor in fulfilling the scope of work comprehensively lies in identifying an alternative route that shall avoid impacting on the natural ecosystems. Several alternative routes have been discussed in this report and the impacts associated with them identified but the overall net project impacts have not been concluded as the extent of impacts for each alternative varies.

1.6 *Approach and Methodology*

1.6.1 *Approach*

In order to properly address the environmental issues, a team of experts participated in undertaking the ESIA Study. The experts were Environmentalist, Environmental Engineer, Highway Engineer and a Sociologist. The team approached the study by conducting Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA). The two assessments (SIA and EIA) were then combined to produce one ESIA report.

1.6.2 *Impact Assessment Methodology*

The socio-economic team conducted social survey and consultative meetings in three districts of Handeni, Pangani and Bagamoyo villages to gather relevant information related to the impact of the proposed road project as explained under the methodology of this study. Both qualitative and quantitative techniques were applied to collect data and information in the study area. Qualitative information was collected from focus groups discussions. During the focus group discussions, the consultant identified perceived positive and negative impacts of the project, and establishes the community's opinions on a sound SMP, mitigation measures and their associated costs.

The method used included:

- A desk study whereby the relevant documents were reviewed; this included the relevant policies, district profile of the respective districts and all other secondary source of information.
- Key Informant Interviews and Semi-Structured Interviews were conducted with the District Council Administrators, Street/ward/village governments, Saadani National Park Officials, TANAPA, Tanzania Port Authority as well as local Authorities.
- Transect walks, where possible were conducted to confirm the information from the discussion and observation were made on physical and environmental conditions.
- Household questionnaires were administered to a good number of selected villages in the project area.
- Various methods for data analysis have been used including SPSS and Excel to come up with descriptive Statistics and establish baseline information.

1.6.2.1 *Desk Study*

A desk study was done through an extensive review of various literatures that contain information about the study area. This included previous studies made by other consultants for the same project. At the district levels, large quantities of information were collected from the district profiles that were found in planning departments of the respective districts.

1.6.2.2 *Courtesy Call on District Offices*

Consultative meetings were carried out at district, ward and village levels in order to introduce the proposed project work, make arrangements for interviews and book appointments for meetings. This provided an opportunity to learn and share the salient information about the proposed project. In addition, the team obtained important socio-economic secondary data about the project area. The secondary data from the village governments were obtained by a checklist, which was filled in by village executive officers or the village chairperson. Semi-structured questionnaires and interviewers' guides were used for the discussions with households, key informers and focus groups discussions. The interviewees were encouraged to give their opinions and perceptions regarding possible positive and negative impacts of the proposed project.

1.6.2.3 *Stakeholder's Consultations and Public Involvement*

The Public Consultation and Involvement process was conducted in December 2011 and repeated in March, April and August 2019 in the areas where the project road traverses. A wide range of stakeholders at local and national levels were consulted with the objective of describing the existing socio-economic conditions within the project area of influence and the immediate surroundings.

Formal and informal interviews were conducted with Tanga Region officials, District/Municipal Councils officials, Inter-governmental and EAC stakeholders, Tanga and Pangani Port Officers representing Tanzania Port Authority (TPA), TANAPA and Saadani National Park officials; TANESCO, TARURA, Ward/street/village governments, Tanga UWASA and local Government authorities.

A total of five (5) delegates meetings were held in both Kenya and Tanzania to discuss the proposed project which included evaluation of project impacts and mitigation/alternative identification. In Tanzania a total of 22 consultative meetings were held with the communities along the project road. The minutes of the meeting and the list of consulted stakeholders are annexed to this report.

The specific objectives of the consultation process were:

- To create awareness on the project;
- To involve the stakeholders in identifying and predicting the project impacts which are likely to happen during road construction and operation phases and propose proper mitigation measures;
- To exchange addresses and contacts between the consultant and the stakeholders for future communication, particularly during preparation Resettlement Action Plan (RAP); and
- To consult and gather recommendations from the District Council, Ward/Street/village governments as well as all necessary institutions.

1.6.2.4 Observation

A visual inspection (critical observations) was carried out along the proposed project area to get an impression of the physical features, land tenure systems and land use, vegetation cover, proposed corridor demarcations, condition of the existing infrastructures, and land development e.g. farms, buildings, type of crops etc.

1.6.2.5 Data Analysis

Data obtained from participatory methods and tools were analyzed during fieldwork. Further analysis was made through comparison and cross - checking with relevant and dependent secondary sources within respective study villages. The primary data from questionnaires were analyzed by using SPSS and Excel statistical programs while other data were compiled manually.

1.6.3 Environmental Assessment Methodology

Superimposing project elements/activities onto the existing social and environmental natural conditions has identified the potential environmental impacts of the proposed road development. The checklist method has been used to identify the impacts. Further, the environmental impact correlation matrix method has been adopted to predict impacts of major concern. A key guiding assumption in this study is that the project will be designed, constructed, operated and maintained with due care for safety and environmental matters using current and practical engineering practice and/or Best Available Technology Not Entailing Excess Cost (BATNEEC). The implementation schedule of the mitigation measures is summarized in the Environmental and Social Management Plan (ESMP).

The environmental assessment has been undertaken in close interaction with the engineering, planning and design team. In this process environmental impacts have been evaluated for various alternatives. Several project alternatives were considered including that of not implementing the project. The fundamental environmental protection strategy and environmental considerations influencing engineering design were incorporated. However, reasonable regard to technological feasibility and economic capability were taken into account. *Inter alia*, the assessment entailed the following:

1.6.4 Collection of Data

The collection of baseline data was conducted subsequent to defining the scope of the EIA. These data allows the study team to determine whether more detailed information on environmental conditions at the development site and its surroundings are needed, where such information can be obtained, and how. Both primary and secondary data were collected. Primary data were collected by direct measurement, observations and using semi-structured interviews with respective and targeted parties

(as explained in the previous section). Secondary data were obtained from various relevant sources of information such as district profiles, Feasibility study report, Detailed Engineering Design Report for the project road, Materials report, Hydrology report, Traffic report, Cost estimates and Bidding document and many other official and non-official documents.

1.6.5 Review of Policies, Legal and Institutional Framework for Environmental Management

This allowed the study team to update and enhance their understanding of EAC policies, national policies, legislation and institutional arrangements for environmental management in Tanzania and relevant international procedures to ascertain the optimal management of impacts.

1.6.6 Impact Identification and Evaluation

Various data collection tools were used to guide identification; assessment and analysis of impacts in order to enable quantify them and identify mitigation measures. Impact evaluation was undertaken in three steps:

- The first step was identification of impacts based on Environmental Impacts Identification (EII) Checklist.
- The second step was impact assessment using matrices.
- The third step was impact analysis.

Identification of Impacts

The consultant used the EII Checklist based on road development needs which considers various aspects of the natural and human environments that are likely to be affected by the project during construction and operations phases. The parameters included in the checklist to enable evaluate impacts were:

- Available local resource and associated socio-economic aspects;
- Biophysical, chemical and landscape aspects;
- Air and water quality aspects; and
- Occupational health and safety, natural hazards and construction related aspects.

Assessment of Impacts

The impacts identified were further evaluated using the Rapid Impact Assessment (RIA) Matrix and then categorised using the Impact Categorization (IC) Matrix. The RIA Matrix was used to assess the effect of potential impacts on biophysical and socio-economic components. The assessment of impacts focused on their **magnitude**, **significance**, **permanence**, and whether the impact is **cumulative** and **reversible or irreversible**. The IC Matrix was used to categorize impacts into negative and positive impacts based on the project activities. The impacts were also grouped according to environmental components (biophysical and socio-economic) likely to be affected.

a) Analysis of Impacts

After categorisation of the impacts, they were analysed using the Impact Evaluation (IE) Matrix, which is complemented by grid method for determination of significance of the impacts. The technique considers the characteristics of impacts based on the following factors:

- Type of impact - whether positive or negative;
- Its effects - whether direct, indirect or cumulative;
- Intensity - whether low, intermediate or high;
- Magnitude - whether site specific, local or regional;
- Duration - whether permanent, or temporary; short term or long term;
- Reversibility - reversible or irreversible; and
- Significance - whether low, intermediate or high.

In order to determine the significance of impacts the IE Matrix is complemented by Grid method, which considers **intensity**, **magnitude** and **duration** of impacts. The frequency of occurrence of each factor for a given impact has been used to obtain the characteristics of impacts.

1.7 *Report Structure*

This report is divided into Thirteen (13) chapters. **Chapter one** contains the introduction on the background information of the proposed project, its development objectives, rationale and the proposed project implementation arrangements; **Chapter two** contains the project description, in which there is a description of the location and relevant components of the project and their activities; **Chapter three** illustrates policy, legal and administrative framework, which are the relevant Tanzanian environmental policies and legislation applicable to construction projects; **Chapter four** has the baseline information relevant to environmental characteristics, which gives details concerning the Bio-physical environment and socio-economic environment at the project area; **Chapter five** express the consultation exercise at the project area detailing the list of stakeholders consulted and the issues raised; **Chapter six:** presents the analysis of project alternative for the projects; **Chapter seven** identifies and describes the positive and negative environmental impact of the project that are likely to be generated from the different phases (the planning and designing, construction, operation and maintenance and the demobilization phases); **Chapter eight** gives the mitigation measure for the potential negative impact of the project; **Chapter nine** presents the Environmental and Social Management Plan (ESMP); **Chapter ten** presents the Environmental Monitoring Plan that contains the proposed institutions to carry out the monitoring activities, the monitoring indicators, time frame and the proposed budget for monitoring; **Chapter eleven** gives the cost benefit analysis of the project; **Chapter twelve** provides the decommissioning plan for the proposed project however the decommissioning is not anticipated in the foreseeable future and **Chapter thirteen** gives the summary and conclusions of the study.

The Annexes, containing key information collected during the study are attached as Volume II of the report. Generally, the report contents are in conformity with the format and requirements specified in the EIA and Audit Regulations of 2005; African Development Bank Environmental and Social Safeguard Policy and Guidelines for Environmental and Social Considerations for Development Projects.

2 PROJECT DESCRIPTION

2.1 Project Location

The the Pangani Bridge and its approaches and Tungamaa – Mkwaja – Mkange road are located in Coast and Tanga regions. The road forms part of the Coastal Corridor that connects Dar-Es-Salaam to Tanga and Mombasa in Kenya. The project has a total length of 120.8km which include Tungamaa village located in Pangani District, Tanga Region through Mkwaja and Kwamsisi villages in Handeni District (bypass to Saadani National Park and Zaraninge Forest found along the eastern Coast of Tanzania) and ends at Mkange village in Bagamoyo District. The road sections are as described in Table 1 below. The main road from Mkange – Tungamaa – Pangani is majorly located in Tanga region and is built to gravel and earth standard and its layout is provided in Figure 1 below. In the Coast region, the proposed road covers only two villages of Mkange and Manda Mazingara in Bagamoyo district, while in Tanga the road passes in more than 20 villages of Pangani and Handeni Districts.

Table 1: Lengths of Road Sections

S/N	Description	Chainage from	Chainage to	Length (km)
1	Mkange - Tungamaa	73 + 500	168.7	95.2
2	Pangani Bridge (525 m)	168.7	183	14.3
	Pangani Bridge approach roads (14.3km)	183	183.5	0.525
3	Ushongo spur road	0	5.9	5.9
4	Pangani Access road	4.1	4.1	5.4
TOTAL				120.8
5	Kipumbwi Access road to be constructed under Complementary projects	0	3.7	3.7
GRAND TOTAL				124.5

The project has been split into two lots to easy implementation as indicated below:

- Lot 2 – Upgrading Works Tungamaa – Pangani including Pangani Bridge (525m span) approach road (14.3 km), Ushongo Spur road (5.9 km) and Pangani Access road (5.4 km) to Bitumen standard);
- Lot 3 – Mkange – Mkwaja – Tungamaa (95.2 km) inclusive of 3.7km of spur road to Kipumbwi port to be implemented under complementary initiatives.

BAGAMOYO TO TANGA

OPTIONS	NEW CONSTRUCTION	TRAVEL LENGTH
Existing	0 km	268 km
OPTION A	179 km	191 km
OPTION B	196 km	237 km
OPTION C	224 km	237 km

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2.2 General Layout Size and Capacity

The general layout of the road relative to the project area and Tanzania in general is shown in the maps provided above. The section below discuss each section of the road relative to the entire project thier sizes and area covered.

2.2.1 Main Road from Bagamoyo to Tanga

The main north-south corridor along the Tanzanian coast from Bagamoyo to Tanga namely the Makurunge -Saadani – Pangani - Tanga road is an existing poor quality gravel road, which reduces to a track in places. The existing route is currently discontinued at the Pangani River, where crossing in only made possible by a ferry and at the Wami River, where crossing is currently provided by a temporary Bailey bridge. For the purpose of this study, the main road has been divided into several sections as described in the sub-sections that follow. The subsections will focus on the sections of the road that shall be financed by the African Development Bank.

2.2.2 Mkange to Mkwaja

The section is within the bypass that escapes the Saadani National Park. The proposed road start at the junction of the gravel road to Mandera and it passes through a completely new route (Greenfield) up to Kwamsisi. From Kwamsisi it turns back towards the coast up to Mkwaja along an existing gravel road.

The road took this route due to the environmental sensitivity of the park and issues raised in regards to upgrading the road through Saadani Park by the Tanzania National Parks Authority and Saadani National Park Authority during consultation. Near Kwamsisi the road deviates from the existing alignment to limit the RAP impact on Kwamsisi and to improve the road geometry. The Mligazi/Msisi River is the regional boundary between the Tanga Region and the Coastal Region which is crossed at km 82.5 within this section.

2.2.2.1 Mkwaja to Pangani

From Mkwaja the road follows the existing gravel road alignment to Pangani with some local improvements to the horizontal alignment. At Pangani the road deviates around the town due to the position of the proposed new Pangani River Bridge to reduce the impact on the historic town center. The road section between Mkwaja and Pangani is currently a gravel surfaced road with a rough surface that results in poor riding quality. The existing route is currently discontinued at the Pangani River, where crossing in only made possible by a ferry. The road through Pangani Town is surfaced. However, if a bridge is to be constructed across the Pangani River, careful consideration will have to be given to the route selection through the town. Our proposed position for such a bridge will incorporate a bypass around the town to allow for approaches to be constructed. Land availability at the current ferry crossing is not sufficient on both banks to allow for construction of the bridge approaches. The formation is good and can be utilised by adding the strength layers on top.

2.2.2.2 Pangani Streets

The main road will bypass Pangani on the western side. To provide proper access from the main road some streets in Pangani needs to be upgraded. On the southern side of the river the existing road will be re-gravelled. A new surfaced road will be constructed from the Pangani South road to pass under the new bridge and connect to the main road to provide surfaced access. On the northern side a main street of 500m will be constructed to link the town center to the new road. The existing northern approach road will also be surfaced. This will then provide Pangani with three surfaced access streets roads from the main road.

2.2.3 Bypasses in the Project

Two bypasses of Saadani bypass and Pangani have been proposed in connection with the main project.

2.2.3.1 Saadani Bypass

The aim of the Saadani bypass is to escape and reduce environmental impacts to the Saadani National Park and Zaraninge Forest. The bypass leaves the main road from Matipwili through the existing tracks and passes through the villages of Tumbini, Gongo, Mkange, Manda and ends at Kwamsisi Village where it joins the main road from Mkata.

2.2.3.2 Pangani Bypass (10km)

The purpose of this bypass is to provide clear link with the proposed Pangani Bridge. The route also bypasses the built up area of the historical Pangani town. The Pangani Bypass diverts to the western side of the existing road from km 174.9. It roughly follows some informal track and descent through bush towards a side valley of the Pangani River. In the valley it follows the edge of the hill till near the Pangani River where it cuts into the mountain to connect with the bridge. The road then passes around Pangani Town Centre on the western side until it meets the existing road at km 184.3.

2.2.4 Link Roads

Being a coastal road, the main road provides access to a series of coastal resorts in Kenya and Tanzania. Some of the access roads to these hotels and resorts were identified for inclusion under this project for upgraded to surfaced standards. Three link roads were investigated and two shall be constructed under this project as discussed in sections 2.2.3.1 to 2.2.3.2 below.

2.2.4.1 Ushongo Link Road (5.9km)

Ushongo link road (5.9Km) is connecting to the Ushongo beach that is located between Mkwaja and Pangani at approximately at km 120. There are five (5) resorts along the beach road. Access to this beach is via the Mwera Sisal Estate. Currently, the most frequently used access meanders through the built-up area of the estate, where the processing takes place. The old alignment is now proposed for the new access to be constructed. The road reserve of the link roads need to be redefined, as the resorts are close to the road as can be seen in the Plate below.



Plate 1 Junction of Ushongo link road with main road



Plate 2 Ushongo Beach road



Plate 3 Large baobab next to the link road



Plate 4 Existing bridge to be replaced

The existing structure over the Tungamaa River found on the link road does not meet the required safety standards and need to be reconstructed as part of this link road.

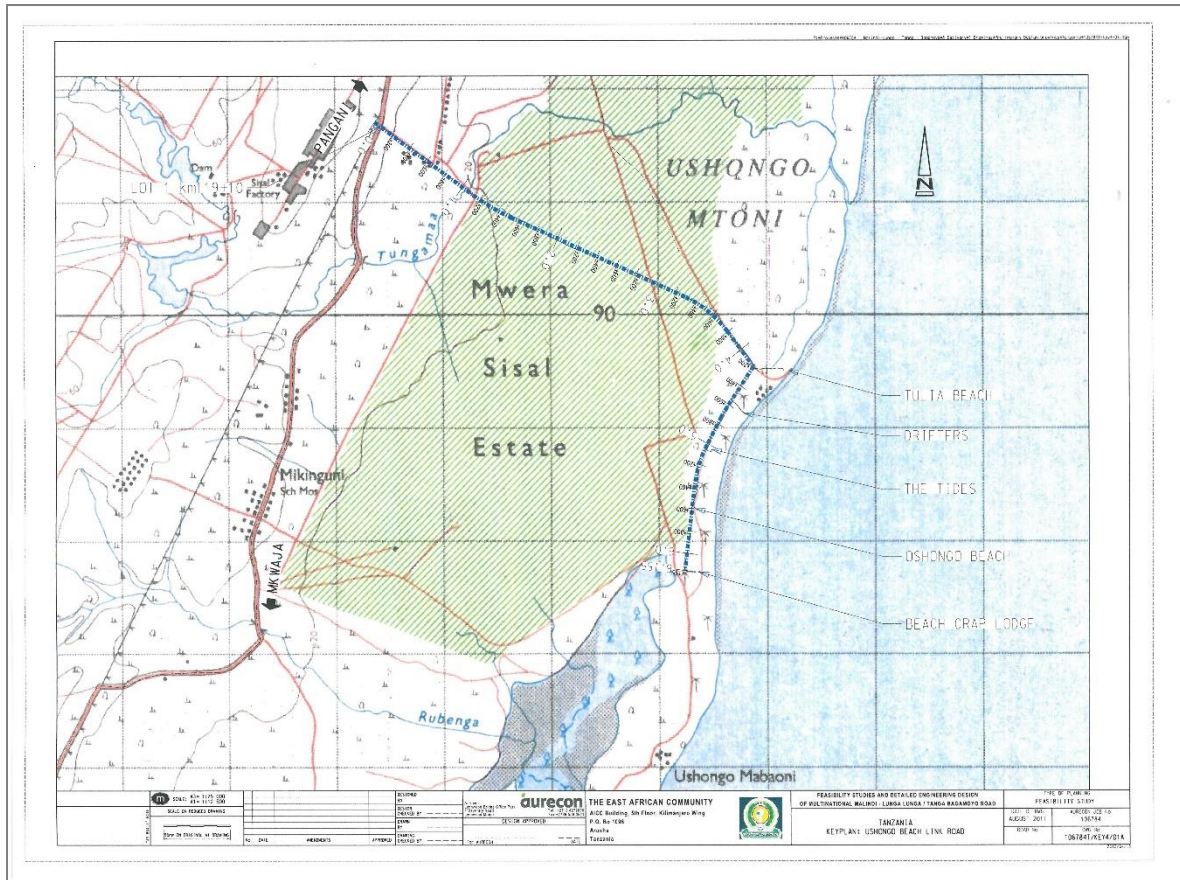


Figure 2 Layout showing location of Ushongo Link Road

2.2.4.2 Kipumbwe Link Road (3.7km)

The Kipumbwi Link road (3.7Km) provides access to Kipumbwi from Kwakibuyu from the main road. Kwakibuyu village is located between Mkwaja and Pangani at km 104 on the main road. Kipumbwi is a local fishing port. The link road is currently gravel surfaced, traverses a fairly flat terrain. The road will cross the Beji and Manomvi streams and will end at the entrance to the Kipumbwi village with a small roundabout. The proposal is to upgrade the road to bitumen surfaced standards.



Plate 5: Kwakibuyu village on the main road



Plate 6: Kipumbwi access road



Plate 7 Fishing port at Kipumbwi



Plate 8 Kipumbwi town

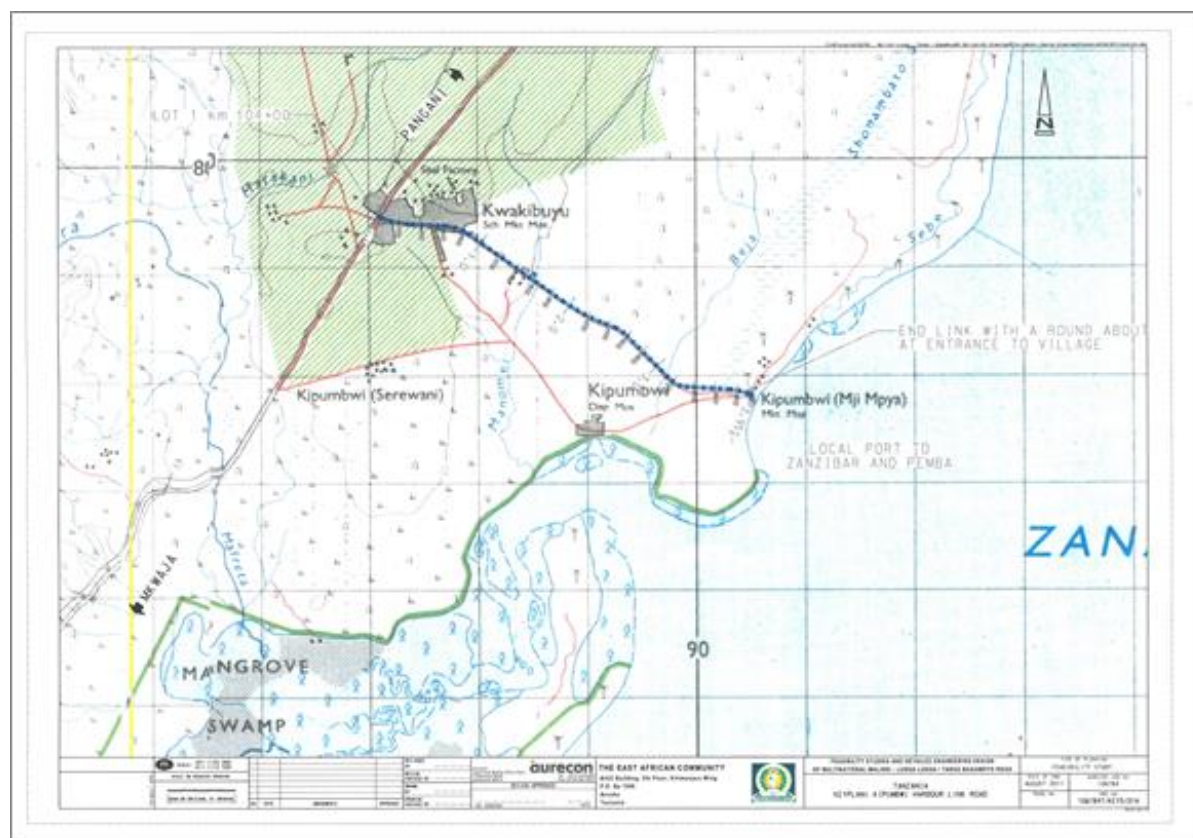


Figure 3 Layout showing location of Mwarongo Link Road

2.2.5 Bridging Options

2.2.5.1 Pangani River

Pangani Town is situated on the northern bank near the mouth of the Pangani River. On the southern embankment, a large hill restricts the geometrical alignment of the road on the approach to the river. The river is currently crossed by means of a ferry. At the ferry crossing the river is about 300m wide. River traffic appears limited, with a regular ferry during the day and some dhows and motorboats moving out to the sea.

Three alternative routes were investigated at the Pangani crossing as shown in the Figure below.

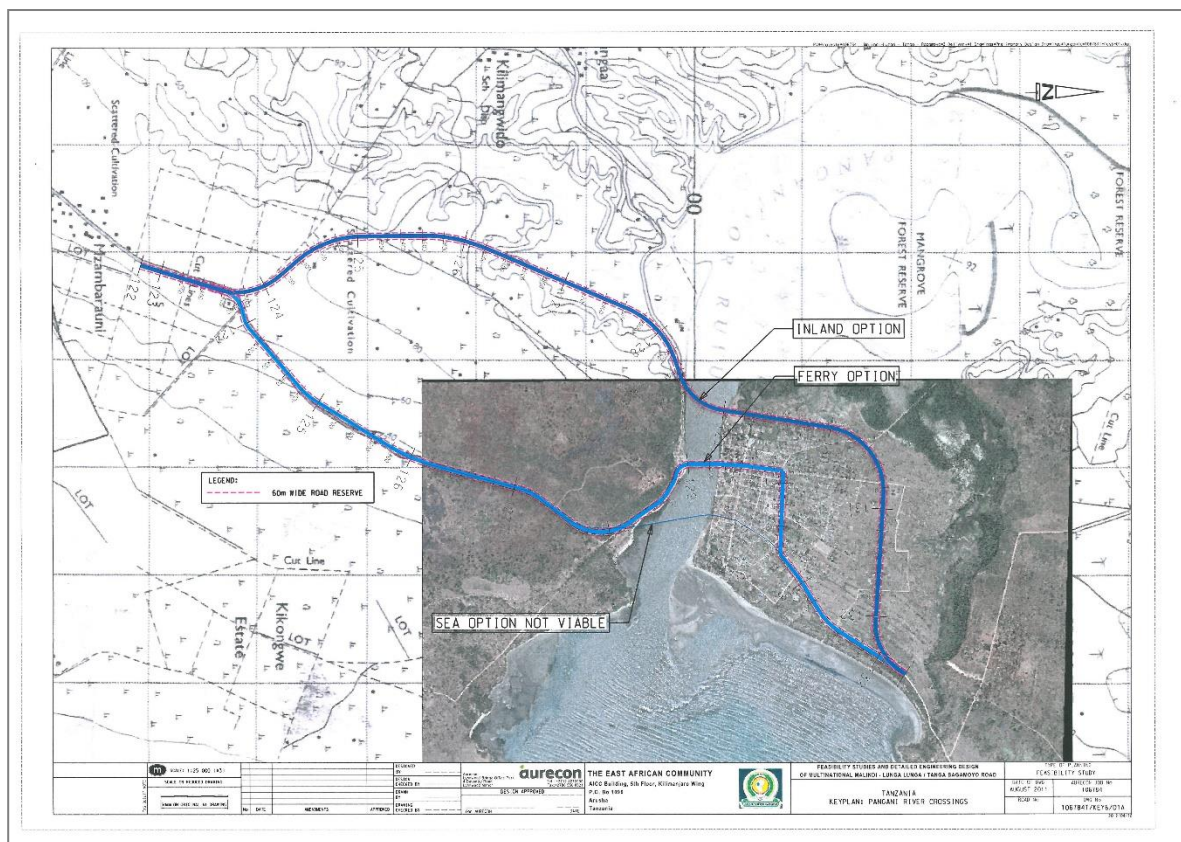


Figure 4: Layout of Pangani River Bridging Option

The first option is to improve the existing road alignment slightly and to cross over the river at the current ferry position, which is the shortest distance. On the northern side, the bridge approach will have to line up with the existing street approach to the ferry docking position, which comes directly from the town centre. This will have a major social impact due to the higher traffic volumes, higher speeds and expropriation of historical buildings to enable construction of the bridge approaches.

The second option investigated was a bridge crossing closer to the sea. This would require a much longer bridge as well as a new road corridor through old section of Pangani town. This option was not deemed viable due to poor foundation conditions and the associated cost of the long structure required and not pursued any further.

The third option investigated was to cross the river inland of the ferry with a fairly short structure similar to the first option. This will require a new road alignment to be constructed that will bypass Pangani town on the western side, with less social impact on the town, and will divert around the western side of the hill on the southern bank.



Plate 9 Hill on southern bank – Direction south
(note the settlements at the foot of the hill)



Plate 10 Pangani Town-Direction North

2.2.6 The Road Reserve

In Tanzania the road reserve width is 60m as per the new Road Act of 2007. Before amendment of the Roads Act, the road reserve was 45m. The government is now identifying the properties within the additional road reserve area throughout the country so that they can be compensated. These properties were also identified in this project for record.

The proposed project will be implemented in 45m RoW. Census of the properties in this section has been identified for compensation before construction. Properties in the proposed Bypasses have also been identified for compensation to pave the way for construction of the road. The properties at 45m ROW that were identified for compensation are as indicated in Table 2.

Table 2: Number of affected properties along the proposed project

District	Number of PAPs	Structures	Crops	Mosques	Churches	Schools
Bagamoyo	186	107	1325	0	0	0
Handeni	470	107	678	1	0	0
Pangani	930	367	24156	7	0	0
Total	1,586	581	26159	8	0	0

2.3 Project Design

The proposed road is a multinational passing through the two countries of Kenya and Tanzania and therefore classified as a Trunk Road (Class A). This type of classification leads to design criteria for mobility such as higher speed, higher level of service and longer trips with less access where low speed is required for controlled access. With a functional classification of A, the traffic volume is used to determine the road design class. A DC3 road design class is recommended for an **AADT value between 1000 and 4000**. This DC3 design class recommends a 3.5m lane with surfaced shoulders.

2.3.1 Typical Cross Section

The project has a single typical road cross-section as shown below. The design Class (DS3) has specified the road width and carriageway widths. The normal cross-fall of the road will be 2.5% from the road centreline. The maximum super elevation of 8% has been implemented on the flat and rolling sections with a 6% maximum on mountainous sections and in villages with 50km/h speed limit. The typical side slopes and back slopes of the road that has been used are given on the typical drawings. These comply with the maximum rates as specified in the RGM.

In this project there are three variations to the typical cross-section. At climbing lanes an extra lane of 3.5m width is added and the shoulder is reduced to 1.0m. In the urban areas such as Pangani, walkways for the non-motorised traffic will be provided. The shoulders widths on these urban sections are reduced to 1.5m and 3.0m wide walkways are added on both sides. The third variation is where black cotton soils are encountered. The PMM specify flatter side slopes of 1:6 instead of the typical 1:2 side slope for 1 to 3m fill heights. On fills higher than 6m a bench of 4m wide was added to limit the extent of the side slope and to improve access for maintenance. A similar bench was also introduced on 6m or deeper cuttings.

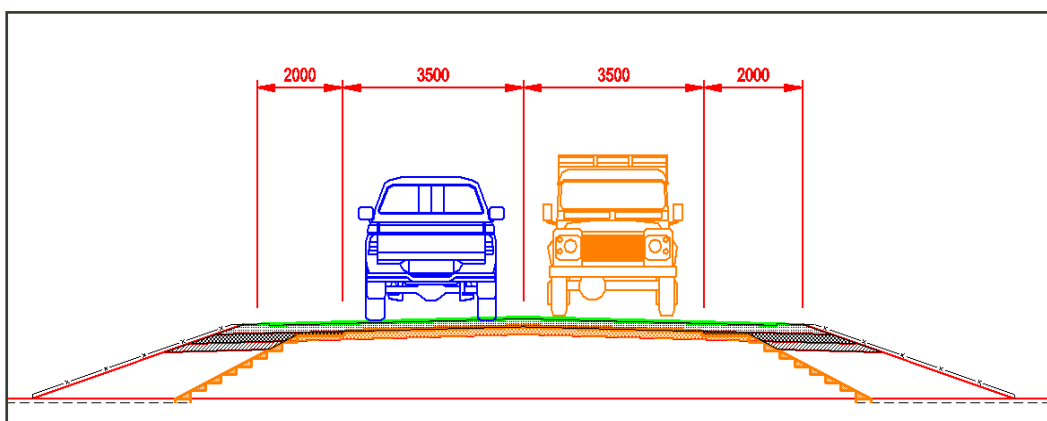


Figure 5 Typical cross-section

2.3.2 Design Speed

The Design Speed of a road dictates various geometrical design elements. The recommended design speeds for Design Class 3 is shown in Table below. Where the road passes through villages the Speed limit will be 50km/h.

Table 3: Design speed - Design Class 3

Terrain	Recommended Design Speed (km/h)	Minimum Design Speed (km/h)
Flat to Rolling	110	100
Rolling to Hilly	80	80
Mountainous	70	60

2.3.3 Horizontal Alignment

The horizontal alignment contains 25 curves on this section of the road of which 11 curves have a radius of less than 750m. Five curves have a radius of 600m which is the desirable minimum radius. The spacing of the curves is sufficient to fit the super elevation run-off lengths.

2.3.4 Vertical Alignment

The terrain is very flat dominated by clay soil with most of the road longitudinal slope less than 1.0%. Therefore, due to the flat terrain and clay soil, the road construction shall involve major cutting and filling.

2.3.5 Drainage Structures

2.3.5.1 Cross Drainage

The drainage requirements across the road have been determined by the hydrological study. The drainage structure will consist of concrete pipe structures. The pipe drainage structures consist of two sizes namely 900mm diameter and a 1200mm diameter. The two sizes will ease the construction process. The nominal size of 900mm is currently specified mainly for maintenance and cleaning purposes.

2.3.5.2 Side Drains

Side drains will be constructed in all cuttings and are mainly gravel lined. Concrete lining of the side drains are expected where the slope is steeper than 6%. Side drains with slopes steeper than 4% will be protected against erosion with energy dissipaters. The erosion potential of the soil in which the side drain is excavated will ultimately govern the protection required. Where the side drains cross through side access roads a 900mm diameter concrete pipe needs to be installed.

2.3.5.3 Sub Soil Drains

Subsoil drains are normally installed where the ground water could influence the road pavement structure. During the material investigation ground water was encountered and subsequently provision has been made to install subsoil drainage in deep cuttings. The extent and final position of the subsoil drains need to be determined during construction.

2.4 Road Side Furniture

2.4.1 Road Signs and Road Markings

The proposed road signs and road markings are shown on the Plan and Profile drawings. There is also Schedule Drawings containing the road signs. The proposed sign size as per Traffic Sign Guide of 2007 is tabled in Table below:

Table 4": Proposed road sign sizes

	Speed Limit 100km/h or higher	Speed limit below 100km/h
Regulatory Signs	1200mm diameter	900mm diameter
Warning Signs	1500mm side length	1200mm side length

2.4.2 Safety Features at the Park

Due to the fact that part of this road is passing in the periphery of Saadani National Park, special features will be installed for animal safety. Warning boards, day and night speed limit signs will be installed in the road. Also proper marking and speed humps will be installed.

2.4.3 Guardrails

Guardrails will be provided on the approaches to all the bridges as well as at all box culverts. Where the fill is more than 4m, guardrails will also be provided where the side slope is 1:1.5. The guardrails will be the standard w-shape steel profile on steel post.

2.4.4 Road Edge Markers

The Draft Tanzania Traffic Signs Manual specify that warning signs be placed on curves with radii of 600m or smaller. Hazard signs W401 or W402 should also be provided at drainage structures. The Tanzania Traffic Manual is in line with the SADC Manual on the use of road signs. The Tanzania Geometrical Manual however, specifies concrete road edge markers. The Bill of Quantities includes both concrete markers and road signs and TANROADS should instruct the Contractor on the final markers to be placed.

2.4.5 Kilometer Markers

Concrete kilometer markers will be installed at 5km intervals on alternating sides of the road. The two destinations are Tanga and Bagamoyo. The distance from Bagamoyo to Makurunge is 13km. The project road length to Tanga is 229km, thus the distance from Bagamoyo to Tanga will be 241km or rounded to 240km. The abbreviation on the markers will be TNG for Tanga and BGM for Bagamoyo.

2.4.6 Service Ducts

It is proposed that dual 300mm service ducts are installed for future underground services such as electricity or telecommunication cables. The position of such service ducts is at all type 1 and 2 junctions as well as at villages at 500m intervals.

2.4.7 Utilities

Electrical services are all overhead power-lines. The water services are mainly along the existing gravel roads from Kwamsisi to Pangani Telephone lines were surveyed in km 171 in Mzambarauni.

2.4.8 Street Lighting

The Bills of Quantities include the provisional sums for installation of street lighting along the Pangani Bypass. The successful Contractor must provide the detail design as part of the installation of the street lighting.

2.4.9 Bus Bays

Bus bays will be provided at all villages and towns. The proposed position of the bus bays are provided in the drawings. These need to be finalized during construction in liaison with the local authorities.

2.4.10 Bus Terminal

The Bus terminal at Pangani is not part of the design but shall be implemented under this project as the complementary project. The Pangani town is a big town but has no designated bus station.

2.5 Construction Materials

The main construction materials for the road include sand, gravel, hard stones (aggregates), reinforcement iron bars, water and bitumen. Most of the materials shall be obtained locally (within Tanzania) except bitumen which shall be imported. Material investigations have been made with the aim of identifying sources for suitable construction materials including borrow pits, sand pits, construction water sources and quarry sites.

2.5.1 Borrow Areas

Based on field studies several borrow pits were seen especially along the Mkange - Pangani sections of the road.

Table 5: Proposed borrow areas

S/No	Chainage	Name
1	km 138+000 on the RHS	Choba
2	km 133+000 on the LHS	Boza
3	km 123+700 on the RHS	Mzambarauni
4	km 118+500 on the LHS	Tungamaa
5	km 106+100 on the RHS	Sukura
6	km 96+200 on the LHS	Msangazi
7	km 95+100 on the RHS	Msangazi
8	km 52+000 LHS with an offset of 12km	Saadani
9	km 52+000 LHS with an offset of 17km	Mkange
10	km 33+900 LHS with an offset of 16km	Gongo
11	km 0+000 at an offset of 9.2km towards Msata	Kidomole
12	km 0+000 at an offset of 24km towards Msata	Mtakuja
13	km 0+000 at an offset of 30km towards Msata	Kiwangwa - Madola

2.5.2 Quarry Sites

Five quarries were identified in the project area and these include Lugoba, Msata, Kitumbi, Kisasa and Mkata.

- The first four are located along the Chalinze-Segera road while the Mkata one is a potential quarry located in Mkata village along the Mkata - Saadani Road.

- The Lugoba and Msata quarries are operational and are the only sources of granite aggregates which are used within the Coast region. Records show that the crushed aggregates from these two quarries comply with the Tanzanian Standard Specification for Road Works (2000).
- The Lugoba quarry is located about 70km from Makurunge and 92km from Saadani. It is the main quarry in the area with four commercial crushing plants. The site is set on 100 hectare piece of land and has a depth of 30m and is considered to be ample for supply to the proposed project.
- The Msata quarry is located about 60km from Makurunge and 80km from the Saadani National Park. This is also an operational quarry with one private crushing plant. It is located in 120 hectares of land with a depth of 10m and was considered adequate for the development of the proposed project.
- The Kitumbi quarry is located about 120km from Tanga and 90km from the Saadani National Park. This is also an existing quarry which was used as the material source during the construction of Chalinze-Segera Road in the early nineties. The rocky hill occupies 20 hectares of land and has a depth of 20m. However the use of the quarry is constrained as locals have developed a village around it thus not found suitable for the project as it shall require resettlement and other environmental mitigation measures.
- Kisasa hill is located about 106km from Tanga and 100km from the Saadani National Park. This is a virgin site located in Kisasa village near Kitumbi. The hill occupies about 16 hectares and is considered adequate for the proposed project.
- Mkata site is located about 106km from Mkwaja village in the Saadani National Park. This rock hill occupies 5 hectares and is adequate for utilization and is also considered as adequate for the project construction.

2.5.3 Concrete Sand

Three sand sources were identified at the project area and these included:

- Bigo Primary School located in Makurunge at km 0 on the LHS at an offset of 2km.
- Wami River at km 32 on the LHS.
- Mkwaja Village located at km 84+500 on the RHS at an offset of 0.2km
- The Bigo Primary School source is found in Makurunge village at the beginning of the project road. The source is being used for small-scale construction by the locals. However, the area is large but the grading of the sand varies as shown by its profile some areas have fine and coarse sand while others shows the sand is dominated with silt thus will require careful selection during utilization.

The sand at Wami shall be sourced from the River banks and its deltas located at least 32km from Makurunge. The sand at this site was seen to be clean with good grading. Apart from its favourable quality, the site was seen to be located in areas where major drainage works such as the Wami Bridge shall be developed.

The sand source at Mkwaja village is located at least 46km from Pangani town. The sandy area stretches under shrubs other potential sandy site near Mkwaja is Makorora village. The grading of the sand varies from course to fine.

2.5.4 Construction Water Sources

The area has four main perennial rivers which shall be used as source of water for the proposed project and these rivers are;

- Ruvu located at km 0+000;
- Wami located at km 32+000;
- Mafuleta located at km 102; and
- Kirare located at km 159.

Samples of water from the sites were analysed and the results showed that the water is suitable for construction apart from Mafuleta which had higher chloride content. Results of the water analysis are shown under **Annex 8** of this report.

2.5.5 Sources of Manufactured Materials for Road Construction

Traditional construction materials to be used have been tested for compliance and for those manufactured materials for road construction and their sources are being describes hereunder.

- **Cement:** Cement is easily available in the mainland, packed in 50kg bags and sourced from the factories in Dar es Salaam and Tanga.
- **Reinforcement Steel:** Reinforcing steel for structural works is also available in the mainland from various factories in Dar es Salaam, or abroad. Strength and other properties of reinforcing steel to be confirmed by testing of samples in approved testing laboratories.
- **Bitumen:** Bitumen for road works is generally readily available from either Tanzania Petrol Development Corporation (TPDC) or external suppliers. Bitumen properties need to be checked by testing representative samples in approved laboratories.
- **Lime:** Industrial hydrated Lime properties need to be checked by testing representative samples in approved laboratories.
- **Fuel:** Fuel will be supplied by the local fuel companies to be contracted by the contractor. Fuel will be hauled from either Dar es Salaam port or Tanga Port using tankers through the road

2.5.6 Construction Equipment

The list of equipment's to be used during the project construction phase is provided in the Table 6 below. It is important that the performance of the equipment's meet the environmental and safety standards before they are engaged in the project.

Table 6: Project Equipment

Name of Equipment	Supplier
Dozer	Contractor
Grader	Contractor
Pay Loader	Contractor
Excavator	Contractor
Vibro Roller	Contractor
Tandem Roller	Contractor
Macadam Roller	Contractor
Tire Roller	Contractor
Dump Truck	Contractor
Mixer Truck	Contractor
Water Truck	Contractor
Tractor w/Trailer	Contractor
Tire crane	Contractor
Cargo Crane Truck	Contractor
Cargo Truck	Contractor
Crusher Plant	Contractor
Screen Unit	Contractor
Concrete Batch Plant	Contractor
Asphalt Plant	Contractor

Name of Equipment	Supplier
Asphalt Finisher	Contractor
Asphalt Distributor	Contractor
Air Compressor	Contractor
Generator	Contractor
Fuel Truck	Contractor
Light Vehicle	Contractor
Water Boozers	Contractor
Vibrators	Contractor

2.6 *Project Activities*

The project shall have four major activities namely pre-construction, construction, operation and decommissioning.

2.6.1 Mobilization or Pre-Construction Phase

This phase entails mobilization of labour force, equipment and construction of offices/camps as well as acquisition of various permits as required by the law. The implementation of the project's design and construction phase will start with thorough investigation of the site biological and physical resources in order to develop a baseline data bank that shall guide in impact monitoring.

The activities to be involved in the pre-construction phase include:

- Familiarization of proposed alignment or route selection;
- Land survey to align the road;
- Geo-technical investigation
- Materials analysis including soil, stones and water tests;
- Design of the proposed road based on recommended standards and site conditions;
- Identification of suitable quarry and labour camp sites and source of water;
- Clearance of area for labour camp site construction;
- Construction of camps;
- Mobilisation of the labour and equipment's to the construction site;
- Land acquisition; and
- Material storage and material preparation.

2.6.1.1 *Campsite Location and Development*

The location of the contractor's campsite has not been identified but the selection criteria for camp sites is based on the availability of an adequate land for establishing the camp sites, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from environmental sensitive areas. Further, the Environmental Code of Practice for Road Works, 2009 shall guide on the suitable site for campsite location.

2.6.1.2 *Transportation*

Materials (fine and course aggregates) from quarries will be transported by trucks to the construction site. Water will be moved by water boozers. Other materials like cement, timber and reinforcement bars will be transported by Lorries to the construction site.

2.6.1.3 Storage

Some of the materials from borrow pits will be used directly after delivery and as such no piling up is expected. Other materials like aggregates and sand will be stored at the backyard of the camp site ready for use. Cement and reinforcement bars will be stored in special storage rooms. Timber will directly be used at the required areas and consequently there will be no stockpiling of timber at the camp sites. Fuel will be stored in drums at bund areas.

2.6.1.4 Waste Generation and Management

Types of waste to be generated at this phase of the project and their management methods are provided in the Table 7 below.

Table 7: Types, amounts and treatment/disposal of wastes during the pre-construction phase

Waste	Types	Amount	Treatment/ Disposal
Solid Waste (Degradable)	Vegetation (Trees, Thickets and Grasses) and remnants of timber.	150m ³ (Clearance for campsites).	Source of energy for cooking at the camp site or villages nearby.
	Food remains, cardboards and papers.	2kg/day (based on generation rate of 20g/day/person and 100 workers).	Collected in a large skip bucket at the campsite then disposed at the authorized dumpsite or decomposed for use is adding nutrients to landscaped areas and planted trees or manure sold to farmers.
Solid Waste (Non-Degradable)	Top soils.	1,000 m ³ (Based on removal of 10cm topsoil from the (100x100) m ² area for Contractor's and Engineer's camps.	Backfilling material in the borrow pits, fill the diversions and landscaping of the campsite.
	Scrap metals.	5- 8kg per day	Sold to Recyclers.
	Tins, glasses and plastics.	5- 9 kg per day	Sold to Recyclers and those cannot be sold due to quality of material to be collected in a large skip bucket at the campsite then disposed at the authorized dumpsite at Bagamoyo/Tanga when full
Liquid waste	Sewage	3.2 m ³ (Based on 100 people, 40l/capita/day Water consumption and 80% becomes wastewater)	Septic tank and waste water collection system at the campsite.
	Oils and greases	None, because car maintenance shall be done at contractors garages	Sold to recyclers

2.6.2 Construction Phase Activities

The overall objective of the road construction works is to:

- Improving the structural capacity, drainage and ride ability of the existing road with some improvement and realignment of the road geometry; and
- Improve the width to standards acceptable for a trunk road in Tanzania.

The construction phase which shall be undertaken by contractors shall commence after the ESIA has been approved and the affected people resettled. The project implementation activities undertaken by the contractor shall be supervised by a contracted resident engineer and monitored by an Environmental expert from TANROADS. NEMC shall oversee the adherence of the conditions of the EIA Certificate for the project.

The main activities to be undertaken during the construction phase will include the following:

- Filling and shaping of the road section;
- Cutting of earth section to facilitate widening of the road;
- Upgrading or construction of longitudinal and cross drainage structures; and
- Provision of sub-base, base course and asphalt concrete.
- The actual works that shall be undertaken during this phase includes:
- Route and Topographical survey.
- Earth works including cutting of the earth sections to facilitate widening of the roads; clearing of areas to pave way for the construction works; excavation of the existing roads and the construction of fill embankments, filling and reshaping of the road section to sub-grade level.
- Construction of drainage structures culverts and bridges.
- Provision of sub-base, base course and asphalt concrete
- Provision of temporary crossings and traffic diversions.
- Quarrying of gravel from borrow pits for sub-base and base.
- Extraction of sand.
- Extraction of stones and crushing them to form aggregates.
- Transportation of building materials like cement, reinforcement bars and asphalt to site.
- Preparation of form works for handling of concrete.
- Mixing of aggregate.
- Extraction of water from surface sources and transportation to construction site.
- Transportation of construction materials including bitumen and stone chippings.
- Excavation for the construction of the concrete bridges and incidental works.
- Installation of road signs/sign boards.
- Operation of the camp site.

The road construction process shall be supported by activities discussed below.

2.6.2.1 Detour and Labour Force

Detour will be required in order to maintain a usable road during the construction period with exceptions being along the Zaraninge Forest and other parts within the Saadani National Park traversed by the road. This shall be avoided as the project has identified alternative routes located outside the natural ecosystems. Other alternatives to enable opening up of detour will be use of a single lane by motorist while the other lane is under construction and vice versa. The construction and maintenance of the detour should be of expected standard that ensures road safety. Detours outside the road reserve should be done after consultation with land owners and any losses likely to be incurred should be compensated. Once the

construction is completed this detours on private firms should be rehabilitated by covering with top soil so as to reinstate to its original state or a manner that shall prevent soil erosion.

Road construction is a labour intensive activity and requires skilled and unskilled manpower consisting of management and technical personnel and labourers who can be sourced locally. Sourcing of local labour is considered to be a major mitigation measure for social impacts on the local community and this is supported by the locals who requested to be given first priority in terms of employment.

2.6.2.2 Drainage

The drainage systems along the project road are either not existing at all or where side drains and culverts exist, they are poorly maintained. Most inlets and outfalls are overgrown thereby significantly reducing the efficiency of the drainage system. There is need to install additional pipe culverts at sections where drainage was noticeably poor and in areas requiring drains as discussed under section of drainage structures.

The drainage requirements across the road have been determined by the hydrological study. The pipe drainage structures consist of two sizes namely 900mm diameter and a 1200mm diameter. The two sizes will ease the construction process. The nominal size of 900mm is currently specified mainly for maintenance and cleaning purposes. A total of 32 box and pipe culverts will be installed along the road. 3 bridges are also found in the designed road. These include the rail bridges and river bridges as indicated in table below.

Table 8: List of bridges

BRIDGE NAME AND LOCATION	CONFIGURATION
Pangani River Bridge at Km 179.900	9-span with a length of 532m
Mligazi River Bridge (BT62) at km81+850	2 No 20.0m Spans
Msangasi River Bridge (BT79) at km147+210	2 No 20.0m Spans

All new and existing road-over-road bridges will be designed with a minimum vertical clearance of 5.2 m, measured from the highest point on the road surface. Road over Rail bridges will allow 11.5m clearance horizontally and 7.1m vertically and all new River Bridges will have 20m spans, with the exception of the bridge over the Pangani River. The rail bridges will have span lengths of approximately 12.5 meter to ensure 11.5-meter horizontal clearance.

Side drains will be constructed in all cuttings and are mainly gravel lined. Concrete lining of the side drains are expected where the slope is steeper than 6%. Side drains with slopes steeper than 4% will be protected against erosion with energy dissipaters. The erosion potential of the soil in which the side drain is excavated will ultimately govern the protection required. Where the side drains cross through side access roads, a 900mm diameter concrete pipe needs to be installed.

2.6.2.3 Road Furniture

The project has proposed development of road furniture and supporting facilities like bus stops, bus parks, markets, signage, and speed control devices. The installation should be done in areas beneficial to the locals in order for them to serve their purpose. There will be need to consult the community members in some instances on the right location to develop these facilities.

2.6.2.4 *Sourcing and Transportation of Building Materials*

Road building materials will be transported to the project site from their extraction, manufacture, or storage sites using transport trucks. Materials (fine and course aggregates) from quarries will be transported by trucks to the construction site. Water will be moved by water boozers. Other materials like asphalt, cement, timber and reinforcement bars will be transported by trucks to the construction site.

The building materials to be used in construction of the project will be sourced from within the project area with manufactured materials being sourced from major towns such as Dar-es-Salam. Greater emphasis will be laid on procurement of building materials from sites located closer to the construction site being worked on; this will make both economic and environmental sense as it will reduce negative impacts of transportation of the materials to the project site through reduced distance of travel by the transportation vehicles. Excavated materials from the road can be reprocessed and reused as construction material for the same or other projects.

2.6.2.5 *Storage Materials*

Building materials will be stored on site though some of the materials from borrow pits will be used directly after delivery and as such no piling up is expected. Bulky materials such as aggregates, stones, ballast, sand and steel shall be contractor's yard and protected from elements of weather in order to avoid wastage due to weather conditions such as wind and rain. Cement and reinforcement bars will be stored in special storage rooms. Timber will directly be used at the required areas and consequently there will be no stockpiling of timber at the camp sites. Chemicals material such as emulsifiers, stabilizers, petroleum products and solvents shall also be stored at site in tanks/drums in bonded areas to control contamination of natural resources in case of spillage.

2.6.2.6 *Excavation and Masonary Work*

The project activities will involve undertaking excavation and, masonry work and other related activities including: stone crushing, asphalt mixing by use of both manual and mechanical means. These activities are known to be labour intensive and a source of air pollutants as activities such as quarrying are associated with explosives thus lead to vibration, noise and fugitive emissions.

2.6.2.7 *Landscaping*

To improve the aesthetic value or visual quality of the site once construction ceases, the proponent will be required to carry out landscaping this will include establishment of roadside tree planting, backfilling and vegetating of disused quarry sites.

2.6.2.8 *Waste Generation and Management*

The proposed project shall generate a substantial amount of waste both at the labour camp and at the road maintenance site. Contractor/proponent should provide facilities for handling solid waste generated. These will include dust bins/skips for temporarily holding waste within the camp before final disposal at the designated dumping site. Bulky excavated material should be stock piled at designated collection point before disposal or reuse. The appropriate strategy will be to cut and fill so as to reduce stock piling and impacts associated with un-rehabilitated excavated grounds.

Sewage generated from the camp should be discharged into the sewerage system of the facility to be recycled, while storm water from the project area shall be channeled into the storm water drainage system or directed to natural water courses with consideration of downstream effects. Types of waste to be generated during this phase are provided in Table below.

The occupants of the camp units will be responsible for regular washing and cleaning of their units and other common/communal areas. Cleaning operations will involve the use of substantial amounts of water, disinfectants and detergents.

Table 9: Types, amounts and treatment/disposal of wastes during the construction phase

Waste	Types	Amount	Treatment/ Disposal
Solid Waste (Degradable)	Vegetation (Trees, Thickets and Grasses) and remnants of timber.	About 500-700m ³ of biomass.	Source of energy for cooking at the camp site or villages nearby.
	Food remains, cardboards and papers.	6kg/day (based on generation rate of 20g/day/ person for 300 people).	Collected in a large skip bucket at the campsite then disposed at the authorized dumpsite or decomposed for use is adding nutrients to landscaped areas and planted trees or manure sold to farmers.
Solid Waste (Non-Degradable)	Top soils.	3,000 m ³ (Based on removal of 10cm topsoil from the (100x100) m ² area in the construction site.	Backfilling material in the borrow pits, fill the diversions.
	Scrap metals, drums.	7-9kg per day.	Sold to Recyclers.
	Tins, glasses, used tires, lead acid batteries and plastics.	7-9kg per day.	Sold to Recyclers and those cannot be sold due to quality of material should be collected in a large skip bucket at the campsite then disposed at the authorized dumpsite at Bagamoyo/Tanga when full.
Liquid waste	Sewage.	To be determined.	Septic tank and waste water recycling system at the campsite. Recycled water to be used for non-domestic use.
	Oils and greases.	None, because car maintenance shall be done at contractor's garages.	Sold to recyclers.

2.6.2.9 General Repairs and Maintenance

The construction camp's machinery and equipment will be repaired and maintained regularly during the construction phase of the project. Such activities will include repairs and maintenance of construction plants and equipment, electrical gadgets and equipment, repairs of refrigeration equipment, repairs of leaking water pipes, painting, maintenance and replacement of worn out parts in vehicles, machines and equipment including oil changes among others.

2.6.3 Demobilization Phase

Upon completion of the Contracted Work, the contractor shall remove all of its tools, materials and other articles from the construction area. Should the Contractor fail to take prompt action to this end, TANROADS at its option and without waiver of such other rights as it may have, upon sixty (60) calendar days' notice, shall treat such items as abandoned property. The Contractor shall also clean areas where he worked, remove foreign materials and debris resulting from the contracted work and shall maintain the site in a clean, orderly and safe condition.

Materials and equipment shall be removed from the site as soon as they are no longer necessary to minimize the demobilization work after completion of the project. Before the final inspection, the site shall be cleared of equipment, unused materials and rubbish so as to present a satisfactory clean and neat appearance.

All the campsites will be built as temporary structures and these will also include the use of movable structures such as movable containers. All the temporary structures will be demolished after accomplishing the contracted jobs.

2.6.4 Operation Phase

The actual usage of the roads is expected to commence after the construction works. The project road is under "Trunk Road" category and therefore will be directly managed by TANROADS. During this time, TANROADS will carry out routine maintenance by attending to cracks, pot holes, clearance of vegetation within the ROW (road reserve area) and monitoring. Other activities includes Installation of road signs, thermo-plastic road marking, reinforcement and replacement of road furniture, control of litter accumulation on road sides, awareness rising on proper road use and road management to the communities, monitoring and evaluation, management to reduce pollutant concentrations in runoff, disposal of wastes from road maintenance activities, storage and management of maintenance materials and equipment. The duration of this phase will be twenty (20) years for roads and fifty (50) years for the culverts and one hundred (100) years for the bridges.

2.6.4.1 *Transportation*

Materials (fine and course aggregates) from quarries will be transported by trucks to the construction site. Water will be moved by water boozers. Other materials like bitumen, cement, timber and reinforcement bars will be transported by Lorries to the construction site.

2.6.4.2 *Storage*

Some of the materials from borrow pits will be used directly after delivery and as such no piling up is expected. Other materials like aggregates and sand will be stored at the backyard of the camp site ready for use. Cement and reinforcement bars will be stored in special storage rooms. Timber will directly be used at the required areas and consequently there will be no stockpiling of timber at the camp sites. The bitumen will be stored in their respective containers which will be kept in the storage rooms.

2.6.4.3 *Types, Amounts and Treatment/ Disposal of Wastes*

Types, amounts and treatment/disposal of wastes during the operation phase shall be similar as those described under the pre-construction and construction phases though their quantities shall be smaller. Treatment methods of waste at this phase shall be similar as described in the sections mentioned.

2.6.5 Description of the Project's Decommissioning Activities

The decommissioning phase shall also occur at various stages of the proposed project this includes decommissioning of construction site and that of the project road once its life span is over in about 20 - 25 years. The construction decommissioning phase shall involve the following:

- Removal of temporary structures, installations and equipment's from the workshop, quarry sites and camp sites;
- Rehabilitation of the stoke pile yard, quarry site, workshop and camp site to at least its original state or acceptable land use that shall not promote land and social degradation;
- Clearance of all sorts of waste including used oil, sewage and solid waste and depositing them at authorised dumping sites; and
- Landscaping the area with suitable vegetation that can adapt in the area preferably indigenous plant species.

The demobilization of the temporary structures will result mainly into solid wastes such as timber, iron sheets and rubbles from demolitions. Timber and iron sheets will be sold to people in the nearby communities for reuse while the rubbles will be used in backfilling the borrow pits.

2.6.5.1 Demolition Works

It is anticipated that the proposed project will have a lifespan of two decades save for period maintenance. Upon decommissioning, the project components including the road pavements, drainage systems, parking areas and camp sites will be demolished. This will produce a lot of solid waste, which is advisable be reused for other construction works or if not reusable, disposed of appropriately by a licensed waste disposal company.

2.6.5.2 Dismantling of Equipment and Fixtures

All equipment including road surface, electrical installations, quarrying equipment, crushers, furniture partitions, pipe-work and sinks among others will be dismantled and removed from the site on decommissioning of the camp site, the road and other project components. Priority will be given to reuse of these equipment in other projects. This will be achieved through resale of the equipment to other contractors or donation of this equipment to schools, churches and charitable institutions, rehabilitation of feeder roads etc.

2.6.5.3 Site Restoration

Once all the waste resulting from demolition and dismantling works is removed from the site, the site will be restored through replenishment of the topsoil and re-vegetation using indigenous plant species or developed according to the development trend of the time.

2.6.5.4 Construction Materials and Energy Used

The main sources of energy that will be required for decommissioning of the project will include electricity and fossil fuels (especially diesel). Electricity will be used for welding, metal cutting/grinding and provision of light. Diesel will run material transport vehicles and construction equipment/machinery such as bulldozers and concrete mixers. The proponent should intend to promote efficient use of materials and energy through proper planning to reduce economic and environmental costs of excavating new materials.

2.6.5.5 Types, Amounts and treatment/disposal of Wastes

Types, amounts and treatment/disposal of wastes during the decommissioning phase shall be similar as those described under the pre-construction and construction phases though their quantities shall be smaller. Treatment methods of waste at this phase shall be similar as described in the sections mentioned.

3 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 *Environmental Management Regulation in Tanzania*

A clean and safe environment is the constitutional right of every Tanzanian citizen. Regulation on environmental management in the country is mainly vested on two public institutions, the National Environment Management Council (NEMC) and the Division of Environment (DoE) in the office of the Vice President. The NEMC undertakes enforcement, compliance, and review of environmental impact statements whereas the DoE provides the policy formulations and technical back-up and executes the overall mandate for environmental management in the country. The EIA certificate is issued by the Minister responsible for Environment. There are many policies and pieces of legislation on environmental management in Tanzania, the relevant ones to this project area briefly discussed below.

3.2 *National Policies*

Environmental awareness in the country has significantly increased in recent years. The government has been developing and reviewing national policies to address environmental management in various sectors. The key objective of these policies is to regulate the development undertaken within respective sectors so that they are not undertaken at the expense of the environment. The National Policies that address environmental management as far as this project is concerned and which form the corner stone of the present study include *inter alia*.

3.2.1 National Environmental Policy (NEP)

Tanzania currently aims to achieve sustainable development through the rational and sustainable use of natural resources by incorporating measures that safeguard the environment in any development activity. The environmental policy document seeks to provide the framework for making the fundamental changes that are needed to incorporate environmental consideration into the mainstream decision making processes in the country.

The National Environmental Policy, 1997 stresses that for a framework law to be effective, environmental standards and procedures have to be in place. For example, Chapter 4 of the policy (Instruments for Environmental Policy), Section 61, states that “*As part of the (National Environmental Policy) strategy in the implementation of the National Environmental Guidelines, specific criteria for EIA conduct will be formulated*”. The NEP advocates the adoption of Environmental Impact Assessment (EIA) as a tool for screening development projects which are likely to cause adverse environmental impacts.

The National Environmental Policy as a national framework for environmental management emphasizes that the transport sector shall focus on the following environmental objectives:

- Ensure sustainability, security and equitable use of resources to meet the basic needs of the present and future generations without degrading the environment or risking health or safety of the people.
- To prevent and control degradation of land, water, vegetation and air which constitute the life support system.
- To conserve and enhance natural and man-made heritage, including the biological diversity of the unique ecosystem of Tanzania.
- To improve the condition and productivity of degraded areas including rural and urban settlement so that all Tanzanians may live in safe, healthy, productive and aesthetically pleasing surroundings.
- To raise public awareness and understanding of the essential linkages between environment and development and to promote individual and community participation in the environmental action.
- To promote international co-operation on the environment and expand participation and contribution to relevant bilateral, sub-regional, regional, and global organizations and programs, including implementation of treaties.

Critically, the National Environmental Policy emphasize the following aspects of natural resources management taking into account that the project proposal might have impacts on natural resources:

- Wildlife resources should be protected and utilized in a sustainable manner; with participation of, and with benefits to, the local communities. Environmentally impacts of development project in wildlife conservation area e.g. (tourist hotels, road construction) should be minimized by Environmental Impact Assessment studies.
- It encourages the development of sustainable regimes for soil conservation and forest protection, taking into consideration the links between desertification, deforestation, freshwater availability, climatic change and biological diversity.

On addressing the issues of poverty alleviation, the policy recognizes its impact to the environment. The policy focuses on the satisfaction of basic needs of citizens with due cognizance to protecting the environment. *This project will ensure that the above policy objectives are met by minimizing environmental impacts.*

3.2.2 National Transport Policy (2003)

The vision of this policy is “to have an efficient and cost-effective domestic and international transport service to all segments of the population and sectors of the national economy with is associated with maximum safety and minimum environmental degradation”. Its mission is to “Develop safe, reliable, effective, efficient and fully integrated transport infrastructure and operations which will best meet the needs of travel and transport at improving levels of service at lower costs in a manner which supports government strategies for socio-economic development whilst being economically and environmentally sustainable”.

In transport, the main objective of the policy is to improve infrastructure whilst minimizing wasteful exploitation of natural resources and enhancing environmental protection. Improving infrastructure assists in poverty reduction and eradication which is a major goal in Tanzania. Most activities in the project area depend in one way or another on the environment and therefore protection of the environment is vital. In order to promote environmental protection whilst reducing poverty in rural areas, the policy direction is to:

- Influence use of alternative energy sources such as biogas and solar available at the residential levels instead of travelling long distances in search of firewood as a source of power; and
- Raise environmental awareness.

Sections 5.9 and 6.13 on Road Transport and Environment respectively give policy directions towards enhancing environmental protection through environmentally friendly and sustainable transport infrastructure both in the rural and urban areas. *The project will adhere to the requirements of this policy by incorporating green technology development by using alternative sources of energy such as solar and/or wind, adequate develop structures with adequate natural lighting, use water recycling technology among other climate adaptation techniques.*

3.2.3 National Mineral Policy (1997)

The National Mineral Policy requires that mining activities are undertaken in a sustainable manner. Reclamation of land after mining activities is recommended. As far as this project is concerned, mining activities refer to quarrying and gravel extraction (borrow pits) activities. *The project team will adhere to the requirements of the policy by obtaining required mining licenses and adhering to the conditions by observing noise regimes and rehabilitating the mined areas.*

3.2.4 National Construction Industry Policy (2003)

Among the major objectives of the policy, include the promotion and application of cost effective and innovative technologies and practices to support socio-economic development activities such as road-works, water supply, sanitation, shelter delivery and income generating activities and to ensure application

of practices, technologies and products which are not harmful to either the environment or human health. *The policy requires the project management to give priority to local people / consultants / contractors. It will also be required to use locally available materials and ensure delivery of good quality road infrastructure. The project management team will adhere with the provisions of this policy in the project implementation.*

3.2.5 National Land Policy (1995)

The National Land Policy states that, “the overall aim of a National Land Policy is to promote and ensure a secure land tenure system, to encourage the optimal use of land resources, and to facilitate broad - based social and economic development without upsetting or endangering the ecological balance of the environment”. It emphasizes on the protection of environment and natural ecosystems from pollution, degradation and physical destruction. In addition, it recognizes the importance of social services such as water, roads, energy and solid waste management for environmental protection. Finally, the policy identifies the need for conservation and preservation of prehistoric / historic sites and buildings.

To meet the policy requirements, the project management will ensure protection of existing natural and social services. Also the management will be required to ensure proper disposal of solid wastes, especially within campsite.

3.2.6 Energy Policy (2003)

The first energy policy for Tanzania was formulated in April 1992. Since then, the energy sector has undergone a number of changes, necessitating adjustments to this initial policy. These changes include changes in the role of the government from a service provider to a facilitator, liberalization of the market and encouragement of private sector investment. The overall objective of the National Energy Policy of 2003 is to contribute to the development process by establishing efficient energy production, procurement, transportation, distribution and end-user systems in an environmentally sound manner and with due regard to gender issues.

The continuing decline in industrial and agricultural production during the period between 1980 and 1985 led to increased inflation and a decline in the standard of living. In order to arrest this decline, the Government gave priority to the rehabilitation of the basic economic infrastructure, especially communication, so that they can fully support the production sector. The energy policy considers the condition of roads as a determinant factor in vehicle energy use. Rough and pothole filled roads necessitate frequent braking and acceleration, leading to wasteful use of fuel; smooth, well-surfaced and well maintained roads lead to energy savings.

The policy is relevant to this project because the road transportation relies on fossil fuel, which is the major source energy supply in the transport sector. However, poor road condition may lead into increased consumption of fuel, with low efficiency. Not only that poor road condition also leads into increased emission of exhaust fumes due to overworking of vehicle engines. Therefore, it is expected that the road rehabilitation project will ensure efficient use of energy resource during the project implementation and that work programmes are undertaken on time to enable abate the energy use challenges being faced by the road users.

3.2.7 National Human Settlements Development Policy (2000)

Among the objectives of this policy is to improve the level of the provision of infrastructure and social services for the development of sustainable human settlements and to make serviced land available for shelter to all sections of the community. Such infrastructure and services constitute the backbone of urban/rural economic activities. All weather roads and a reliable and efficient transport system, bus stands, drainage channels, and proper collection and disposal of solid waste are essential to increase productivity and the establishment of manufacturing industries.

The policy recognizes the role of the National Environment Policy and other sectoral policies for attainment of urban development. Thus, the policy identifies the need for coordination and cooperation with other sectors / stakeholders, including CBOs, and NGOs in urban development planning.

It recognizes environmental planning and management as one of the broad human settlement issues. According to the policy, “environment means the physical, economic and social conditions in which people live, influencing their feelings and development. Human activities take place in human settlements affecting the environment positively or negatively. In that regard, the policy identifies environmental protection as one of the strategic issue in human settlement planning and development.

On environmental management the policy singles out poor solid waste management, crude dumping of industrial toxic chemical compounds, industrial effluents and air pollution due to industrial and gasoline emissions as one of the health problems facing well-being of urban population. As such, major issues in the policy include:

- Poor management of solid and liquid waste, leading into environmental deterioration;
- Emission of noxious gases from vehicles and industrial activities as a major cause of air pollution in urban areas;
- Encroachment into fragile and hazardous lands (river valleys, steep slopes and marshlands-leading into land degradation, pollution of water sources, etc;
- Increasing dependence on fuel wood and charcoal as a main source of energy in human settlements leading into depletion of forests, hence environmental deterioration and air pollution; and
- Unauthorized sand mining in river valleys leading into environmental hazards.

On urban agriculture, the policy recognizes its importance as a source of income, source of supplementary food supply at affordable prices and employment to urban population. However, improperly practiced urban agriculture leads into conflict with other urban land use and land degradation, water pollution and a potential threat to health and safety of urban population. Thus, policy calls for well-planned urban agriculture to minimize land use conflicts and environmental degradation.

The policy recognizes the impacts of human activities within residential areas. Since the project road passes through human settlements the project management will ensure environmental protection within human settlement, for example by minimizing dust pollution. The road crosses several streams / rivers; hence, in this case the project management will be required to ensure that natural ecosystems like natural rivers / streams are protected from pollution as directed in the policy objective.

3.2.8 National Gender Policy (2002)

The key objective of this policy is to provide guidelines that will ensure that gender sensitive plans and strategies are developed in all sectors and institutions. While the policy aims at establishing strategies to eradicate poverty, it puts emphasis on gender quality and equal opportunity of both men and women to participate in development undertakings and to value the role-played by each member of society.

The policy requires the project management to ensure that gender issues are given emphasis. It also requires that women and men are given equal employment opportunities in the project, whenever possible. The project will insure women's participation is incorporated in at all levels of project planning and implementation.

3.2.9 National Water Policy (2002)

The overall objective of this policy is to develop a comprehensive framework for the sustainable management of the national water resources. The policy seeks to ensure that water plays an important role

in poverty alleviation. Section 2.15 notes that the size of Tanzania means that communication is time consuming and expensive. Inadequate communication systems (including poor roads) affect the effective implementation of water resources management activities in terms of higher cost of monitoring, supervision, management, policing and data transfer. These roads development will help to alleviate accessibility problems and thus facilitate the enhancement of water resources management within the project influence area. *The road project could result into degradation of water source if not carried properly. In this case, the project management will ensure that pollution of water source is avoided or minimized during road construction.*

3.2.10 Tanzania 2025 Development Vision

The Tanzania Vision 2025 aims at achieving a high-quality livelihood for its people attain good governance through the rule of law and develop a strong and competitive economy. Specific targets include:

- A high-quality livelihood characterized by sustainable and shared growth (equity), and freedom from abject poverty in a democratic environment. Specifically, the Vision aims at: food self-sufficiency and security, universal primary education and extension of tertiary education, gender equality, universal access to primary health care, 75% reduction in infant and maternal mortality rates, universal access to safe water, increased life expectancy, and absence of abject poverty, a well-educated and learning society.
- Good governance and the rule of law moral and cultural uprightness, adherence to the rule of law, elimination of corruption.

A strong and competitive economy capable of producing sustainable growth and shared benefits a diversified and semi-industrialized economy, macro-economic stability, a growth rate of 8% per annum, adequate level of physical infrastructure, an active and competitive player in regional and global markets.

Developing core urban and rural infrastructure is one of the most important agents to enable Tanzania achieve its Development Vision objectives (both social and economic), such as eradicating poverty, attaining water and food security, sustaining biodiversity and sensitive ecosystems. Providing good urban infrastructure through this project contributes to the attainment of the 2025 Vision.

3.2.11 National Strategy for Growth and Reduction of Poverty (2005)

The National Strategy for Growth and Reduction of Poverty (NSGRP or “MKUKUTA” as known in Kiswahili) formulated in 2003, sets out the medium term strategy for poverty reduction and indicators for measuring progress. It defines the objectives for poverty eradication by the year 2010, by achieving its goal in the following key priority areas: (i) poverty reduction through equitable economic growth, (ii) improvement of human capabilities, survival and social well-being, and (iii) containing extreme vulnerability among the poor. The NSGRP recognizes the heavy dependence of the poor on the environment (soil, water and forests), in particular household’s reliance on environmental resources for income generation. Sound urban infrastructures are key factor in the socio-economic development and the fight against poverty. *Providing good urban infrastructure through this project is in line with the MKUKUTA’s goals.*

3.2.12 National Policy on HIV/AIDS (2001)

The National Policy on HIV/AIDS (2001) was formulated by the Government of Tanzania (GOT) under technical support from the World Health Organization Global Programme on AIDS (WHO-GPA) that led to the establishment of National HIV/AIDS Control Programme (NACP) under the Ministry of Health. However, due to its multi-sectoral nature there was a need to involve all sectors and community participation was found to be crucial. One of the government strategic initiatives is to establish Tanzania Commission for AIDS (TACAIDS) under the Prime Minister’s Office. The Commission provides leadership and coordination of national multi-sectoral response to the HIV/AIDS epidemic. The management functions, institutional and organizational arrangement of TACAIDS are outlined in the National Policy.

The Policy identifies HIV/AIDS as a global disaster, hence requiring concerted and unprecedented initiative at national and global levels. It recognizes HIV/AIDS as an impediment to development in all sectors, in terms of social and economic development with serious and direct implication on social services and welfare. Thus, the policy recognizes the linkage between poverty and HIV/AIDS, as the poor section of the society are the most vulnerable.

The main policy objective is reflected well in the establishment of TACAIDS. However, the policy has also set a number of strategic objectives to deal with specific HIV/AIDS problems:

- Prevention of transmission of HIV/AIDS.
- HIV Testing.
- Care for People Living with HIV/AIDS (PLHAS).
- Enhance Sectoral roles through participation and financial support.
- Promote and participate in research on HIV/AIDS-including dissemination of scientific information and development of HIV vaccine.
- Creating a legal framework through enactment of laws on HIV/AIDS-governing ethical issues and legal status of HIV/AIDS affected families.

Other objectives:

- Monitoring and safeguarding rights of infected or affected people.
- Prevent human rights abuse, discrimination and social injustice.
- Provide effective treatment for opportunistic diseases.
- Promote fight against drug substance abuse.
- Prohibit misleading advertisements of drugs and other products for HIV/AIDS prevention, treatment and care.

The project will involve construction of worker's camp site, hence leading into possible interaction between the workers and the local community members. This may lead into increased transmission of HIV / AIDS to both the workforce and the local communities. In this case the contractor will follow the policy directives to minimize the problem by developing and implementing a HIV/AIDS mitigation plan.

3.2.13 National Forestry Policy (1998)

The national forest policy is based on macro-economic, environmental and social framework. Its overall aim is to manage Tanzania's forest resources as a national heritage on an integrated and sustainable basis to optimize their environmental, economic, social and cultural values. The policy drives towards implementing the directives contained in the National Environmental Policy (1997) in regard with forest resources management. For instance, the forest policy advocates and directs the conduction of EIA for development projects that will affect forest reserves including services crossing them (e.g. roads). The proposed roads have been earmarked to traverse through Zaraninge forest the contractor will observe this policy during Construction. Several alternative routes were evaluated during the study to ensure the road passes through the shortest section of the forest. Details of alternative route evaluation are discussed under chapter 6 of this report.

3.2.14 National Fisheries Sector Policy and Strategy Statement (1997)

The document forms the Policy Statement and Strategy for the fisheries sector. The Policy encompasses the need for a change in attitude towards fisheries resource use practice as well as the necessity to manage, conserve and develop them for good of all and for prosperity. The Policy acknowledges that, fisheries sector has a lot of economic and social significance to the country which is reasonably rich in marine and inland fishery resources and therefore a significant fisheries sector. The sector contributes over 10% revenue to the National GNP whereby, about 80,000 people are employed full time in the fisheries and millions of

people derive their economic livelihood from the sector in one way or another in fisheries related activities. Besides, it is a source of recreation, tourism and foreign exchange.

However, the sector is faced with various challenges including: insufficient information on the resource base; Inadequate infrastructure and inefficient utilization; Poor handling and inadequate processing methods and techniques; Poor transport and distribution network leading to high levels of post-harvest losses; environmental degradation and inability to integrate environmental protection with development; insufficient empowerment of the local communities; Poor interaction between players in community and community related issues and activities; Unfavourable credit condition from lending financial institutions; and Scanty information on the traditional and local knowledge of fisheries resources. The Policy reveals that, in spite of the above mentioned challenges, there are various opportunities in the sector that could be promoted to facilitate increased contribution of the sector to the national economy, among others include: vast resource use potential to attract investment; sufficient human resources; demand for fisheries products from both foreign and domestic markets; fish quality management can be improved to satisfy traditional and new markets; some development partners are interested in assisting fisheries development in the country.

Furthermore, the Policy stresses that, the Private sector, community, NGOs and other non-state sectors have a very useful role to play in the development, management and sustainable utilization of the fisheries resources. They possess diverse experience, expertise and capacity in various fields tapped, enabled and strengthened in support of the efforts to achieve the sector objectives. Thus, the involvement of these stakeholders in the fisheries sector would enhance investment, improve business and general management in the fishing industry, revitalize financing, operations and transportation and marketing of the fisheries products.

The overall goal of the Policy is to promote conservation, development and sustainable management of the fisheries resources for the benefit of present and future generations. The Policy has a several specific objectives, among others include: Improve involvement of fisher communities in the planning, development and management of fishery resources; incorporate gender perspective in the development of fisheries sector; promote efficient use of available resources in order to increase fish production so as to improve fish availability; To enhance knowledge of fisheries resources base; improve fisheries products utilization and their marketability; develop national training and educational programmes based on assessed needs and the use of national and international training institutions optimised; protect productivity and biological diversity of coastal and aquatic ecosystems through prevention of habitat destruction, pollution and overexploitation

*The proposed road project is in line with the Policy and Strategy plans as the road when completed it will help to promote the fisheries sector as the market within and outside Tanga Region will easily be accessible, investors in fishing industry will be attracted due to the good road. Furthermore, the proposed road project will also contribute to sector by constructing the access road (3.7km) and modern Fish Market at Kipumbwi Village. Besides, to protect productivity and biological diversity of coastal and aquatic ecosystems protect will establish mangrove trees nurseries and plant them along the Pangani River and Indi sea shore as one of the complementary initiatives (**Annex 5**) to enhance the benefits of the project*

3.2.15 The Gender Policy 2001

Based on this Policy the Bank is commented to gender mainstreaming as a means of fostering poverty reduction, economic development and gender equity. The aim of the policy is to integrate both genders equally in development. The policy is supported by a Gender Plan for Action for 2004 - 2007. The plan provides evaluation indicators to gauge the impact of project in meeting gender related objectives such women access to services, employments and their participation in project planning. *The ESIA study indicated that the people in the project area take into consideration women development and they stated they try to balance women participation in project planning this was indicated by the number of women*

leaders at the local level and their involvement in public participation. Despite that property ownership was still highly regarded as a men's domain with women mainly working for the family and fruits of production being given to men. The community emphasis the need of providing equal opportunities to both men and women during project development in terms of employment among other project benefits.

3.3 Legal Framework

3.3.1 Environmental Management Act No. 20 of (2004), Cap. 191

The Environmental Management Act (EMA) is a piece of legislation that forms an umbrella law on environmental management in Tanzania. Its enactment has repealed the National Environment Management Council Act. 19 of (1983) while providing for the continued existence of the National Environment Management Council (NEMC).

Among the major purposes of the EMA are to provide the legal and institutional framework for sustainable management of the environment in Tanzania; to outline principles for management, impact and risk assessment, the prevention and control of pollution, waste management, environmental quality standards, public participation, compliance and enforcement; to provide the basis for implementation of international instruments on the environment; to provide for implementation of the National Environmental Policy; to provide for establishment of the National Environmental Fund and to provide for other related matters.

Part III, Section 15(a) states that in matters pertaining to the environment, the Director of Environment shall coordinate various environment management activities being undertaken by other agencies to promote the integration of environment considerations into development policies, plans, programmes, strategies projects and undertake strategic environmental assessments with a view to ensuring the proper management and rational utilization of environmental resources on a sustainable basis for the improvement of the quality of human life in Tanzania.

Part VI of the EMA deals with Environmental Impact Assessments (EIA) and other Assessments and directs that an EIA is mandatory for all development projects. Section 81(2) states that "An Environmental Impact Assessment study shall be carried out prior to the commencement or financing of a project or undertaking", while Section 81(3) states "a permit or license for the carrying out of any project or undertaking in accordance with any written law shall not entitle the proponent or developer to undertake or to cause to be undertaken a project or activity without an environmental impact assessment certificate issued under this Act". *In adherence to this Act,*

TANROADS the project proponent commissioned a registered firm of experts M/s OOP Consulting Engineers to undertake Environmental Impact Assessment.

3.3.2 Environmental Impact Assessment and Auditing Regulations (2005) and Amendments of April 2018

These regulations set procedures for conducting EIA and environmental audit in the country. The regulations are made from Section 82 and 230 of the EMA (2004) and prescribe that the Minister responsible for environment shall formulate regulations and guidelines on how EIA shall be conducted. The EIA regulations are applicable to all project contained in Third Schedule of the EMA (2004) and First Schedule of the EIA and Audit Regulations. These Regulations prescribes the stages and/or the EIA process, which are in principal managed by the NEMC.

The Regulations prohibit commencing the project implementation without obtaining the approval of the environmental impact assessment as required by the Environmental Management Act and define the contents and form of an environmental impact assessment and the basic principles of an environmental

audit. A developer shall apply for an environmental impact assessment certificate in the form as prescribed by these Regulations. The Minister shall take the final decision on an environmental impact assessment. The Regulations also provide for public consultations in relation with environmental impact assessments and appeal against decisions of the Minister.

The implementation of this project is in line with the requirements of the regulations. The project implementation will start upon the acquisition of the EIA certificate. The environmental monitoring and audit will be conducted during the construction works to ensure Contractors' compliance with the ESMP throughout the project implementation phases.

3.3.3 The Environmental Management (Air Quality Standards) Regulations 20017

Section 7 of the Act requires all to comply with the minimum air quality standards published in the regulations. The regulation prohibits release of hazardous substances, chemicals, gases or mixtures containing gaseous and hazardous substances to the environment if they do not meet the thresholds set in the regulations contrary to which one commit an offence. The law requires that all those individuals or organizations producing, transporting, trading, using, storing or disposal of chemicals, toxic substances, inflammable or explosive substances to comply with requirements of the regulation so as to ensure human and, other living beings safety and avoid causing environmental degradation.

The project shall involve the use and storage of substances likely to produce emission and cause emission thus there is need to adapt cleaner development mechanism such as use of green energy such bio-diesel, solar, clean fuels; use equipment's with high combustion efficiency; maintain project vehicles and equipment's among other measures.

3.3.4 Workers Compensation Act of 2009

The worker compensation Act of 2008 is a supplementary Act that provides guidelines for compensating of employees for death and disablement caused by work related injuries or diseases. The Act is supported by Cap 366 the Employment and Labour Relations Act and other labour related laws. Section (2) of the Act states that, '*it applies to all employers and employees in main land Tanzania*'. Part VIII of the Act outlines the obligation of the employer in regards to content of the Act, which includes registration of the business activity with the Director General, making returns and keeping work place incident records. The Act requires the employer to register with the Director General, make returns on the injuries and deaths that would have occurred at the work place and requires them to contribute to the fund established through the Act. The employee and employer are required to report injuries on time.

This project shall abide to the requirements of the Act as the Contractor shall employ workers who should be covered under Workers compensation fund scheme as stipulated in the Act.

3.3.5 The Water Resources Management Act No. 11 of 2009

This is a new legislation that has repealed the Water Utilization (Control and Regulation) Act (1974). The Act provides for institutional and legal framework for sustainable management and development of water resources; outlines principles for water resources management; for prevention and control of water pollution; and provides for participation of stakeholders and general public in implementation of the National Water Policy. Its main objective is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways that among others meets the basic human needs of present and future generations, prevents and controls pollution of water resources and protects biological diversity especially the aquatic ecosystems. *Section 9 of this the law requires carrying out an Environmental Impact Assessment for any development in water resource areas or watershed. This ESIA is in line with this legal requirement.*

3.3.6 The Water Supply and Sanitation Act No. 12 of 2009

This is also a new legislation that provides for sustainable management and adequate operation and transparent regulation of water supply and sanitation services; provides for establishment of water supply and sanitation authorities as well as community owned water supply organizations; and provides for appointment for service providers. The main aim of this law is to ensure the right of every Tanzanian to have access to efficient, effective and sustainable water supply and sanitation services for all purposes by taking into account among others protection and conservation of water resources and development and promotion of public health and sanitation; and protection of the interest of customers. *The project might affect water supply and sewerage lines in Tanga Municipal Council and it is important that programmes of such activities will be communicated to the public and period of interruptions communicated to enable them plan their activities. Duration of interruptions will be kept as minimum as possible.*

3.3.7 The Road Act, 2007

For purposes of the proposed project, the Act 2007 serves as a guide to the use of the road reserve. Contrary to previous informal understanding, the reserve is exclusive to road related activities that do not include other utilities. However, clause 29 (2) does give provision for the request and terms of approval for use of the road reserve by utilities such as power lines and water pipes. *On land acquisition, the Act clearly states in part III, Section 16 that 'where it becomes necessary for the road authority to acquire a land owned by any person, the owner of such land shall be entitled to compensation for any development on such land in accordance with the Land Act and any other written law'. All PAPs that are entitled for compensation will be fairly and propyl compensated before the commencement of the project.*

3.3.8 Antiquities Act of 1964 (as amended in 1979) and the Antiquities Rules of 1991

The Antiquities Act of 1964, as amended in 1979, and the Antiquities Rules of 1991 govern archaeological research in Tanzania. The main thrust of this legislation is that no archaeological research in Tanzania will be undertaken without the permission of the Director of Antiquities. The Director, under the Act, gives permission for qualified scientific personnel, both foreign and local, to undertake research after being satisfied that they possess adequate financial resources and professional competence. Excavation permits are issued for a period not exceeding one year at a time. Furthermore, where the need arises, artefacts export permits are issued for a period not exceeding three years at a time.

Under the 1964 Act, all objects (relics) that were made or modified by man before the year 1864 are automatically protected under the law whilst the Minister responsible for Antiquities can declare monuments and protect objects, which were made or modified by man after the year 1863. The 1979 Amendment Act was passed to correct inherent deficiencies in the 1964 Act. For instance, the collection and export of ethnographic objects without the permission of the Director of Antiquities was made illegal. Furthermore, the Act established the National Antiquities Advisory Council to advise the Government on matters related to the preservation, development and research of our archaeological heritage including publications and the establishment and maintenance of archaeological research facilities. Concurrently, a National Antiquities Fund was established to complement government budgetary financing.

Section 16 of the 1964 Act (which was amended in the 1979 Act) gives powers to Local Government Authorities, under the Local Government Ordinance, to pass by-laws (with the approval of the Minister responsible for Antiquities) with respect to the preservation of the archaeological heritage in their areas of jurisdiction. *The proposed project is located outside the areas of archaeological importance; however, chance findings should be conducted due to the fact that, the project road traverses potential historical towns. Historical structures found along Pangani River in Tanga shall be preserved by identifying and developing alternative routes.*

3.3.9 The Urban Planning Act (2007)

The law provides for the orderly and sustainable development of land in urban areas, which also includes preserving and improving amenities; to provide consent for development of land and control land use. Expropriation of land for urban infrastructure development and associated activities in urban areas shall comply with the provisions of this law. Under Section 3, among others the law seeks to improve level of the provision of infrastructure and social services for sustainable human settlement development. Therefore, road development is in line with the objectives of this law.

Section 58 of the Urban Planning Act provides for protection of buildings or group of buildings of special architectural or historic interest. The law states “The planning authority may compile a list of areas, buildings or group of buildings of special architectural or historic interest and may amend any list so compiled, such areas may include; buildings, group of buildings, areas of unique biodiversity; and rare species of trees and special trees”. Section 59 gives powers to the Planning authority to grant permission for demolition of such buildings or otherwise powers to restrain any proposed demolition. Any building of special architectural or historic interest located in the road reserve and is to be demolished. This law is in line with this project.

3.3.10 The Land use Planning Act (2007)

The Act, which was enacted on 24th April 2007, provides for the procedures for the preparation, administration and enforcement of land use plans; to repeal the National Land Use Planning Commissioning Act and to provide for related matters. Among the objectives of the Act as given in Section 4 are to facilitate the orderly management of land use and to promote sustainable land use practices. Development of Urban Infrastructure that affects land use and livelihood shall comply with the provisions of this Act. Any infringement on existing land use shall need consultation with land use planning authorities.

The Act has distinctive authorities of land use planning in Tanzania, and establishes land use planning authorities. It outlines their functions and powers conferred upon. The authorities established under the Act include:

- Village Councils – which plan and manage village land.
- District Councils – which plan and manage all land in the district and assist Village Councils to plan and manage their areas of jurisdiction.

Land Use Planning Commission – which prepares national land use planning framework plan and assist the lower echelon to prepare plans and manage their lands.

The project management will make consultation with the village and district land use planning authorities before implementing the project in their areas of jurisdiction. The project proponent must be aware and well informed of the current land use plans in the project area to avoid any possible conflicts or incompatibility with current and future land use plans. The ESIA has identified the land use along the project area and has proposed alternative where the land use is not compatible with the proposed project this includes the Saadani National Park and its associated forests.

3.3.11 The Occupational Health and Safety Act (2003)

The Occupational Health and Safety Act No. 5 of 2003, deals with regulation of health, safety and welfare of workers in factories / workplaces. Some of the provisions that could be relevant to the road sector are outlined in this section.

In adherence to the provisions of this Act, the Contractor will:

- Appoint safety and health representative and committee;
- Register their workplace (campsite, borrow pit and quarry sites) before operation;
- Provide safety precautions;

- Ensure health and welfare of workers; and
- Ensure proper handling of hazardous materials/chemicals and process.

3.3.12 Local Government Acts No. 7 and 8 of 1982

The Act gives authority to local governments to regulate matters that are local. A pertinent example of such authority to the projects is that the local government may opt to regulate extraction of minerals or construction materials, through their bylaws. Despite the authority of local governments the bylaws should not derogate any principal legislation e.g. in the case of extraction of material, the Mining Act.

3.3.13 Land Act 1999

Section 156 of the Land Act No. 4 of 1999 applies to non-governmental corporate bodies, institutions or group of persons. This section of the Act requires that compensation be paid to any person for the use of land of which he/she is in lawful or actual occupation as a communal right of way and with respect to a way leave. These include:

- Any damage suffered in respect of trees, crops, and buildings as result of creation of way leave;
- Damage due to surveying or determining the route of that way leave.

It is the responsibility of the government department of Ministry, Local Government authority or corporate body that applied for right of way to pay compensation. *The proposed road project shall involve destruction of properties or land acquisition hence requiring compensation to be effected according to existing legislation. Valuations of affected properties have been done and all PAPs will receive a fair, full and timely compensation.*

3.3.14 The Valuation and Valuers Registration Act No. 7 of 2016 and Valuers Regulations of 2018

The Act provides with respect to the process in which the value of an interest in real property is assessed by a certified and registered Valuer. Registered Valuer as defined under Section 15 of the Act, means a person professing to practice valuation of properties. Part V of the Act provides guidance on valuation practices of which Section 47 states that, *‘Every registered Valuer or person practicing valuation shall comply with guidance on valuation practice set out under this Part V and Regulations made under this Act’*. The carrying out of valuation shall be for various purposes including compensation, sale or purchase, land rent assessment, market value, etc.

In the valuation process, a registered valuer shall apply the appropriate method of valuation and shall include: direct market comparative method; replacement cost or contractors test method; income approach or investment method; profit method; and residual method.

These regulations set out criteria for the assessment of compensation of land. The basis for assessment of the value of any land and un-exhausted improvement shall be the market value of such land. The market value is arrived at by the use of comparative method proved by actual recent, sales of similar properties or by use of income approach or replacement cost method, in case the property is of special nature and not saleable. The assessment is done by Qualified Valuer and verified by the Chief Valuer of the Government or his/ her representative

In addition, compensation issues include the following opportunity cost which is based on the following:

- The Market Value of the Real Property
- Disturbance allowance
- Transport allowance
- Loss of profits /income or accommodation

- Cost of acquiring or getting an equivalent land
- Any other immediate costs, loss or capital expenditure incurred to the development of the subject land and
- Interest at market rate

Accommodation allowance: Accommodation allowance is estimated by assessing the market rent of the building and multiplying it by thirty-six months.

Loss of profit: Loss of profit is estimated by assessing the net monthly profit of the business carried out on the land (evidenced by audited account where necessary and applicable) and multiplying by thirty-six months.

Disturbance allowance: Disturbance allowance is calculated by multiplying value of the land by average percentage rate of interest offered by commercial banks on fixed deposits for twelve months at the time of loss of interest in land.

Transport allowance: Transport allowance is determined by taking actual costs of transporting twelve tons of luggage by rail or road (which ever cheaper) within twenty kilometers from the point of displacement. No payment shall be made for transport allowance, accommodation allowance, and loss of profit for unoccupied land at the date of loss of interest on land.

Interest: Interest is determined by average percentage rate of interest offered by commercial banks on fixed deposits and will be recoverable until such compensation is paid (Sub-section 3 of Section 13). The following procedures outlined in Section 6 of the regulation shall apply:

- Publication of notice by Commissioner for lands on public notice board;
- Notification of the occupier of the land;
- Submission of claims for compensation by occupier;
- Physical appearance of occupier on specified date, time and place where assessment is to be made;
- Valuation for compensation by Commissioner or the authorized officer;
- Preparation of compensation schedule and submission of the schedule with claim for compensation to the Compensation Fund;
- Verification and acceptance of rejection of payment by the Fund within not more than 30 days from the date of receipt of claim;
- If the person does not agree with the amount or method of payment or dissatisfied with time taken to pay compensation he/she may apply to the High Court. The high court shall determine the amount and method of payment and make any additional costs and inconveniences incurred;
- To comply with the requirements of the law Prompt compensation shall be paid for acquired land or damaged properties.

Since the proposed project will involve destruction of properties such as buildings, crops, water wells, etc, TANROADS as project proponent shall abide to the Act requirements by engaging a Registered Valuer as described in this Act to undertake valuation of project affected properties for compensation as guided in Part V of the Act.

3.3.15 Explosives Act 1963 and Explosive Regulations of 1964

The Explosive Act of 1963 and the Explosives Regulations of 1964 provide for the control of the manufacture, importation, exportation, purchase, sale, possession and use of explosives. According to the provisions of the Act and its Regulations no person is allowed to acquire, possess and disposal of explosives without permission from the Commissioner of Mines. This Act requires all persons planning to

use explosives in their activities to acquire an explosive license. For this project, this applies to use of material from any quarries and borrow pits where blasting is to be undertaken. *The project shall involve quarrying operations at material sites which will include use of mining techniques which shall involve use of explosive or blasting to enable remove stone/rocks from the road or borrows pits during construction works. In such circumstance the Contractor shall adhere to the conditions of dealing with explosives as stipulated in the legislations.*

3.3.16 Regional and District Act No 9, 1997

The Act provides for Regional Commissioners to oversee Regional Secretariats, with District Commissioners directly supervising the District Councils. Local authorities oversee the local planning processes, including establishing local environmental policies. The National Environmental Policy establishes a policy committee on Environment at Regional level chaired by the Regional Commissioner, mirrored by environmental committee at all lower levels, i.e. at the District, Division, Ward and Village or Mtaa Councils.

Under the EMA 2004, the Regional Secretariat is responsible for coordination for all advice on environmental management in their respective region and in liaison with the Director of Environment. At Local Government level, an Environmental Management Officer should be designated or appointed by each City, Municipal, District or Town Council. In each City, Municipality, or District Environmental Committees should be established to promote and enhance sustainable management of the Environment. The Village Development Committee is responsible for proper management of the environment in their respective areas. The District Council designates for each administrative area as township, ward, village, sub-street and Environmental Management Officer to coordinate all functions and activities related to protection of environmental in their area.

3.3.17 Road Sector Compensation and Resettlement Guidelines, 2009

The guideline provides a consistent approach in the development and implementation of compensation and Resettlement Plans. The main strategy of a road project should be to integrate compensation and resettlement process from its planning phase. This guideline elaborates the factors that need to be considered when identifying and compensating /resettling those affected by a road project. The guideline recognizes the Acts governing compensation and resettlements in Tanzania and requires that displacement associated with road development be minimized as much as possible. To enable this, the guidelines require that a Compensation and Resettlement Plan (CRP) be develop with the aim of identifying those to be affected by the road project through displacement and loss of land or other assets. The overall objective of CRP is to:

- Ensure displaced persons/parties receive benefits from the project that displaces them;
- Ensure Social disruption is minimized;
- Ensure Resettlement activities are executed as sustainable development programmes
- Ensure Affected persons are consulted throughout the planning and implementation stages of the compensation and resettlement process;
- Ensure Income restoration is integral to the C&R process;
- Ensure there is a net improvement in livelihood activities and standards of living of affected persons as compared with their situation prior to displacement or project implementation;
- Ensure fair and prompt compensation (in cash or kind, as preferred by the PAP) is paid before roadwork activities begin;
- Ensure resettlement timetable is well coordinated with roadwork's activities;
- Ensure an adequate budget is provided for the C&R process.

During the project implementation, all PAPs will be well treated. All PAPs whose properties/land will be affected by the project will be compensated as per the requirements of the law.

3.3.18 Mining Act No. 14/10 (2010)

This Act states that “building material” includes all forms of rock, stones, gravel, sand, clay, volcanic ash or cinder, or other minerals being used for the construction of buildings, roads, dams, aerodromes, or similar works but does not include gypsum, limestone being burned for the production of lime, or material used for the manufacture of cement. *This Act makes sure that minerals are well controlled and Section 6(1) states that no person shall, on or in any land to which this act refers, prospect for minerals or carry on mining operations except under the authority of Mineral Right granted, or deemed to have been granted under this Act. For this Project, the Contractor shall apply for Mining permit before starting Quarrying Activities.*

3.3.19 National Forest Act 2002

This Act deals with the protection of forests and forest products in forest reserves. The Act restricts and prohibits illegal activities in such forest reserves. The forest management plans are administered under the Forest Ordinance (1957). Any contravention of the restrictions and prohibition is considered an offence under the Ordinance.

The law was revised in 2002 to meet the new requirements under the Forest Policy. The new Forest Act No. 14 of 2002 requires a proponent to undertake Environmental Impact Assessment for any development activities conducted within a Forest Reserve, Private Forest or Sensitive Forest. The road traverses through forest reserve areas and fall under those project which requires EIA as prescribed under Section 18 (2) if the First Act No. 14 of 2002. The project proponent will acquire all required licenses and permits activities undertaken within the national or local forest reserves. The licenses required include, inter alia, felling or removing trees, harvesting forest produce, entering a forest reserve for the purpose of tourism or camping, cultivation and erecting any structures.

3.3.20 Wildlife Conservation Act 2009

The prime purposes of this Act are;

- To make better provisions for the conservation, management, protection and sustainable utilisation of wildlife and wildlife products;
- To repeal the Wildlife Conservation Act Cap. 283; and
- To provide for other related matters.

Section 74 of the Act states that, "A human activity, settlement or any other development that will adversely affect wildlife shall not be permitted within five hundred meters (500) from the wildlife protected area borderline without the permission of the, Director."

Road construction and its use can be deleterious to the biological diversity of any place and any kind regardless whether the area is protected or not. As far as the Act is concern there is inconsequential concern from the project caretakers that protecting wildlife from encounters along the road will be difficult since the project traverses sections of Saadani Park home to several wildlife species thus TANAPA proposed an alternative route that avoids the park as discussed under project alternative under chapter 7 of this report. Despite that fact that the law provides a buffer zone of 500m which the location of Option A meets in most its section, several wildlife moves between the ocean and the park of significant importance is the elephant and the green turtle which uses for both ecosystems. *This law will be observed as any negative impact to the wildlife and it ecosystem will affect several other sectors that are dependent on this ecosystem.*

3.3.21 Employment and Labour Relations Act No. 6 of 2004

The Act makes provisions for core labour rights; establishes basic employment standards, provides a framework for collective bargaining; and provides for the prevention and settlement of disputes. *TANROADS shall ensure Contractor's adherence to employment standards as provided by the law.*

3.3.22 HIV and AIDS (Prevention and Control) Act 2008

The law provides for public education and programmes on HIV and AIDS. Section 8(1) of the law states that “The Ministry of Health, health practitioners, workers in the public and private sectors and NGOs shall for the purpose of providing HIV and AIDS education to the public, disseminate information regarding HIV and AIDS to the public”. Furthermore, Section 9 states that “Every employer in consultation with the Ministry of Health shall establish and coordinate a workplace programme on HIV and AIDS for employees under his control and such programmes shall include provision of gender responsive HIV and AIDS education....”*This project will abide to HIV/AIDS Act in the fight against the disease by planning and implementing mitigation measures with line ministries.*

3.3.23 Environmental Code of Practice for Road Works 2009

The document recognises that roads are important for economic and social development of an area but notes that if the development of roads is not well planned and construction works implemented in a professional manner, the project shall have effects on human health and the environment. The document therefore aims to define environmental criteria to be applied in Tanzania during the feasibility, design, construction and operation of road infrastructure. In this respect the code provides technical assistance; guidance for general understanding of environmental impacts and defines environmental criteria to minimise project impacts; ensure that Road Engineers and Technicians can find solutions for any problems arising during road construction or maintenance activities. The code provides guidelines of implementing good engineering practices during road development thus its requirements should be practised during the road construction.

3.4 Regional Policies, Treaties and Guidelines

3.4.1 East African Treaty 1999

The East African Treaty establishes the East African Community (EAC). It requires the Partner States to cooperate in all issues of Environment and Natural Resource (ENR) Management (Article 11). The Treaty requires the Partner States to cooperate, preserve, protect and enhance the quality of the environment and to ensure sustainable utilization of shared natural resources. In so doing, the Partner States are required to develop jointly common policies and strategies to ensure sustenance and preservation of ecosystems. In particular, the Partner States are to develop strategies, manage fragile ecosystems including both terrestrial and aquatic resources and mitigate negative trans-boundary impacts. The Partner States are also expected to integrate environmental management and conservation measures in all their national development plans and activities, institute measures to encourage public awareness and education, harmonize their policies and regulations, and adopt common environmental standards and exchange information. The Treaty therefore sets the premise for instituting regional environmental assessment guidelines for the management of trans-boundary ecosystems in East Africa.

3.4.2 The Southern African Development Community Protocol on Wildlife Conservation and Law Enforcement, 1999

Tanzania is also a Party to the Southern African Development Community Protocol on Wildlife Conservation and Law Enforcement signed by Southern African States in Maputo, Mozambique in 1999, (the SADC Protocol). The Protocol contains provisions that are relevant for hunting industries in the Contracting Party States. Most of these are reflected in Tanzania's principal wildlife legislation and the new wildlife policy. The hunting-related objectives of the SADC Protocol are provided for in Articles 3, 4, 6 and 7.

Articles 3(a) and 4 of the Protocol call upon Party States to take legislative measures to ensure the sustainable use of wildlife resources. Regulating the hunting of species of wild animals seeks to ensure sustainable use of the wild animal population and squarely fits in this objective. Article 6(2) on the other hand urges Parties to penalize the taking away of wild animals or their products for purposes of trade.

Article 7(2) and (3) obliges the Parties to control activities that may significantly affect conservation and sustainable use of wildlife in order to avoid or minimize negative impacts, and to take measures to prevent over-exploitation and extinction of wildlife.

3.4.3 International Policy Framework/ Multilateral Environmental Agreements

Tanzania is a signatory as well as a party to various international conventions, treaties and protocols relating to the environment, which aims at achieving sustainable development. According to the Registrar of International Treaties and other Agreements in Environment (UNEP 1999), there are 216 treaties, 29 of which are of interest to Tanzania. The country is a signatory to 11 such agreements, which range from use of oil, protection of natural resources and protection of the atmosphere. The agreements are both regional and international and became legally binding on the country upon ratification thereof by the rightfully designated Authority. The agreements relevant to this project are discussed below.

3.4.4 United Nations Framework Convention to Climate Change (UNFCCC), 1994

The Government of Tanzania (GOT) ratified the convention on 17th April 1996. The convention requires parties to consider climate change considerations in their relevant social, economic and environmental policies and actions. The proponent has undertaken this EIA with the aim of minimizing adverse effects of the project on the economy, on public health and on the quality of the environment. The requirements of this convention to reduce impacts on climate change can be mitigated by growing trees suitable for the area to act as carbon sinks along the highway. The community members in the proposed project area depend majorly on wood as their source of energy, which is known to directly affect the ecosystem in terms of volumes of precipitation and quality of water catchments. The proponent is advised to enhance the positive impacts of the project through engaging activities that control climate change for example developing tree planting programmes with line ministries and the community members and conserving the catchment through water conservation.

3.4.5 Convention on Biological Diversity, 1992

The GOT ratified the convention in June 1996. The Convention requires Parties to use EIA effectively to avoid or minimize significant adverse impacts on biodiversity; it introduces Strategic Environmental Assessment (SEA) to assess environmental implications of policies and programmes particularly for those with major implications on natural resource use. The Convention also led to the establishment of Cartagena Protocol on Biosafety 1999 namely “*The Cartagena Protocol on Biosafety to the Convention on Biological Diversity*” which was adopted on 29th January 2000 entered into force on the same date. The protocol is an international treaty governing the movements of Living Modified Organisms (LMOs) resulting from modern biotechnology from one country to another. *The proponent shall observe the requirements of this regulation if programmes such as landscaping are incorporated and will involve use of plant species some of which can be products of biotechnology modification. The use of LMO can have adverse environmental impacts if the correct material is not used leading to destruction of the micro-ecosystems, food webs and even invasion of farms.*

3.4.6 Convention on Wetlands of International Importance (RAMSAR, 1971)

The convention seeks to ensure the wise use of all wetlands and provides stringent guidelines for the conservation of those wetlands listed in the List of Wetlands of International Importance. The proposed project is not located within an Important Bird Areas (IBA) according to the Ramsar Sites list.

3.4.7 Kyoto Protocol to the United Nations Framework Convention

The GOT ratified the convention in August 2002. The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. The Clean Development Mechanism (CDM), defined in Article 12 of the Protocol, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project

in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO₂, which can be counted towards meeting Kyoto targets.

3.4.8 The World Commission on Environmental and Development (The Brundtland Commission of 1987

The commission focuses on the environmental aspects related to development and requires all development projects be sustainable economically, socially and environmentally. The principle of the organization emphasis that development project should not have permanent negative effects on the biosphere and in particular the ecosystems. *The project proponent shall incorporate mitigation measures to ensure that the project impacts on the ecosystem are reduced. The consultants used participatory methods to involve the target group and concerned stakeholders in order to inform and enlightened them on the likely negative environment and social impacts in order to enable them to prepare mitigation measures to ensure the proposed project is sustainable throughout its life span.*

3.4.9 Convention Concerning the Protection of World Cultural and Natural Heritage, 1972

The convention requires parties to adopt effective measures that include assessment of the feasible project alternatives to prevent or minimise or compensate for adverse impacts and assess the nature and extent of potential impacts on natural heritage resources, and designing and implementing mitigation plans. The convention also protects threatened plants.

The proposed project road design does not traverse areas considered to be of cultural importance despite the fact that the project regions namely Bagamoyo, Pangani, and Handeni are known to have several sites of cultural importance such as the slave trade route, first church of East Africa to mention a few. The development of the proposed Pangani Bridge shall be developing in such a way that the historical buildings found along the Pangani River are not impacted.

3.4.10 Convention on International Trade in Endangered Species (CITIES) of Wild Fauna and Flora, 1990

This convention protects forests as habitat for endangered species. The proposed project area has gazette forests in its immediate environment which are rich in plants and wildlife thus will need protection from project impacts. The area is also home to the elephant which has been listed endangered due to it being killed for its tusks. It convention makes it illegal to sale of raw ivory. A no-trade moratorium on sale of ivory has been put in place since 2007 and set to last for 9 years. This moratorium was upheld in 2010 in Doha during the 15th Conference of Parties to CITES (COP15).

3.4.11 The Convention of Control of Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (CCD), 1992

The GOT ratified the convention in June 1994. This convention requires Parties to promote cooperation among affected parties in the fields of environmental protection and the conservation of land and water resources, as they relate to desertification and drought. The proponent is advised to engage in activities geared towards eradicating drought through developing tree programmes with relevant ministries/local communities, encouraging clean energy use, eliminate use of controlled substances and incorporating water conservation measures in the project.

3.4.12 The Basel Convention

This is the Convention on the Control of Trans Boundary Movements of Hazardous Waste and their Disposal. Its overall goal is to protect human health and the environment against the adverse effects resulting from generation, movement and management of hazardous waste. This Convention requires that the Parties exercising their right to prohibit the import of hazardous wastes or other wastes for disposal should inform the other Parties. It also requires parties to ensure that the trans-boundary movement of hazardous wastes and other wastes is reduced to minimum levels consistent with sound environmental management of such wastes, and that it is conducted in a manner, which will protect human health and the environment against the adverse effects, which may result from such movement. *The proposed project will involve use of solvents, emulsifiers, petroleum products and thus the requirements of the agreement should be observed by not importing or accepting expired inputs or others termed as hazardous.*

3.4.13 Other Multilateral Environment Agreements

Other agreements ratified by GOT include:

- Stockholm Convention on Persistent Organic Pollutants (POPs).
- Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol).
- Convention for the Protection of the Ozone Layer (Vienna Convention).
- The Rio Declaration (1992) and Agenda 21.
- United Nations Environment Programme (UNEP) Principles on Shared Natural Resources (1978).

3.5 The AFDB's Integrated Safeguards System 2013

The Bank's Integrated Safeguard System (ISS) is a cornerstone of its strategy to promote growth that is socially inclusive and environmentally sustainable. The ISS is designed to promote the sustainability of project outcomes by protecting the environment and people from the potentially adverse impacts of projects. The ISS aim at avoid adverse impacts of projects on the environment and affected people, while maximizing potential development benefits to the extent possible; Minimize, mitigate, and/or compensate for adverse impacts on the environment and affected people when avoidance is not possible; and also help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks. The Bank has adopted five Operational Safeguards (Oss) to achieve the goals and optimal functioning of the ISS as described below:

- **OS1 - Environmental and social Assessment:**

The African Development Bank's OS1 governs the process of determining a project's environmental and social category and the resulting environmental and social assessment requirements. Under OS1, projects are categorized as category 1, 2, 3 or 4, according to type, scale, location and anticipated severity of environmental impacts. The category indicates the scope and detail required for the ESIA and RAP. Since this project is the upgrading of the road to bitumen standard and some sections passing through the sensitive Saadani National Park, forests and Pangani River may induce significant and/or irreversible adverse environmental and/or social impacts, or significantly affect environmental or social components. This project falls under Category 1. TANROADS and the Government as whole comply with the provisions of this OS by undertaking the environmental and social assessment of the proposed project.

- **OS2- Involuntary resettlement land acquisition, population displacement and compensation:**

Regarding resettlement, the Bank's OS2 prescribe measures to minimize the negative impacts and ensure that the displaced community benefits from the project. Therefore the Safeguard seeks to ensure that when people must be displaced they are treated fairly, equitably, and in a socially and culturally sensitive manner;

that they receive compensation and resettlement assistance so that their standards of living, income-earning capacity, production levels and overall means of livelihood are improved; and that they share in the benefits of the project that involves their resettlement. The policy requires also the client to prepare a Full Resettlement Action Plan (FRAP) for any project that involves 200 or more persons or any project that is likely to have adverse effects on vulnerable groups. The proposed project has triggered this OS since some of the people's properties shall be expropriated to secure a road reserve of 45m. In this regard, RAP and the valuation of all affected properties have been conducted. The project will affect properties of more than 200 people and thus a full Resettlement Plan (FRP) has been prepared.

- **OS3- Biodiversity and ecosystem Services:**

The objective of this safeguard is to conserve biological diversity and promote the sustainable use of natural resources. The safeguard provides for the protection of biodiversity on the African continent and the value of key ecosystems to the population, emphasizing the need to “respect, conserve and maintain [the] knowledge, innovations and practices of indigenous and local Communities... [and] to protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements. The proposed road section cuts across the Saadani National Park with some patches of forests. Although the road section does not traverse within the Zaraninge forest which part of Saadani National Park it may have indirect impacts to some biodiversity (Flora and Fauna) found in the forest. This therefore needs special attention to ensure biodiversity is not adversely affected by the road project. In this regard, prior to commencement of construction works, the project will engage independent Consultant to collect baseline data to improve the ESMP and monitor its implementation among others and Biodiversity in particular before, during and after project implementation. Parallel to road construction, the project will implement complementary projects whereby among others, there will be trees planting and mangrove planting in some degraded areas to be identified during construction as restoration measures as part of complementary initiatives included in the project implementation plan.

- **OS 4: Pollution Prevention and Control, Hazardous Materials and Resource Efficiency:**

This OS provides for prevention and control of various sources of pollutions and generation of hazardous wastes during the implementation of development projects. The safeguard calls for proper mitigation measures to be applied for storage, transportation and disposal of various Hazardous chemicals and materials. It emphasises on proper management of project operations that can trigger pollution of water sources, air quality and soil which may cause impact to human. Its overall goal is to protect human health and the environment against the adverse effects resulting from generation, movement and management of hazardous waste.

The proposed project strives to manage and handle its operations in a manner that environmental pollution is controlled throughout the project implementation phases. The proposed project involves the use of asphalt products solvents, emulsifiers, petroleum products. Thus, plans which are in line with OS 4 have been put in place to ensure that pollution from dust, smokes and fumes is prevented and controlled and hazardous wastes and materials are well handled in order to minimize pollution.

- **OS5: Labour Conditions, Health and Safety:**

This OS outlines the main requirements for borrowers or clients to protect the rights of workers and provide for their basic needs. It further provided that client should provide all employees with documents that contain information on their employment terms, conditions and rights, including national employment law. This project has triggered the OS5 as it will employ more than 500 workers whose rights should be provided. TANROADS has been complying by making sure that all workers are paid and their rights re preserved as required by this OS and the country's laws (Labour Law and Wage Order).As the project is going to be

funded by the African Development Bank, its Integrated Safeguards System (ISS) should be adhered in the implementation of the project. This ESIA has reviewed four out of five operational safeguards, which are triggered by the project as described above.

3.6 *The AfDB's Policy on Poverty Reduction, 2004*

The policy paper affirms the commitment of the African Development Bank (AfDB) to poverty reduction by emphasizing the importance of supporting national ownership, participation and outcome orientation in the effort to improve the lives of the poor. The main objective of the policy is to provide a framework for action by putting poverty reduction at the center of Bank supported projects. The Bank has identified priority development areas that shall enable meet the goals of poverty reduction and this includes agriculture and, rural development , infrastructure development, human resources development, HIV/AIDs, private sector development, good governance and two cross-cutting issues, i.e. gender and the environment. The Banks support for the proposed project is a direct indicator of its intention to implement the policy as the road shall lead to development of the rural areas served by the project.

3.7 *Institutional Framework*

3.7.1 Overall Management Responsibility

The institutional arrangement for environmental management in Tanzania is well spelt out in the EMA (2004). There are seven (7) institutions mentioned by the Act, of which the Minister responsible for the environment is the overall in-charge for administration of all matters relating to the environment.

Part III, Section 13(1) of EMA (2004) states that the Minister responsible for environment shall be in overall in charge of all matters relating to the environment and shall in that respect be responsible for articulation of policy guidelines necessary for the promotion, protection and sustainable management of environment in Tanzania.

The legal institutions for environmental management in the country include:

- National Environmental Advisory Committee.
- Minister responsible for environment.
- Director of Environment.
- National Environment Management Council (NEMC).
- Sector Ministries.
- Regional Secretariat.
- Local Government Authorities (City, Municipal, District, Township, Ward, Village, sub-village “*Mtaa* and *Kitongoji*”)

3.7.2 National Environmental Advisory Committee

The National Advisory Environmental Committee is comprised of members with experience in various fields of environmental management in the public and private sector and in civil society. The committee advises the Minister on any matter related to environmental management. Other functions include:

- Examine any matter that may be referred to it by the Minister or any sector Ministry relating to the protection and management of the environment.
- Review and advice the Minister on any environmental plans, environmental impact assessment of major projects and activities for which an environmental impact review is necessary.
- Review the achievement by the NEMC of objectives, goals and targets set by the Council and advise the Minister accordingly.

- Review and advise the Minister on any environmental standards, guidelines and regulations.
- Receive and deliberate on the reports from Sector Ministries regarding the protection and management of the environment.
- Perform other environmental advisory services to the Minister as may be necessary.

3.7.3 Minister Responsible for Environment

The Minister is responsible for matters relating to environment, including giving policy guidelines necessary for the promotion, protection and sustainable management of the environment in Tanzania. The Minister approves an EIA and may also delegate the power of approval for an EIA to the DoE, Local Government Authorities or Sector Ministries. The Minister also:

- Prescribes (in the regulations) the qualifications of persons who may conduct an EIA.
- Reviews NEMC reports on the approval of an EIA.
- Issues an EIA Certificate for projects subject to an EIA.
- Suspends an EIA Certificate in case of non-compliance.

3.7.4 Director of Environment

The Director of Environment (DoE) heads the office of the Director of Environment and is appointed by the President of the United Republic of Tanzania. The functions of the Director of Environment include:

- Coordination of various environmental management activities undertaken by other agencies;
- Promotion of the integration of environmental considerations into development policies, plans, programmes, strategies, projects.
- Undertaking strategic environmental risk assessments with a view to ensuring the proper management and rational utilization of environmental resources on a sustainable basis for the improvement of quality of human life in Tanzania.
- Advise the Government on legislative and other measures for the management of the environment or the implementation of the relevant international environmental agreements in the field of environment.
- Monitoring and assessing activities undertaken by relevant Sector Ministries and agencies.
- Preparation and issuing of reports on the state of the environment in Tanzania through relevant agencies.
- Coordination of issues relating to articulation and implementation of environmental management aspects of other sector policies and the National Environment Policy.

3.7.5 National Environment Management Council (NEMC)

The NEMC's purpose and objective is to undertake enforcement, compliance, review and monitoring of EIA's and to facilitate public participation in environmental decision-making. According to the Environmental Management Act (2004) the NEMC has the following responsibility pertaining to EIA in Tanzania:

- Registers experts and firms authorized to conduct EIA.
- Registers projects subject to EIA.
- Determines the scope of the EIA.
- Set-ups cross sector Technical Advisory Committee (TAC) to advice on EIA reviews.
- Requests additional information to complete the EIA review.
- Assesses and comments on EIA, in collaboration with other stakeholders.
- Convenes public hearings to obtain comments on the proposed project.
- Recommends to the Minister to approve, reject, or approve with conditions specific EIS.
- Monitors the effects of activities on the environment.
- Controls the implementation of the Environmental and Social Management Plan (ESMP).
- Makes recommendations on whether to revoke EIA Certificates in case of non-compliance.

- Promotes public environmental awareness.
- Conducts Environmental Audits

3.7.6 Sector Ministries

The existing institutional and legal framework that the Sector Ministries are required to establish is the Sector Environmental guidelines headed by the Sector Environmental Coordinator. The Sector Environmental Ministries' guidelines are:

- Ensure environmental compliance by the Sector Ministry.
- Ensure all environmental matters falling under the sector ministry are implemented and report of their implementation is submitted to the DoE.
- Liaise with the DoE and NEMC on matters involving the environment and all matters with respect to which cooperation or shared responsibility is desirable or required.
- Ensure that environmental concerns are integrated into the ministry or departmental development planning and project implementation in a way, which protects the environment.
- Evaluate existing and proposed policies and legislation and recommend measures to ensure that those policies and legislation take adequate account of effect on the environment.
- Prepare and coordinate the implementation of environmental action plans at national and local levels.
- Promote public awareness of environmental issues through educational programmes and dissemination of information.
- Refer to the NEMC on any matter related to the environment.
- Undertake analysis of the environmental impact of sectoral legislation, regulation, policies, plans, strategies and programmes through strategic environmental assessment (SEA).
- Ensure that sectoral standards are environmentally sound.
- Oversee the preparation of and implementation of all EIA's required for investments in the sector.
- Ensure compliance with the various regulations, guidelines and procedures issued by the Minister responsible for the environment.
- Work closely with the ministry responsible for local government to provide environmental advice and technical support to district level staff working in the sector.

3.7.7 Regional Secretariat

The Regional Secretariat, which is headed by the Regional Environmental Management Expert, is responsible for the co-ordination of all environmental management programmes in their respective regions. The Regional Environmental Expert:

- Advises local authorities on matters relating to the implementation of and enforcement of environmental laws and regulations.
- Creates a link between the region and the DoE and the Director General of the NEMC.

3.7.8 Local Government Authorities

Under the Local Government Act of 1982 (Urban and District Authorities), Local Government Authorities include the City Councils, Municipal Councils, District Councils, Town Councils, Township, Ward (*Kata*) and Village (*Mtaa*). The Environmental Management Committee of each jurisdiction undertakes the following:

- Initiates inquiries and investigations regarding any allegation related to the environment and implementation of or violation of the provisions of the Environmental Management Act.
- Requests any person to provide information or explanation about any matter related to the environment.

- Resolves conflicts among individual persons, companies, agencies non-governmental organizations, government departments or institutions about their respective functions, duties, mandates, obligations or activities.
- Inspects and examines any premises, street, vehicle, aircraft or any other place or article which it believes, or has reasonable cause to believe, that pollutant or other articles or substances believed to be pollutant are kept or transported.
- Requires any person to remove such pollutants at their own cost without causing harm to health.
- Initiates proceedings of civil or criminal nature against any person, company, agency, department or institution that fails or refuses to comply with any directive issued by any such Committee.

Under the Environmental Management Act (2004), the City, Municipal, District and Town Councils are headed by Environmental Inspectors who are responsible for environmental matters. The functions of the inspectors are to:

- Ensure enforcement of the Environmental Management Act in their respective areas.
- Advise the Environmental Management Committee on all environmental matters.
- Promote awareness in their areas on the protection of the environment and conservation of natural resources.
- Collect and manage information on the environment and the utilization of natural resources.
- Prepare periodic reports on the state of the local environment.
- Monitor the preparation, review and approval of EIA's for local investors.
- Review by-laws on environmental management and on sector specific activities related to the environment.
- Report to the DoE and the Director General of the NEMC on the implementation of the Environmental Management Act.
- Perform other functions as may be assigned by the local government authority from time to time.

4 ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

4.1 *Background*

The chapter describes the relevant environmental, socio-economic and cultural characteristics of the project location along the Bagamoyo – Saadani – Pangani road section as well as broad description of the areas of influence including Pangani and Handeni Districts (in Tanga City) and Chalinze and Bagamoyo Districts (in Coast Region). The level of details in the various sections depends on the interactions between the project activities and the particular environmental or socio-economic aspect. This section begins with providing a brief national environment and socio-economic perspective, which could be impacted on and from the project road. Information provided in this chapter will be superimposed onto the project concept and components for impact identification, evaluation and development of mitigation measures.

4.2 *Project Boundaries*

4.2.1 Spatial Boundaries

The spatial dimension encompasses the geographical spread of the impacts regardless of whether they are short term or long term. The spatial scale considers the receptor environmental component and can be local or broader. Two zones of impacts namely core impact zone and influence impact zone are considered. The core impact zone includes the area immediately bordering the project (local). In the case of this project, local impacts will include the site of the construction (borrow areas, quarries and the actual road construction site) and the immediate surrounding areas. The influence impact zone includes the area beyond 500m - 1000m from the road alignment. Based on the environment surrounding the road the influence impact zone includes areas such as Saadani National Park, the Indian Ocean and the forest.

4.2.2 Temporal Boundaries

Temporal boundaries refer to the lifespan and reversibility of impacts, the temporal impacts can be either short term or long term. The short-term impacts are considered those which will be apparent only for a short period and as such will include mainly construction related impacts. The long-term impacts are considered those, which will be apparent after construction has been completed (but may include also impacts which may become apparent during the construction phase). Short-term impacts include noise, dust and vehicle movements. Long-term impacts include impact to the ecosystem, revenue to the government, employment and benefit to the local communities in terms of accessibility to agricultural markets, industrial goods, transport, health services etc.

4.2.3 Institutional Boundaries

Institutionally, TANROADS is a government agency with mandates to develop and maintain trunk and regional roads in the Tanzania Mainland. TANROADS converts policies set by government into actions on the ground. The agency was established on 1st July, 2000 under the Executive Agencies Act, No.30 of 1997. It is a semi-autonomous government executive agency under the Ministry of Works, Transport and Communications and is responsible for the day-to-day management of the trunk and regional roads networks. Its primary function includes the maintenance and development of the primary road network to support the economic and social development of Tanzania.

From an institutional point of view, TANROADS has the responsibility of maintaining and developing the road and its associated infrastructure such as the proposed Pangani Bridge. From the central government line of administration, by virtue of its location, the project road is under the jurisdiction of the Regional Manager of Tanga and Coast Regions it extends from Bagamoyo District in Coast region to districts of Handeni and Pangani in Tanga Region. However, since the project road is a trunk road, it falls directly under the operation and maintenance of the TANROADS Head Office. TANROADS HQ will hand the road

construction works while TANROADS Regional Office in Coast and Tanga will handle the operation and maintenance of the road.

4.3 National Environment and Economic Perspective

4.3.1 Geographical Aspects

The United Republic of Tanzania lies on the Eastern Coast of Africa, South of the equator between the Great Lakes Victoria, Tanganyika and Nyasa, on one hand, and the Indian Ocean on the other hand. It is located between latitude 1° and 11°, south, and between longitude 29° and 41°, East. Tanzania has borders with Kenya and Uganda to the North, Rwanda, Burundi and Democratic Republic of Congo [DRC] to the West and Zambia, Malawi and Mozambique to the South.

The country occupies an area of 945,087 square kilometres, of which 881,000 comprises landmass. It has several major lakes; among them are Victoria (35,000 sq. km), Tanganyika (13,000 sq. km), Nyasa (6,000 sq. km) and Rukwa (3,000 sq. km). Other small lakes are Lake Eyasi, Lake Manyara and Lake Natron there are much smaller ones occupying about 2,000 sq. km. Of the land mass, about 4 million hectares are considered arable land.

The country has a vast central plateau sloping down towards the Indian Ocean. Except for a narrow belt along the 900 km-long coastlines, most of the land lies above 200 m altitude and much of the country is higher than 1,000 metres above sea level. In the North, Mt Kilimanjaro near the border with Kenya, with a permanent ice cap, rises to over 5,500 metres with the highest peak Kibo reaching 5,895 metres. A distinctive feature of Tanzania is the rift valley. The great valley runs from near the mouth of the Zambezi River northwards through Tanzania, Kenya, and Ethiopia and across the Red Sea to Israel. Woodland, bush land and grassland are the predominant types of vegetation.

4.3.2 Climate

The climate in Tanzania is generally tropical but has regional variations due to the country's topography. The coast areas are warm and humid, while the highlands are warm and temperate. There are two rainy seasons; the short rains are normally from October to December. The long rain season is from March to May.

4.3.3 Demographic Aspects

4.3.3.1 Population Distribution and Annual Growth Rates

The Population and Housing Census conducted in October 2012 enumerated a total population of Tanzania are 44.93 million people out of which 21.87 million are male and 23.06 million female. A total of 43.62 million people reside in Tanzania Mainland in which 21.24 million people are male and 22.39 million are female and 1.3 million people resides in Zanzibar islands out of which 630,677 and 672,892 are male and female respectively, growing at a rate of 2.7 per cent per annum. However, based on the estimated results of the national population census, which took place in 2002, the total population was 34.44 million people: 33.46 million in Tanzania mainland and 981,754 in Zanzibar, growing at the rate of 2.9 per cent per annum in 1988-2002. Table 4.1 below shows the population distribution and average annual intercensal growth rate by Region for year 2002, 2012 and estimates for 2015.

Table 10: People Population Distribution and Average Annual Intercensal Growth

Population Distribution and Average Annual Intercensal Growth Rate by Region, Tanzania				
Region	2002 Census	2012 Census	Population Intercensal Growth Rate	2015*
Tanzania	34,443,603	44,928,923	2.7	48,775,567
Tanzania Mainland	33,461,849	43,625,354	2.7	47,351,275
Dodoma	1,692,025	2,083,588	2.1	2,217,856
Arusha	1,288,088	1,694,310	2.7	1,839,531
Kilimanjaro	1,376,702	1,640,087	1.8	1,728,522
Tanga	1,636,280	2,045,205	2.2	2,186,757
Morogoro	1,753,362	2,218,492	2.4	2,380,750
Pwani	885,017	1,098,668	2.2	1,172,306
Dar es Salaam	2,487,288	4,364,541	5.6	5,166,570
Lindi	787,624	864,652	0.9	889,197
Mtwara	1,124,481	1,270,854	1.2	1,318,374
Ruvuma	1,113,715	1,376,891	2.1	1,467,362
Iringa	840,404	941,238	1.1	973,784
Mbeya	2,063,328	2,707,410	2.7	2,937,310
Singida	1,086,748	1,370,637	2.3	1,469,469
Tabora	1,710,465	2,291,623	2.9	2,501,796
Rukwa	729,060	1,004,539	3.2	1,105,931
Kigoma	1,674,047	2,127,930	2.4	2,286,727
Shinyanga	1,249,226	1,534,808	2.1	1,632,593
Kagera	1,791,451	2,458,023	3.2	2,702,715
Mwanza	2,058,866	2,772,509	3.0	3,031,422
Mara	1,363,397	1,743,830	2.5	1,877,451
Manyara	1,037,605	1,425,131	3.2	1,567,479
Njombe	648,464	702,097	0.8	719,036
Katavi	408,609	564,604	3.2	622,121
Simiyu	1,317,879	1,584,157	1.8	1,674,075
Geta	1,337,718	1,739,530	2.6	1,882,141

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Tanzania Zanzibar	981,754	1,303,569	2.8	1,424,292
Kaskazini Unguja	136,639	187,455	3.2	206,343
Kusini Unguja	94,244	115,588	2.0	122,736
Mjini Magharibi	390,074	593,678	4.2	673,398
Kaskazini Pemba	185,326	211,732	1.3	220,153
Kusini Pemba	175,471	195,116	1.1	201,662

Source: Population and Housing Censuses 2002/ 2012: National Bureau of Statistics

Rate by Region for Year 2002, 2012 and Estimates for 2015

Table above shows that the regions where the project road is located i.e. Tanga and Coast (Pwani) Regions the total population is 3.1 million with an intercensal growth rate of 2.2% according to 2012 census and estimated to increase up to 2.2 million in 2015 for Tanga region. Compared to the Coast Region where the population is about 1.1 million with an intercensal growth rate of 2.2, Tanga Region is highly populated.

4.3.3.2 Key Indicators from 2002 and 2012 Population and Housing Census

Table below shows the main key indicators for Tanzania Mainland and Zanzibar based on the population census for year 2002 and 2012. From the Table 11 below it can be observed that the population of Tanzania mainland grew from 33.5 million in 2002 to 43.6 million 2012 whereby for Zanzibar it grew from 1.0 million to 1.3 million respectively. It also indicates that life expectancy at Birth in Tanzania Mainland increased from 51% in 2002 to 61.7% in 2012 compared with Zanzibar where life expectancy increased from 5.7% to 65.2%. Furthermore, it is indicated that literacy rate in Tanzania Mainland has increased from 70% in 2002 to 71.5% in 2012.

Table 11: Key Indicators for 2002 and 2012 as per Population and Housing Census, Tanzania

Indicators	2002			2012		
	Tanzania	Mainland	Zanzibar	Tanzania	Mainland	Zanzibar
Total Population (million)	34.5	33.5	1.0	44.9	43.6	1.3
Young Population < 15 years (%)	44.2	44.2	44.3	43.9	43.9	42.5
Sex Ratio (males per 100 females)	96	96	96	95	95	94
Life Expectancy at Birth	51.0	51.0	57.0	61.8	61.7	65.2
Life Expectancy at Birth (Male)	47.0	47.0	46.0	59.8	59.7	63.3
Life Expectancy at Birth (Female)	50.0	50.0	49.0	63.8	63.7	67.1
Households without Toilets (%)	9.2	8.6	34.4	7.8	7.5	19.3
Annual Growth Rate	2.9	2.9	3.1	2.7	2.7	2.8
Literacy Rate	71.0	70.0	73.0	71.8	71.5	80.0
Child Orphan hood (%)	1.1	1.1	0.4	7.7	7.7	5.8
Floor Materials (Mud) (%)	73.0	74.0	46.0	60.0	60.9	28.6
Persons with Disability (%)	2.0	2.0	1.4	9.3	9.3	7.3
Children Population < 5 years (%)	16.4	16.5	15.7	15.2	15.2	13.3
Youth Population 15-35 years (%)	-	-	-	35.1	34.9	42.2
Working Age Population 15-64 years (%)	51.8	51.8	52.7	52.2	52.0	59.0
Elderly Population 60+ years (%)	5.7	-	-	5.5	5.5	4.3
Elderly Population 65+ years (%)	3.9	-	-	3.8	3.8	2.9
Percent of Urban Population	23.1	22.6	-	29.6	29.1	46.3
Percent of Rural Population	76.9	77.4	-	70.4	70.9	53.7

Source: Population and Housing Census 2002 and 2012

4.4 Macro - Economic Trends and Indicators

4.4.1 Gross Domestic Product

Tanzania's economy has generally performed well in recent years due to successful implementation of various economic reforms with the purpose of sustaining macro-economic stability of the country. The country has experienced an average annual growth rate of about 7% over the last 7 years, which is in line with National Strategy for Growth and Poverty Reduction (NSGPR II) popularly known as MKUKUTA II in Kiswahili language with a target of growth rate of 6-8% in 2010 per annum despite the effects of global economic and financial crisis, drought and power crisis.

In year 2015 the GDP grew at 7.0% same as year 2015. Sectors that highly contributed to the GDP growth are communication (15%), Public Administration (12.6%), construction (10.5%), Insurance and Financial Institutions (10.4%) and Transport (9.5%). Agricultural sector i.e. (crops, livestock, forestry and fisheries) grew by only 3.4%, which is a low growth rate although it contributes about 25% of the GDP and employs about 79% of Tanzanians. The Industrial Sector that is the focus of the Second Phase of the National Development Plan contributed only 6.6% to the GDP. Table 12 below shows Gross Domestic Product (GDP) at Market Prices for the past six years. GDP Growth Rate as at 2007 prices is presented in Figure 6:

Table 12: Gross Domestic Product at Market Prices (TZS Billion)

Tanzania Mainland	2010	2011	2012	2013	2014	2015
At Current Prices	43,836	52,763	61,434	70,953	79,718	90,864
At 2007 Prices	31,676	34,179	35,936	38,547	41,231	44,101
GDP Growth Rates	6.4	7.9	5.1	7.3	7.0	7.0

Source: Tanzania National Bureau of Statistics

Figure 6: GDP Growth Rate at 2007 Prices



Source: Tanzania National Bureau of Statistics

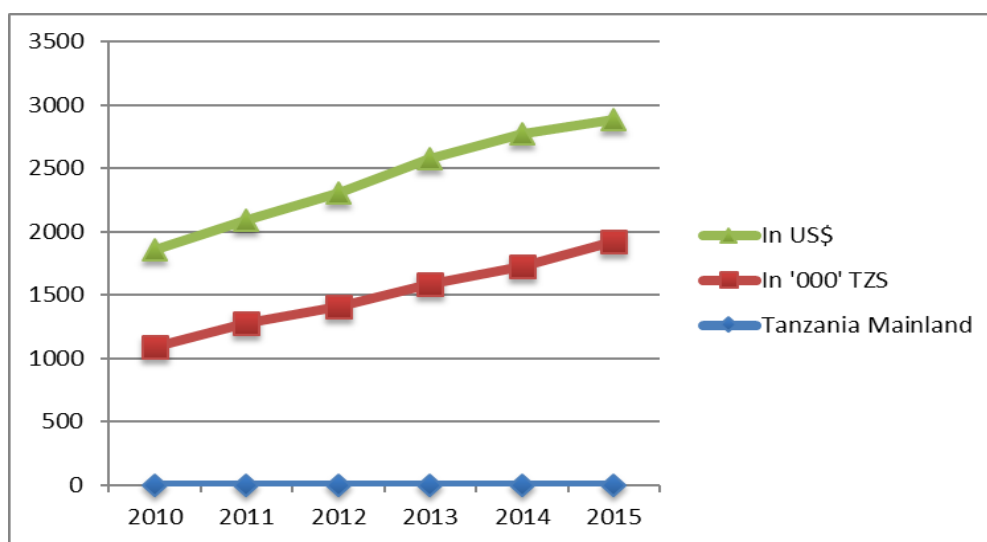
Per Capita Income in 2015 increased to Tshs 1,918,000 compared with Tshs 1,725,000 in year 2014 as shown on Table 13 and Figure 14 below.

Table 13: Per Capita GDP (Current Prices)

Year	2010	2011	2012	2013	2014	2015
Tanzania Mainland						
In '000' TZS	1,087	1,274	1,408	1,583	1,725	1,918
In US\$	771	818	896	991	1,044	967

Source: Tanzania in Figures 2015

Table 14: Per Capita GDP (Current Prices)



Source: Tanzania National Bureau of Statistics

4.4.2 Performance Indicators for Selected Economic Activities

Agriculture - food and cash crops. More than 80% of the population in Tanzania lives in rural areas and almost all of them are involved in the farming sector. Land is a vital asset in ensuring food security and among the main food crops in Tanzania includes maize, sorghum, millet, rice, wheat, beans, cassava, potatoes and bananas. Production of Cassava and paddy registered the highest growth rate between year 2014 and 2015. While the production of cassava increased by 17.9% and paddy increased by 15.2% in the same period. On the other hand production of cash crops includes cotton, tobacco, sugar, tea, pyrethrum, coffee, sisal and cashew nuts. Recently production of cashew nuts has shown the highest growth rate by about 60% while production of cotton and pyrethrum dropped by 17.6% and 14.7% respectively.

Livestock farming is one of the major agricultural activities in the country that is contributing towards achieving development goals of the national Growth and Reduction of Poverty (NSGRP). The livestock sector contributes about 13% to the Agricultural Gross Domestic product. The main livestock keeping regions in Tanzania are Mwanza, Shinyanga, Mara, Singida, Tabora, Dodoma, Arusha and Manyara.

The Mining Sector: The minerals found in Tanzania include metals (gold, iron ore, nickel, copper, cobalt, silver), industrial minerals (diamond, tanzanite, ruby, garnet, limestone, soda ash, gypsum, salt, phosphate, gravel, sand, dimension stones and lately graphite), and fuel minerals (coal, uranium).

Tourism: Tanzania is endowed with numerous attraction features that include Serengeti National Park, which is the largest, at 14,763 square kilometres of protected area that borders Kenya's Masai Mara Game Park. The Ngorongoro Crater often called 'Africa's Eden' and the '8th Natural Wonder of the World,' which attracts a greater number of tourists from all over the world. Other National Parks include Rubondo, located at south west shore of Lake Victoria, Mahale Mountains National Park and Gombe Stream all located on the western border with Congo, Saadani National Park, located in Bagamoyo district, Mikumi National Park, Tarangire National Park, Arusha National Park just to mention a few. The country also is endowed with a good numbers of game reserves, Lakes, highest mountains, beaches, historical sites that forms tourist's attraction centers. The direct and indirect contribution of tourism was 14% of Tanzania's GDP in 2014 with USD 6.7bn. This is expected to rise by 6.6% annually in the next 10 years, according to the World Travel and Tourism Council (WTTC).

Manufacturing Sector: The general industrial structure of Tanzania is comprised of manufacturing (53%), processing (43%), and assembling industries (4%). The manufacturing sector in Tanzania consists mainly of food processing (24%), textiles and clothing (10%), chemicals (8.5%), and others, including beverages, leather and leather products, paper and paper products, publishing and printing, and plastics. The Sector contributed 5.6% to the country's GDP in 2014 with USD 2.69bn, compared to USD 1.47bn in 2009, representing an increase of 82%.

Electricity and Gas: The installed capacity of electricity in Tanzania has been increasing each year from 1003.5 MW in 2010 to 1516.2 MW in 2015 compared with the estimated demand of about 6,100 MW. The Government of Tanzania is doing the major reforms in this sector to ensure that the country gets reliable power supply that will sustain the industrial sector. These initiatives include installation new gas machines and minimize dependence on hydroelectric power that is unreliable especially.

Transport Sector: Transport sector plays a crucial role in the growth of the Tanzanian economy; it facilitates domestic and international trade, contributes to national integration, and provides access to employment, health, education and other essential facilities. The effectiveness, appropriateness and adequacy of the Tanzania transport system all contribute a great deal to the successful implementation of social economic activities, lowering of domestic production costs through timely delivery, the enhancement of economies of scale in the production process and creation of economic opportunities. Currently, the transport system of Tanzania consists of Road, Rail, Civil Aviation, Maritime and Pipeline.

Railway: Railway transport is the second most important mode of transport after road and critical for long distance freight along the main transport corridors in Tanzania. Tanzania has a total of 3,676km of railway lines operated by two railway systems, Tanzania Railways Corporation (TRC) and Tanzania – Zambia Railways (TAZARA). The mainline of TRC comprises the central corridor between the port of Dar es Salaam in the east, linking central and western areas of the country and terminating at Kigoma on Lake Tanganyika in the west. The TAZARA line is 1,860 km in length, of which 975 km is in Tanzania and 885 km in Zambia.

Civil Aviation: There are 58 airports and more than 300 private airstrips in Tanzania owned by mining companies and tour operators. The total number of air passengers in Tanzania increased by 62% in the past 5 years, from 2.1m in 2010 to 3.5m in 2015, while Tanzania's cargo handling capacity rose by 7% during the same period, from 23,453 tonnes to 25,165 tones. The Julius Nyerere International Airport (JNIA), located in Dar es Salaam, is the largest and busiest airport in Tanzania, accounting for over 70% of Tanzania's air passengers with almost 2.5m in 2015. JNIA also accounts for 80% of the country's cargo capacity, which is expected to increase to 80,000 tons per year, starting May 2016, after the construction of a new cargo facility. Currently (2016), there are 21 airline operators on the JNIA, including some of the leading international air carriers such as SWISS, Qatar Airways, and British Airways.

Maritime: Tanzania has a coastline of about 720 km on the Indian Ocean, and also borders Lake Victoria, Lake Nyasa, and Lake Tanganyika. Both sea and inland waterways ports in Tanzania are managed and operated by the Tanzania Ports Authority (TPA). The TPA's main Indian Ocean ports are Dar es Salaam, Mtwara, and Tanga. Minor seaports serving coastal traffic include Lindi, Kilwa Masoko, Mafia Island, Bagamoyo, Pangani and Kwale. Dar es Salaam is the Tanzania's principal port with intrinsic capacity of 10.1m tons per year. The port handles over 92% of the total maritime ports' throughput. The port serves land locked countries of Malawi, Zambia, Democratic Republic of Congo, Rwanda, Burundi and Uganda. These countries are connected to the port through two railway systems (TRL-1.0 meter gauge and TAZARA-1.067 cape gauge), road network as well as the TAZAMA oil pipeline to Zambia. TPA also operates Tanzania's lake ports, maintaining around 20 ports on Lake Victoria. Some major ports include Bukoba, Kemonondo Bay, Musoma and Nansio. Principal lake ports on Tanganyika include Kigoma and Kasanga. Additionally, there are 15 smaller ports along the lake. These ports provide trade connections between Burundi, Eastern Democratic Republic of the Congo and Zambia. Lake Nyasa has 4 important ports, at Itungi, Mbamba Bay, Liuli and Manda. There are up to 10 other smaller TPA ports on the lake that facilitate passenger movement along the lake and between the countries of Malawi, Mozambique and Tanzania.

Road Transport: Tanzania Road Transport Road transport is the most widely used form of transport in Tanzania, carrying over 90% of the passengers and 75% of the freight traffic in the country. The road network in Tanzania currently comprises 86,472 km of roads, of which 12,786 km are trunk roads, 21,105 km are regional roads and the remaining 52,581 km are district, urban and feeder roads. Tanzania's Ministry of Works, Transport, and Communication through the Tanzania National Roads Agency (TANROADS) is managing the national road network of about 33,891km, comprising 12,786 km of trunk and 21,105 km of regional roads. The remaining network of about 53,460km of urban, district and feeder roads is under the responsibility of the President Office Regional Administration and Local Government (PO-RALG).

The geography of Tanzania, its size, diversity and dispersion give roads a special position in integration of the national economy. In particular, roads serve rural areas more effectively than any other mode of transport, where the majority of the people live. Roads have a direct impact on the welfare of the rural poor. The process of poverty reduction is embedded in a broad range of socio-economic activities to which roads and services provide intermediate inputs. It has been observed in a study in Tanzania that there is a marked decline in the income of households living at a distance of more than 5km from a good road. The distance to the nearest good road also provides a measure of national physical integration. The further the household lies from a good road, the less likely it would be to have access to markets or other economic and social facilities and opportunities. Isolation is one of the key indicators of poverty.

Improved transportation leads to improved accessibility to economic and social opportunities by reducing transport costs. It also ensures increased agricultural productivity, opens up room for participation in non-agricultural activities through time saving, improves accessibility to education and health services, and it links rural communities to the rest of the economy. In the case of urban areas, the quality of transportation and other types of infrastructure appear to play a significant role in controlling inflation, because transportation costs have been found to be a significant component in the total cost of foodstuffs, affecting the survival of urban dwellers.

4.4.3 Poverty Indicators

Regarding to the poverty indicators, the results from the Household surveys (2011/12) indicate that the rate of poverty in Tanzania reached 28.2% in 2011/12 from 34.4% in 2007.

4.4.4 Inflation

The inflation rate in the country continued to be controlled at a single digit from 6.1% in 2014 to 5.6% in 2015. The inflation rate is estimated to be below 5% in the coming years provided that the oil price in the world market is controlled, adequate food supply both in local and neighbouring countries markets and availability of good monetary policies focused on the protection of value of the currency against inflation. This decrease was due to decrease in food prices caused by favourable weather condition, decrease in fuel prices in the world market and decrease in prices in the energy sector. Table 15 below present a trend of inflation level in the country since year 2010 to 2015.

Table 15: *Inflation Rate (%)*

Year	2010	2011	2012	2013	2015	2015
Inflation	5.5	12.7	16	7.9	6.1	5.1

Source: Ministry of Finance and Planning 2015

4.4.5 Mean Exchange Rate

For the past 6 years the value of Tanzania Shilling has not been encouraging. Statistics indicate that between year 2010 and 2015 the value of Tanzania Shilling dropped from Tshs 1,409 in 2010 to TShs 1,985 in December 2015 as shown on Table 16 below. This drop is mainly caused by trade imbalance. That means imports were outsmarting exports. The proposed solution is to minimize the trade imbalance by encouraging more exports. To encourage more exports, the Government established Special Economic Zone (SEZ) in Dar es Salaam, Tanga, Bagamoyo and elsewhere in the country is aiming at.

Table 16: *Mean Exchange Rate 2001-2015 (TZS to 1 US\$)*

Year	2010	2011	2012	2013	2014	2015
Exchange Rate (TZS to 1 USD)	1,409	1,557	1,572	1,598	1,653	1,985

Source: National Bureau of Statistics 2015

4.4.6 Strategic Planning and Forecasts

To address the issue of poverty in the country in line with Vision 2025 as well as Millennium Development Goals (MDGs), Tanzania has been implementing National Strategy for Economic Growth and Poverty Reduction (NSGRP), also known as MKUKUTA in Swahili language. The 1st Phase of NSGRP covering a period of five years from 2005/06-2009/10 was completed in June 2010. Phase 2 of the NSGRP covering another 5 years was launched in October 2010 and was completed in June 2015. The five years perspectives adopted for the NSGRP has been considered as a better time frame than that of the

predecessors Strategies of three years, as it allows for a more sustained effort of resources mobilization, implementation and evaluation of the poverty reduction.

The NSGRP pays greater attention than the previous Strategies to further stimulating domestic saving and private investment response, infrastructure development, human resources development, increased investment in quality education, science and technology and use of Information and Communication Technologies (ICTs), a competitive knowledge-based economy and an efficient government. The target GDP's growth rate adopted in the NSGRP is estimated to be 6 – 8 percent per annum over the period of year 2005 - 2015. The achieved GDP of about 7% in 2015 is within this target.

4.5 Project Location

The proposed road project traverses the regions of Coast and Tanga as indicated in the Map below, figure below

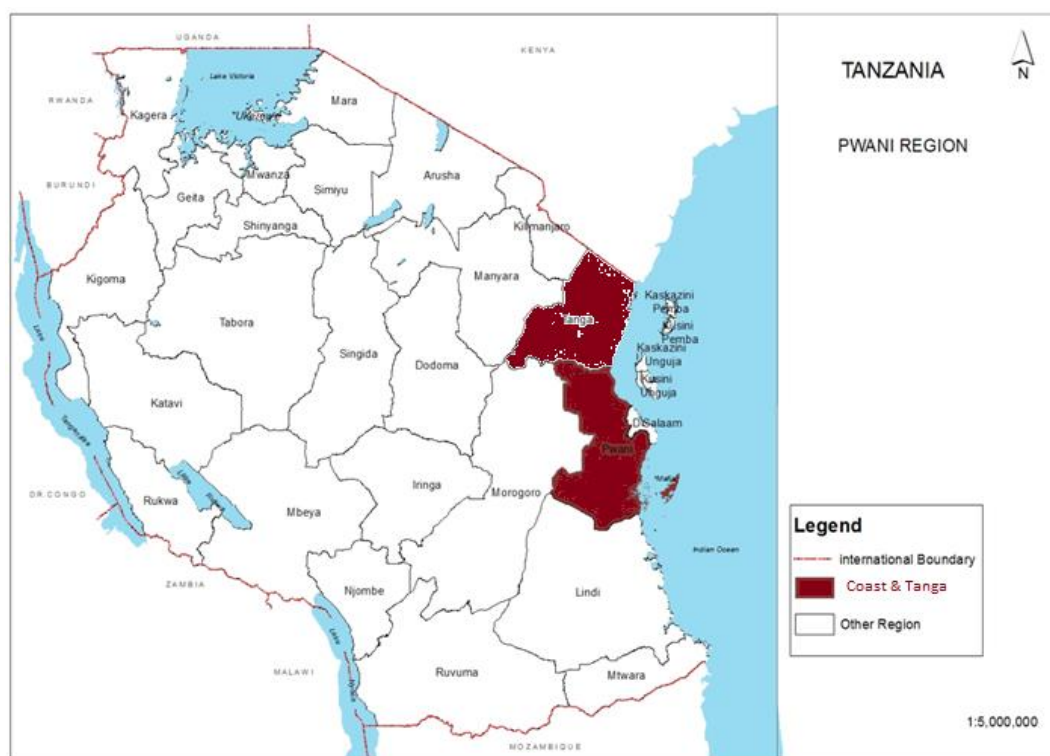


Figure 7: The Location Map of the Proposed Road project in Tanzania (Tanga and Pwani (Coast) regions)

4.6 Tanga Region: Environmental and Social Baseline

4.6.1 Administrative Aspects

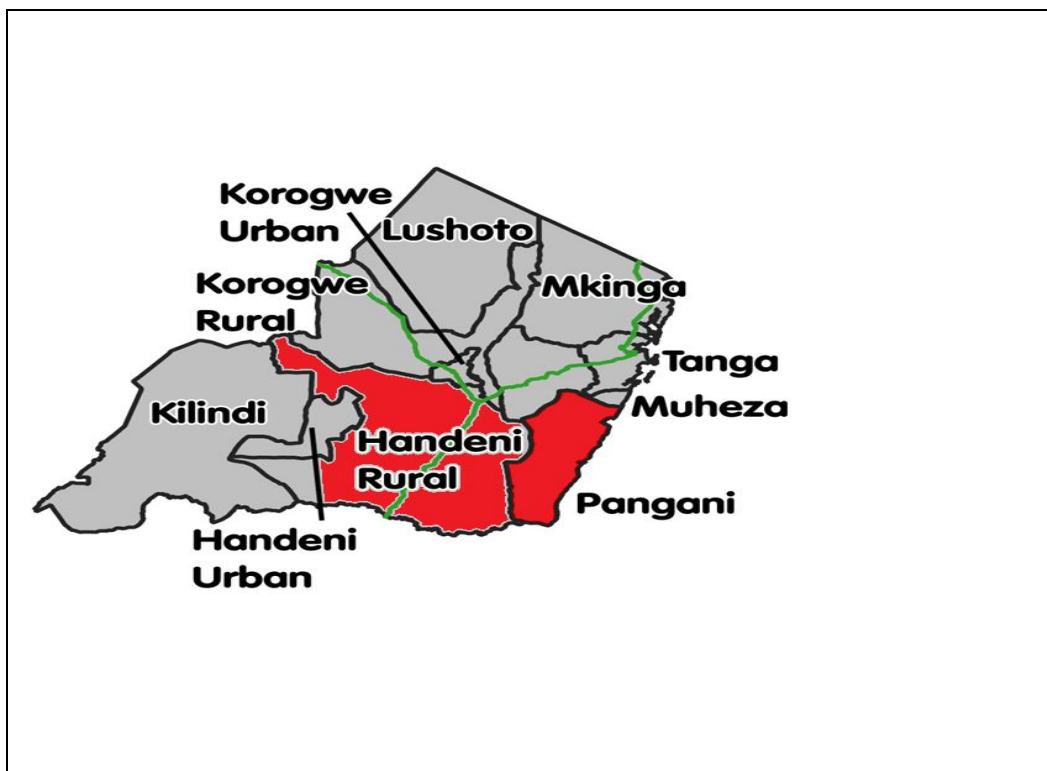
The Tanga Region was previously known as Tanga Province which included Same and Mwanga districts that are at present in Kilimanjaro Region. Administratively is divided into ten (10) districts as listed in Table 17 below and shown in Figure 8 below. As per the 2012 census, it has a population of 2,045,205^[2]. The tribes that have migrated to the region are the Pare, Wataita, Wasambaa, Wambugu, Segeju, Wadigo, Wanago and Wazigua.

Table 17: Districts of Tanga Region

District	Population
Handeni Rural	276,646
Handeni Urban	79,056
Kilindi	236,833
Korogwe Rural	242,038
Korogwe Urban	68,308
Lushoto	492,441
Muheza	204,461
Mkinga	118,065
Pangani	54,025
Tanga	273,332
Total	2,045,205

Source: "[Population Distribution by Administrative Units, United Republic of Tanzania, 2013](#)" (PDF). National Bureau of Statistics, Ministry of Finance, Dar es Salaam

Figure 8: Location of Pangani and Handeni Districts in Tanga Region



Source: "[Population Distribution by Administrative Units, United Republic of Tanzania, 2013](#)" (PDF). National Bureau of Statistics, Ministry of Finance, Dar es Salaam

4.6.2 Population Size and Growth by District

According to 2012 National population census, Pangani and Handeni Districts contribute about 330,671 of people population. The Pangani District has a total population of 54,025 by which 26,870 are male and 27,155 are female with the average household size of 4.1. Handeni district has a population of 276,646 people whereby 137,218 are male and 139,428 are female with the average household size of 3.2. The total population for the districts where the road traverses was estimated at 642,411 in 2012. Population trend has shown to increase as compared to the 2002 census with highest rate being 3.2% for Handeni District. Population trend is shown in table 18 below.

Table 18: Population Trend along the Proposed Road Project

Council	2002 Pop. Census			2012 Pop. Census			Growth Rate (%)
	Number			Number			2002 - 2012
	Male	Female	Total (P0)	Male	Female	Total (Pt)	
Pangani DC	22,094	21,826	43,920	26,870	27,155	54,025	2.1
Handeni DC	99,446	100,910	200,356	137,218	139,428	276,646	3.2
Total						330,671	

Source: 2012 Population and Housing Census

It is expected that with the improvement of the road the population of the area is likely to increase as several other service sectors shall improve thus attract people to the area.

4.6.3 Physical Environment

4.6.3.1 Climatic Conditions and Rainfall

The coastal nature which forms the larger part of Tanga Region affects the patterns of temperature and rainfall. The study area experiences moderate temperatures and rainfall with the average annual temperatures being 32°C. The warm season normally runs from October to February. There are two major rainfall seasons namely the long rains which occur between March and May and short rains which occur between October and December with average annual quantities of 1200mm. However, the average annual rainfall varies from year to year and between the various ecological zones. Moreover, the coastal nature which forms the larger part of the Region affects the patterns of temperature and rainfall. The coastal plains in Pangani district experiences moderate high annual rainfall of 800-1,400mm while the dry plains mostly in Handeni district receive low rainfall ranging from 200 to 600mm annually.

4.6.4 Socio-Economic Profile

4.6.4.1 Social and Economic Activities

The analysis of social economic activities determined income and expenditure pattern of people living along the proposed road Project. In access to, and utilization of production resources, both genders are involved. Although men are still regarded as the family breadwinner gender relationships reflect the importance of

both men and women in the present socio-economic set-up and activities in the area. Ownership of means of production such as land, labour, basic capital assets and seasonal inputs such as seed is also gender balanced. However, at the end, men are regarded as the owner and final decision-maker over the family resources. Both men and women are engaged in agriculture, retail business, operating food-vending and casual labour.

One of the main concerns of the locals in regards to economic empowerment is the involvement of women in the project both for skilled and non-skilled labour. Therefore, it is recommended that women are given equal opportunities as men during recruitment of personnel and labourers for the project. It is anticipated that the road will open up the area for business and both the men and women are waiting in anticipation to benefit from the opportunities to be generated.

4.6.4.2 Agriculture

Agriculture is the primary occupation of the villagers living away from the seashore while people along the seashore depend largely on fishing. About 90% of the population in the study area earn their living from agriculture, animal husbandry, forestry and fishing activities. Other activities are mining, trade and formal employment. Out of the total labour force for the population aged 5 years and above except are engaged in agriculture and (5.6 percent) are in fishing. Forestry and, related industries take 8 percent while trade and commerce is at 4.4 percent, public administration and education sectors are at 2 percent.

The most common cash crops grown in the Districts along the project road are cassava, cashew nuts, sisal, and coconut, maize and fruits mainly oranges and pineapples. The climate favours those crops to be producing, as result people tend to engage fully in those crops on which in one way or another give them the opportunity of acquiring their basic needs. Despite their efforts in agriculture bad road networks hampers the intended outcomes of which the entire population remain in poverty situation.

4.6.4.3 Fruit Production

Tanga Region is known for production of different fruit notably mangoes, oranges, pineapples, banana, etc from local and improved varieties. Production of fruits increases in this area every year. Last year, production of fruits was more than 65,300 Tons of oranges and 750,000 Tons of pineapples. There is constant production of fruits throughout the year. Pineapples are being sold within the country, Zanzibar and some transported to nearby countries of Kenya, Zambia and Malawi. However, the rate of spoilage is high due to lack of preservation facilities that pineapples and oranges would be processed and then being sold within the country, East Africa and other parts of the world.

Improvement in transport facilities (in this case the project road) and packaging system will improve the quality of fruits and the market for export worldwide. Upgrading of the road is expected to stimulate processing industries by engaging investors with larger capital that can run farms and encourage farmers in the whole process of production and improve production system. Encourage villagers/farmers to improve production by growing different/varieties of fruits and offer market for the products. This could provide farmers with high skills for improvement of production and high skills to the farmers. With cheap labour available, simple sorting, cleaning and packaging would be done without depending on heavy equipment.

4.6.4.4 Fishing

More than 90% of Coastal people in Pangani Districts depend on the fishing Industry as their major sources of daily income. The coastal lines of Pangani covers about 200km and small-scale fisheries contribute more than 96% of the total marine fish catches dominate the fishery sector. For example, there were about 1,780 fisheries, 305 fishing vessels and 8 marine engines, in Pangani by the end of 2010. The fishery industry is operated by trawlers who are licensed by the Ministry of Natural Resources and Tourism for prawn fishing between May and September every year.

The average annual fish production is about 700 tons. Other income generating activities conducted are seaweed farming and fish culture. Other income generating activities conducted are sea weeds farming and fish culture. There are about 100 sea weeds farmers in Pangani alone. However, poor transport facilities and infrastructure along the coast seemed to be a hindering factor towards access to the markets outside the sea shore. Upgrading of this Road will open economic avenues such as establishment of Fish Processing Industries, use of fishing modern technology and gears, establishment of fishing related products like fish nets, modern fishing boats and food staff to meet the demand of magnitude of fishermen along the coast. *The project will also incorporate construction of the modern Fish Market and a spur road of 3.7 km at Kipumbwi to enhance fishing activities and transportation of fish products to consumers as one of the complementary initiatives (Annex 5).*



Figure 9: Fishing site at Kipumbwi

4.6.4.5 Livestock Sector

The study area is suitable for grazing and it is considered to be underutilized as only 35,000 Ha is currently used for grazing. Despite having secluded a large area only some villages were selected to engage on livestock keeping. Most of the livestock keepers have the Tanzanian short Horns Zebu breed. The breed is characterized to be diseases tolerant but with low milk production and a good butter fat content which is a good source of ghee and/or butter. The Zebu can be crossbred with high yielding cow breeds to produce animals with better performance and productivity.

- **Live animals:** Live animals are sold at local auctions in different parts of the District though export to Zanzibar Island and other parts of the World are undertaken.
- **Animal Production:** All animals' products can easily be available; these products can be processed into different animals by- products such as butter, ghee, and cheese etc. Pangani Districts is suitable for animal husbandry. Meantime there are milk collecting centres/points in both districts. In Pangani the milk company Tanga Fresh collects from the points and sell it in Tanga, Dar es Salaam and other regional towns in the country. There are some tourist hotels There is accessibility to Dar es Salaam city where there is a larger number of consumers. The target is to increase the carolling facilities within the villages as well as establishment of small milk processing units. The rehabilitation of the road may attract both small and larger scale dairy farmers with capital that can extensively introduce or construct an industry or cooling facility which would collect milk

from the villagers from different parts of the coast zone for example Mwera Estate, Kwamsisi and Pangani.

4.6.5 Forestry and Beekeeping

Since time in memorial humankind survival has heavily depended on natural resources with the most affected natural resource being the vegetation cover this forests. This dependency has heavily distracted the forest environment to the point of nearing depletion. To reverse this trend the Government of Tanzania has issued new directives on forestry products harvesting. The same has been dwelt with in Pangani District Council and these imposed measures have caused shortage of forestry products such as charcoal, firewood, poles and timber. The remedy measures identified to stall the deforestation problem are to:

- Plant more threes;
- Encourage people to opt for alternative sources of energy (i.e. gas, solar, and electricity); and
- Create awareness among the people on the presence of other types of building materials (i.e. Aluminium frames, pre-fabs, PVC etc).

4.6.6 Micro and Small – Scale Enterprises and Trading

- This is another important sector, one of the main occupations of the households besides agriculture, and fishing. The activities include retail shops and small restaurants which are found in every village along the project area, petty trade, charcoal making and fuel wood. These activities indicate money circulation in the area.
- Trading in the project area is characterized by food stuff, building materials, soft drinks, garments and others crossing local ports of Kipumbwi, Pangani and Mwarongo to and from Zanzibar and Pemba. It is estimated that more than 30 to 50 tons pass through these ports weekly by boats and dhows. Another advanced trade is carried out in Tanga port where annual traffic amounts 194,000 tons whereby 66,000 tons are imports and 129,000 tons are exports. This includes 6, 5000 TEUS in container traffic, Bulk, liquid bulk and break bulk cargo. More than 90% of annual traffic is moved by road and the remainder by rail. Rehabilitation of the road including a bridge at Pangani River will drastically boost the trading among the coastal towns and the rest in the mainland because cargo from the port can easily transported southwards and south-west to Bagamoyo, Morogoro, Dodoma and Dar es Salaam. The proposed road will relieve traffic snag at Dar es Salaam port and Mombasa in Kenya as well as reducing smuggling goods to and from Zanzibar which use local ports in night.
- The principal import includes chemicals, machinery motor fuel oil vehicle materials consumer goods and food grains while export are Coffee, seed beans, sisal fiber, sisal twines forest products.

4.6.7 Formal Salaried Employment

Prominent occupations recognized for salaried employment in rural areas are the education, health and local government sectors. These sectors employ teachers, Village Executive Officers (VEO), Ward Executive Officers (WEO) and medical personnel. In urban settlements like Pangani pattern of employment is different due to existence of various sectors such as the industrial and commercial sectors which employ majority of the population.

4.6.8 Tourism Potentials

The study area has a very high potential for tourism because of its nature and cultural attraction sites. While some investment has been made much or more is needed to build high quality hotels along the Coastal Shore and develop other tourism operations. Pangani for example, have the potentials to attract more visitors to holiday in other parts of Tanzania and the neighbouring countries. Besides, the historical attractions rehabilitation of the road will increase number of tourists in the hotels along the beach for example Safari Lodge, Beach Crab Lodge, Ushongo Beach, The Tides, Tulia Beach and others which are

getting fewer tourists against their capacity. The Ushongo beach spur road shall be upgraded under this project to enhance tourism.

Saadani National Park is another tourists' attraction in both Tanga and Coast regions. It is the most unique destination where the Indian Ocean meets the bush. The Park was transformed from Old Saadani Game Reserve and now has a total area of 1,000sq kilometres. The Saadani National Park has been enlarged by adding land of South of Wami River, Zaraninge forest and North Mkwaja. The Zaraninge (or Kiono) forest is situated on the western part of the Park and although the Park has been established, forest encroachment issues cannot be predicted because there are some villages closer to the park boundary.

4.6.9 Small Scale Mining

The major mining activities taking place in the project area is extraction of salt from sea water through evaporation. In Bagamoyo and Pangani salt is obtained from the Coast areas such as Saadani, Mapinga Changalikwa, Magomeni, Makurunge, and Kitame while in Tanga salt is produced at Mwarongo village in Tongoni ward (Figure 11). Calcite (Terrazo) is also found in the project area in places such as Msonga, Miono, Saada and Mkange. The minerals are of different colours this is pink, white, red and black. They are used for marble, chickenfeed and glassmaking. Gemstones like ruby are found in Mkange, Mbwewe and Miono. Iron ore is currently mined at Mkalama village and transported to Dar es Salaam. Graphite is also potential mineral found at Kwamsisi Ward but it is yet to be mined. Calcite (Terrazzo) Gemstone and salt Calcite are sold locally in the project area and in Dar es Salaam, Tanga and Zanzibar.

Methods used for obtaining the mentioned minerals are local with exceptional of salt and iron ore on which modern way of extraction is used. This sector is also potential to the development of the community in the study area through investors who can either extract or finance indigenous people to extract the minerals and offer market for the goods. Feldspar, Gold, Graphite and iron ore are mined at Kwamsisi village. These mining are done at large scale. Upgrading of the proposed road will be a pillar towards mineral development.



Plate 11: Salt farming at Mwarongo Tongoni Ward

4.6.10 Social Services

- **The Infrastructure**

The study area has several transportation infrastructure including roads, marine and airstrips located in Pangani, Kipumbwi, Mkwaja and Saadani National Park. The road forms the main means of transportation in the area. Other economic infrastructural services found in the area include telecommunication, power supply, banking among others. The improvement of infrastructure is continuously being undertaken in order to support socio-economic development.

- **Roads**

Roads are the most important means of transportation within and outside the locality. The two regions Coast and Tanga have a good road network giving easy access within, the areas, and its neighbours. The highway, which connects Tanga and Coast region with other regions such as Dar es Salaam, Morogoro, and Kilimanjaro, has a length of 354km of bitumen standard and starts from Dar-es-Salaam to Tanga via Chalinze and Segera. Another road is Dar es Salaam through Bagamoyo (Makurunge) via Saadani National Park which is gravel and impassable during rainy seasons. This is the road proposed for upgrading to bitumen standard.

- **Marine Transport**

Besides marine transport between Zanzibar, Pemba and Pangani, Bagamoyo and Tanga the proposed road passes through Pangani where ferry (Figure 10) connects Bweni and Pangani West Wards. The ferries operates from 6.00 in the morning up to 10.00 at night with priced scheduled as follows: Adult passenger Tshs. 200/=, bicycle Tshs.300/=, animals (cattle) Tshs. 500/=, luggage above 20Kg Tshs. 500/=, cars (7 tons) Tshs. 7,000/=, saloon Tshs. 4,000/=, cars (less than 2 tons) Tshs. 5,000/=, cars (2-6 tons) Tshs. 6,000/=, bus Tshs. 9,000/= and heavy trucks Tshs. 15,000/=. Children and pupils are ferried for free.

Figure 10: Mv Pangani ferrying people in Pangani



Considering the transport cost it reflects that the Pantan charges increase the economic burden of the people who frequently use the service. During public consultation people of Bweni, Pangani West and East wards suggested that the proposed road project should also consider constructing a bridge across river Pangani at the point where it joins the sea. They suggested that the bridge should be constructed at Kumba area to Bweni Ndogo and stretch to Mzambarauni at Mwera sisal estate to avoid demolition of historical

buildings in Pangani. On the other side people of Bweni has opted the bridge to be constructed along the existing road with the hope of being compensated. Looking at socio-economic point of view, construction of bridge at Kumba and cross Bweni Ndogo to Mzambarauni will ease transport and affect few structures as well as maintaining the beauty of historical town of Pangani.

- **Telecommunication**

The project area has a well-defined communication networks. The companies, which provide communication services in the area, are TTCL (Tanzania Telecommunication Company Ltd.), Vodacom, Airtel and Tigo. The last three companies provide mobile telephone services. Other services such as Fax, Television, Internet services and Radio Broadcasts are also available in the area.

- **Power Supply**

The main sources of energy in the villages are firewood, charcoal and kerosene. In urban areas electricity is used as a source of energy especially for lighting, cooking and cooling soft and hard drinks. Due to unstable price of kerosene, people have shifted from its use to charcoal. Few people use electricity as their primary source of energy for cooking but a good number use it as a source of light only. In urban areas, electricity is used in workshops, small, semi, and heavy industries. The main supplier of electricity is TANESCO.

- **Financial Institution**

The main financial Institution in all the districts where the road is passing is NMB (National Micro-finance Bank) but in Tanga several other financial institutions exists such as National Bank Corporation (NBC), CRDB among others. Furthermore, non-banking institutions like PRIDE, SACCOS, and SEDA also exist.

- **Water Facilities**

Pangani water supply is under the District Water Department. Majority of people in rural areas (60%) obtain water from shallow wells and springs. Most of sources are not protected so they are prone for water borne diseases. The District authority in collaboration with other stakeholder's such as the World Bank, TASAF are striving to supply water to the marginalized rural population.

- **Health Facilities**

According to the findings good health is regarded as state of absence of disease and general wellbeing of the people. Sounding health includes physical, social and psychological wellbeing of the household and community members. The villagers admit that the villages along the project area have health problems ranging from biological diseases, malnutrition, and cultural, social and psychological problems. Poor health and survival are attributed to lack of proper nutrition, clean and safe water, sanitation, and safe and clean place to live. Lack of proper health care, belief and cultural practices and lack of other basic amenities complicate the problem. Some of outlined direct threats to survival and health in the project area as reported by the respondents and from District Medical Officers (DMOs) in Bagamoyo and Pangani are; malaria (47%), HIV/AIDS (not quantified), Ear infection (15%), Acute Respiratory Infection (ARI) (13%). Others are Intestines worms (7%), diarrheal (6%) mostly in (rain seasons) others such as joint pain, rheumatics and hernia problems (12%) Both HIV/AIDS and malaria continue to be two of the most important health problems facing the study area and Tanzania today. HIV infects approximately 6 percent of adults according to the 2007-08 THMIS. Malaria is endemic in almost all parts of Tanzania and accounts for approximately 18 percent of the national disease burden. The government of Tanzania has developed national policies to combat both diseases, including efforts to change sexual behaviour, promote wider coverage of HIV testing, disseminate mosquito bed nets, and introduce newer, more effective anti-malarial drug treatments

Thus, the mode of health service delivery in the project area is based on curative, preventive and promotive health care and rehabilitative services provided by either government or private owned health facilities. These include Hospitals, health centers and Dispensaries. Tanga has a referral Regional hospital Bombo

while Pangani and Handeni have District hospital which serve as referral hospital for nearby dispensaries and health centres in respective Districts.

From consultation with the community, health centers available along the project road are not adequate and can not deliver the required services due to lack of facilities. The big hospitals such as Bombo in Tanga City and Tumbi Hospital in Kibaha are not easily accessible due to poor roads that contributed to high mortality rate. Pangani hospital which serves most of the villages along the project road has no adequate emergency facilities and modern facilities for health care. So people still rely on Bombo referral hospital in Tanga. Communities in the next side of the Pangani river pointed out that mortality rate is high especially maternal and infant mortality occurs due to difficulties in crossing the river to access Pangani hospital and Tanga referral hospital. The difficulties in crossing Pangani River is due to lack of bridge, therefore necessitates the use of ferry which is not available in all time.

The Government through the Ministry of Health, Community Development, Gender, Children and Elderly is planning to construct more Health Centres in the Districts and Wards throughout the country to improve health services to the people. This plan will also include the Districts and Wards where the road project is passing in order to improve communities accessibility to health facilities. Moreover, as mitigation and preparedness measures for road safety, the proposed project has included in the complementary projects provision of modern Xray machine, two ambulances for Pangani District Hospital which will also promote health services to the communities living along the Mkwaja – Tungamaa – Pangani road project.

- **Education Services**

Provision of quality education, has remained a challenge in development of the Coastal regions. The Government identified that economic, social problems and rapid expansion of the area in general affected the provision of education infrastructure in the area.

The Government has developed measures to alleviate these problems as per the Education Training Act of 1995. According to the Act, a primary education means full-time education given during the first seven years of formal education in accordance with syllabus approved by the commissioner. In the study area every village has a pre-school and primary school and at ward level there is a secondary school. The government through respective district authorities owns most of schools in the study area. Few private schools are found in towns Handeni and Pangani. Net Enrolment Rate (NER) in public schools range from 67% to 96%. Truancy (dropout/absenteeism), early pregnancy and poor living conditions of some families are said to be bottlenecks towards achieving 100% of NER.

Pangani district has 32 government primary schools and 4 private primary schools, while the government secondary schools are 7 and private are 2. Handeni district has a total of 181 government primary schools but there is no private primary school while government secondary schools are 30 and private secondary schools are 5. The numbers of enrolment in both secondary and primary schools are as shown in Table 19 below.

Table 19: Numbers Enrolment of Government and Private Primary and Secondary Schools by District

Council	Primary		Secondary	
	Public	Private	Public	Private
Pangani DC	32	4	7	2
Handeni DC	147	0	23	1
Handeni TC	34	0	7	4

Source: Tanga Region Socio – Economic Profile, 2015

The proposed project has included in the complementary initiatives, construction of classes, toilets and dormitories for some secondary and primary schools that are located along the project road in order to contribute to the improve education facilities in Tanga and Coast Regions.

4.6.11 Historical, Archaeological, Rituals, Cultural and Heritage Sites

Historical places are other tourists' attractions which make Tanga region attractive to many local and foreign tourists. These sites have very potential historical background for the country. The proposed road passes through several historical places and sites as indicated in the table 20 below.

Table 20: Historical sites along the project area

Type of historical site available	Village/Mitaa	Ward	District Council
Saidi Abreki residence(Boma)	P/Magharibi	P/Magharibi	Pangani
German Post Office (1916)	P/Magharibi	P/Magharibi	
Muhembo Ruins and graves	P/Mashariki	P/Mashariki	
Slave's Market (1859)	P/Magharibi	P/Magharibi	
Asian quarters (1888).	P/Mashariki	P/Magharibi	
Portuguese well 1498	Choba	Kimang'a	
Mr. Christian Lautherborn (sisal specialist - 1 st farm manager) grave	Bweni	Bweni	
1 st sisal seed monument	Bweni	Bweni	
British hospital 1919.	P/ Magharibi	P/Magharibi	
1 st Primary School built by Germans	P/Magharibi	P/Magharibi	
Uhuru ground	P/Magharibi	P/magharibi	
Arabs Caves	Kwedikabu	Kwamsisi	Handeni
Historical Tree that used crucified Slaves	Mkalamo	Kwamsisi	
Magic Stick	Kwamsisi	Kwamsisi	

Source: Tanga Region Socio – Economic Profile, 2015

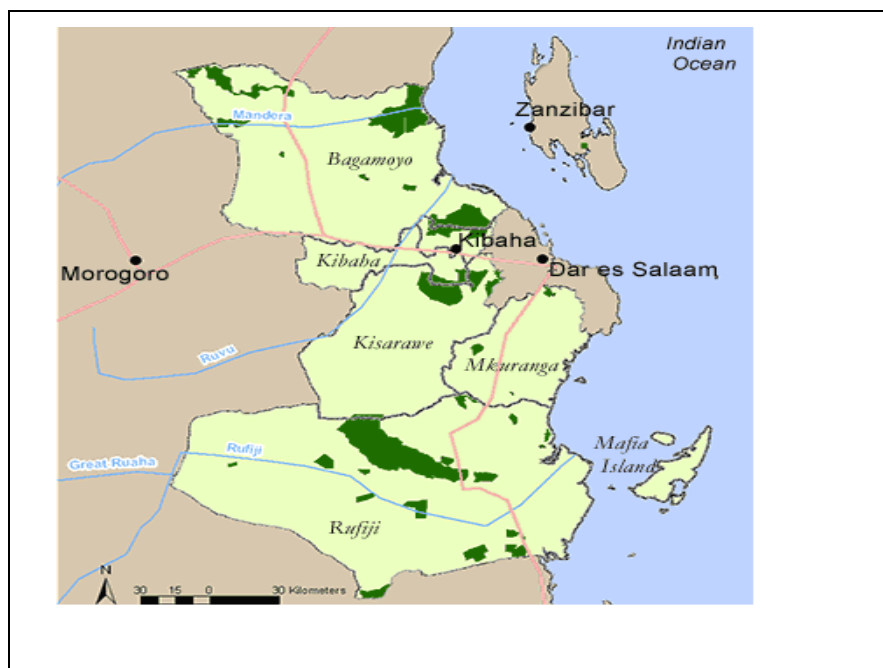
The design of the proposed road will not affect directly either of these historical sites. The sites will be affected indirectly as the accessibility to them will be improved. During the stakeholders consultations it was noted that the Msisi River with ritual importance may be affected by the proposed project. The Kwamsisi residents pointed out that in case the proposed road is to cross the Msisi River, consultation and involvement of the village cultural elders must be considered.

4.7 Coast (Pwani) Region: Environmental and Social Baseline

4.7.1 Land Area and Administrative Units

Administratively Coast region is divided into six Districts, namely Bagamoyo, Kibaha, Kisarawe, Mkuranga, Rufiji and Mafia as shown on Figure 11 below. There are also seven local authorities of which six are district councils (Bagamoyo, Kibaha, Kisarawe, Mkuranga, Rufiji, and Mafia) and one is an urban council - Kibaha Town Council.

Figure 11: **Administrative Map of Coast Region**



Source: Coast Region Investment Profile 2015

Table 21 below shows that Rufiji District Council covers 41 percent, a big portion of total land area of the region followed by Bagamoyo (30 percent), Kisarawe (14 percent), Mkuranga (7 percent), Kibaha (6 percent) while Mafia occupies only 2 percent of the total land area.

Table 21: **Distribution of Land Area by Council, Coast Region; 2012**

Council	Land Area	Percent
Bagamoyo	9,842	30
Kibaha	1,812	6
Kisarawe	4,464	14
Mkuranga	2,432	7
Mafia	518	2
Rufiji	13,339	41
Total	32,407	100

Source: Pwani Regional Commissioner's Office, 2013

4.7.2 Physical Environment

Geographically, Coast (or Pwani) region is on the Eastern part of Tanzania mainland and a large part of the region is situated along the Indian Ocean coastal belt. The region shares borders with four regions. Northern part is Tanga region, Western part is Morogoro region, Southern part is Lindi region and Eastern part is Dar es Salaam region. On the eastern part, the region shares borders with Dar-es-Salaam region and the Indian Ocean (Figure below). The region lies on the eastern part of Tanzania Mainland along the Indian Ocean coastal belt. It is located between latitudes 6° and 8° south of equator and between longitudes 37° 30' and 40° east of Greenwich Meridian.

The Coast region covers an area of about 33,539 total sq. km (about 3.8 percent of the Country's total area) of which 32,407 sq. km being dry land area and about 1,132 square kilometres water area.

4.7.3 Topography and Soils

Most of the Coast region's topography is within the coastal belt, ranging from 0 -100 m above sea level, with sand, sandy loam and heavy clay soils. River basins are found in Rufiji, Ruvu and Wami Rivers with loamy clay, silt and alluvial soils. These rivers, which discharge their waters into the Indian Ocean, are major source of water for human consumption, industries, livestock and irrigation. In many areas these river are wide, shallow and sandy which allows irrigation. Highland plateau ranges from 100m and above, dominated by sandy loam and sandy clay soils.

4.7.4 Socio-Economic Environment

4.7.4.1 *Population Size and Growth*

Like most regions in Tanzania Mainland, the population of Coast Region has experienced a significant growth. Table 22 shows that the region had 1,098,668 people in 2012 compared to 885,017 inhabitants counted in the 2002 Population Census, resulting in a significant increase of 213,651 people (24.1 percent) during the intercensal period. Coast Region accounts for 2.5 percent of the total population of Tanzania Mainland and it is the 5th least populous region followed by Iringa, Lindi, Njombe and Katavi at the bottom.

Table 22: *Comparison of Population Sizes by Region: 2002 – 2012*

Region	Population		Population Increase 2002 – 2012		
	2002	2012	Number	Percent	Annual Rate Of Growth(per cent)
Pwani	885,017	1,098,668	213,651	24.1	2.2
Iringa	837,847	941,238	103,391	12.3	1.1
Dodoma	1,692,025	2,083,588	391,563	23.1	2.1
Arusha	1,288,088	1,694,310	406,222	31.5	2.7
Kilimanjaro	1,376,702	1,640,087	263,385	19.1	1.8
Tanga	1,636,280	2,045,205	408,925	25	2.2
Morogoro	1,753,362	2,218,492	465,130	26.5	2.4
Dar es salaam	2,487,288	4,364,541	1,877,253	75.5	5.6
Lindi	787,624	864,652	77,028	9.8	0.9
Mtwara	1,124,481	1,270,854	146,373	13	1.2
Ruvuma	1,113,715	1,376,891	263,176	23.6	2.1
Mbeya	2,063,328	2,707,410	644,082	31.2	2.7
Singida	1,086,748	1,370,637	283,889	26.1	2.3
Tabora	1,710,465	2,291,623	581,158	34	2.9
Rukwa	729,060	1,004,539	275,479	37.8	3.2
Kigoma	1,674,047	2,127,930	453,883	27.1	2.4
Shinyanga	1,249,226	1,534,808	285,582	22.9	2.1
Kagera	1,791,451	2,458,023	666,572	37.2	3.2
Mwanza	2,058,866	2,772,509	713,643	34.7	3
Mara	1,363,397	1,743,830	380,433	27.9	2.5
Manyara	1,037,605	1,425,131	387,526	37.3	3.2
Njombe	648,464	702,097	53,633	8.3	0.8
Katavi	408,609	564,604	155,995	38.2	3.2
Simiyu	1,317,879	1,584,157	266,278	20.2	1.8
Geita	1,337,718	1,739,530	401,812	30	2.6
Tanzania Mainland	33,461,849	43,625,354	10,163,505	30.4	2.7
Source: The United Republic of Tanzania Population and Housing Census, 2012 Vol. 1					

4.7.4.2 *Social and Economic Activities*

Economic activities in the Region fall into two major categories of formal and informal sectors.

- **Formal and Informal Sectors**

Formal activities undertaken include agriculture, industry and trade, livestock keeping, beekeeping, fishing, forest and tourism. On the other side, more than 1,243 people are engaged in small and medium informal enterprises, processing products like cassava nutritious flour, milk, mango and pineapple. The challenges faced by these SMEs include lack of capital and modern equipment facilities for packing.

- **Agriculture**

Agriculture is the back born of the Regional economy whereby about 80 percent of its population depends on it as its main source of livelihood. It also contributes 60 percent of the Regional Income. The most important cash crops are cashew nuts, coconuts, and fruits such as oranges, mangoes and pineapple. Main

annual cash crops produced are seaweeds, simsim, sunflower and cotton. The food crops include maize, cassava, paddy, cowpeas, sorghum, simsim, sweet potatoes and green grams. The Coast Region has an estimated 1,933,224 Ha of arable land, which is suitable for agriculture production, of which only 530,328 Ha of it is utilized, equivalent to 27.4 percent of the total arable land.

- **Irrigation schemes**

The area suitable for irrigation is more than 128,795 hectares, of which only 1,945 Ha (or 1.5 percent) is utilized for irrigation. The Region has fourteen (14) irrigation schemes; six schemes are working while eight schemes are still under construction as shown in Table 23 below shows Rufiji as one of the important irrigation scheme in Coast region (Figure 12).



Figure 12: A photo of Rufiji Basin, One of Important Irrigation Source in Coast Region

Source: Coast Region Investment Profile 2015

Table 23: *Irrigation schemes, potential areas and the level of utilization*

	Name of Council/ Town	Irrigation schemes		Irrigation schemes under construction	
		Name of the Scheme	Hect ares	Name of the scheme	Hect ares
	Bagamoyo	B.I.D.P	72	Msoga	100
		Chauru	668	Kiwangwa	8
		Mapitwili	8		
		Kidogozero	10		
	Kibaha	Kwala	19	Kwala	81
	Mkuranga			Yavaya va	54
				Kisere	200
				Changa nyiken	10
	Rufiji	Segeni	60	Segeni	60
				Nyamw eke	320
	Grand total		837		833

Source: Coast Region Investment Profile 2015

- **Industries and Trade**

The Region has two cement manufacturing factories: Rhino factory located in Mkuranga and one in Kisarawe. However, more than 37 medium scale processing industries have been established. Also there are some Agro Processing Industries including Fruits canning at Mkuranga (SS Bakhresa Factory).

- **The Livestock Sector**

Livestock contributes 16 percent of Regional Growth Domestic Product (GDP). It is dominated by small holders' livestock keepers who raise mostly indigenous cattle, goats, sheep, pigs and chicken. Livestock products produced are beef, milk, eggs, skin and hides. Also there are livestock keepers with calves cross breeds of Boran and Zebu cattle at Mafizi village in Kisarawe (Lushu ranching) (Figure 13 below). Table 24 below shows the types and number of livestock population available in Coast Region.

Table 24: *Types and Number of Livestock Population in Coast Region*

Type of livestock	Population Number
Cattle	455,300
Goats,	166,400
Sheep,	69200
Pigs	14781
Indigenous Chicken	1,817,200
Commercial Chicken	336455



Figure 13: Group of calves' cross-breeds of Boran and Zebu cattle at Lushu ranch at Mafizi Village in Kisarawe

- **Natural Resources**

Coast Region is endowed with numerous natural resources such as minerals, energy, fisheries, hot water spring, forests, beekeeping and wildlife.

- **Beekeeping**

Beekeeping is one of livelihood activities in Coast Region although not fully utilized. Honey production has increased from 17,450 litres in 2005 to 27,862 litres in 2011.

- **Fisheries**

Fishing activities are done in Ocean and in small amount in constructed dams and ponds. The potential fish species kept in the region are Tilapia and Catfish. The Region has one fish processing plant in Mafia District.

- **Forestry**

The Region has 44 official forest reserves covering a total area of 335,712 ha for forest conservation and production. In addition to that, 2.2 million ha is unofficial forest in general land. Apart from providing opportunity for beekeeping, investing in forestry activities ensure sustainable supply of forest products.

- **Tourism and Wildlife**

Coast Region has a wide range tourism sites to be visited. It is also blessed with wildlife resources of flora and fauna. Historical site found in coast Region such as:

- German Fort (Boma) at Kisangire in Kisarawe District;
- The first State House of the Tanganyika Colony built in 1897 at Bagamoyo;
- Arab and Germany ruins of building dating back to the 13th Century. Other historical and tour sites worth visiting include: Kaole Ruins where the oldest mosque and fresh water well are found;
- The first church in East Africa built by Holy Ghost Fathers; Hot water springs in Rufiji District; Bagamoyo Slave Trade Ferrying Harbour from mainland to Zanzibar; Bagamoyo's Caravan Serai (The area where slaves were kept before being transported to Zanzibar).

- **Mining**

Mining activities are relatively small. However, prospects are significant as there are signs of natural gas deposits in some places in the Region. Sand and gravel quarry are mainstay mining activities in the Region. Building aggregates are extracted in Msolwa, Lugoba and Msata in

Bagamoyo District. Other minerals include: Kaolin which is found in Kisarawe District and salt, which is found in Bagamoyo, Mkuranga, Mafia and Rufiji Districts.

- **Transport Infrastructure**

The region's proximity to the commercial city of Dar es Salaam, coupled with a good communication network with the rest of the upcountry regions; by roads, railway lines, telephone and other modes, makes it's a uniquely appropriate location for expanding industries outside Dar es salaam, which is already congested and therefore adding cost of doing business.

- **Road Networks**

Coast Region has well developed transport network system, which allows smooth transportation of goods to and from neighbouring Regions. Most of rural areas are well connected with roads passable throughout the year. The Region's total road network is 1,924.9 kilometres of which 501.5 km are trunk roads; 1000.7 km are Regional roads, 1422.7 km are District and village roads.

- **Railway Services**

The Region is traversed by the Central Railway Line from Dar es Salaam to upcountry regions (Kigoma, Mwanza, Tanga and Arusha) and The Tanzania- Zambia Railway line (TAZARA).

- **Air Services**

Coast Region is near to Julius Nyerere International Airport located in Dar es Salaam which is about 45 Km. Also, there is local airport located in Mafia District, airstrips in Selous Game Reserve and Saadani National Park.

- **Port Services**

Coast Region, in Bagamoyo District has a small seaport suitable for deep sea and coastal transport. Plans are underway to develop a deep sea port in Bagamoyo in order to ease the congestion at the seaport in Dar es Salaam.

- **Telecommunication Facilities**

Coast Region is best served in terms of communication facilities. The telephone companies currently giving communication services include Tanzania Telecommunication Cooperation Limited (TTCL), Vodacom, Airtel, Tigo, Zantel and National Optical Fibre Network. Most of urban and rural areas are served by either all or some of these companies.

- **Power Supply**

Coast Region uses various sources of energy for domestic and industrial purposes. These sources include hydroelectricity, LPG gas, natural gas, firewood, thermo electricity and solar power. At the moment about 90percent of the domestic energy is biomass/fuel wood.

- **Financial Services**

In Coast Region, There are Financial Institutions which are conducting business operations by opening their branches and Automatic Telling Machines (ATM) in different location within the region. These ATMs which operate 24 hours accept VISA and MASTER Card. Some of Financial Institutions available are National Microfinance Bank (NMB), National Bank of Commerce (NBC), Postal bank and Cooperative Rural Development Bank (CRDB).

- **Water Facilities**

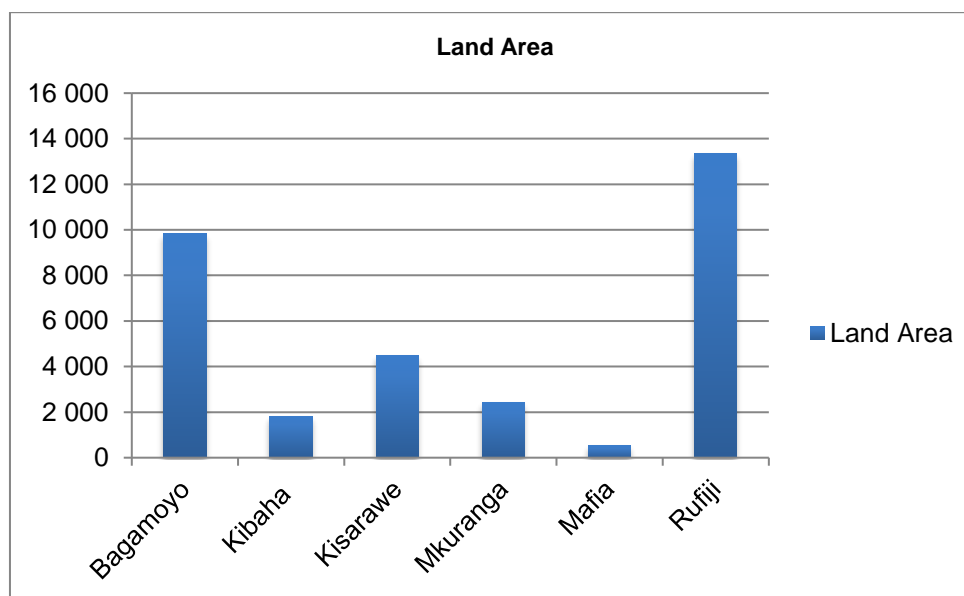
Coast Region has several water piped schemes which provides clean and safe water to communities. These communities use water from Rufiji, Wami and Ruvu Rivers as well as Dams for various uses. Hydrological studies reveal that Coast Region has potential groundwater reserves, which enhance people who are living in rural areas to get water for their domestic purposes.

4.8 *Bagamoyo District: Environmental and Social Baseline*

- **Land and Administrative Units**

The total surface area of Coast Region is 33,539 km². Out of this, 32,407 km² or 96.6 % is land area while 1,132 km² or 3.4 % is water surface. Bagamoyo is the second largest district in the Coast Region with 30% of the total regional area and a total land area of 9,842 per sq.km after Rufiji District (i.e.13, 339 sq.km), Figure 15 below.

Figure 14: Distribution of Land Area (Sq.Km) by Council, Pwani Region; 2012



Source: Pwani Regional Commissioner's Office, 2013

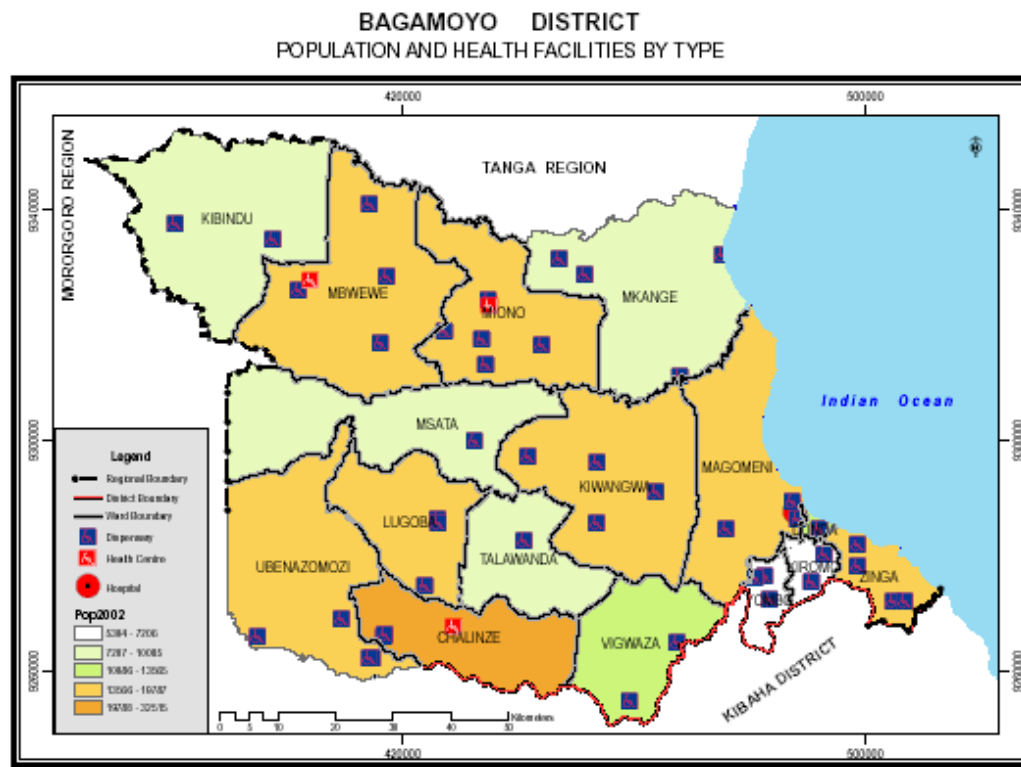
The District council is divided into seven divisions and 22 wards with a total of 97 villages and 690 hamlets distributed unevenly. There are two parliamentary constituencies (Bagamoyo and Chalinze). Msata ward covers about 14.7 percent of total land area of the council followed by Kibindu ward with about 9.4 percent of the total land area. Dunda ward has the smallest land area in the council constituting only 0.4 percent of the total council land area.

4.8.1 **Physical Environment**

4.8.1.1 *Geographical Location*

Bagamoyo town is one of the 6 districts of Coast (Pwani) Region in Tanzania. It is located - 6.44 latitude and 38.90 longitudes and it is situated at elevation 13 meters above sea level. Bagamoyo Council is located 70 kilometers north of Dar es Salaam and borders Morogoro District on the west; Mvomero, Kilindi, and Handeni districts on the north; Pangani District on the northeast; the Indian Ocean on the east; Kinondoni District on the southeast and Kibaha District on the south. Figure 14 is a map showing Bagamoyo town.

Figure 15: A Map Showing Bagamoyo Town.



Source: Bagamoyo District Profile, 2013

Historically, the Bagamoyo Town (also spelled **Bagamojo**) was founded at the end of 18th century. It was one of the first landing points for the Arabian slavers and is a town steeped in history and decline. Thereafter it became the original capital of German East Africa and was one of the most important trading ports along the East African coast. Today, however, Bagamoyo is the last stop on the road that runs out of Dar. Nonetheless, Bagamoyo is a primarily agricultural town with the largest foreign exchange earning trade limited to tourism on its few beach resorts. Bagamoyo is currently among the main tourist hubs. This has attracted investors from local and foreign sources to set out their investments to share in the booming tourism sector. The production of fish is mainly consumed in town, very little is exported or sold to the hotels.

- **Climate**

Bagamoyo district is generally hot and humid throughout the year with average temperature ranging from 13°C to 30°C. The hottest season is from October to March while it is relatively cool between May and August with temperatures around 25°C. There are two rain seasons: - the short rain season commonly known as “vuli” from November to December and the long rain season commonly known as ‘masika’ between March and June. The average annual rainfall is between 800 mm and 1,000 mm.

- **Topography and Soils**

The district receives rainfall of between 600mm and 1,000mm annually, falling between the months of October or November and December and a dry season from January to February or March and a second lower peak occurs in February or March and the rains then tail off in April

or sometimes May. Vegetation found in the district council includes coastal forests (mangroves), swamp, miombo woodlands and savannah vegetation.

- **Drainage system**

Bagamoyo District Council forms part of the vast northern lowlands of Coast Region, an area of flat and gently undulating plains broken in places by small gorges. Most parts of the District council lie between 100 meters and 600 meters above sea level and form the main watershed separating rivers flowing from westward into the Indian Ocean to the northeast. In most cases rivers are wide, shallow and sandy which allows irrigation to take place.

Major rivers in Bagamoyo are Wami, Ruvu and Mpiji. These rivers are adjoined by other small streams, which at the end all pour water into the Indian Ocean. Ruvu River flows eastwards through Bagamoyo Township into the Indian Ocean while Wami River starts from Kilosa through Wami Dakawa and finally flows into the Indian Ocean through Saadani National Park. Mpiji River starts in Kisarawe and joins other small streams, which separate Kinondoni Municipality and Bagamoyo DC, and also pours its water into the Indian Ocean.

- **Noise, Air and Water Pollution and Vibration Situation in the project area**

Baseline data on noise, air and water pollution as well as vibration condition within the project area could not be found during the study. Districts' Socio-Economic profiles of Bagamoyo District Council as a whole which were reviewed before and during the study were silent regarding the existing situation on these environmental parameters. This therefore becomes a bottleneck to the comparison between the existing situation and contribution of the project activities during implementation.

4.8.2 Socio-Economic Environment

4.8.2.1 Population Pattern

According to the 1988 Population and Housing Census the Bagamoyo District Council had 173,871 people in 1988 compared to 228,967 inhabitants in 2002 and in the 2012 Population and Housing Census the inhabitants were 311,740. The increase of the district council population, among other factors, was due to the in migration and investment opportunities found in the district council. Table 25 shows the population sizes and growth rates for Pwani Region and its district councils for the 1988 and 2002 censuses.

Table 25: Population Sizes and Growth Rates for Pwani Region

Council	2002 Pop. Census				2012 Pop. Census				Growth Rate	
	Male	Female	Total	Percent	Male	Female	Total	Percent	1988 - 2002	2002 - 2012
Bagamoyo	113,991	114,976	228,967	25.9	154,198	157,542	311,740	28.4	2.0	na
Kibaha TC	38,954	38,537	77,491	8.8	62,653	65,835	128,488	11.7	3.4	na
Kibaha (DC)	26,843	26,908	53,751	6.1	34,515	35,694	70,209	6.4	3.4	na
Kisarawe	48,152	47,171	95,323	10.8	50,631	50,967	101,598	9.2	ND	na
Mkuranga	91,411	95,516	186,927	21.1	108,024	114,897	222,921	20.3	ND	na
Mafia	20,564	19,993	40,557	4.6	22,954	23,484	46,438	4.2	1.5	na
Rufiji	97,735	104,266	202,001	22.8	104,851	112,423	217,274	19.8	1.9	na
Total	437,650	447,367	885,017	100	537,826	560,842	1,098,668	100	2.4	2.2

Table above shows that, based on the population census of 2012 Bagamoyo district council was the most populous rural district in the region and contributed 28.4 percent of the regional population. The average population density of Bagamoyo District council increased slightly from 23 persons per sq. km in 2002 to 32 persons per sq. km in 2012. Bagamoyo District is the fourth densely populated district council in Pwani Region and it is below the regional average population density of 27 persons per sq. km in 2002 and 34 in 2012. Among other reasons, its large area has caused the relatively small population density of Bagamoyo district council.

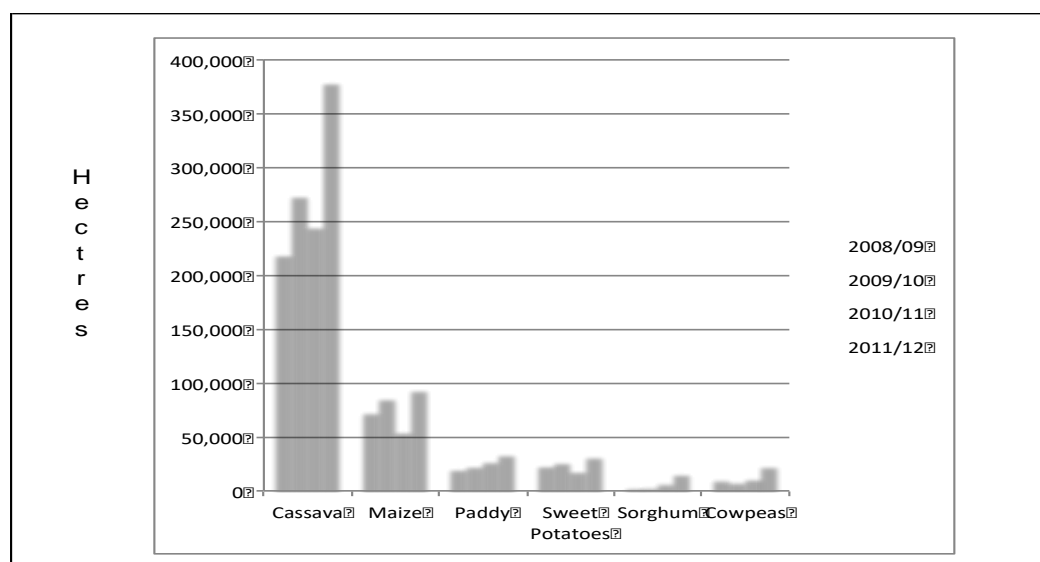
4.8.2.2 Economic Activities

The economic activities in Bagamoyo cover various sectors including: agriculture, livestock, natural resources, mining, industrial development and the land sector development.

• Agriculture

Agriculture in Bagamoyo District Council is the largest economic sector. In 2012 the sector employed about 57.8 percent of the adult population (2012 Population and Housing Census, Basic Demographic and Socio-Economic Profile, Pwani Region, 2014). According to Agriculture Sample Census Survey 2007/08, Bagamoyo District had the largest number of agricultural households (44,868 households, 25.7% of total agricultural households in the region), Kibaha (18,277, 10.5%), Kisarawe (23,356, 13.4%), Mkuranga (43,933 25.2%), Rufiji (35,372, 20.3%) and Mafia, (8,717). The main agricultural products in Bagamoyo District are Cash and Food Crops.

Figure 16: Estimated Area (Ha) under major food crops, Bagamoyo District Council, and 2008/09 to 2011/12



Source: District Executive Director's Office (Agriculture Department), Bagamoyo District Council, 2013.

Maize and cassava are the most important food crops grown in Bagamoyo district in terms of the area planted with food crops. Other food crops are paddy, sweet potatoes, sorghum and cowpeas. As shown in Figure 16 above, from 2008/09-2011/12, cultivation of maize occupied high percentage by 38 per cent of the total area planted with food crops compared to other crops. The crop occupied an average of 32,939 hectares per year over the period 2008/09 – 2011/12. In 2008/09 the area planted was 37,569 hectares but dropped to 23,510 hectares in 2011/12. This was followed by cassava which occupied 31 per cent of the total area planted with food crops from FY 2008/09 - 2011/12. The cultivation of Sorghum occupied the lowest area of land compared to other crops. Generally, the area planted with sorghum kept on increasing from 2008/09 to 2011/12. The highest area was 8,320 hectares (2011/12) and the lowest area found was 4,378 hectares (2009/10).

Major Cash crops produced in Bagamoyo include simsim, cashewnuts, coconuts, pineapple, mangoes, oranges, sunflowers and cotton. Simsim is the major cash crop in terms of the area planted in Bagamoyo District Council. The average area planted simsim was 51.3% whereby yearly average production area was 31,488 ha out of the average total of 61,429ha. The area planted simsim increased from 31,456 ha in 2008/09 to 34,362 ha but dropped to 25,772 ha in 2010/11. In 2011/12 it increased back to 34,362 ha. Pineapple accounted for 13.6 per cent of the area planted with cash crops. Bagamoyo district council is the leading producer of pineapples in the region. The crop is grown in Kiwangwa Ward. In terms of the average area covered by this crop annually, it covered 13.6 per cent of the total area cultivated cash crops in

the council from 2008/09 - 2011/12. Over this period the average planted area was 8,379 hectares. The area-cultivated cotton in the period of 2008/09 was 14,101 ha, which decreased to 13,069 ha, in 2009/10. The planted area decreased further to 278 ha in 2011/12. The reason for this downward trend could be lack markets and low prices, which ultimately demoralized the farmers.

- **Fruit Production**

Production of different fruit notably pineapples and oranges from local and improved varieties are significant in the project area and mostly in Bagamoyo. Production of fruits increases in this area every year. Last year, production of fruits was more than 65,300 Tons of oranges and 750,000 Tons of pineapples. There is constant production of fruits throughout the year. Pineapples (Figure 17) are being sold within the country, Zanzibar and some transported to nearby countries of Kenya, Zambia and Malawi. However, the rate of spoilage is high due to lack of preservation facilities that pineapples and oranges would be processed and then being sold within the country, East Africa and other parts of the world.

Figure 17: Pineapples Plantation at Gongo village



Improvement in transport facilities (in this case the project road) and packaging system will improve the quality of fruits and the market for export worldwide. Rehabilitation of the project road would stimulate processing industries by engaging investors with larger capital that can run farms and encourage farmers in the whole process of production and improve production system. Encourage villagers /farmers to improve production by growing different/varieties of fruits and offer market for the products. This could provide farmers with high skills for improvement of production and high skills to the farmers. With cheap labour available, simple sorting, cleaning and packaging would be done without depending on heavy equipment.

Sugarcane Plantations: Eco-Energy, a company in the process of developing a sugarcane estate was identified as a major contributor to traffic. Eco Energy's estate stretches from Gama to about 50km north of Makurunge on the western side along the current regional road R515. During discussions, the following information was received from Eco Energy:

- Sugar: Production of 125 000 ton of sugar to the domestic market. Trips will be undertaken with smaller trucks (10t-20t) and the produce will be transported to Dar es Salaam over a 9 month period;

- Ethanol: Will be transported by Agro-Econ Energy to Dar and most probably with the payload (33t) indicated.
- Out growers will also supply Eco-Energy with about 300,000 tons annually to be transported by 41 medium trucks.

The Bakhresa group company is establishing the sugarcane plantations and sugar factory at Razaba area in Makurunge Ward. The 20,000 hectare experimental farm in Makurunge area Bagamoyo, is expected to start producing 160,000 tons of sugar annually in recent years. Exporters of sugar will greatly use the Bagamoyo – Saadani –Pangani -Tanga Road to sell sugar in northern regions of Tanzania and neighbouring countries of Kenya and Somalia. Definitely, more Investors shall be attracted to develop agriculture based industries, such as the sugar, fruits processing and other food processing factories, in the area once the road has been developed.

- **Livestock keeping and Production**

Livestock is one of the main economic activities in Bagamoyo District, which earns income to the Communities. According to Livestock Census, which was carried out in 2012, Bagamoyo District had a total of population of 398,901 Chicken (indigenous, broilers and layers), 241,925 Cattle, 84,998 goats, 38,694 sheep, 19,406 ducks, 3,825 pigs and 315 donkeys.

All animals' products can easily be available; these products can be processed into different animals by- products such as butter, ghee, and cheese etc. Bagamoyo District is suitable for animal husbandry. Meantime there are milk collecting centres/points in both districts. Milk from Bagamoyo is sold in hotels along the sea shore of Bagamoyo town such as Malaika, Oceanic, Millennium, Livingstone, Gogo and Traveller. The target is to increase the carolling facilities within the villages as well as establishment of small milk processing units.

The rehabilitation of the road is expected to attract both small and larger scale dairy farmers with capital that can extensively introduce or construct an industry or cooling facility which would collect milk from different parts of the coast zone.

- **Beekeeping**

Bagamoyo District has a high potential for beekeeping activities. Areas with good yield include Miono, Kwaruhombo, Msoga and Msata, the potential has not been fully exploited due to use of traditional methods. The areas mentioned are mainly miombo woodlands which are famous for beekeeping in the tropics.

The total number of Beekeepers in the study area is 672. These beekeepers have got 2,722 beehives. There are 29 groups of beekeepers of with a total number of beekeepers in those groups are 242. The 237 beekeepers have 1258 beehives. The Production of honey per year is 72.5 tons and 4.8 tons of wax. The products are sold in the local market. Market for these products is available in large centres such as Dar es Salaam, Tanga, Arusha and Zanzibar. In beekeeping there are a lot of potentials which are yet exploited. Honey itself is used as jam, traditional medicine and for brewing beer. Beer wax is used for various purposes one of them being manufacturing of candles.

The project area produces about 1500 kg of honey each year and 50,000 kg of bee wax each year on average. The production of honey is done traditionally. The buyers of the said product are the people in the nearby area as noted above. The sub- sector appeals for firms or institutions like SIDO through UNIDO assistance or individuals with experience, and knowledge of beekeeping in all aspects, that is in increasing the production using modern methods of processing, keeping and transporting honey. The rehabilitation of the road can open this avenue through access to the market and establishment of honey processing industries.

- **Fisheries**

The fisheries sector is another important economic sub-sector to the economy of Bagamoyo. The sector provides employment to significant number of residents in the district. Fishing is mainly taking place in Indian Ocean and Ruvu River. Depletion of fish stocks due to over-fishing and harvesting of juveniles, habitat destruction due to unsustainable fishing practices and

conflict between trawlers and artisanal fishers are the major challenges facing fishing industry in Bagamoyo. In addition to this, fishing industry in Bagamoyo is facing limited data on fish production. However, statistics, which were obtained from Bagamoyo District Executive Office, show that in 2012 there were 1,577 fishermen and 456 registered fishing vehicles.

- **Tourism**

Saadani national park and presence of numerous history sites make possible for both wildlife and history sites viewing tourism. Wildlife represents a most valuable resource in Tanzania being one of the country's major tourist attractions hence a major source of foreign exchange earnings. Saadani National Park is the only national park, which is located in Bagamoyo district council. It is located 45 km north of Bagamoyo town and covers 1,100km square. Saadani national park is the only unique wildlife sanctuary in Tanzania bordering the sea. About 30 species of larger mammals are present as well as numerous reptiles and birds. Besides, many species of fish (over 40), green turtle, humpback whale and dolphins also occur in the ocean nearby. Apart from Saadani NP, a number of zoos are available in the district as shown in Table 26 below

Table 26: Animal Zoo by Ward in Bagamoyo District, 2012

Ward	Name of Zoo	Owner	Animals Found
Dunda	Snake Park	Fimbo Putara	Snakes and Tortoise
Dunda	Crocodile farm	Dirishad O. Hassan	Crocodiles
Zinga	Snake park	Juma Ally	Snakes

Source: District Executive Director's Office (Natural resource Department), Bagamoyo DC, 2013

4.8.3 Water

The level of provision of water services in the project area varies from one district to another. Generally Bagamoyo have larger water supply coverage due to presence of major water projects in the first two districts this is the Ruvu and Wami water supply projects under DAWASA. Most of the villages in Bagamoyo are supplied with water. There are ten piped water schemes which provide clean and safe water to 170,000 people which is equivalent to 73% of the population while the remaining receive water from minor scheme.

4.8.4 Health

According to the findings good health is regarded as state of absence of disease and general wellbeing of the people. Sounding health includes physical, social and psychological wellbeing of the household and community members. The villagers admit that the villages along the project area have health problems ranging from biological diseases, malnutrition, and cultural, social and psychological problems. Poor health and survival are attributed to lack of proper nutrition, clean and safe water, sanitation, and safe and clean place to live. Lack of proper health care, belief and cultural practices and lack of other basic amenities complicate the problem. Some of outlined direct threats to survival and health in the project area as reported by the respondents and from District Medical Officers (DMOs) in Bagamoyo; malaria (47%), HIV/AIDS (not quantified), Ear infection (15%), Acute Respiratory Infection (ARI) (13%). Others are Intestines worms (7%), diarrheal (6%) mostly in (rain seasons) others such as joint pain, rheumatics and hernia problems (12%). Both HIV/AIDS and malaria continue to be two of the most important health problems facing the study area and Tanzania today. HIV infects approximately 6 percent of adults according to the 2007-08 THMIS. Malaria is endemic in almost all parts of Tanzania and accounts for approximately 18 percent of the national disease burden. The government of Tanzania has developed national policies to combat both diseases,

including efforts to change sexual behavior, promote wider coverage of HIV testing, disseminate mosquito bed nets, and introduce newer, more effective anti-malarial drug treatments.

Thus the mode of health service delivery in the project area is based on curative, preventive and promotive health care and rehabilitative services provided by either government or private owned health facilities. These include Hospitals, health centers and, Dispensaries. Bagamoyo has District hospitals which cater for their respective districts.

From consultation with the community, health centers available along the project road are not adequate and can not deliver the required services due to lack of facilities. The big hospital such as Tumbi Hospital in Kibaha are not easily accessible due to poor roads that contributed to high mortality rate.

4.8.5 Education Services

Provision of quality education, has remained a challenge in development of the Coastal regions. The Government identified that economic, social problems and rapid expansion of the area in general affected the provision of education infrastructure in the area.

The Government has developed measures to alleviate these problems as per the Education Training Act of 1995. According to the Act, a primary education means full-time education given during the first seven years of formal education in accordance with syllabus approved by the commissioner. In the study area every village has a pre-school and primary school and at ward level there is a secondary school. Most of schools in the study area are owned by the government through respective district authorities. Few private schools are found in towns of Bagamoyo and Kibaha. Net Enrolment Rate (NER) in public schools range from 67% to 96%. Truancy (dropout/absenteeism), early pregnancy and poor living conditions of some families are said to be bottlenecks towards achieving 100% of NER.

Bagamoyo district has a total of 128 government primary schools, 4 private primary schools and 24 government secondary schools and 14 private schools.

4.8.6 Historical, Archaeological, Rituals, Cultural and Heritage Site

Bagamoyo has a rich history as a major maritime trading centre including the RC Mission Monument built on 17th June 1887 denoting the spreading of RC Christianity; Kaole village about 5 km from Bagamoyo town was founded in the 12th century and was an important link in early trade routes (Figure 18). Dunda village was another important historical site. It was a key slave holding area-receiving slaves from western Tanganyika before they were shipped to Zanzibar. In the 1800s, the village/town became the site for the first German headquarters in East Africa. Underneath picture shows historical sites in Bagamoyo. Table 27 below is a list of various historical sites in Bagamoyo town.

Table 27: Historical Places Potential for Tourism Bagamoyo District; 2012

Type of historical heritage available	Village/Mitaa	Ward	Division
Kaole ruins	Kaole	Dunda	Mwambao
Caravan Serai	Dunda	Dunda	Mwambao
Old Stone Town	Dunda	Dunda	Mwambao
Catholic museum	Magomeni	Magomeni	Mwambao

Source: District Executive Director Office (Natural Resources Department), Bagamoyo DC, 2013

Figure 188: Historical and cultural sites of Bagamoyo



Source: District Executive Director Office (Natural Resources Department), Bagamoyo DC, 2013

However, according to the literature review and consultations there are no archaeological and monumental sites of special interest that exist along the proposed road project site. During stakeholders' consultative meetings in the Wards it was reported and study team observed that along the proposed road project there are some graves which are likely to be affected by expansion of the road at several sections. Big trees including Baobabs and Fig trees which are used by some locals for ritual activities might be affected during road construction activities.

4.9 Biological Environment (Flora and Fauna of Saadani with Zaraninge Forest Reserve)

The Saadani National Park contains distinctive and rare habitats, (Unique in East Africa) beach with salt grass flats along the Indian Ocean. One can live at Saadani where river, beach and bush have been thrown together in a clash of colourful ecosystems found nowhere on the Eastern Coast of Africa. However, there is a confusion of nature that crocodiles vie with coral reefs, lions roar at Lionfish and baboons bound along the beach. Neatly described in a “Symbiosis of luxury with nature” the enthusiasm for nature here is infectious.

The warmth of service and comfort provide and perfect backdrop from which you can, relax and adventure through Saadani National Park extraordinarily diverse scenery and wildlife National Park. At least 24 species of large mammals are found there, including the rare Roosevelt Sable Antelope, Furthermore the beach areas contain a number of the last significant East African breeding beaches for the green turtle. At the Warm River mouth, there is large and still well preserved mangrove swamps. The northern part, which was a cattle ranch is now dominated with coastal lowland mosaic, presenting an exceptional variety of habitats, woodland, forest, coastal thicket, semi-and Grassland, wetlands, salt marshes, mangroves and beaches, this vegetation has a considerable number of elephants (**Annex 7: Elephant distribution**), buffaloes, antelopes and the rare Giant brown bat.

On the coast of Indian Ocean, the park, have unique land form, which includes several pristine dunes with interesting vegetation types. The Zaraninge Wilderness Forest Reserve is also found in the South western of the Park.

A detailed account of the endemic species and status is shown in the table below.

Table 28: Summary of species of vertebrates and trees that are endemic and near-endemic* to the coastal forests and woodland mosaic habitats in the coastal regions of Tanzania (Source USAID spot check report 2019)

Common Name	Scientific Name	Endemic to East Africa Coastal Forest?*	IUCN Red List Status*	Likely present in Saadani National Park?	Present in Bagamoyo-Malindi Corridor?	Reference
BIRDS						
Sokoike scops owl	<i>Otus ireneae</i>	Yes	EN, 2016	No	Yes	1, 2, 3
Southern banded snake eagle	<i>Circaetus fasciolatus</i>	Yes, NE	NT, 2016	Yes	Yes	1,2,3
Sokoike pipit	<i>Anthus sokokensis</i>	Yes	EN, 2000	Yes	Yes	1, 3
Little yellow flycatcher	<i>Erythrocerus holochlorus</i>	Yes	LC	Yes	Yes	1, 2, 3
Fischer's turaco	<i>Tauraco fischeri</i>	Yes	NT, 2016	Yes	Yes	1, 2, 3
Eastern green tinkerbird	<i>Pogoniulus simplex</i>	Yes, NE	LC, 2018	Yes	Yes	1, 2, 3, 4

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Green-headed oriole	<i>Oriolus chlorocephalus</i>	Yes, NE	LC, 2016	Yes	Yes	1, 2, 3
Clarke's weaver	<i>Ploceus golandi</i>	Yes	EN, 2016	No	Yes	2, 9
Mombasa Woodpecker	<i>Campethera mombassica</i>	Yes	LC, 2018	Yes	Yes	1, 3
Mouse-coloured sunbird	<i>Nectarinia veroxii</i>	Yes	LC, 2016	No	Yes	1, 2
Plain-backed Sunbird	<i>Anthreptes reichenowi</i>	Yes	NT, 2008	Yes	Yes	1, 2, 3
Uluguru violet-backed sunbird	<i>Anthreptes neglectus</i>	Yes	NT, 2016	Yes	Yes	1, 2, 3
Chestnut-fronted Helmetshrike	<i>Prionops scopifrons</i>	Yes, NE	LC, 2016	Yes	Yes	1, 2, 3
Kretschmer's longbill	<i>Macrosphenus kretschmeri</i>	Yes, NE	LC, 2016	Yes	Yes	1, 2, 3
Tiny greenbul	<i>Phyllastrephus debilis</i>	Yes, NE	NT, 2016	Yes	Yes	1, 2, 3
Fischer's greenbul	<i>Phyllastrephus fischeri</i>	Yes, NE	LC, 2016	Yes	Yes	1, 2, 3
East coast akalat	<i>Sheppardia gunningi</i>	Yes, NE	NT, 2016	No	Yes	1, 2
Spotted ground thrush	<i>Zoothera guttata</i>	Yes, NE	EN, 2017	No	Yes	1,2
Amani sunbird	<i>Anthreptes pallidigaster</i>	Yes, NE	EN, 2016	No	Yes	1,2
MAMMALS						
Aders' duiker	<i>Cephalophus adersi</i>	Yes	VU, 2016	No	Yes	1, 2, 9
Rondo dwarf galago (Rondo bushbaby)	<i>Galagoides rondoensis</i>	Yes	CR, 2008	Yes	Yes	1, 2, 5, 6, 7
Tanzania Coast Dwarf Galago (Zanzibar galago)	<i>Galagoides zanzibaricus</i>	Yes, NE	LC, 2008	Yes	Yes	1, 2, 8
East African little collared fruit bat	<i>Myonycteris relicta</i>	Yes, NE	LC, 2016,	Yes	Yes	1, 2
Decken's horseshoe bat	<i>Rhinolophus deckenii</i>	Yes, NE	NT, 2008	Yes	Yes	1, 2, 9

Environmental and Social Impact Assessment for Upgrading of Mkanga – Tungamaa – Pangani Bridge Road (120.8 Km) in Tanga and Coast Regions

Least long-fingered bat	<i>Miniopterus minor</i>	Yes	LC, 2018	Yes	Yes	1, 2
Hildegard's tomb bat	<i>Taphozous hildegardeae</i>	Yes, NE	VU, 2008	Yes	Yes	1, 2
Black and Rufous Sengi (elephant shrew)	<i>Rhynchocyon petersi</i>	Yes, NE	LC, 2016,	Yes	Yes	1, 2
Golden-rumped sengi	<i>Rhynchocyon chrysopygus</i>	Yes	EN, 2013	No	Yes	2, 9
Long-tailed Pouched Rat	<i>Beamys hinde</i>	Yes, NE	LC, 2016	Yes	Yes	2, 9
Tanzanian woolly bat	<i>Kerivoula africana</i>	Yes, NE	EN, 2016?	Yes	Yes	1, 2
Zanj sun squirrel	<i>Heliosciurus undulatus</i>	Yes, NE	DD, 2016	Yes	Yes	1, 2, 9
Swynnerton's bush squirrel	<i>Paraxerus vexillarius</i>	Yes, NE	NT, 2008	Yes	Yes	2, 9
Abbott's Duiker	<i>Cephalophus spadix</i>	Yes, NE	EN, 2016	No	Yes	1, 2
Eastern tree hyrax	<i>Dendrohyrax validus</i>	Yes, NE	NT, 2014	Yes	Yes	1, 2, 9
Lesser pouched rat	<i>Beamys hindei</i>	Yes, NE	LC, 2016,	Yes	Yes	1, 2
Garnett's (small-eared) galego	<i>Otolemur garnettii ssp. panganiensis</i>	Yes, NE	LC, 2008	Yes	Yes	1, 2
Jackson's shrew	<i>Crocidura jacksoni</i>	Yes, NE	LC, 2016	No	Yes	1, 2
African elephant	<i>Loxodonta africana</i>	No	VU, 2008	Yes	Yes	1, 2
Masai giraffe	<i>Giraffa camelopardalis ssp. tippelskirch</i>	No	EN, 2018	Yes	Yes	2, 13
AMPHIBIANS						
Loveridge's snouted toad, woodland toad	<i>Mertensophryne micranotis</i>	Yes	LC, 2013	Yes	Yes	1, 2
(Forest banana frog or forest spiny reed frog)	<i>Arixalus sylvaticus</i>	Yes	VU, 2015	Yes	Yes	1, 2
REPTILES						

Usambara flap-nosed chameleon	<i>Kinyongia tenuis</i>	Yes, NE	EN, 2015	No	Yes	1, 2
Matschie's dwarf gecko	<i>Lygodactylus conradti</i>	Yes, NE	Not assessed	Yes	Yes	1, 2
Green turtle	<i>Chelonia mydas</i>	No	EN, 2004	Yes	Yes	1, 2, 4
TREES						
Pod mahogany	<i>Azelia bipindensis</i>	No	VU, 1998	Yes	Yes	2, 11
African teak, mvule or iroko	<i>Milicia excelsa</i>	No	NT, 1998	Yes	Yes	2, 11
Silver oak	<i>Brachylaena huillensis</i>	No	NT, 1998	Yes	Yes	2, 11
Mkwe, mkue	<i>Julbernardia magnistipulata</i>	No	VU, 1998	Yes	Yes	2, 11
Mkuruti, baphia, camwood	<i>Baphia kirkii</i>	Yes, NE	VU, 1998	Yes	Yes	2, 11
Many other endemic plants, mullusks, and insects (butterflies only) are listed in reference 1, with reference to their presence in coastal forests (CF) of Tanzania and conservation status. There are too many to repeat here. Other groups of organisms, like fish, are not listed.						
*NE=Near endemic (see 10), CR=Critically endangered, EN=Endangered, VU=Vulnerable, NT=Near threatened, LC=Least concerned, DD=Data Deficient						

4.9.1 Vegetation (Flora)

Tanga and Coast Regions are endowed with unique Biodiversity and natural resources including the natural ecosystems of forests, savannah, pastures and rangelands as well as, wetlands, rivers and the Ocean which form the basis of the natural resource wealth. The grassland savannas provide habitats for large mammals in Saadani National Park. The two regions are dominated by Natural forests of miombo woodlands, Montana forests and mangroves forests. These forests are either Reserved or managed by Local government community owned. The Miombo woodlands are the most extensive woodland area in Tanga and Coast regions covering a large part of the hinterland from the coastal area. The miombo ecosystem is dominated by dry woodlands. Significant amount of wildlife areas is within the Savannah grasslands characterized by dry miombo woodlands dominated by the genera of Acacia, Combretum and Commiphora.

Both Tanga and Coast regions are bordering the Saadani National Park with Zaraninge wilderness forest reserve. These are areas of high biodiversity values and their main purpose is conservation of habitats and wild animals, which constitute unique naturally occurring biodiversity. In the National Park only non consumptive tourism, education and research are permitted. The Saadani National Park and Zaraninge Forest Reserve possess various flora and fauna. They are essential habitats to some of the rare and endemic species of primates, mammals, Birds, invertebrates, reptiles and trees species.

The Montana forests is mostly possessing high water catchment value, hence being main sources of major rivers such as the Wami, Ruvu, and Pangani, just to mention a few. Apart from water catchment values the Montana forests are also centers of high biodiversity

resources of flora and fauna including harboring endemic and near endemic species (Annex 6(a) and (b)). The Eastern Arc Mountain forests are of exceptional global importance because of their high biodiversity values. A number of plant species including some tree species, are known to be endemic to the Eastern Arc Mountains. Due to such values, the Conservation International included the Eastern Arc Mountain forests together with the Coastal forests are amongst the World's 25 Biodiversity "Hotspots". The main and much recognizable nature feature of the park is the Zaraninge Forest, 200 square kilo meters (50,000 acres) of closed tropical forest. It is one of the largest coastal forests in Tanzania, and part of the "Eastern Arc and Coastal Forest for Kenya and Tanzania Hotspot.

The Mangrove Forests are found in all coastal districts of Tanzania including Tanga and Coast regions. There are eight species of mangroves in mainland Tanzania. These are *Avicenia marina*, *Bruguiera gymnorhiza*, *Ceriops tagal*, *Heritiera littoralis*, *Lumnitzera racemosa*, *Rhizophora mucronata*, *Sonneratia alba*, and *Xylocarpus granatum*. In addition to Mangroves, there are adjacent coastal forests that possess important species of flora and fauna. The coastal forests are centers for valuable species such as *Dalbergia. melanoxylon*, which is an exceptional valuable tree species for wood curving and production of other important products like music clarinets. Plantation Forests Main species planted in the plantations throughout the country include *Pinus patula*, *Cupressus lucitanica*, *Tectona grandis* and some *Eucalyptus* species.

In the urban areas, the project area is characterized by planted shade trees, lawns, hedges, and gardens with few natural trees like Baobab and Fig trees. Most of the natural vegetation cover has been lost due to urbanization. Different plant species such as palm trees, peacock flower, Christmas trees, neem (*Azadirachta indica*), bougainvillea and governors plum (Mchongoma in Swahili), yellow cassia and varieties of grass species are available in the project area.

4.9.2 Animals (Fauna)

The western part of Saadani National Park host new species of reptile (gecko), amphibian (*Hyperolius parkeri*), an Endemic snail and many other species of invertebrates, 8 bird species. Large mammals, African buffaloes, zebras, giraffes, several antelope' species including Sable Antelopes (Rare species) lions and elephants (Threatened Species), are all found in the southern portion of the National Park, dominated by Wami river and its delta. The Saadan beach is famous as breeding site of Green Turtles (Endemic species). However, according to the Saadani General Management Plan, the Park does not habitat any endangered species. Mkwaja, which is a part of the Park, has complex ecosystem, which holds a large number of water including the greater flamingo, high concentration of cetacean and important population of crocodiles and hippos. It is important that the park is protected from the projects negative impacts by identifying an alternative route that traverses an area with minimum natural resources and sensitive ecosystem as discussed in the report and various stakeholders meetings.

In urban C areas, existing animal species include terrestrial creatures which are domestic and free range animals such as cats, dogs, pigs, cattle, goats, chicken, and other types of birds. Few wild animal including, monkeys, birds, reptiles, and squirrels are found in flood plains, tree groves, shrubs and bushes and along the river banks. The presence of domestic animals in the project area signifies that there is dependence of natural water streams/river as a source of drinking water for animals. Prevention of surface and underground waters from pollution is therefore very essential, and the provided mitigation measures have to be implemented.

Biodiversity threats in Forest Ecosystem area due to over exploitation of forest resources Conservation and management of natural forests in Montana, miombo and coastal areas has been a challenging task. This is due to increased human population that exerts great pressure on the forest resources. Pressure on coastal forests is due to more demands for cultivation, timber harvesting, and production of charcoal. Illegal logging in Montana forests and in the

miombo woodlands is a big environmental problem throughout Tanga and Coast regions. There is degradation of mangroves in the two regions as it for many other parts of Tanzania. Besides decrease in the area covered by mangroves, there is also a considerable decrease in the density, height and canopy cover of the mangroves within the forests. The areas hardest hit are those near urban centres and forests around Tanga. In some areas mangrove forests have been cleared for paddy cultivation and Salt mining. The major immediate causes of mangrove forest degradation were the over-harvesting of mangrove for firewood; charcoal - making; building poles; and boat construction which accounted for about 46%, and clear-cutting of mangrove for agriculture, solar salt production, road construction, urbanization and hotel construction, firewood for lime making. Near urban centers, various types of pollution including municipal sewage, garbage and oil pollution also pose threat to mangroves. Bush Fires are another hindrance to sustainable forests management in the regions. Thousands of hectares natural forests are set to fire every year thereby reducing their biodiversity values by killing various species of flora and fauna and retarding growth rate to some of the tree species.

4.10 Gender Analysis

Both in Tanga and Coast regions as the case in most parts of Tanzania, Gender relations and structure among the PAPs is dominated by male members of the households. It is generally a patriarchal socio-economic system. The division of labour in such systems is mainly based on gender and age-sets. Among the families and households of the project affected persons, child rearing and other domestic chores such as washing clothes and cleaning houses are the major household activities undertaken by women and girls. Thus women spend an average of 10 hours per day with very limited time for relaxation and resting on these domestic activities. And depending on the season women are expected to play a significant role in farming activities. There is a great deal of commonality between women household activity profile in the study area with other areas of Tanzania. The implication of this is a possible increased work load for women because of other activities such as construction of houses because of project impacts.

Data shows that in general women are involved in making decisions on issues that are significant to the households and families including finances, education of child, health of child, purchase of assets, day to day activities and social functions. In 84% of households women were reported to make decisions. However it should be observed that this issue is subject to social desirability responses with a potential for attitude-behavior discontinuity.

4.10.1 Matrilineal and Patrilineal Systems

The impact areas are characterized by both matrilineal (mainly in Bagamoyo District) and patrilineal systems. In matrilineal society's family and property relations are tracked down the female line while for patrilineal societies this is through the male line. It is however important to note that women in both the two systems were found to be in a disadvantaged position in terms of access and ownership of social and economic resources.

4.10.2 Reproductive and Productive Systems

The division of labor described above shows the dual role for women in terms of productive and reproductive roles. Women as mother and wives are extensively involved in household tasks and farm activities. They have both social and economic responsibilities. Women in the impact areas spend most of their time preparing food for the family, fetch water, collect firewood, work in farms, take care of the children and the sick and attend social activities such as funerals and wedding ceremonies. In the subsistence economy a women and specifically a wife is part of the production unit yet it often the men who control the output of the women's work.

4.10.3 Education Attainment Levels

Generally women in Tanzania and in the impact areas have low educational attainment levels compared to men. While there is equal enrolment levels at primary schools significant disparities are observed at secondary and higher education levels with more boys than girls at these levels. In the impact areas are major explanations for the disparity in educational attainment levels in the impact areas include: traditions that value boys more as women are

expected to be married and leave the families therefore parents are willing to invest in boys' and girls' education. The other factor is early pregnancies and marriages.

4.10.4 Access to Resources

Access and control of resources in most communities in the impact area is dominated by men. For example in these areas traditionally women do not own land and livestock. They do not control income from farms etc. Women do not inherit significant properties such as land.

4.10.5 Economic Empowerment

The customs and norms describe above where women's primary responsibility is in the household they have limited access to income, employment, lack skills training etc. They by and large depend on men even accessing capital to invest in small income generation activities such as petty trade. Women therefore are not economically empowered in the impact areas.

4.10.6 Poor Headed Households

Poor female-headed are the most vulnerable group with low income levels and time constraint to adjust to resettlement activities which might require relocation.

4.10.7 Issues of Concern Related to Gender and the Impact

- **Negative impacts:**

During consultation a concern was raised that women may be taken advantage of – that is their property will be claimed by men, who in turn will claim compensation and other benefits. This is a critical problem as men are generally the owners of land being head of households. Some women-headed households may find it difficult to farm, such as the elderly. Gender-sensitive project monitoring and evaluation will be conducted using gender indicators. Women as a vulnerable group, and especially women-headed households, will obtain not only equal benefit to men in the project, but also be placed at an added advantage over some mitigation measures, to enhance their economic and social wellbeing. This will be addressed through provisions under the entitlement framework. Therefore affected women will be constrained by time and other negative impacts include: loss of land; houses; loss of small businesses; increased rate of transmission of diseases such as HIV/AIDS where women are more vulnerable; increased truancy and rate of drop out among school girls.

- **Positive Impacts:**

The main positive impact is increased income generation activities for women during the construction phase and possible employment opportunities for women>

5 STAKEHOLDER CONSULTATIONS AND INVOLVEMENT

5.1 Stakeholder Identification

The Scoping study started with identification of the key stakeholders of the project including those who are likely to be directly affected by the project (Project Affected Persons), Authorities and decision makers, Interested and pressure groups. All identified stakeholders were analysed in order to distinguish the relevance of each stakeholders to the project. The study therefore revealed the following groups of stakeholders:

Table 29: Project Stakeholders and their Relevance to the Proposed Project

S/NO	Stakeholder Groups	Relevance to the project
1	<ul style="list-style-type: none"> National Environment Management Council (NEMC), Ministry of Lands and Human Settlement Development, Local Authorities of Arusha and Arumeru Districts 	Authorities or decision makers
2	<ul style="list-style-type: none"> Ministry of Works, Transport and Communication TANROADS Regional Office – Tang and Coast Regions 	Developer
3	<ul style="list-style-type: none"> Wards and Villages Executive offices (WEO/VEO) and other Local Leaders of Villages/Streets and Division along the project road and NGOs within the core impact area. General Public and Local Communities along the road; Tanga Urban Water and Sewerage Authority (TAUWSA); Tanga and Pangani Port Officers representing Tanzania Port Authority (TPA); Tanzania National Park Authority (TANAPA) and Saadani National Park (SANAPA) officials; Tanzania Rural and Urban Roads Authority (TARURA) of Handeni and Pangani; Municipal Councils heads of departments including Municipal Planners, Land Officers, Surveyors, Water Engineer, Health Officers, Economist, Development officer, Environmental officer, Natural resources, Doctors; Utility Companies e.g. Water Authorities and Tanzania Energy Supply Company (TANESCO), Telecommunication Company (TTCL); Pangani Water Basin; 	Affected Parties (Directly affected by the project)
5	<ul style="list-style-type: none"> Non- Governmental Organizations (NGOs), Community Based Organizations (CBOs), Faith (Religious) Based Organizations (FBOs) International Organizations (e.g. African Wildlife Foundation, WWF, CITES, IUCN), Departments and Agencies. 	Interested parties

5.2 Stakeholders Analysis

Having identified the key stakeholders of the project, consultations through meetings and interviews were made. During consultations, the interested and affected parties (IAPs) were briefed on the proposed road widening project as well as the EIA process, giving stress on the existing environmental legislation. They were given opportunities to express their fillings and air their views regarding the proposed project. The aim was to find out potential difficulties, which the Project Affected Persons could face as a result of project implementation and resettlement in particular. For so doing it will help to guide on how to minimize the impacts and improve efficiency in the project implementation.

The field visits were conducted throughout the road alignment (i.e. road corridor and right of way) prior to the stakeholders meetings and dialogues in order to compare the actual situation on site and the information gathered during the consultative meetings.

5.3 *Methodology of Consultations*

Dialogues were the main methods used in order to determine the feelings of people who are the main stakeholders of the proposed project. A wide range of stakeholders were met during the public meetings, local authorities, individually or as focused groups. The focus group discussions involved a bigger number of leaders from all levels, women, business people or economic venture groups, farmers, influential people, the disabled and youths. The draw round hereunder underscores how the stakeholders were involved.

- *Group discussions* in case of crucial matters that require digested outputs, independent interventions, 'specialized' or certain expertise are central. Decisions and outcomes of such gatherings were to be weighed against the issues raised during the big meetings and incorporated into the information gathered.
- *Important and resourceful people were interviewed* and will continue to be interviewed by the helpers through meetings which were organized to get much more reliable information.
- *Consultations are imperative to different people* that have expertise and those who are in power. The consultations were made with the Regional and district officers, TANROADS engineers in Tanga and Coast Regional Offices and Utility owners should enrich the gathered information and data.

5.4 *Stakeholders Consultation and Involvement*

The consultations with stakeholders for this study were undertaken during Feasibility study in March 2012, during the Detailed Engineering Design between January and February 2014, and during updating of the ESIA and RAP between March and April 2019. However, continuous consultations with various stakeholders were conducted as matter arose in order to get clarifications and information as necessary.

The overall goal of the consultation process was to disseminate project information and to incorporate views of stakeholders in the design of the Environmental and, Social mitigation measures, the management and monitoring plan. The specific aims of the consultation process were:

- To disseminate information on the proposed project;
- To gather people opinions, perceptions and expectations from project proposed;
- To improve project design and, thereby, minimize conflicts and delays in implementation;
- To facilitate the development of appropriate and acceptable entitlement options;
- To increase long term Project sustainability and ownership;
- To reduce problems of institutional coordination; and
- To increase the effectiveness and sustainability of income restoration strategies, and improve coping mechanisms.
- to seek the opinion and concerns of community members regarding the proposed projects so as to have precautions during consultation and involve them in the overall planning of the mitigation measures for the identified impacts.

Consultative meetings: The meetings with authorities were through direct interviews with the relevant specialists and technical personnel. The following consultative meetings were conducted:

- **Inter-governmental and EAC stakeholders** represent both Kenya and Tanzania: five delegates meetings were held in both Kenya and Tanzania to discuss the proposed project, which included evaluation of project impacts and mitigation/alternative identification.
- **General Public:** The consultative meetings were organized by the local leaders. The meetings were attended by men, women and the youth. The composition of the groups was determined after consultation with the relevant district officials and local government leaders in Chalinze, Bagamoyo, Pangani, Muheza and Handeni District. The meetings with communities in the project area were more detailed and were attended by a cross-section of people. First a brief description of the project was explained to them. The attendance and proceeding of the meetings were recorded by a secretary chosen among the attendees.
- **Focus Group Discussions** with PAPs whose properties will be affected by the project were also held with specific and targeted groups in the society including women, youths and small business entrepreneurs, village leaders and environmental committees. Guiding questions or checklists were prepared to facilitate the discussions and to focus it on issues related to a particular group. Dynamics of focus group discussions were observed to ensure fruitful discussions under the leadership of the sociologist and TANROADS environmental experts.

The consultations enable collection of pertinent information including Community's perceptions on the proposed project, available urban infrastructure in the municipality and environmental and social data such as land use, ecosystems, and human habitat, economic activities demography, social services and other indicators related to the study and project area. The minutes of the consultative meetings have been attached under **Annex 3** of this report.

5.5 *Stakeholders Response to the Projects Plans*

The study realised that the communities living in the project area are eagerly waiting for the road to be improved. They believe that the road shall bring numerous benefits to the area in terms of economic and social growth and even improved health and education status. They appreciate the government's efforts to give its priority in improvement of the Municipal Infrastructure. However, the stakeholders consulted are worried about the land expropriation, destruction of properties and poor arrangements of compensation issues. The stakeholders identified both positive and negative anticipated impacts from the project but they stated the positive impacts outweighed the negative impacts as long as mitigation measures are implemented. A summary of issues/concerns raised by various stakeholders is presented in **Table 30** below.

Table 30: Stakeholder views and concerns

S/No	Organization / Authority	Issues / Concern	Remarks
1.	TANAPA and Saadani National Park,	<ul style="list-style-type: none"> The development of the road shall attract settlements to the park and forests thus lead to multiple environmental impacts. Possible environmental pollution by sewage if the sewerage system is destroyed/broken during construction. Should there be any construction activities near water source/rivers, the contractor should take care not to cause pollution of any kind to the source. Employment opportunity to the local people during the construction period. The currently proposed route will serve relatively fewer people because it passes through the National Park. Possibility of increase of road accidents and killing of animals due to speeding vehicles. Possible environmental pollution and poisoning of animals. Possibility of increase in poaching. Possibility of increased human activities in the park. There is need to identify an alternative route that will not pass through the park and at the same time shall serve more people. 	<ul style="list-style-type: none"> The ESIA evaluation involved establishing alternatives routes that shall ensure impact on the ecosystem is reduced in this regard the consultant proposed three other road alternatives for consideration this has been discussed in the project alternative section and a map showing the location of the routes has been provided for decision making. The alternatives shall also ensure a larger population is served as opposed to the status quo. In regard to sewerage as part of mitigation measures the consultant has proposed development of sewerage facilities at the camps this containerised collection of sewage and recycling the water for non-domestic uses such as toilet flushing and gardening, sewage system should be made of impermeable material so that raw water does not infiltrate the soil which will lead to contamination. It is advised that the contractor development road side toilet facilities/ provide mobile toilets to be used at site and the waste be discharged into the sewer system at the camp. In regards to employment of the locals they should be given priority in employment and only skills lacking locally should be out sourced. In skills requiring little training locals should be trained to enable them get the job opportunities. The design of the road shall take into consideration a reasonable speed through the park with support of safety signs.
	Tanzania Port Authority: Tanga Port Manager and Engineer; Pangani Port Manager; and Kipumbwi informal port operators	<ul style="list-style-type: none"> The TPA is planning to formalize Kipumbwi, Kigombe and Mkwaja small ports which are used to ship people and goods to Mkokotoni – Unguja port of Zanzibar. For instance the Kipumbwi Port transports a big volume of goods about 30 -50 tons per day. Therefore the upgraded road will help to boost its operations and shipping capacity; Increase in revenue collections for TPA and national in general; Currently, about 16 busses are operating between Tanga, Pangani and Kipumbwi transporting about 500 people per day to and from Tanga, Mombasa and Unguja. Therefore the upgraded road will improve safety and comfort to bus passengers. 	<ul style="list-style-type: none"> The project shall involve improvement of the Kipumbwi spur road to enhance the use of Kipumbwi port

S/No	Organization / Authority	Issues / Concern	Remarks
2.	Tanga City Council, Pangani, Handeni, Muheza, Chalinze, and Bagamoyo Districts Councils. (The Municipal Planners, Environmental Engineer, Roads Engineer, Surveyor and the Wards Executive officers).	<ul style="list-style-type: none"> • Employment opportunities to the local people during road construction and during operation due to investments stimulated by upgraded road such as tourism, industries, fish markets, hotels etc. Economic growth from revenues collected as a result of formalized, Kipumbwi and Kigombe Ports. • Improved status of the Council due to urban expansion by new residents and increased economic activities. • Improved values of plots, farmlands and house rents, and other services and goods due increased demands that resulted from population influx. • Possible environmental pollution by sewage if the sewerage system is destroyed/broken during construction. • Improved livelihoods of the communities along the project road due to diversification of socio-economic activities and increased income levels. • Improved access to social amenities like health services, education centres and communication services. • Temporal loss of access to services such as road, water supply and electricity during construction. "Residents will not appreciate prolonged water shortage period". • The consultant should make sure that the works are well designed and construction works are well supervised to ensure sustainability and to avoid soil erosion. "it has happened in other projects that some parts of the road or the road surface finish is eroded just after the completion of the construction works". • Tourism and trade sectors will expand due to improvement of the town roads. • Population influx into the project areas as a result of improved services and job seeking. Increased road accidents due to increased vehicle speed on the improved roads - • Delayed and unfair compensation to the affected people. • Increased revenues of the Councils due to increased investments and businesses following the improved road. 	<ul style="list-style-type: none"> • Mitigation measures on employment are as discussed above. • The contractor shall identify location of all the service lines in Tanga before project commencement and develop a working plan which shall aim to avoid interfering with the lines and if inevitable works should be planning such as that the impact of interference occurs within the shortest time possible. The locals will be informed in advance on work plan and its impact on them and the services. Service lines found in the area are water supply lines, sewage pipes, data cables and telephone lines. • The contractor should develop project as designed and improve design where soil protection and road furniture protection measures are missing. Such measures should include backfilling in excavated areas and revegetating, stabilisation of steep faces among others. • The overall project objective is to maintain good housekeeping therefore the contractor is advised to clear area of any stockpile materials, obsolete equipment, avoid melting bitumen on open land among others. • The EMP recommends backfilling of pits. • The project aims to open up touristic areas: • HIV/AIDS mitigation plan has been incorporated in the project programme. • • The local council should plan and control haphazard development the area. • All project workers shall be housed at the camp site. • Road signs shall be installed but it is important that road safety campaigns are undertaken in the area and nationwide. • Compensation of PAP should be done before the project commences. • The contractor should leave the working site clean before handing over the work. • The contractor should use the existing borrow pits, stone quarries and sand pits in order to minimise the land degradation at new sites.
3.	The general community	<ul style="list-style-type: none"> • Transportation of various agricultural produce such as cassavas, coconut and various fruits including pineapples, oranges, etc. • Reduced market costs of commodities due to reduced transportation costs and distance. • Reduced travel fares and transportation costs of goods and crops to market places; 	<ul style="list-style-type: none"> • The issues raised by the public were similar in nature as those raised by the key stakeholders and the mitigation measures are similar to those mentioned above. • In regards to resettlements of PAP, a Resettlement Action Plan (RAP) shall be developed once the road alignment to be developed has been agreed on and the design finalised. This will enable identify those found within the proposed road corridor and

S/No	Organization / Authority	Issues / Concern	Remarks
		<ul style="list-style-type: none"> • Reduce maternal and infants mortality. • Increased incomes of community members and revenues of the municipality as many investors will be influenced by improved roads. • Interaction with newcomers which can bring new development ideas and knowledge in the region • Inter-marriages with people outside project area. • Increased income and wealth levels due to compensation and diversified economic activities. • Impaired security in the Region due to threat of penetration of terrorists, unknown people and refugees • Opportunity to women to undertake food vending and other petty trades. • Increased revenue collection and boost income of the councils and nation. • Reduced travel time. • Increased Family conflicts, unstable marriages and Family separation. • Increased crime rates. • Increased dust emissions during construction of the road. • Destruction of water wells in the villages. • Increased street children due to Childhood pregnancy to girls and unplanned pregnancies to women by migrant construction workers who leaves the babies behind after completion of construction works. • Spread of HIV diseases due to increasing sexual interactions among the workers and community members. • Environmental degradation due to trees cutting/uprooting, generation of liquid and solid wastes and land excavations. • Ruined or spoiled traditional norms and culture. • Impairment or Destruction of archaeological and ritual sites. • Improved air quality and Beautification of settlements (houses and business premises) due to eliminated dust blow by paved road. • Gaining of new skills which can sustain the livelihood of the local people. • Upgrade the status of the villages to urban areas, • Increased land and property values, house rents due to increased demands by population influx and expansion businesses activities along the roads. • Employment opportunities in road construction and maintenance works. Employment chances to investors. • Absorb existing stress among the community members caused by unreliable transport. 	<p>enumerate them and their effects. The RAP costing shall be based on prevailing market rates.</p> <ul style="list-style-type: none"> • The contractor should strictly follow the activity time schedule in order to minimize the duration of the effects such as “loss of access to services”. • Contractor should use good quality construction materials and ensure good workmanship. • To ensure road safety to the users, the contractor should install road safety signs and speed humps especially near schools to minimise accident risks”. • Persons whose valuable properties will be affected should timely and fairly be compensated. • The public must be made aware of the developments planned at their areas in advance. Also the affected persons must be informed in advance, at least 36 days before the date of demolition. • Local Leaders at Wards, Street/Mtaa/Village level should be involved during the process of compensation because they are more familiar with the environment, they know their people, and they can help in identifying exactly what belongs to whom. • The most current rates should be used during compensation so as to enable affected persons to recover their lost properties. • To promote fisheries sector, the road project will also facilitate construction of access road of 3.7 km and fish market at Kipumbwi Ward as one of the complementary projects to support communities along the project road. • As part of complementary activities, the project will include construction of primary and secondary school classes and dormitories for girls in order to contribute to addressing childhood pregnancy and school dropouts. • To control dust “the Contractor should control dust by sprinkling water on the surfaces for dust suppression. • To minimize noise pollution, the Contractor should make use of mufflers and other appropriate devices. •

S/No	Organization / Authority	Issues / Concern	Remarks
		<ul style="list-style-type: none"> • Temporal destruction of access roads, water supply and electricity during construction. • Environmental pollution by sewage if the sewerage system is destroyed/broken during construction. • Tourism, fishing and trade sectors will expand due to improved roads. • Exacerbated spread of communicable diseases such as HIV/AIDS, TB, STIS, STDS and competition over available resources as result of increased population influx. • Increased road accidents to pedestrians and vehicles due to speeding drivers enjoying improved paved roads. Unfair and untimely compensation payment to the affected persons may affect their standard of living and lead them to poverty. • Dust, vibration and noise during construction activities. 	

6 ANALYSIS OF ALTERNATIVES

The aim of the EIA process is to come up with the most sustainable project considerations, which shall enable optimal benefits from the project. Therefore, it was important to evaluate the proposed road based on its anticipated impacts thereafter come up with alternatives which include a consideration of without the project alternative.

During project design and ESIA study different alternatives were considered in order to achieve the project's objectives. A range of systematic methods were used for comparing and evaluating various alternatives. These include simple checklists, overlay maps, complex matrices, mathematical models descriptions of the main impacts and the reasons for their rejection. The consultations with stakeholders and project site visits provided basis for identifying project alternatives.

This section analyses the two cases of project alternative considered i.e. "without project" case and "with project" case. The section goes further by analyzing and conclude on various options considered 'with' project alternatives in terms of site, technology scale and waste management options. The alternatives considered for the project are elaborately discussed in the sections below.

6.1 *'No' or 'Without' Project Alternative*

The 'Without' project alternative can be viewed from two perspectives this is retaining the current status quo by developing option A and at the same time leaving it as it without a tarmac road. Adopting the latter option is the most beneficial from an extreme environmental perspective as it ensures non-interference with the existing environmental conditions. Despite that choosing the option will however, involve several losses both to the local community and the nation as a whole. The community will continue to face the constraints they are currently experiencing due to inefficient transport network and associated systems and the anticipated economic development aimed at fulfilling the Vision 2025 and other development policies such as transport policy shall remain unattainable. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors.

Considering the "with project", four (4) alternative routes were identified considered and analysed, namely option A, B, C and D as shown in the project layout found under **Annex 4**. Alignment selection was carried out on the basis of evaluation of various alternatives. The improvement of the existing alignment was included as an alternative. Both qualitatively and quantitatively evaluation has been done for various factors influencing the selection process. These factors can be broadly grouped under main heads such as geometrics, cost, economic benefits and social and environmental impacts. The qualitative evaluation rates the alternative as less desirable, desirable, more desirable and most desirable against each factor.

It was noted that to the large extent the road must follow the existing alignment to avoid destruction of many properties as well as destruction of natural ecosystems and wildlife habitat along the road. Therefore, all the alternatives were based on how to improve the existing alignment and to bypass the Saadani National Park for maintaining the quality of its ecosystem.

6.2 *Alternative Routes*

According to the field survey and stakeholders consultations it was noted that alternative consideration needs to be evaluated at some sections of the project roads. Alternative selection for this project is very challenging as the project area has a forest, Ocean and Park. The consultants tried as much as possible to avoid all the three ecosystems but at least one has to be affected. In the end the selected alternative of route managed to avoid the park

and Ocean but sections of the forest could not be avoided thus it was agreed the route selected should be the shortest through the forest.

Apart from selection of routes based on environmental impact the route had to also make economic sense and according to practice a highway corridor should not be so close to another one as it shall not be economical viable. The existing highway from Dar-es-Salaam to Arusha was seen run parallel option B with 50km in between them which according to the economists is considered not economically viable.

6.2.1 Description of the Key Sensitive Areas that Necessitated Alternative

Option A

Road through Saadani Park Area: There is need to consider alternative route for the section of the road traversing through the park in order to reduce the anticipated impact to it and its associated forests. This led to the identification of three alternative alignments namely Option B, C and D as shown on the map found in **Annex 4**. The aim of identifying the options is to provide the developer with alternatives to Option A as it was seen to traverse through a large section of sensitive ecosystems namely turtles breeding sites, elephants corridors and other wild animals habitat found within the park.

Option B

This alternative was selected to minimize the impact on Saadani National Park and therefore chosen to navigate around the boundaries of Saadani National Park, but on an existing track/gravel road alignment. This will be a complete new road as shown in blue on the map found in Annex 4. The route is more rolling than the coastal route, but with better expected foundation conditions as opposed to the black cotton soil found on the coastal route. It will also start on the Bagamoyo to Msata road near Kiwanga, which is currently being upgraded and will link with Mkange, Kwamsisi and Mkwaja. From Mkwaja the route passes beyond the park (although a short section will cut through the northern part) and from there it will follow the coastal alignment up to Tanga.

This route will still require bridges across the Wami and Pangani rivers, and will have one additional railway crossing near Mkalamo. This alternative is 17km longer in terms of new constructed length and will add 46km to the travel length between Bagamoyo and Tanga as compared to Option A. However, a higher operating speed will be possible on Option B, since speed restriction will have to be enforced through the park, should the coastal road be selected. There are some existing tracks going from Kiwangwa to the Wami river and then to Mkange that are used by locals to access the river to collect water. The section between Mkange and Kwamsisi is currently only a track, which is used by locals and only passable by off-road vehicles. This route avoids the Kiono/Zaraninge forest by moving outside its boundaries. Area after Kwamsisi through outside the forest and park is densely vegetated and is inhabited by tsetse flies.

Option C

The proposed village route follows the existing road from Makurunge to Gama. After crossing the Wami River, it follows the Wami River upstream to Matipwili. After Matipwili, the route turns away from the river and passes through the Zaraninge forest, which is part of Saadani National Park to Mkange. From Mkange the route follows the same way as option B, through Kwamsisi to Mkwaja. Their proposal will also require bridging at Wami and Pangani, but will give shorter access to the Park from Bagamoyo, without the negative impacts on the park. It will be 45km longer than Option A in terms of construction length and also 46km longer travel length between Bagamoyo and Tanga. Two additional grade separated rail crossings will be necessary. Note that Options B and C reduce the travel length from Bagamoyo to Tanga by only 31km compared to the existing road, whereas Option A reduces the length by 77km.

Option D

The first section will cross through the Sakura Sisal Estate. The road will then follow the existing road through the Msubugwe Forest Reserve (similar impact as Zaraninge forest,

where after the road will turn northwards to Segera. The proposed route will cross two streams of the Pangani River and the railway line. This link will only be analyzed with Option A, since it will not attract traffic to Arusha in combination with Options B or C.

Option D will thus incorporate the entire Option A up to Tanga, plus the added link to Segera. This combination will be referred to as Option D. This option shall still join Bagamoyo to Tanga as the Msata-Bagamoyo road is currently undergoing upgrading to bitumen standard but it shall not facilitate movement of locals located in the villages.

The results indicate that the overall Option D (upgrading of section Makurunge-Gama-Mkwaja-Pangani-Tanga to paved standard and construction of Kipumbwi-Segera road) is the most viable option followed by Option A (upgrading of Makurunge-Gama-Mkwaja-Pangani -Tanga to paved standard). Option D however, have the added link that increases the construction cost with about US\$70 million. Options B and C are both viable for the optimistic scenario being above 12%.

6.3 Conclusion

After a thorough scrutiny and analysis, taking into consideration the sensitive Saadani ecosystem, the best option to be built is option C. The route for this alternative follows the existing road from Makurunge to Gama. After crossing the Wami River, it follows the Wami River upstream to Matipwili. After Matipwili, the route turns away from the river and passes through the Zaraninge forest, which is part of Saadani National Park to Mkange. From Mkange the route follows the same way as option B, through Kwamsisi to Mkwaja towards Tanga. This option includes 5 river bridges and 3 rail bridges. This access provides shorter access to Saadani from Bagamoyo but lengthens the distance to Tanga from Bagamoyo by 46km. Therefore this option is longer than the existing road by 46km.

The designed road is therefore 229km out of which, construction of 50km from Tanga – Pangani will be financed by the Government of United Republic of Tanzania and construction of 120km from Pangani – Tungamaa – Kwamsisi and Pangani Bridge will be financed under the AfDB loan in collaboration with the Government of Tanzania. The remaining road section of 59km will be constructed when funding is obtained.

7 IDENTIFICATION, ASSESSMENT OF IMPACTS AND PROJECT ALTERNATIVES

7.1 Project Boundaries

7.1.1 Spatial Boundaries

The spatial dimension encompasses the geographical spread of the impacts regardless of whether they are short term or long term. The spatial scale considers the receptor environmental component and can be local or broader. Three zones of impact were defined in these include;

- **Direct Impact Zone (DIZ):** This is the Right of Way of the project road which includes 22.5m either road sides for the main road and 30m either road sides for Bypass roads from centerline (i.e. 45 and 60m in total); sites for borrow/ quarry materials, camping etc.
- **Immediate Impact Zone (IIZ):** These are immediate surrounding areas about 500m on both side of the road (villages and streets along the road).
- **Area of Influence (AI):** This includes the wider geographical areas that are influenced by this project (e.g. Bagamoyo, Chalinze, Pangani, Muheza and Handeni Districts).

7.1.2 Institutional Boundaries

From an institutional point of view, TANROADS has the responsibility of developing and maintaining the road. Currently, the project road is under the jurisdiction of the TANROADS Regional Managers of Coast and Tanga Regions. The road construction works will be handled by TANROADS HQ while TANROADS Regional Offices will handle the operation and maintenance of the Project road.

7.1.3 Temporal Boundaries

Temporal boundaries refer to the lifespan and reversibility of impacts. For example, the impact of construction work for the project may be short-lived, but the presence of this infrastructure may have implications that stretch far into the future. Therefore, some of the impacts that may occur during construction, e.g. noise, dust and alike caused by bulldozers will disappear as soon as the construction phase is completed. The construction period will last for not more than 3 years while the operational phase is designed for 20 years unless unforeseen event occur.

7.2 Impact Identification

The impacts are categorized into project implementation phases i.e. Pre-Construction phase impacts, Construction phase impacts and Operational phase impacts. The main receptors of impacts associated with the anticipated infrastructure upgrading include physical resources (hydrology, surface water quality, soils, air quality and noise); ecological resources (vegetation); material assets, public health and safety, aesthetics and landscape.

The following impacts associated with pre-construction phase were identified and predicted:

- Job creation and increased income.
- Land expropriation, loss of property and destruction of settlements/buildings

The following impacts associated with construction phase were identified and predicted:

➤ Positive Impacts:

- Job opportunities and increased income
- Develop new skills and diversification of skills
- Inter-marriages with people outside project area.

- Increased income levels of community members and revenues of local authorities as a result of compensation payments, diversification of economic activities and stimulated investments.
- Increased interactions with newcomers which can bring new development ideas and knowledge in the region
- Opportunity for women to undertake food vending and other petty trades.
- Implementation of complementary community support projects (**Annex 5**)
- Reduce traffic volumes of public vehicles passing through the park.

➤ **Negative Impacts**

- Destruction of public utilities i.e. water, power, gas, communication cables.
- Soil erosion and slopes instability.
- Risks of water and land pollution.
- Increased childhood pregnancies and school dropouts
- Loss of income/bussinesses
- Increased street children
- Loss of archeological and ritual sites
- Family instability/conflicts and separation
- Increased crime rates
- Interference in Cultural, traditions, norms and ethics
- Increased noise, vibration and air pollution. Increased occupational health and safety risks
- Impaired security in the Region due to threat of penetration of terrorists, unknown people and refugees
- Increase road accidents
- Increased generation of solid and liquid wastes
- Increased water abstraction.
- Loss of definite materials
- Loss of vegetation cover.
- Child labour/abuse
- Sexual abuse or harassment
- Increased spread of HIV/AIDS, STDs, STIs and TB.
- Competition over available resources due to increased population influx.
- Visual intrusion by dust and smoke during construction phase.
- Open exhausted Borrow Pits and quarry sites.
- Loss of natural habitat of animals and breeding sites.
- Environmental and land degradation

The following impacts associated with operation phase of the project were identified and predicted:

➤ **Positive impacts**

- Easy transport and transportation of goods.
- Decreased price of goods and services
- Reduced maternal and infant mortality rates
- Economic growth and revenue collection due to increased trade and business opportunities
- Expansion of towns and centers
- Attract investors in various economic sectors
- Improved living standard due to improved housing standard and money circulation
- Increased women opportunities in economic activities including self-employment, vending or petty trade
- Expansion of the markets for
- Easy access to social services like hospitals, markets, and schools

- Increased values of goods.
- Improved social services
- Reduce travelling costs and time
- improved air quality due to disappearance
- Reduced vehicles operation and maintenance costs
- Reduction of road accidents due to increased road safety
- Campsite facilities handed over to Local Authority upon project completion project.
- Increased tourism operations at Saadani National Park, and Archeological sites of Tanga, Pangani and Bagamoyo
- Improved international trade and communication
- Improved drainage systems for storm water
- Improved Accessibility to Agricultural and forest products.
- Enhance management and monitoring of the Park and forest reserves

➤ **Negative Impacts**

- Interference to local hydrology.
- Increased rates of natural resources exploitation.
- Increased crime.
- Involuntary resettlements and destruction of houses
- Interruption of services such as water, telecommunication, gas and electricity
- Interference with traditional and cultural norms,
- Dust, soil and air pollution
- Deforestation and destruction of animal habitats

7.3 Impact Rating

Taking into account the criteria stated in methodology section, a simple matrix with the following ratings was used to determine significance of the identified impacts stated in Section 7.2 above:

- | | |
|------|------------------------------|
| +3 | -Very high positive impacts. |
| +2 | -High positive impacts. |
| +1 | -Minor positive impact. |
| 0 | -No impacts. |
| -1 - | Minor negative impact. |
| -2 - | High negative impacts. |
| -3 - | Very high negative impacts. |

Table 31: Environmental and Social Impacts Matrix

		Impact Rating Criteria					Impact Significance Rating			
S/N	Environmental parameters/Impacts	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Mobilization Phase	Construction Phase	Operation Phase	Decommissioning Phase
NEGATIVE IMPACT										
	Destruction of public utilities.	L	ST	R			-1	-2	0	0
	Interference in Cultural, traditions, norms and ethics	LT	IR	IR	✓	-1	-2	-2	-2	0
	Soil erosion and instability of slopes.	L	ST	R			-1	-2	0	-2
	Increased childhood preginancies and school dropouts	L	MT	IR	✓		-1	-1	-1	-1
	Water, Air and Land Pollution.	L	ST	R	✓		-2	-2	-1	-1
	Increased noise and vibration.	L	MT	R	✓		0	-3	-1	0
	Occupational health and safety risks.	L	ST	R			-2	-2	0	-2
	Increase road accidents.	L	MT	R	✓	✓	0	-3	-3	0
	Solid and liquid Wastes generation.	L	ST	R			-3	-3	0	-3
	Increased Water Abstraction	L	ST	R		✓	-1	-3	0	0
	Land expropriation, loss of property and resettlement.	L	LT	R			-3	-3	0	0
	Increased values and prices of goods.	R	MT	R			0	-2	-2	0
	Loss of Definite Materials	L	LT	R		✓	-2	-2	0	0
	Loss of Vegetation cover	L	MT	IR		✓	-3	-2	0	0
	Child Labour and abuse	L	ST	R	✓		0	-2	-2	0
	Increased spread of HIV/AIDS, STDs, STIs and TB.	R	LT	IR	✓	✓	-1	-3	0	0
	Competition over available resources due to increased population influx	R	LT	R	✓		-2	-3	-1	0
	Visual intrusion by dust and smoke during construction phase.	R	ST	R	✓		0	-3	0	0

S/N	Environmental parameters/Impacts	Impact Rating Criteria					Impact Significance Rating			
		Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Mobilization Phase	Construction Phase	Operation Phase	Decommissioning Phase
	Dangers caused by open Borrow Pits and quarry sites	L	ST	R			0	-3	-1	0
	Interference to local hydrology	L	LT	IR			0	-2	0	0
	Increased Rates of Natural Resources Exploitation	L	ST	R	✓	✓	-2	-2	0	0
	Loss of natural habitat of animals and breeding sites	L	LT	IR	✓	✓	-2	-3	0	0
	Increased Crime rates	L	ST	R			-2	-3	-2	
	Settlements in the Road Reserves	L	LT	R		✓	0	0	-3	0
	Family disputes and instability/ increased marriage divorces									
	Gender violence and Sexual harassment	R	LT	IR	✓	✓	-1	-2	0	0
	Environmental and land degradation	L	MT	R	✓		0	-3	-1	0
	Loss of archeological and ritual sites									
	Impaired security in the Region due to threat of penetration of terrorists, unknown people and refugees	L	MT	R	✓		0	-1	-1	0
POSITIVE IMPACTS										
	Job creation and increased income.	R	ST				+3	+3	0	0
	Easy transport and transportation of goods.	R	LT				0	0	+3	0
	Economic growth and trade.	L	MT				0	+2	+3	0
	Creation of job opportunities during construction phase.	L	ST				0	+3	0	0
	Easy access to and expansion of the markets.	N	LT				0	0	+3	0

		Impact Rating Criteria					Impact Significance Rating			
S/N	Environmental parameters/Impacts	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Mobilization Phase	Construction Phase	Operation Phase	Decommissioning Phase
	Improved Accessibility to Agricultural and Forest Products.	R	LT				0	0	+3	
	Enhanced Socio-Cultural Interaction.	N	LT				0	0	+3	
	Enhance Management and Monitoring of the Park and Forest Reserves.	L	LT				0	0	+3	
	Diverting traffic volume of public vehicles outside the Park	R	LT				0	0	+3	
	Implementation of Social support Complementary activities	L	LT				0	0	+3	

Key:

- **Spatial Scale:** Local (L), Regional (R), National (N)

- **Temporal Scale:**

Short Term (ST), Medium Term (MT), Long Term (LT)

- **Reversibility:**

Reversible (R), Irreversible (IR): Significance: Highly Adverse (-3); Adverse (-2); Mild Adverse (-1); No impact (0); Mild Beneficial (+1); Beneficial (+2); highly Beneficial (+3);

The team focused on significant positive and negative impacts that were rated +2, +3, -2, -3 and developed mitigation measures and ESMP for them.

7.3.1 Pre-construction Phase

Positive Impacts

- **Job Creation and Increased Income to Local Communities**

During this phase people shall be employed by the contractor to do mobilization works such as construction of camp sites, quarrying and material extraction and transportation activities etc. About 80 people shall be employed during this phase. This shall increase the income to all those who have the opportunity to be employed by the contractor.

Negative Impacts

- **Land Acquisition and Resettlements**

The proposed project road traverses in a built up centres. In order to obtain construction corridor some people's properties must be displaced. The project also has several bypasses in which land acquisition is required to obtain construction corridor. According to the detailed design both the main road and the proposed project alternative routes have shown that, land acquisition and subsequent resettlement shall occur in order to pave the road. Land acquisition and/or relocation will be required in areas where social utilities and residents or services. Land acquisition will also be required for borrowing materials (sand, aggregates, and gravel) and construction of camp sites for Contractors and Consulting Engineers.

7.3.2 Construction phase

Negative Impacts

- **Increased Water and Soil Pollution**

Whichever construction method used, small-scale and short-term water pollution may occur, especially during construction of bridges and culverts at Pangani River crossing and other streams. Construction of off-road drainage structures shall also be a source of pollution. Other sources of pollution can be accidental spillage of fuels and construction materials, which may pollute both water and soil. Culvert construction may stir riverbed deposits into suspension. Though the large particles may settle quickly, the finer ones will increase the turbidity of surface water sources. The turbidity impacts may be short-term since the stream construction takes place within a few weeks. Construction works shall make use of the locally available water sources for construction. Pollution may occur in the sources during water abstraction.

- **Soil Erosion and Instability of Slopes**

Soil erosion generally takes place where ground cover is removed and inadequately re-established. The construction of the proposed project shall lead to soil erosion at the following areas: borrow pits, road cuttings, embankments, construction camps etc. Soil erosion may affect the road stability, and increase flood risk due to rapid and higher flowing volumes of runoff, silting up of water bodies, landscape value and in worst cases may reduce the economic productivity of land and biodiversity in the project area. The impacts of soil erosion would be temporary and moderate negative if stripped soils are stored and reused properly. Poor management of other catchment area can cause impacts in the project area leading to the same effect such as floods, siltation of structures among others.

- **Air Pollution**

Various forms of air pollution is anticipated to occur during the development and operation of this project. The main sources of pollution during development will be:

- ✓ Excavation and quarrying activities which will pollute the air by generating dust particles, flying stones and noise. Air pollutant from these sources shall be accentuated with operation of crusher

and asphalt plants, and general earth works at the site which shall also generate exhaust fumes from fuel used or materials being processed such as bitumen and other chemicals to be used.

- ✓ Movement of vehicles which will generate noise, exhaust fumes and dust
- ✓ Stock piling of materials which will generate fugitive emissions in form of fine to large dust particles,

Dust and fumes will have major direct but short-term impacts during the project construction phase. The area adjacent to the project roads relatively open, without impediment to air movement hence dilution levels of air pollutants will fast. Vegetation on farms along the road is likely to be affected. Leafy vegetation in areas far from the road should be able to filter out a considerable content of low level air borne pollutants. Thus, ventilation and vegetation are anticipated to lessen the air pollution problem. Water palliation during construction work shall further lessen generation of dust, and consequently alleviate the air pollution problem.

- **Noise and Vibrations**

Noise will be produced by construction vehicles, plant and machinery during delivery of materials, processing of materials, and actual construction work. Due to an increase in activities and number of operational vehicles, the impacts of noise will cause disturbance to humans and animals as well as birds. Vibration may even cause physical damage to those near the construction site. The vegetation and loose soil along the roads in the project area have the potential for damping noise. As such, noise impacts will have short range – near the construction site apart from highly settled areas like in Pangani. Dust will be a temporary nuisance to the people within the core impact area especially during construction in the dry season.

- **Increased Spread of HIV/AIDS**

The main health risk associated with road projects is the spread of HIV/AIDS epidemic. Considering the socio-economic as well as geographical characteristics of the project area, there exist a number of parameters that either may influence a high infection rate, or deter efforts to combat the epidemic. For example, the problem of low or irregular incomes among young women aged 15 – 45 years is a HIV/AIDS risk factor, which can influence high infection rates in the project area. At the same time, the existence of poor road networks in the villages found along the project road hinder the dissemination of information, education and communication on the prevention of HIV/AIDS to reach people in the interior rural areas.

Local people at the project area were concerned about the influx of people into the area including construction workers. This would result in an increase in the incidence of diseases including STI, and HIV/AIDS. This would also lead to an increased pressure and demand on social services. They also pointed out that misuse of the compensation funds by the property owners may lead to spread of HIV/AIDS.

To some extent the improved road is expected to stimulate creation of self-employment activities for unemployed women which empower them economically thus reduce them from engaging in work that exposes them to the virus. This will reduce the HIV/AIDS infections in the project areas especially to sexually active women.

The road project is also expected to facilitate the dissemination of HIV/AIDS education and prevention information to the majority of people living in the villages thus plays a role in curbing it. Generally the road will be very useful for saving the lives of people who might succumb to HIV/AIDS including the economically active young people.

- **Safety and Health Risks**

Roads construction activities normally exposes the labourers and the general public to bronchial and other respiratory tract diseases if measures such as water palliation, use of safety gears are not practised during construction and using of closed materials ferrying systems. This can result to loss of lives or injuries during construction. The incidence rate of water borne diseases such as cholera and diarrhoea might increase if proper sanitation practices at the camps and roadside are not observed. Leaving opened grounds such as borrow pits and quarry site shall lead to development of water borne

disease vectors breeding sites for disease transmitting vectors such as mosquitoes and filarial worms. The impact has a long-term significant effect to the health of local communities. For example, standing waters could stimulate growth of *Culex* mosquitoes, which transmit filarial worms (*Wuchereria bancrofti*). The filarial worms are known to cause Lymphatic filariasis (*Elephantiasis* or “*matende*” in Kiswahili). Elephantiasis causes swelling of legs, vulva, breasts and scrotum (“*busha*” in Kiswahili). The project area is known to be home to wildlife such as elephants, crocodiles in Wami River and snakes. A tsetse fly prone area is also found around Kwamsisi. It is recommended that the workers are provided with the right gear and the park warden is consulted before working in areas near wildlife corridors so as plans on training and other mitigation measures are devised.

- **Increased Road Accidents**

Increased traffic during construction and poor road safety measures like absence of diversion (where necessary), signage during construction and road safety awareness campaigns will result into unnecessary road accidents involving livestock and people especially school children and old people. For instance the Village located next to the Pangani Ferry crossing is mainly occupied by old aged people, which makes them vulnerable to the accidents especially considering they are used to a low traffic road. During consultation, the community recommended that detour roads equipped with standard and adequate road signs should be provided and maintained during construction.

- **Interference with Local Hydrology and Increased Water Abstraction**

Construction of the road shall entail significant water abstraction from the river to be used for domestic and construction purposes which shall include dust mitigation in the local areas. This increase in abstraction of water will have negative impacts to the people living nearby and the local groundwater hydrology. However, this will be controlled by the Water Offices at the project districts which are responsible for regulating water use of all water courses in the region. The contractor will have to contact the Water Offices before any abstraction is undertaken.

Interference with the local hydrology can be a direct long term time impact if not eliminated during construction and to ensure the impacts are minimised, the roads interface should be constructed with the natural surface and groundwater flow regimes. Good design features should be adopted to ensure that the changes of the hydrological regimes are minimized and that any impacts are insignificant. The design should also provide controlled and effective storm water dispersion by indicating areas of installation of appropriate drainage structures. The discharges points should be well designed to avoid accelerate erosion downstream.

- **Loss of Definite Materials and Land Degradation**

Construction of the road will have direct impacts associated with excavation, quarrying and deposition of spoil material. Significant volumes of earthworks fill; road gravel and rocks will be extracted during project execution. Since the road will be constructed to bitumen standard, then, significant use of definite materials is expected.

Quarrying involves clearing the vegetation at the sites, excavation and transportation of the material. Thus, borrowing and quarrying activities will cause habitat change, land degradation (due to removal of fertile top soil), landscape impairment (visual intrusion) and soil erosion-which lead to siltation of waterways. Quarrying, excavation and the disposal of spoil material can destroy the economic and aesthetic value of public and/or private property including land. Some species may be affected during construction, but not to the level of extinction. However, establishment of detour routes during construction may damage some species.

Scenic quality deterioration will occur due to stock piling of construction materials and discoloration of plant leaves and houses in the vicinity of the roads due to windblown dust. Excavation work as well as presence of construction vehicles, plant and equipment will also add to scenic quality deterioration. Scenic quality deterioration will also occur off-site, at the sources of construction materials, the quarries and sand mines. If these are not made good they may become an eyesore. Scenic quality deterioration can destroy the economic and aesthetic value of public and/or private property including land. Scenic quality degradation effects will be significant, short term and direct. They will, in spite of everything, be

manageable given proper site operation and prior warning as well as issuance of site operation guidelines.

- **Loss of Natural Habitats**

The Saadani National Park is very unique destination where the Indian Ocean meets with the bush. The actual audit of the natural ecosystem cannot be quantified to the exact figure, but it is known that the park together with its associated forest this is South of Zaraninge forest and North Mkwaja covers a total area of 1,000sq kilometres. The park is also known to be rich in wildlife and coral reefs found along the beach. The proposed road section to be implemented does not cross the Zaraninge Forest. The road is located from a distance of about 72 km from the forest. However, attention is required to ensure that biodiversity (Flora and Fauna) found within the forest and the entire Park is not adversely disturbed.

Land clearance to obtain the a 7m carriage way and detours to provide access to traffic during construction phase will involve uprooting trees and crops which falls within the right of way as well as excavating masses of topsoil. Though the entire road reserve of 45m shall not be cleared in the near future or current design span of the road, they shall be cleared when need of expanding the road occurs to develop other social amenities or expanding the road to accommodate other forms/modes of transport. This shall entail significant clearance of the vegetation found within the forest and park.

Other activities that might lead to forest degradation and reduction of wildlife during project implementation are timber logging for construction, biomass harvesting for fuel, poor waste management and hunting of wildlife for food or sale. It is due to such impacts that the consulting team identified alternative routes. It was noted development of option A shall attract several adverse impacts to the natural ecosystem which will lead to long term and cumulative impacts to the areas micro-climate and livelihoods of the locals dependent on the ecosystem. Some of the notable livelihood impacts shall include:

- **Catchment Degradation:** Clearance of vegetation leads to catchment degradation through erosion due to uncontrolled flow of storm water on bare land without undergrowth; and degradation of water towers due to lack of water retention for infiltration into topsoil's and aquifers. This in turn leads to contamination of water bodies with silt which affects aquatic life, river bed levels leading to breaking of banks thus flooding of other areas and also leads to damage of other road structures.
- **Change in areas micro-climate:** This shall occur if clearance of vegetation is intensified through charcoal burning, timber logging, and uncontrolled fires among others by the construction team. This will in turn lead to reduced carbon sequestration due to lack of carbon sinks thus increase global warming which will in turn lead to unreliable rainfall thus affect agricultural productivity of the area and in turn reduce the locals sources of incomes which will eventually lead to increased poverty levels and dependency which is counter to the project's objective. Amount of carbon-dioxide in the air is likely to increase due to the increase traffic which shall accentuate the situation.
- **Reduction in fish spawning grounds:** Destruction of the mangrove forests and disposal of wastes including both liquid and solid into the ocean and other bodies shall lead to destruction of the fishing area and their reproduction cycle thus reduce fish populations. This will affect the fishermen's livelihood as they would be forced to go much further into the Ocean to fish and only to get small volumes of fish. Deep sea fishing is an expensive venture which will eat into the locals' earnings and due to small volumes fished majority shall be driven out of the business. Mangrove trees are known for their buffering function as they filter out impurities as water enters the ocean and their destruction shall affect the marine environment in the Coastal strip as waste shall freely flow into the ocean thus destroying the corals and aquatic animals' habitats and breeding sites. The green turtles and other aquatic wildlife shall also be affected as their ecosystem which includes their breeding sites located 500m from the beach shall be damaged. The seas turtles found in the East African coast lines in between East Africa and Australia and interfering with their breeding cycles also means interfering with environments of other members that share the same ecosystem.
- **Reduced tourism:** Destruction of the Saadani National Park shall make it less attractive to the visitors which will in turn reduce earnings to the country and workers dependent on the sector. Majority of the tourists coming to Saadani are those that like conservation tourism thus changes to it might affect earnings from the visitors.

- **Socio-cultural interference**

Potential socio-economic impacts resulting from an influx of job seekers into work place, including potential competition for resources and the delivery of social services, disruptions to social fabric, public health impacts such as the transmission of infectious diseases, HIV/AIDS and STDs, effects on women and economic impacts such as increase in price of goods. Also due to incoming people looking for employment during road construction, there is possibility of interference to traditional norms, culture and ethics that may result to moral deterioration.

- **Climate Change**

Factors likely to lead to climate change due to project implementation are;

- Emissions from vehicles, machines and equipment due to efficient combustion systems and use of unclean fuels. Emissions to be emitted shall include NO_x (Nitrogen Oxides), SO_x (Sulphur Oxides), Ozone (O₃), Carbon Monoxide and the notorious Green House Gas Carbon dioxide. These pollutants have different impacts on the stratosphere leading to climate change such as increased temperature, acid rain and impacts on human health. They also destroy the Ozone layer leading to direct radiations that can cause skin cancer.
- Lack of appropriate project plan in regards to transportation of project workers and use of vehicles, materials, equipment and other supplies. If not well planned the emissions levels from the gadgets shall be high thus contribute to climate change.
- Ozone Depleting Substances (ODS) due to the use of halogenated compounds chlorofluorocarbons (CFCs), hydro-chlorofluorocarbons (HCFCs), methyl bromide, carbon tetrachloride, and methyl chloroform found in cooling system in the vehicles and, refrigerators, fire extinguishers and other machines and equipment. The release of ODS will result to formation of dioxins and other uncontrolled substances which will thus affect the climate by depleting the ozone layer. Impacts of dioxins are known to be long term as they can exist in the atmosphere for years moving slowly to the stratosphere. Depletion of the ozone layer causes increased amounts of UV radiation to reach the earth which can lead to more cases of skin cancer, cataracts, and impaired immune systems. Over exposure to UV is believed to be contributing to the increase in melanoma, the most fatal of all skin cancers.
- Clearance of vegetation
- The magnitude of climate change related to emissions are anticipated to be low at this phase of the project and can be eradicated by implementing cleaner production mechanism as mentioned in the mitigation measures.

- **Loss of Vegetation and Environmental Degradation**

The construction of a road support structures such as bridges will involve clearing of river riparian vegetation and soil excavations. The degree of perturbation is expected to be high when heavy moving equipment/machinery are used. The degradation of riparian vegetation jeopardizes water sources sustainability for locals use as it allows direct flow of contaminated water into the natural water source. This will include run-off from cultivated farms, sanitation facilities upstream may be carried out to the water bodies hence contaminating it. Some sections of the road traverse along the virgin land where there is no defined road. Vegetation clearance is inevitable during construction of roads. During consultation the community pointed out that there are trees planted along the road which will be cleared to pave the way for road construction. They further proposed that, the project should include the component for tree planting so as to recover the lost vegetation and maintain the scenic view of their environment.

- **Population influx**

Construction projects attract people from different areas seeking for job and for investment opportunity. This project shall require a labour force of more than 1000 people. The influx of this number to the community may result to the following:

- **Increased crime;** the road construction will attract people from different places to the project area by which not all incoming people will be employed by the project and not all are coming in to seek for job. Believing that people are earning money from the project, thieves and robbers will increase. Drugs business may also increase.
 - **Increased street children;** many workers are moving to the project site without their families which may cause them to engage into sexual interaction with young girls and women along the project area which may result to some children. When the project is decommissioned, men are moving back to their families and leave the children with their mothers. Since most of the families are poor, they cannot afford to take care of the kids and hence increase street children.
 - **Family disputes and instability;** this mainly occur after compensation where men may decide to get married to other wives than the original wife. Community pointed out that due to coast culture many men may abandon their families and start new relationships after getting money. They also show the concern on the possibility of their wives being bribed by the construction workers as they are getting money than their husbands.
 - **Increased childhood pregnancies;** due to the nature of the project site, many children are working a distance to access schools. There is a possibility that the school girls are raped or bribed by construction workers that may result to school dropouts due to pregnancies.
- **Destruction of Public Utilities**

Several utilities such as water pipes, electric poles, telecommunication cables etc. are installed along the project road. During construction these utilities may occur as there is no sufficient information to show location of the utilities especially underground utilities. Utilities will be relocated to the safe side to pave the way for construction of the project. During relocation it is anticipated that services will be interacted for some time.

- **Loss of Income**

The project will involve resettlement of all properties along the project road including businesses and the like. The relocated business men will lose income as they will be relocated to the new areas. Also there are vendors who are selling their businesses along the road whose business will be interfered during construction by lack of accessibility.

- **Loss of properties and ritual sites**

Many properties will be displaced to obtain the construction corridor for the road. These properties range from residential buildings, commercial, plants and land. Several graves shall also be affected by the proposed road that will necessitate their relocation. Also public properties such as mosques, churches and schools shall be affected. The owners shall lose their properties though compensation will be done as required by the law.

- **Increased waste**

Construction works are associated with production of wastes ranging from solid to liquid wastes. Solid wastes include debris resulted from clearing and grubbing, packaging materials such as cement and lime bags, used tires, metal scraps, used lead acid batteries, used filters, office wastes, food wastes, etc. liquid wastes anticipated are used oil, sewage etc. The quantities are provided in chapter two of this report. These wastes if not well handled can change the aesthetic nature of the project area and can even lead to water pollution in case of improper disposal.

Positive Impacts

The operation phase of the project is associated with several positive project multiplier effects which are the main objective of developing a road of such magnitude. These positive impacts are discussed below.

- **Job Creation and Increased Income to Local Communities**

Road operation and maintenance shall generate both direct and indirect employment opportunities. Direct employment will be to those working on the road during maintenance and shall be engaged in skilled and non-skilled labour such as engineers, surveyors, labourers among others. Activities to be undertaken at this stage shall include grass cutting, cleaning drainage culverts, etc.; as well as some clerical / low level supervision jobs. Such employment would contribute to poverty reduction, especially for women. The operation of the road shall create jobs by attracting other socio-economic infrastructure or businesses to the area.

- **Develop new skills/diversification of skills**

The project shall employ many people others with specific skills and others without skills for casual jobs. Workers may develop new skills at work as there are varieties of jobs done during construction. Many skills of different types will be obtained from the project that may be applied to get income after the project.

7.3.3 Operation Phase

Negative Impacts

- **Increased Noise, Vibration, and Air Pollution at Operation Phase**

Air pollution will be evident during the operation phase of the road due to fuels and other chemicals emissions from vehicular traffic and, maintenance works machinery and equipment. The emissions to be released include particulate matter, NO_x (oxides of Nitrogen), SO_x (oxides of sulphur), Ozone Depleting Substances (ODS) and carbon monoxide and the notorious Green House Gas Carbon dioxide. The chemical emission is likely to be washed by rainfall to water sources and adjacent soils. However, the magnitude of the pollution is considered to be very low.

Noise is one of the most obvious negative impacts of daily road use. The discomfort caused by noise includes auditory fatigue and temporary lessening of hearing ability. However, perceived noise is related to background noise level, so that new roads in quiet areas or noisy trucks at night are often perceived as worse than higher levels of noise in a busy area during a working day. For this project road, the noise and vibration impacts will be reduced due to improved road surface. In addition, since the vehicular density is low, it is therefore considered that the perceived effect on traffic noise and vibration effects will likely be greatly reduced.

The effect on air quality due to the increased traffic flow is considered to be significant if no maintenance program shall be instituted. Under good maintenance schedule, traffic exhaust emissions, will be intermittent and atmospheric dispersal of exhaust emissions will affect the air quality. However, concerted effort to check engine performance is needed so as to deter vehicles not road-worthy from using the road.

- **Increased Road Accidents**

Road deaths, injuries and damage to property are most tangible negative impacts on the community environment and may be reduced or increased as a result of road projects. The project roads transverse villages and the effects the road causes on safety in these settlements are dependent on location.

Increased traffic and speed driving will result into unnecessary road accidents to livestock and people especially school children and old people. The main causes for accidents are poor road conditions due to lack of maintenance, reckless driving, defective vehicles, drunkenness, poor road facilities for the pedestrian and cyclists and unqualified drivers.

Vehicles travelling at increased speeds will make it difficult for road users to cross the road, particular animals, children and elderly people will be at risk of accidents.

Bearing in mind that part of this road passes through the National Park, its improvement may result into increased animal hitting frequency due to over speeding of vehicles crossing the park.

- **Increased Rates of Natural Resources Exploitation**

Increased accessibility to the forest-rich project area will propel the exploitation rates of forest products and animal poaching. Inadequate control of these vices may lead to increased deforestation and declination of animal population in the area that will affect ecology of the area and the livelihood of the people as discussed under section on land degradation above. Forests and general catchment degradation leads to increased siltation and storm water run-off which affects the road structure, drainage structures and stability of bridge.

- **Increased Crime**

Improve road is more likely to attract more advanced criminal activities in the project area. Criminals will be able to move faster in the project area. The life of residents will be at a higher risk than the currently situation. Advanced weapons are more likely to increase. Influx of job seekers of all ages and subsequent crime poses a threat to security in the project area. Other crimes likely to occur shall include illegal hunting, poaching, timber logging, illegal harvesting of forest products and charcoal burning.

- **Settlements on the Road Reserves**

Areas with efficient roads normally attract large numbers of people some of who decides to settle or conduct business on the road reserve. This is normally done with a conscious mind on the assumption that it is no one's land and/or that the road authority shall not develop the road in a long time and also since most traders believe their clients are found near the roads thus their business have to be adjacent to the road . Such people normally expose themselves to several road hazards including accidents and pollution. Such settlements if not controlled can grow so rapidly that it affects any plan of further road development in terms of compensation of those to be relocated and it consumes lots of the road develop planning time. Such settlements in most cases are normally unplanned with no basic services such as water sewer and solid waste management, which lead to the use of the road, drains and neighbouring area as dumping grounds which affects the performance of the road.

Positive Impacts

- **Improved Transport and Economy of the People**

The road will facilitate easy transportation within the project area as well as increasing communication among the communities along the project road. The improved road would be particularly beneficial to passengers and cargoes where journey time will be shortened. The road will open up inter district and inter region markets for the agricultural product and forest products. Currently, one has to go to Segera to reach Bagamoyo or Dar es Salaam from Tanga which consumes a lot of human and economic resources. The proposed road shall shorten the route to reach Bagamoyo and Dar es salaam reduce unnecessary traffic that goes to Dar-es-Salam which will in turn reduce traffic jams along the Segera – Msata – Dar es salaam road.

Local businesses will grow due to increased demand of both local and other commodities triggered by increased number of people living in the villages and road users as well. The new bridge and improved road is expected that will attract more investment on vehicles providing services along the road therefore prices of travel will be lowered and will save time spent on journey.

At present vehicle owners incur high operating costs such as high fuel consumption and frequent need to replace parts such as the suspension system due to the condition of the road. Moreover, during wet season, the road is not passable therefore sometimes fuel consumptions become high. There will be an increase in the number of vehicles plying the Bagamoyo to Arusha and Tanga route thus lowering transport costs.

- **Improved Community Life and Services**

Several socio-economic infrastructures shall be developed due to the project and will lead to accrue project benefits in various sectors such:

- **Health:** Improved transportation will enable easy delivery of drugs/medicines to health care facilities. The proposed road will facilitate patients in the villages along the road project to receive faster medical attention (especially emergency cases). The community pointed out that construction of the road and Pangani Bridge will reduce maternal and infants mortalities as many pregnant women and children below 5 years die due to lack of emergency facilities for crossing Pangani River at night after 10 pm. Health workers will enjoy easier access to work than before. The roads will facilitate easy access to health centres, and thus lives of some patients will be saved. The road shall also open up the areas for development of more health facilities both by government and the private sector.

Bitumen roads will reduce current level of dusts experienced in the villages and settlement centres. In so doing quality of settlement will increase and health of the people living in the villages and towns will also improve.

- **Education:** Most of the school in the area are located in the major towns. The situation gets worse as during the rainy season children and teachers cannot cross the floodplain at Wami River and therefore miss classes. The construction of the bridge shall ensure reliable transportation of students and teachers throughout the year. Also teachers and other public workers shall be attracted to stay due to accessibility of the areas. Currently, there are insufficient public workers due to poor working environment and mostly lack of accessibility.

- **Improved Accessibility to Agricultural and Forest Products**

This is one of the core missions of the project i.e. to open up the area in order to stimulate economic growth. Throughout the world, roads are built to bring benefits to community life and economic activities, for example through improved access, lower transport costs, and better markets for local products and services. The road development would bring about a greater range of transport opportunities to agricultural, forest products and livestock products and improve communication links that are vital for economic endeavour.

The road shall link the areas to markets as it produces several food and cash crops and it has fisheries reserves. The roads may also enhance the viability of new types of industries in the area, especially agro-based industries. The villages along the road are very famous for cultivation of maize, coconut, pineapples, and maize among other. A sugarcane factory has been proposed around the Wami area and its operation shall be enhanced with the proposed road and bridge especially in transporting finished products to the markets and when collecting raw materials from the farms.

- **Enhanced Socio-Cultural Interaction**

The implementation of the project will bring many people from different cultural backgrounds. Such interactions may bring about social changes in the communities along the road. Interaction with technocrats will stimulate adoption of the new technologies. Also, local people will acquire skills from the road workers during constructions and after implementation they will get from visitors. The skills and acquired knowledge shall be implemented locally thus lead to the development of the project area.

- **Enhance Management and Monitoring of the Park and Forest Reserves**

The development of the road shall open up the area and make forest areas which are currently inaccessible by the forest and park wardens to be easily reached. This shall enable the officer's control illegal logging, charcoal burning, uncontrolled forest fires, poaching, water uses among others

- **Increase of values and prices for goods**

An increase of people from various parts for the road project will also increase demand for goods such as food, accommodation, water, drinks and other basic needs. In case there will be short supply

compared to demand, the prices of goods will tend to go up and this will be beneficial to the local communities because their goods will fetch high prices, which will in turn, help them to meet other needs for their families. The community pointed out that, since this road will be the shortest route to Dar es Salaam many busses will be passing through that route and so passengers will be buying goods from their centres. Also the products can reach the market while fresh which can increase its value.

- **Reduced travelling time**

Due to poor condition of the road, users spend a lot of time to travel because the drivers are forced to drive slowly. This costs travellers in terms of duration and expenses especially heavy trucks with goods to the market, passengers and patients. The improvement will facilitate drivers to drive faster and serve time and expenses to reach their destinations and also save life as patients can reach the medical facility easily.

- **Reduced road and vehicles operation and maintenance costs**

Improved road will be advantageous not only to TANROADS but also to owners of vehicles or road users because it will tremendously reduce the costs for maintenance of the road and the vehicles because of reduced breakdown caused by poor road condition. Besides, maintenance costs of the paved road will be as compared to the gravel road which requires regular and periodic maintenance more than two times annually, especially during and after rain seasons.

- **Reduction of road accidents**

The road will be constructed based on standard and therefore it will be of high quality. It will be different from the current road in the sense that it will be wider than the present road, and surfaced. It is anticipated that some corners will be reduced which will allow drivers to have good sights or views from a distance. Climbing lanes shall be provided to accommodate heavy vehicles that climb with small speed to allow those moving with high speed to overtake without causing accidents. Standard signs shall be provided together with the walkways and pedestrian crossing to avoid accidents. At the schools also standard signs together speed reduction options will be applied to make the road safer to school children.

- **Campsites after decommissioning of the project**

Contractors are expected to locate appropriate places where to establish campsites and construct buildings for multiple uses including offices. It's anticipated that these buildings will remain and be beneficial to the government institutions or adjacent villages after completion of the project. In this respect, a suggestion was made that contractors should construct their buildings with permanent materials so that such buildings become useful and handed over to the government.

- **Economic growth and trade**

The improved road condition will contribute to the growth of local economy as well as regional and national economy. The business for different goods will be expanded because people will increase and explore different business ventures or interests. The project will help to promote trade at international level between Tanzania and Kenya.

- **Increased tourism operations**

Several tourism attractions are located along the proposed project road. The main tourism attraction is Saadani National Park. Others are the old and historical towns with a lot of historical attractions as indicated in section 4.3.7. Upgrading of this road will easy access to these tourists attraction areas and hence boost tourism industry and revenue collection and incomes of the local people who will be employed in tourist.

- **Reduced traffic volume of none tourists vehicles passing through the Park**

The proposed road project will help to reduce the number of normal/public vehicles (none tourists vehicles) that are now passing through the Park as public route and cause wildlife kills. On the other side public vehicles which are currently charged for passing within the Saadani National Park will get relief from being charged.

- **Implementation of Complementary Community Projects**

The proposed road project will be implemented together with some complementary projects with aim of enhancing the benefits of the project to the communities. These projects which will be implemented in some villages along the road include, education facilities/support (VETA), water supply, fish markets, health services, trees planting, etc (**Annex 5**).

8 IMPACT MITIGATION MEASURES

8.1 General Considerations

This section is devoted to describing measures or actions that shall be implemented so as to minimize any of the potential impacts identified earlier. Many of the mitigation measures put forward are nothing more than good engineering practice that should be adhered to during the design, construction and operation and maintenance period.

8.2 Mitigation Measures for Pre-construction phase

8.2.1 Land Expropriation, Loss of Property and Resettlement

As per the legal mitigation requirement on compensation and resettlement of Project Affected Person (PAPs) and their properties the study team has identified areas likely to be affected by the project and made an estimation of the number of people and properties to be affected. The following will be undertaken:

An inventory of property to be affected and their owners shall be developed. This shall include identifying the service lines in the project area;

Compensation shall be paid to the PAP's before commencement of construction works;

Affected people shall be assisted to settle within their villages as per the legal requirements discussed under chapter 2 on land expropriation and the development partner's policy namely the AfDB policy on involuntary resettlement.

8.2.2 Climate Change Mitigation

As part of mitigating against factors contributing to climate change the project components should incorporate "green development" components this shall include use of locally available resources such as solar and wind to generate electricity, development of water recycling systems in the camps and construction yards, use energy saving bulbs, provide enclosures with adequate natural light, re-plant trees in cleared areas among others.

To mitigate against climate change in addition to green development contractor should possess project equipment and machinery that are designed to abate pollution and its impact on climate change and this should be included as one of the selection criteria of contractor's assets. The key environmental management systems that should be considered when evaluating the contractor's equipment and machinery gadgets are;

- Age of vehicles.
- Components and type of fluids used in the cooling systems.
- Combustion efficiency of the engines.
- Emission and noise abatements gadgets in the plants such as existence of water precipitator in the mixers, enclosed conveyor systems, enclosed transportation systems, installed silencers among other pollution abatement technologies.
- Ability of machines to use or adjust to use of clean flues such as bio-fuels, low sulphur fuels, unleaded fuels among others.
- The above information should be supported with manufactures manuals devices, log books, inspections reports/certificates, calibration reports/certificates. Recommendation from previous clients among others.

8.3 Mitigation Measures for Construction Phase Impacts

8.3.1 Increased water and soil pollution

- Spillage of fuels and chemicals is a risk, but spillages are likely to be local and remediation should include bund their storage area, use of dispenser machines for fuels instead of pumps and pipes, avoid washing project vehicles and equipment's in water bodies, develop garage for repair of project vehicles and collect waste oil in containers for reuse or proper disposal, provide sealed washing basins and collect wastewater in sedimentation/retention pond with oil/water separators and maintain vehicles in proper conditions to avoid spillage.
- Spillage to watercourse is harmful to all living beings. In case of accidental spillage, the contractor shall exercise every effort in order to minimize the associated risks. For instance, refuelling of plant or transfer of materials should not be carried out near watercourses, and any local spillage to the soil should immediately be remedied.
- Good housekeeping should be practiced within material storage compounds or vehicle maintenance yards where the possibility of spillage is great.
- Undertake continue maintenance of piping system to ensure their integrity and avoid accidental spillage.
- The proponent will ensure that the construction work is confined within the RoW and water bodies are prevented from pollution during construction.
- Regular water quality monitoring should be undertaken according to determined sampling schedule;
- The contractor will ensure that construction debris do not find their way into the rivers and drainage channels which may get clogged and lead to several other impacts such as flooding, poisoning of aquatic flora and fauna.
- Avoid undertaking construction works in the water bodies during the rainy seasons as most materials and waste shall be washed into the river.
- To maintain the surface water flow/drainage, proper mitigation measures will be taken along the road, like drainage structures in urban areas.
- All wastes generated by the project should be collected, stored and taken to the approved disposal sites. Waste water discharged into the environment should meet recommended standards and sanitation facilities should be provided to workers both at the labour camp and at working sites including road sides.

8.3.2 Soil Erosion and Instability of Slopes

- .1 Ground clearance should be restricted to areas earmarked for the development and re-alignments of project to sensitive areas shall be avoided.
- Lined drainage channels at sensitive terrains should be provided to control speed and volumes of storm-water. The discharge points must be carefully chosen to avoid erosion of arable land and creation of gullies.
 - Rehabilitate borrow pits and quarries immediately after finishing with them.
 - Remove excavated materials and soils from site to avoid impacts of wind and water which will blow/wash them away thus impacting human health, vegetation, water bodies and even the road works.
 - The denuded ground cover should be re-vegetated as soon as possible following fill placement to facilitate regeneration of a stabilizing ground cover.
 - The road embankments and road cuttings should be vegetated with a fast growing crop and a native seed mix immediately after fill placement to prevent scour and to encourage stabilization.

Use of stone pitching or riprap shall be made at appropriate places especially around overpasses, bridges, culverts.

- Discharge zones from drainage structures shall be furnished with rip-rap to reduce erosion.
- Down drains/chutes shall be lined with rip-rap/masonry or concrete to prevent erosion.
- Side slopes shall be adjusted to a gradient necessary to reduce erosion potential or, if steeper, stabilized, covered with riprap or other material to prevent soil erosion.
- Construction shall be restricted to dry season to avoid soil erosion.
- Soil erosion checking measures such as the formation of sediment basins etc., shall be taken.

8.3.3 Noise, Vibration and Air Pollution

- The nuisance of noise, vibration and dust will be transient and good work practice can minimize them. In addition, most of these impacts are already being experienced due to the existing earth road however it should be ensured that the activities of the proposed road do not accentuate the situation.
- The impacts of noise and dust emissions will further be minimized by proper choice of plant and machinery (i.e. fitted with noise silences and dust arrestors) and locating quarry areas away from human settlements (at least 500m away).
- Dust at work places within or close to human habitation should be critically minimized by periodic water sprinkling on working sections. The contractor shall advise or notify local households on dust, noise, vibration and other dangers.
- Watering should be practiced regularly at all active work sections along the road and at all quarries and borrow sites for the protection of workers. In addition, sections of road heavily traversed by construction vehicles should also be regularly watered.
- Avoid undertaking noisy activities in the night near settlements and animal habitats.
- To control ground and airborne vibration within acceptable limits, blast activities should be design and planned by taking into consideration number of blast holes, weight of explosive, amount of stemming and delay timing. The blasting plan should be communicated by keeping neighbours informed of the nature of the work and progress not only as a mitigation measure but a measure to collect views for monitoring too. Ground and airborne vibration should be controlled and their impacts monitored during construction activities especially during blasting and while working in sensitive areas. Ground vibration is recorded in terms of peak particle velocity in millimetres per second in 3 mutually perpendicular directions (T, V & L) while airborne vibration should be measured in terms of decibels (dB).

Monitoring should takes place at the closest vibration sensitive building to current operations and findings measured against standards known standards. The British Vibration Standards states that there should typically be no damage to structures if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and are normally be reduced to 50% or less for more critical buildings such as historic buildings that may be in poor repair, including residential properties.

8.3.4 Destruction of Public Utilities

City and districts councils and the contractor should work in collaboration with the service providers (i.e. TANESCO, TTCL, TPDC and water authorities in the area) from the project planning stage, so as to reduce adverse impacts that would occur as a result of shifting the service lines from the road, during the roads construction.

8.3.5 Increased Road Accidents

Traffic management plan incorporated in the designs should be implemented by the contractor and this include detailed use of signs, markings, intersection layouts, access restrictions, bus stops, crossings, footpaths etc. The Traffic Management Plans shall be presented both in English and Swahili.

As part of the plan, the contractor should ensure that the traffic flow is not interfered during the whole construction period. No total closure of the road should be allowed. The contractor should provide diversions and deploy a person responsible for traffic safety.

Road Safety features Considered for Wildlife: Several wildlife moves between the ocean and the park of significant importance is the elephant and the green turtle, which uses for both ecosystems. Measures to curb road accidents will include:

- Installation of proper road signs and regular inspections for their presence.
- Installation of speed control devices like humps.
- Increased road safety awareness programmes which will include refresher courses or public campaigns aimed at drivers and pedestrians. This awareness will also focus on the safety measures when driving at the Park. The awareness shall be conducted through public meeting and disseminated through posters, TV, Radio and leaf lets.
- Provision of pedestrian lanes/paths, bridges, zebra crossing at areas of high human presence such as markets, trading center, settlement, schools among other gathering areas.
- Capacity building and monitoring of traffic law enforcers.
- Provide clearly displayed name boards for each village at entrance and exits.
- Installation of speed control signs for the day and night
- TANROADS in collaboration with Saadani National Park Authority will identify the wildlife crossing hotspots so that they can be marked with respective signs and other speed control measure such as speed humps or rumble strip.

8.3.6 Increased Spread of HIV/AIDS

- Since construction camps will attract many job seekers and trade mongers, the contractor is required to enforce code of conduct at the camp to encourage respect for the local community and, to maintain cleanliness and order at the camp all the time. It is important that the camp is located far from the villages, trading centres and markets so as to reduce chances of engaging in vices such as alcoholism, drugs use which are known to play a role in increase of HIV/AIDS infections.
- The contractor should deploy locally available labour to reduce risk of spreading communicable diseases (especially STD) and other social vices such as alcoholism which accentuate such vices.
- Environment, health and safety induction course should be conducted to all workers, putting more emphasis on HIV/AIDS, which has become a national disaster.
- In order to create awareness on prevention of HIV/AIDS infection, information education and communication component (IEC) should be undertaken during the implementation phase in collaboration with line sectoral departments as required by the National Policy on HIV/AIDS. This shall include involving the local NGOs and government agencies already active in the project area in awareness creation and educating the local communities on HIV /AIDS and STIs prevention.

8.3.7 Safety and Health Risks

- Appropriate Personal protective Equipment (PPE) will be provided to construction workers against health risks associated with construction works. Together with good camp management, the contractor is obliged to provide safety gears such as nose masks, gumboots, ear pads and clothing etc. to both casual labourers and permanent staff. During construction the contractors should ensure that the campsites are fenced with good housekeeping. The

camps must hygienically be kept with adequate provision of sanitary facilities such as waste disposal receptacles, sewage handling structures, fire fighting equipment and, clean and safe water supply. The contractor may be required to drill a borehole for obtaining water for construction.

- A well-stocked first aid kit (administered by medical personnel) shall be maintained at each camp. The medical personnel shall also be responsible for primary treatment of ailments and other minor medical cases as well as providing some health education to the workforce.
- Observe hygiene and sanitation standards at the labour camps and construction site by providing adequate clean water for drinking and domestic use; provide sanitation facilities even at the road side to avoid workers from using open spaces.
- Avoid creating breeding sites for disease vectors by draining and restoring quarry sites and burrow pits.
- Work with the wildlife warden in TANAPA when working near animal corridors or buffer zones to guide in co-existence with animals and advice on their timelines or movements.
- Appropriate gear should be worn while working in tsetse fly prone areas such as around Kwamsisi.

8.3.8 Increased Water Abstraction

- The contractor should contact water offices before abstraction of water in the project area.
- The contractor should obtain water use permit from the respective authorities/water basin before abstracting water from the water bodies
- The amount of water given to the contractor should consider the needs of the local communities around the project road and other downstream users. During dry seasons consultations on water abstraction should be held with the community members to ensure they are not affected with the project activities and the contractor should ensure environmental flows recommended by the water office are allocated to the water bodies and downstream users.
- Watering should be done to places with significant dust levels and near the settlement in order to minimise water wastage.

8.3.9 Loss of Definite Materials and Land Degradation

- Where construction materials such as gravel and stones are to be obtained from village lands, the material shall be purchased and this should be officially negotiated with villagers and /or village government in order to avoid conflicts. The contractor may be compelled to pay a small fee to the villager and /or village government.
- Borrow pits and quarry sites should be rehabilitated immediately the sites resource has been extracted and pits shall not be left with steep or vertical sides. The pits should be reinstated using stock piled excavated top soils.
- Shallow slopes will encourage rapid re-vegetation thus preventing erosion as well as providing safety to animals.
- Obtaining sand from valleys and riversides must be well investigated to avoid accelerated land degradation and pollution of water sources and /or interfere with agricultural activities in farmland.

8.3.10 Interference to Traditional Norms and Values

Diffusion of cultural moral values and customs from one community to another is an inevitable especially where more than one cultural background is in contact with each other, maintenance of local

ties becomes very difficult. Though the issue is very difficult to control, the communities shall be encouraged to stick to their traditions and copy only valuable tradition norms from the new comers.

8.3.11 Loss of Natural Vegetation and Habitat

- Close supervision of earthworks shall be undertaken in order to confine land clearance within the proposed road reserve boundaries. Farmers should be notified early enough to enable them harvest the affected crops on time and/or compensated to enable them create new farms.
- Topsoil shall be stockpiled and used for reinstating pits and flora planted along the road. It is important that cleared vegetation is natured to allow their quick re-growth. It is assumed that, displaced fauna will return once the work is over, or seek another habitat locally.
- Uprooted trees/thickets from the road reserves can be given to the villagers through village governments or other legal arrangement that does contravene the Forest Acts 2002.
- The road design should be practically aligned so as to avoid impact on big trees that take many years to grow or other flora of outstanding importance such as the Baobab and mango trees found along the road reserves some which are over 100 years. The contractor should always be in working contact with the forester of the District Councils to check for existence of such flora. Consultation with the District Forest Officer and TANAPA should be planned and undertaken prior to clearing trees/ thickets.
- Collaborate with other departments such as the Water Affairs, Department of Agriculture, Social and Cultural Department, Planning in catchment management to mitigate against impacts of loss of vegetation in the wider catchment so as to protect road structures throughout its life cycle.

Stakeholder Coordination and Natural Resources Management: Opening up the area shall expose the natural resource to over exploitation risks due to activities such as timber logging, charcoal burning to curb this vices which can adversely accelerate climate change in the area. It is important that TANROADS work in collaboration with other organization to promote natural resource conservation as adverse climate change shall also reduce the life span of the road and its associated infrastructure such as culverts, bridges, metre drains among others. Therefore TANROADS will:

- Collaborate with other departments such as the TANAPA, Water Affairs, Department of Agriculture, Social and Cultural Department, Planning in catchment and habitats management to mitigate effects of natural resources exploitation in wider catchment areas and forests so as to protect road structures throughout its life cycle.
- Participate with organization such as TANAPA to create awareness on the need of forest and wildlife management in the areas in regards to poaching and timber harvesting.
- Landscape areas cleared for road development.
- Participate in programmes aimed at increasing vegetation cover in the project area.
- Promote use of alternative energy sources such as solar power.
- Promote afforestation activities through existing NGOs and CBOs.

In collaboration with TFS an inventory of the current status of trees including mangroves will be undertaken in order to identify tree species and their conservation status thereby guiding:

- Tree planting in Zaraninge Forest Reserve to enhance its historical value.
- Proposed Establishment of Mangroves trees nurseries and seedlings planting/maintaining in 2 acres (9,800 sqm) along Pangani River bank: The proposed construction of Pangani Bypass will pass through the degraded areas by human activities especially coconut processing and transportation activities along the Pangani River bank. Historically, the degraded areas were covered by Mangrove forest.
- The proposed project will help to restore the Mangrove forest which is important habitat and breeding sites for various creatures including prawns, etc. Also, it will protect road and bridge embankments from erosion. The proposed project will be implemented and managed by Beach Management Unit (BMU) who has been involved in fisheries and beach environment management activities in Pangani District.

The project will adopt the already existent natural resource management committees to determine the ecosystem value services for communities and ensure that they are sensitized on sustainable communities use the forest, forest conservation value and opportunities for sustained tourism.

8.3.12 Destruction of River Bank Vegetation and Degradation of Water Sources and Catchment

Clearance of vegetation may lead to catchment degradation through erosion due to uncontrolled flow of storm water on bare land without undergrowth; and degradation of water towers due to lack of water retention for infiltration into topsoil's and aquifers. This in turn leads to contamination of water bodies with silt which affects aquatic life, river bed levels leading to breaking of banks thus flooding of other areas and also leads to damage of other road structures.

Uncontrolled clearing of riparian vegetation should be avoided by:

- Use water pump to haul water from the river / stream at a distance of not less than 50 m from the river / stream bank.
- Contractor must minimize destruction of stream/ river bank vegetation by avoiding unnecessary cuttings / excavations during construction.
- Bare areas around the stream / river banks must be planted with grass / shrubs immediately after construction
- Confine the construction activities within the road reserve and designated areas.
- Avoid unnecessary cutting of trees or clearing of land.
- All cleared and compacted areas should be scarified and planted with grass to stabilize the soil.

8.3.13 Change in areas micro-climate

This shall occur if clearance of vegetation is intensified through charcoal burning, timber logging, and uncontrolled fires among others by the construction team. This will in turn lead to reduced carbon sequestration due to lack of carbon sinks thus increase global warming which will in turn lead to unreliable rainfall thus affect agricultural productivity of the area and in turn reduce the locals sources of incomes which will eventually lead to increased poverty levels and dependency which is counter to the project's objective. Amount of carbon-dioxide in the air is likely to increase due to the increase traffic which shall accentuate the situation.

The impact will be mitigated by:

- Avoid unnecessary cutting of trees or clearing of land;
- Bare areas around the stream / river banks must be planted with grass / shrubs immediately after construction;
- Confine the construction activities within the road reserve and designated areas;
- All cleared and compacted areas should be scarified and planted with grass to stabilize the soil.

8.4 Mitigation Measures for Operational Phase Impacts

8.4.1 Increased Road Accidents

It is anticipated that the levels of accidents on the project road shall increase once its operation commences. Measures to curb road accidents should include:

- Installation of proper road signs and regular inspections for their presence.
- Installation of speed control devices like humps and speed limits areas throughout the road project and road section crossing Saadani National Park in particular. TANROADS in collaboration with Saadani National Park authority should identify the wildlife crossing hotspots so that they can be marked with respective signs and other speed control measure such as speed humps or rumble strip.

- Increased road safety awareness programmes which should include refresher courses or public campaigns aimed at drivers and pedestrians. This awareness will also focus on the safety measures when driving at the Park. The awareness shall be conducted through public meeting and also disseminated through posters, TV, Radio and leaf lets.
- Provision of pedestrian lanes/paths, bridges, zebra crossing at areas of high human presence such as markets, trading centre, settlement, schools among other gathering.
- Capacity building and monitoring of traffic law enforcers.
- Provide clearly displayed name boards for each village at entrance and exits.
- The proponent will cooperate with the National Parks authority and the traffic police on the safety measures at the park of the road that traverses the Park including installation **Unmanned Digital Control Mechanism(UDCM)** cameras at the two extreme ends of the road traversing within the Park so as to monitor the over speeding vehicle.
- Installation of speed control signs for the day and night

8.4.2 Increased Rates of Natural Resources Exploitation

Opening up the area shall expose the natural resource to over exploitation risks due to activities such as timber logging, charcoal burning to curb this vices which can adversely accelerate climate change in the area. It is important that TANROADS work in collaboration with other organisation to promote natural resource conservation as adverse climate change shall also reduce the life span of the road and its associated infrastructure such as culverts, bridges, mitre drains among others. Therefore TANROADS can:

- Collaborate with other departments such as the TANAPA, Water Affairs, Department of Agriculture, Social and Cultural Department, Planning in catchment and habitats management to mitigate effects of natural resources exploitation in wider catchment areas and forests so as to protect road structures throughout its life cycle.
- Participate with organisation such as TANAPA to create awareness on the need of forest and wildlife management in the areas in regards to poaching and timber harvesting.
- Landscape areas cleared for road development.
- Participate in programmes aimed at increasing vegetation cover in the project area.
- Promote use of alternative energy sources such as solar power.
- Promote afforestation activities through existing NGOs and CBOs.

8.4.3 Potential Positive Impacts to be enhanced during Project Implementation

Construction of a road in the project area is among the strategies for rural poverty alleviation. The improved road will open more opportunities for self-employment income generating activities for the local communities and at the same time attract investor to the area. A family with sufficient and regular income is more likely to afford paying the costs of education and health services for its members apart from getting enough food to eat.

Most of the casual labourers and some skilled workforce will be absorbed from within the project Districts. In addition, the local people will be selling food and other merchandise to the construction workforce. The utilization of local workmanship will take place for the activities that do not require a high specialization, and in any case there will be diffusion of knowhow from the more qualified personnel towards the local personnel. About 200 people shall be engaged during this phase.

The road project is known to be associated with several positive impacts which if not well undertaken can turn to be negative or have adverse implications to the community and county at large. The major positive impact associated with the project during implementation is the increase of economic activities which shall be achieved as listed below.

- The project is anticipated to create both direct and indirect employment for both the locals and new incoming labourers and skilled personnel.
- The project is anticipated to create markets for goods and commodities for construction work and for personal use by the workers and locals.
- It is anticipated that women will get opportunities to work in the project thus empower them and help improve their skills.
- To ensure the positive impacts are achieved and maintained at acceptable norms it is important that;
- The locals are given employment priority in regards to both skilled and non-skilled labour. Labour should be brought in only in the event that locally available skills are not sufficient or at par to the requirements to the project.
- Locals should be encouraged to tap into the business opportunities associated with the project by calling them to tender for businesses within their capacity or advertising opportunities at the administrative offices frequented by locals.
- Women will be given equal job opportunities as men.
- As part of Community Corporate Social Responsibility (CCSR) TANROADS in collaboration with the contractor shall initiate social programmes such as football matches, capacity building on money and resources management, rehabilitation or building of classroom at identified schools among others. This will not only enhance relationship between the community and the locals but also reduce number of vices that are associated with free time such as alcoholism, incest, and poor money management skills.
- The local community should be allowed to share resources such as clinics if provided to the contractor especially in remote areas where such medical facilities are lacking or are not easily accessible.
- The contractor should adhere to the policy, legal and regulatory framework governing the project as this shall act as an umbrella factor for enhancing the project's positive impacts.
- **Complimentary Initiatives:** According to the ESIA and RAP findings, the project will come with changes in population characteristics. Potential socio-economic impacts resulting from an influx of job seekers into work place, including potential competition for resources and the delivery of social services, disruptions to social fabric, public health impacts such as the transmission of infectious diseases, HIV/AIDS and STDs, effects on women and economic impacts such as increase in price of goods. Also due to incoming people looking for employment during road construction, there is possibility of interference to traditional norms, culture and ethics that may result to moral deterioration. The project has incorporated several complimentary initiatives for social support to enable communities cope with the development and also enable them harness the opportunities that will come with the development. Refer **Annex 5**.

9 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

9.1 Environmental and Social Management Plan

The Environmental and Social Management Plan (ESMP) has been developed to ensure that the recommended mitigation measures for the identified negative impacts are properly implemented so as to enable the road facility to be more environmentally friendly. The ESMP is divided into Impact Mitigation Plan and Monitoring Plan. The respective costs for implementation of mitigation measures are indicated in Table 32 below. The implementation steps will involve the contractor, the works supervisor, local and central government authorities, road agency (TANROADS), local users and the local community at large. The overall co-ordination of implementation of the ESMP shall be vested in the TANROADS. The implementation steps of the ESMP will involve TANROADS Experts, Independent Consultant, Supervising Consultant (RE), Contractor, Environmentalist, Sociologist, Health and Safety Expert, Municipal Councils, infrastructure users and the local communities at large.

9.2 Impact Mitigation Plan

Impact Mitigation Plan provided in Table 32 translates recommended mitigation measures into specific actions that will be carried out by TANROADS and Contractor and form the basis for impact management during project construction and operation. The purpose of this mitigation is to identify measures that safeguard the environment and the community affected by the road project proposal. It describes the best ways and means envisaged at avoiding, preventing, minimizing and remedying negative impacts and enhancing the environmental and social benefits of the proposed road project. The estimated total cost for mitigation of environmental and social impacts is TZs 753,000,000 (USD 321,108). The costs have been included in the Bills of Quantities for the project.

9.3 Management of the Project and Implementation of the ESMP

TANROADS as project proponent shall be the main implementer of the ESMP through other organs. The environmental measures incorporated in the detailed engineering design will be attached to the Bills of Quantities and Contract Documents. Moreover, there will be a **Environmental, Social, Health and Safety (ESHS) Code of Conduct to be signed by the Contractor(s) to show their commitment in the implementation of the Environmental, Social, Health and Safety. The implementation of the Code will be supervised by Consultant (Resident Engineer) and monitored by TANROADS.**

The ESHS Code is a set of **Guidelines** attached to the **Bidding Document and Contract** to be adopted by Contractor during project implementation. It contains the **commitment** and **obligations** of the Contractor and its subsidiaries (i.e. Sub-Contractors and staff) to undertake construction activities in accordance with all applicable **Laws, Rules, and Regulations**. The Contractor and its subsidiaries shall comply with the Code of Conduct **with high ethical standards. Failure** to observe the Code, **will subject** the firm to **disciplinary action**, including Contract termination. **Violation of the Code, is violation of Law which may result to civil and/or criminal penalties to Contractors, Supervisors or Firm.**

According to the Code, Contractor is obliged to prepare various safeguard documents prior to actual construction works. Based on the project Design and ESIA Reports, the document shall include:

- Site specific **ESMP, HSMP**, Traffic Management Plan (**TMP**), Borrow Pit & Quarry Operation Plan (**BQP**):
- HIV/AIDS Awareness Program,
- Road Safety Awareness Program,
- Occupational Health and Safety Awareness Program.
- Sexual Harassment prevention Policy
- Child Labour Prevention Policy

The Code requires the Contractor to deploy the Experts of Environmental, Social and Road Safety, as well as the Sub –Contractor for HIV/AIDS to implement the Plans and Programs

As regards to the environmental management, TANROADS has in place 6 Environmental Experts and 3 Sociologist who are responsible for day-to-day environmental and social monitoring and report to the management. Overall periodic audits will be done according to approval conditions of certificate as specified by the EIA and Environmental Audit Regulations 2005.

During construction works the Contractor shall deploy a full-time staff to execute environmental and social management plan on site. The Resident Engineer appointed by TANROADS will supervise environmental management on her behalf of the project and will employ Environmental Experts, respectively to undertake routine environmental monitoring, advice the contractor and report to the management. After testing and handing over, the project will be operated by the TANROADS. During the guarantee period as shall be specified in the contracts, it will be the responsibility of the contractor to rectify all problems as per the agreement.

The Contractor shall take stock of the contents of the Environmental and Social Impact Assessment Statement of the Project. The appointed Environmental Expert to assist the Resident Engineer shall ensure that the environmental measures recommended in this report are effectively complied with and timely adjusted whenever necessary. The Expert should be familiar with the scientific measurement of environmental impacts and remedies. He/she will work on full time basis and may be selected, by the firm in-charge of supervision works, from the roster of national Environmental Experts. He will liaise with the relevant public agencies and will carry out the training scheme associated to his assignment. Other staff members of the Contractor are as described under section 8.4 below:

9.4 Institutional Arrangements and Reporting Procedures

The purpose of environmental and social monitoring is to quantitatively measure the environmental effects of the road project. The environmental monitoring program will operate through the pre-construction, construction, and operation phases. It will consist of a number of activities, each with a specific purpose, key indicators, and significance criteria.

An Environmental/Social Specialist will carry out the monitoring of mitigation measures during design and construction. He/she will conduct mitigation monitoring as part of the regular works inspections. The responsibility for mitigation monitoring during the operation phase will lie with the Environmental Section in TANROADS.

To ensure adequate implementation of the ESMP and RAP an independent Consultancy Services will be procured to undertake Baseline data collection to update and improve the ESMP/RAP and monitor the implementation of the same by Contractor during project implementation. On the other hand, the Contract will prepare the site specific ESMP and HSMP based on this ESMP and improved based on the recommendations provided by Independent Consultant.

Responsibilities for mitigation have clearly been defined, including arrangements for co-ordination between the various actors responsible for mitigation. The project set up will include various staff. The head of the organization will consist of project Manager, Site Manager (Works Manager), Chief Engineer, Mechanical Manager, Assistant Manager, material Engineer (QA manager). Under the leadership, there will be a lot of departments such as Logistic Department, Environment and Social Department, Technical Department, Contract Department, Construction Department, Mechanical Department, Construction material Department and QA Department (Figure 19).

Major responsibilities:

- i. **Project Manager:** Will be the official representative of the Contractor's company on the site and he will be responsible for dealing with Employers (TANROADS), the Engineer and third parties. He will be responsible for executing and maintaining the works according to the Contract specifications, ensuring the project to be accomplished with high quality with time and acceptable costs. He is responsible for the implementation of regulations, full in charge of site

- management organisation, allocation of personnel and other resources, making decision on critical construction method and financial works.
- ii. **Site Manager:** Will be fully in charge of the site construction activities. He will make detailed site construction scheme and arrange site construction teams accordingly so as to ensure each construction milestone goal is achieved.
 - iii. **Chief Engineer:** Shall be responsible for project construction technology, making decision for major technical methods of the works and coordinating between various departments.
 - iv. **Mechanical Manager (Workshop/Equipment Manager):** Will be in charge of equipment repair, maintenance, construction material supply (such as bitumen, cement, reinforcement etc.) and quarry site team.
 - v. **Assistant Manager:** Shall be in charge of logistics department and STD/HIV/AIDS and environmental Department. He will be responsible for preparing a specific Occupational Health and Safety Management Plan for the project. The plan will also include STS/HIV alleviation measures and the requirements of the approved Environmental and Social Impact Assessment (ESIA). During the project implementation, the Assistant Manager will ensure appropriate activities and measures to be taken as per the requirements of the Plan. To ensure Environmental Protection, a full-time staff will be deployed to execute Environmental and Social management plan of the project.
 - vi. **Material Engineer** is the in charge of QA team and the laboratory. He will be responsible for making quality assurance plan and assurance procedures to ensure that all site personnel know of and implement the right procedure. The entire laboratory test will be under his control to ensure the project accomplished with good quality.
 - vii. **Staff Supervisor:** The Contractor shall assign a competent key supervisory staff to establish the site organization for the project. Varied specialists and experienced engineers and technicians will be mobilized to the site in time so that the project can be carried out smoothly.
 - viii. **Labour Force:** The Contractor shall employ necessary local staff and labour for the project approximately 1,000 people. Labour force will include both skilled and unskilled labours.

SITE ORGANIZATION CHART FOR UPGRADING OF TANGA – PANGANI – SAADANI – MAKURUNGE ROAD (229KM) TO BITUMEN STANDARD

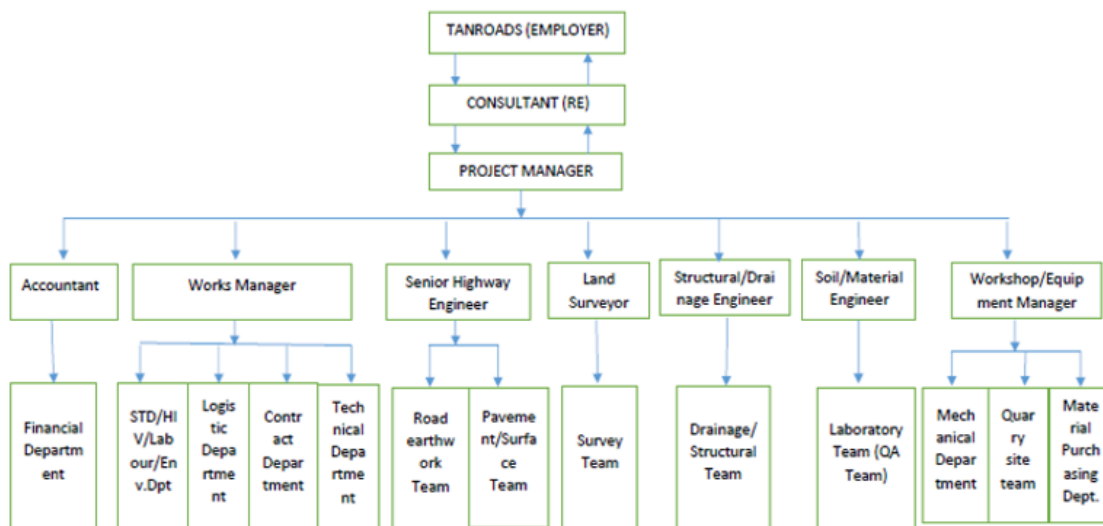


Figure 19: A Sample of Project Organization Structure to be adopted for the proposed Project

9.5 Contingency Measures

The project will frequently provide training of occupational safety and health to the workers and information relevant to health risk including malaria, schistosomiasis, yellow fever, hepatitis, etc. During the whole construction period the Contractor shall provide, equip and maintain adequate first-aid stations and provide sign boards directing where these services are situated and provide all requisite transport in case of emergency.

Training and awareness raising campaigns on HIV/AIDS prevention measures will be offered to all project staff and communities surrounding the project sites before mobilization phase. Training will be organised by qualified experts from designated NGOs and Regional and District health departments. Opportunities for STDS, HIV/AIDS screening, diagnosis and counselling cases will be provided to the site staff and labourers. Besides, condoms will be supplied to them by keeping them at different strategic places like toilets etc. At least 200 condoms per year will be available for each member of the site staff and labour.

To control road accidents during construction period the Contractor will provide enough flagmen, traffic control signboards (in Kiswahili and English languages) and warning devices along the diversions.

The project will install fire fighting facilities such high pressure water horse, fire extinguishers and fire blankets. Furthermore, the project will use fire services existing in Chalinze, Pangani and Bagamoyo Towns including the fire brigade of Tanga Airport and other private companies available in Tanga and Coast Regions. All project staff will be trained fire fighting and fire escaping techniques.

Regarding the use of explosives, the Contractor will be instructed to take good handling of explosives and blasting during operations. The Contractor shall employ persons who are in possession of approved and current blasting certificate recognized by relevant authorities in Tanzania.

Moreover, the Contractor shall ensure maximum-security measures such as a solid brick fence and containment fence of recommended height around the area. There will be a full time security at main entry and exit points. Usual security measures including the Police Force used by Chalinze, Pangani, Bagamoyo and Handeni District Authorities will add security to the project.

9.6 Capacity building and Training Requirements

The effective implementation of ESMP requires that all persons working for the project are aware of the importance of environmental requirements of the project; their roles and responsibilities in the implementation of the ESMP. They should also be aware of the significant actual or potential environmental impacts of their work activities; the benefits of improved performance and the consequence of not complying with environmental requirements.

In order to ensure successful and sustainable implementation of the project we will organise the project management office immediately with qualified administrative staff and senior engineers and skilled technicians who have rich professional experiences in construction management.

9.7 Environmental Monitoring and Audit

The national EIA guidelines require the developer to prepare and undertake monitoring plan and regular auditing. Monitoring is needed to check if and to what extent the impacts are mitigated, benefits enhanced and new problems addressed. Recommendations for monitoring have been included in the ESMP (Table 33). The ESMP also assigns responsibilities for monitoring activities. The However, the Divisional/Ward/Village environmental committees and District Environmental Committee will participate in the long-term daily monitoring of the project road.

Environmental audits determine the long-term effects of adopted mitigation measures. It is recommended that environmental audits be carried out on the project as part of the ongoing maintenance programme. The audits will unveil the actual performance of mitigation measures and will allow effective measures to be included in future projects based on the audit results.

To ensure comprehensive implementation of ESMP and HSMP three Independent Consultancy Services will be procured for undertaking:

1. Baseline data collection and Monitoring of the Implementation of Environmental & Social Management Plan (ESMP) and Resettlement Action Plan (RAP);
2. Sensitization and Awareness on HIV/AIDS, STI, TB Prevention measures and Gender Issues mainstreaming;
3. Baseline Data Collection, Road Safety Audit, Improvement of Road Safety, Awareness and Capacity Building.

9.8 Reporting Procedure

The Contractor will be reporting on ESMP implementation compliance to the Resident Consulting Engineer who will approve the acceptable report and forward the report to TANROADS for monitoring and submission to AfDB and JICA for follow up monitoring. The reports on environmental compliance during implementation will be submitted in monthly and quarterly basis as part of their annual progress reports and annual environmental monitoring reports. Depending on the implementation status of in environmentally sensitive areas, NEMC will perform annual environmental reviews in which environmental concerns raised by the project developer will be reviewed alongside project implementation.

Table 32: Environmental and Social Management Plan (ESMP)

Impact	Mitigation Measure	Responsible Institution	Mitigation Time Frame	Estimated Cost (Tshs)
PRE-CONSTRUCTION PHASE				
Loss of property/farms/land and possible resettlement.	<ul style="list-style-type: none"> Development and implementation of the Resettlement action Plan (RAP), consistent with OP. Confine clearance to road reserve /construction site boundary. 	<ul style="list-style-type: none"> TANROADS/ Consultant/Affected people/Contractor 	Before and during construction phase.	Included in valuation report
Climate change.	<ul style="list-style-type: none"> Use green technology in developing labour camps by installing solar panels, wind generators and water recycling facilities. Provide adequate day natural lighting and use energy saving bulbs. Avoid open air burning of wastes Control bush fires Ensure machines and equipment planned for project use are installed with EMS to abate accentuating contributors of climate change. Tree planting along the Zaraninge forest Planting of mangrove along Pangani River plain 	<ul style="list-style-type: none"> Contractor/Consultant/Environmental Supervisor. 	During camp and site development and after construction	5,000,000, Cost for Mangrove and tree planting included in the complementary project
Health and Sanitation.	<ul style="list-style-type: none"> Development a sanitation management plan to include location of setting up sanitation facilities/or providing mobile toilet facilities along the road and all the construction sites Develop eco-friendly sanitation facilities with capability to recycle water and reuse of sludge. 	Contractor/Consultant/Environmental supervisor.	Mobilization. During camp and site development.	30,000,000
Total Estimated cost of implementing mitigation measures during pre-construction phase				35,000,000
CONSTRUCTION PHASE				
Soil and water pollution.	<ul style="list-style-type: none"> Minimise risks of accidental spillage and clear area immediately it occurs. Practice Good housekeeping. 	<ul style="list-style-type: none"> Contractor/ Environmental Supervisor/ Consultant 	During Construction and operation.	20,000,000

Impact	Mitigation Measure	Responsible Institution	Mitigation Time Frame	Estimated Cost (Tshs)
	<ul style="list-style-type: none"> • Use silt fences and hay bales to remove suspended solids from surface water runoff. • Use silt curtains to minimize sediment suspension and transport while working near water crossings. • Discharged waste water into the environment should meet recommended standards. • Avoid use of heavy machines and equipment's at river riparian. • Provide solid waste/garbage collection containers and sanitation facilities. • Garbage should be segregated, biodegradable composted or sold to locals and others collected in containers and disposed of periodically. • Avoid burying non-biodegradable waste dump at designated sites • Avoid construction of workers camp site facilities close to surface water sources. • Temporary work places must be provided with sanitary facilities (mobile toilets) and must be located far from water sources. • Content of mobile toilets should not be exhausted in water courses or land. • The facilities must be properly maintained and satisfactorily decommissioned after the project. • Solid and liquid waste must be handled as prescribed in the Standard Specification for Road Works (Section 1713). • Solid waste resulting from road construction works should be disposed of as prescribed in the Standard Specification of Road Works (Section 1713). 			

Impact	Mitigation Measure	Responsible Institution	Mitigation Time Frame	Estimated Cost (Tshs)
	<ul style="list-style-type: none"> Avoid burning of waste and melting bitumen on arable land. All vehicles maintenance should be done at the site garage which should have an oil water separator. 			
Soil Erosion and instability of Slopes.	<ul style="list-style-type: none"> Restrict ground clearance to RoW and avoid re-alignments to sensitive areas. Lined drainage channels at sensitive terrains shall be provided to control speed and volumes of storm-water. The discharge points must be carefully chosen to avoid erosion of arable land and creation of gullies. Road run off must be channelled to natural water course through side drains in which baffles and rip rap are placed to check water velocity. Drains must be included at short intervals to cope with run –off. Grassing at the road banks 	Contractor/Environmental Supervisor/ Consultant	During Design and Construction.	10,000,000
Loss of definite materials and Land degradation	<ul style="list-style-type: none"> Purchase construction materials such as gravel and stones from land owners and this will be officially negotiated with villagers and/or village government in order to avoid conflict. Rehabilitate all borrow pits and quarries by landscaping after excavation works are completed Use stock piled topsoil for reinstating pit opened due to road construction. Sand mining from valleys and riversides should be done in a sustainable manner to avoid accelerated land degradation, pollution of water sources and/or interfere with agricultural activities in farmland. 	<ul style="list-style-type: none"> Contractor/Consultant/ Village Leaders. 	During Mobilization, Construction and after construction.	20,000,000

Impact	Mitigation Measure	Responsible Institution	Mitigation Time Frame	Estimated Cost (Tshs)
Increased Road Accidents	<ul style="list-style-type: none"> Traffic management plan (in both English and Swahili). Conduct public awareness for road users. Provide clearly displayed name boards for each village at entrance and exits. Road marks, Speed limits and humps shall be used at schools, congested villages, health centres/dispensaries, worship places, animal crossing areas at Saadani National Park. 	<ul style="list-style-type: none"> Design Engineer/Contractor, SANAPA/Traffic police/ Local Community/ Contractor. 	Constructional Phase.	80,000,000
Increased Spread of HIV/AIDS	<ul style="list-style-type: none"> Safety, Health and Environment (SHE) induction course Support HIV/AIDS campaigns as required by the Act by involving the local NGOs and government agencies already active in the project area in awareness creation and educating the local communities on HIV / AIDS and STIs prevention. Provision of condoms Locate the Construction camp site far from human settlements and employ a large number of unskilled labourers from within the local communities to minimize number of new comers. 	<ul style="list-style-type: none"> Contractor/ TANROADS/ NGOs/CBOs/local communities. 	Construction al Phase.	200,000,000
Safety and health risks	<ul style="list-style-type: none"> Regular maintenance of construction machinery to minimise accidents and professional hazards during construction period. Safety, Health and Environment (SHE) induction course. Comply with the Occupation Health and Safety Act (2003) by provision of safety gears, equipment and clothing's. Adequate signage and availability of First Aid Kit and trained first aiders at each construction site 	<ul style="list-style-type: none"> Contractor. Contractor/ Environmental Supervisor/ Workers. 	Short-term. (Construction phase).	60,000,000

Impact	Mitigation Measure	Responsible Institution	Mitigation Time Frame	Estimated Cost (Tshs)
	<ul style="list-style-type: none"> Ensure hygiene and sanitation is maintained at the labour camps. The management and use of blasting materials should be done by Contractor in strict conformity with the safety requirements for public security as stipulated in the legislations. Drain and restore open pits to reduce incidence of disease vector breeding sites unless local community request to use as water storage structures. 			
Destabilization and/or Destruction of the existing infrastructures along the roads	<ul style="list-style-type: none"> Integrated planning is needed with owners of infrastructures at the proposed project. Early notice to users before interruption. Relocation of the utilities Immediate replacement of the utility once damaged 	<ul style="list-style-type: none"> Councils/ TANESCO/TTCL/TPD water authorities/ Contractor 		Included in the BOQ
Air pollution	<ul style="list-style-type: none"> Water palliation on road section near human settlements and farms. Proper choice of equipment with environmental management systems such as mixing plants with dust precipitators, efficient combustion engines. Use clean fuels and energy. Uses enclose processing and transportation equipment. Avoid open burning of waste and bitumen. Undertake continuous maintenance of machines and equipment to reduce pollutants. 	<ul style="list-style-type: none"> Contractor/ Supervisor' Env. 	Construction.	60,000,000
Vibration	<ul style="list-style-type: none"> Provide advance notice to local communities when activities likely to cause vibration are to be undertaken. 	<ul style="list-style-type: none"> Contractor/ Supervisor. Env. 	Construction	5,000,000

Impact	Mitigation Measure	Responsible Institution	Mitigation Time Frame	Estimated Cost (Tshs)
	<ul style="list-style-type: none"> Locate vibration sources such as of quarry sites far from settlements. Measure vibration levels. 			
Noise pollution	<ul style="list-style-type: none"> Provide working gear to workers. Proper choice of equipment with environmental management systems. Avoid undertaking noisy activities in the night near settlements and animal habitats. 	<ul style="list-style-type: none"> Contractor/TANROADS/ Env. Supervisor 	Construction	10,000,000
Loss of Natural Habitat	<ul style="list-style-type: none"> Close supervision of earthworks shall be observed in order to confine land clearance within the proposed new road reserve boundaries. Donate uprooted trees/thickets in the road reserve area to the villagers as long as it meets the Forest Acts 2002 requirement. Avoid felling big mature indigenous trees such as the Baobab as they take years to grow and replant all trees uprooted due to the project. Consultant with TANAPA and District Forest Officer prior to clearing trees/ thickets. When using a water pump to haul water from the river / stream place them at a distance of not less than 50 m from the river/stream bank. Contractor must minimize destruction of stream/river bank vegetation by avoiding unnecessary cuttings/excavations during construction. Bare areas around the stream/river banks must be planted with grass/shrubs immediately after construction. Confine the construction activities within the road reserve and designated areas. 	<ul style="list-style-type: none"> Contractor/ Environmental Supervisor/ TANAPA/Forest department) 	During Construction	30,000,000

Impact	Mitigation Measure	Responsible Institution	Mitigation Time Frame	Estimated Cost (Tshs)
	<ul style="list-style-type: none"> All cleared and compacted areas should be scarified and planted with grass to stabilise. 			
Attacks by wild animals, disease vectors and venoms	<ul style="list-style-type: none"> Provide workers with protective clothing. Map animal migratory routes and advice works on their existence when working in such areas. Train workers on co-existence behaviour with wildlife. Engage game wardens when working in the vicinity of game reserve of wildlife corridors. 	<ul style="list-style-type: none"> Contractor/ Environmental Supervisor/ TANAPA/Forest department) 	During Construction near wildlife corridor or park boundaries	10,000,000
Total Estimated cost of implementing mitigation measures during construction phase				505,000,000
OPERATION PHASE				
Increased Road accidents	<ul style="list-style-type: none"> Capacity building of district police (traffic) offices. Enforcement of traffic laws. Installation of proper road signs and regular inspections for their presence. Installation of speed control devices like humps. Installation of pedestrian lanes at human settlement crossings. 	<ul style="list-style-type: none"> Design Engineer /Traffic police/ TANROADS 	Operation phase	To be included in the TANROADS annual budget
Increased natural resources exploitation rates	<ul style="list-style-type: none"> Increase forest and wildlife personnel so as to ensure proper management of the forests and wildlife areas. Increased capacity building of the land and natural resources departments' project area districts. Increased control and enforcement on forest and game products. Promote alternative energy sources such as solar power and gas. 	<ul style="list-style-type: none"> Ministry of Natural Resources/NEMC/ Police/ TANAPA and Forest Officers 	Operation phase	To be coordinated by TANAPA

Impact	Mitigation Measure	Responsible Institution	Mitigation Time Frame	Estimated Cost (Tshs)
	<ul style="list-style-type: none"> Promote afforestation and replanting of excavated vegetation through existing NGOs and CBOs. 			
DECOMMISSIONING PHASE (Closure of the project, including campsites)				
Generation of Solid and liquid wastes	<ul style="list-style-type: none"> The proposed Mitigation measures shall be applied 	TANROADS, Contractor, Engineer	12 month	The cost is per Clause 1702
Deterioration of ambient air quality	<ul style="list-style-type: none"> Water shall be sprinkling on the access roads to spoil and borrow areas Transport trucks shall be covered with tarpaulin 		12 month	The cost is per Clause 1702
GRAND TOTAL COST FOR IMPLEMENTATION OF ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)				TZS 540,000,000.00

10 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

10.1 Introduction

Monitoring of the anticipated impacts in the receiving environments is important as it provides the basis for rational management decision regarding impact control. It helps in determining the effects of the project activities that requires enhancing, helps in understanding of cause effect of impacts and their relationships with human activities, and verifies the accuracy of prediction of the social impacts. It ensures compliance with regulatory measures and understanding the degree of implementation of ESPM and its effectiveness.

Monitoring is performed in all stages of project implementation this construction, commissioning and operation to enable verify impact predicted during the study and at the same time to ensure that adverse impacts are minimized. The information collected during monitoring exercise helps to improve environmental management plans by adapting measures to ensure that the anticipated impacts are mitigated. For example, in case environmental monitoring identifies some environmental concerns during construction or operation phase then construction or operation works has to be modified or stopped to allow abatement/minimisation of the impact.

The objectives of environmental monitoring programme are:

- To ensure that mitigation and benefit enhancement measures have been adopted and are effective
- To identify any unforeseen negative impacts during ESIA study stage and propose appropriate mitigation measures
- To provide information on the actual nature and extent of key impacts and effectiveness of mitigation and benefit enhancement measures, which through feedback mechanism can improve the planning and execution of future, similar projects.

10.2 Implementation of Monitoring Plan

The environmental monitoring during construction phase will be comprised of two activities:

- Review of Contractor's plans, methods statement, and temporary works design and arrangements to ensure that environmental protection measures specified in the contract documents are adopted and Contractor's proposals provide acceptable levels of impact control.
- Systematic observation of all site activities and the Contractor's offsite facilities, including borrow pits and quarry sites areas. To ensure that the contract requirements relating to environmental matters are being complied with, and that no impact foreseen and unforeseen are occurring.

The monitoring activities will be comprised of visual observation during site inspection and will be carried out at the same time as the engineering monitoring activities. Site inspections will take place with emphasis on early identification of any environmental problem and the initiation of suitable remedial action. Where remedial actions have been required on the part of the Contractor, further checks will need to be made to ensure that these are actually being implemented to the agreed schedule and in the required form. All sites where construction is taking place will be formally inspected from an environmental view point on a regular basis.

However, in addition to visual observation there shall be informal questioning of members of the local communities and their leaders who live near the project sites since they may be aware of matters which are unsatisfactory but may not be readily apparent or recognized during normal site inspection visits.

The monitoring activities will also be integrated with other construction supervision and monitoring activities to be carried out by the Implementing Agency's Engineer. The Engineer will decide on the appropriate course of action to be taken in cases where unsatisfactory reports are received from the field staff regarding environmental matters. In case of relatively minor matters, advice to the Contractor

on the need for remedial action may suffice, but in all serious cases, Implementing Agency's Engineer should issue a formal instruction to the Contractor to take remedial action, depending on the extent of delegated powers.

10.3 Monitoring Responsibilities and Reporting

The project Implementing Agency TANROADS shall be involved with the construction supervision team to foresee the implementation of the environmental monitoring plan. TANROADS' has Safety and Environmental Section (SED) shall be responsible for coordination of environmental management and monitoring activities time to time. To ensure adequate implementation of the ESMP and RAP an independent Consultancy Services will be procured to undertake Baseline data collection to update and improve the ESMP/RAP and monitor the implementation of the same by Contractor during project implementation. On the other hand, the Contract will prepare the site specific ESMP and HSMP based on this ESMP and improved based on the recommendations provided by Independent Consultant.

The contractor will be responsible for implementation of environmental and social mitigation measures under the Supervision of Resident Engineer and Environmental Officer from SED. This is to ensure that technical and environmental clauses are followed and well implemented by the Contractor.

There must be a feedback mechanism during monitoring to ensure that failure to implement an approved measure incurs a penalty to the Contractor. The Resident Engineer's job should include enforcement of mitigation measures. At times approved mitigation measure may not achieve the desired effect or lead to unforeseen adverse impacts such incidences where failure of a measure to mitigate an adverse impact occurs should be communicated to the EMU site Office, which would work in finding out why the situation did not improve while commissioning appropriate further measures, otherwise absence such mechanism would render the whole mitigation and monitoring process futile.

The Contractor shall assign an Environmental Inspector who shall be responsible for carrying out monitoring on an intermittent basis. The Contractor shall also nominate a Senior Representative to oversee compliance with environmental mitigation measures. The Contractor's representative must submit a monthly report to the Resident Engineer specifying that:

- All previously notified failures to comply with the mitigation measures have been rectified.
- All newly notified requirements have been fulfilled and all standard requirements (as specified in this report) have been put into effect.
- The Resident Engineer must countersign the report and make it available to EMU Site Office, which in turn should pass a copy to the District Councils within a reasonable period not exceeding 30 days from receipt.

Table 33: Environmental and Social Monitoring Plan for the Proposed Tanga - Bagamoyo Road

Parameters Indicator		Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility for monitoring	Annual costs estimates (Tshs)
Pre-construction stage								
Water Quality	Turbidity Status of forests, farms and catchment management	Twice before the construction starts (Once during rainy season and once during dry season)	100m before and after the location of Pangani bridge construction site Forests and farm lands in project area	NTU	Turbid meter	10NTU	TANROADS/ Water basin	2,000,000
Air quality	Dust	Once before the construction starts	Near settlements (villages)	µg/m ³	Micro Dust Pro	0.01	TANROADS	2,000,000
Noise Baseline	Noise level	Once before the construction starts	Near settlements (villages)	dBA	calibrated precision integrating sound level meter, open Field Microphone and GPS, Germin eTrex 12-Channel	110	TANROADS	2,000,000
Biodiversity	Baseline information on biodiversity	Once before the construction work starts	All forests along the road	type and number of living organisms	Counting and Observation	-	TANROADS District Forests Officer, TANAPA	5,000,000
Compensation	Compensation issued	Once before the construction starts	All affected people	Once before construction begins	Resettlement Action Plan (RAP).	All PAPs are compensated	TANROADS, Chief Government Valuer office	5000,000

Parameters Indicator		Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility for monitoring	Annual costs estimates (Tshs)
Machinery and equipment	Emissions, Soot, Noise, (SO _x), (NO _x), (CO _x), (CO), (Pd), (O ₃).	As per manufactures manual	All plants, vehicles, equipment and machinery	PM ₁₀ /PM ₅ , dBA, µg/m ³	calibrated precision integrating sound level meter, open Field Microphone and GPS, Germin eTrex 12-Channel, cartridge with 10mm nylon cyclone with 37mm diameter with polyvinyl-chloride with pores of 5µm or other methods as per TZS	-110 -PM ₁₀ at 24 hr exposure 25 µg/m ³ So _x at 24 hr exposure is 125 µg/m ³ NO _x at 1 hr exposure is 200 µg/m ³ , (CO _x), (CO), measures based on NESC& WHO Air Quality Guidelines, Global Update	TANROADS, TBS	3,000,000
Total cost of monitoring at pre-construction stage is Tshs 19,000,000								
Construction stage								
Water Quality	Turbidity	Once Per month	100m before and after the Mligazi bridge, Msangasi and Pangani bridge construction site	NTU	Turbid meter	10NTU	TANROADS, Water office	3,000,000

Parameters Indicator		Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility for monitoring	Annual costs estimates (Tshs)
Air pollution	Dust	Once Per month	Near settlements (villages)	µg/m ³	Micro Dust Pro	0.01	TANROADS	4,000,000
Noise pollution	Noise level	Once Per month	Near settlements (villages)	dBA	Measurements	110	TANROADS	3,000,000
Soil erosion	Soil erosion along the road	Once in three Months	Project road, Detour routes, Quarry sites.	Level of erosions	Site inspection	–	TANROADS	5,000,000
Natural habitat	Biomass	Once in three month for construction period	All forests along the road	-	Inspection	-	TANROADS District Forests Officer, TANAPA	6,000,000
Biodiversity	Biodiversity	Once year	All forests along the road	type and number of living and organisms	Inspection	-	TANROADS/ District Forests Officer, TANAPA	6,000,000
Vibration	Vibration levels	Once per Month	Project road, Quarry sites	No per time	Records	-	TANROADS	3,000,000
Frequency of illness of construction workers	Illness of construction workers	Once in a month for the construction period	Project site	Number of cases	Health records	-	District Health officers/TANROADS	9,000,000
Employment opportunity	Percentage of local construction labourers	Three times a year	Project site	Number of local people employed in the project	Records, inquiries and observation	-	TANROADS/ Labour Office	6,000,000

Parameters Indicator		Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility for monitoring	Annual costs estimates (Tshs)
Safety and health risks	Number and type of safety equipment such as mask, helmet gloves and ear plugs. Health and sanitation facilities in camps.	Once in three month	Project site	Number of safety measures provided	Actual injuries and illness statistics	-	TANROADS/ OSHA	4,000,000
Dust Suppression	Water sprinkling	Everyday	Project site	Frequency of water sprinkling	Inquiries and observation	Minimum dust emission	TANROADS	9,000,000
Machinery and equipment	Emissions, Soot, Noise, (SO _x), (NO _x), (CO _x), (CO), (Pd), (O ₃).	As per manufactures manual	All plants, vehicles, equipment and machinery	PM ₁₀ /PM ₅ , dBA, µg/m ³	calibrated precision integrating sound level meter, open Field Microphone and GPS, Germin eTrex 12-Channel, cartridge with 10mm nylon cyclone with 37mm diameter with polyvinyl-chloride with pores of 5µm	-110 -PM ₁₀ at 24 hr exposure 25 µg/m ³ So _x at 24 hr exposure is 125 µg/m ³ NO _x at 1 hr exposure is 200 µg/m ³ , (CO _x), (CO), measures based on WHO Air Quality Guidelines, Global Update	TANROADS, TBS	9,000,000

Parameters Indicator		Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility for monitoring	Annual costs estimates (Tshs)
Socio economic issues	HIV prevalence, degradation of culture norms and values, school dropouts etc.	At Pre-construction phase, quarterly during the construction and after construction	At the schools and other special groups like workers, bar workers etc.		Community engagement, Awareness and VCT	No increased number of school dropouts, no increased HIV prevalence and others	TANROADS	5,000,000
Total cost of monitoring at construction stage is Tshs 129,000,000								
Operation stage								
Increased in natural resources extractions	Condition of the forest	Once in three Months	All forests along the road	Volume of wood extracted	Measurements of volume of trees cut	-	TANAPA, SANAPA/ TANROADS	TANAPA budget
Safety of human beings in villages and towns	Road accidents and roads signs	Three times a year for the project life span	Project site	Road signs and number of accidents	Records, inquiries and illness statistics	Zero accident and sufficient no of road signs	Traffic police/TANROADS	TANROADS Road Safety annual budget
Total cost of monitoring Tshs 148,000,000								

11 RESOURCE EVALUATION AND COST BENEFIT ANALYSIS

11.1 Introduction

This chapter provides a detailed quantitative and qualitative analysis of costs and benefits to determine the viability of the proposed project on the environment, social and economic aspects. Cost-benefit analysis for the Makurunge – Saadani – Pangani - Tanga road project was done in the framework of feasibility study in 2008 and reviewed in 2013 to determine whether or not it makes economic sense to continue with the project to guide decision making; whether the chosen option is cost effective alternative; whether the size of a project is appropriate; and whether the project is socially and environmentally acceptable.

Investment of projects involves the expenditure of current wealth and other resources in the expectation of generating future benefits, whether in the form of profits, cost savings or social benefits. For an investment to be worthwhile the future benefits expected, in whatever form, should compare sufficiently favourably, with the prior expenditure of the resources needed to achieve them. Investment appraisal identifies both the resources needed and the expected benefits and makes this comparison. Economic evaluation is that vital part of investment appraisal which concerned with factors which can be quantified, measured and compared in money terms.

The purpose of investment appraisal is to provide information for making good investment decision. Proper investment appraisal helps to ensure that the right project is undertaken at the right time and in a way which gives it the best chance of success.

The economic feasibility of a project is measured by indices such as the Net present Value (NPV) at a predetermined discount rate, the Benefit/ Cost ratio (B/C) the Internal Rate of Return (IRR%) and the First-Year Benefits (FYB).

11.2 Project Cost

The project cost for the proposed road and associated bridges consists of construction cost, design engineering cost, construction supervision cost and construction contingencies.

The estimate of construction costs which involves activities such as bush clearing, earthworks, bridge construction works, culverts and other drainage structures, pavement construction, ancillary works and construction contingencies was based on the preliminary engineering designs and costs of other road project being undertaken in the country. Unit rate were developed from an estimate of material costs, required construction equipment including mobilization and demobilization cost, staff and labour requirement with mobilization/demobilization and accommodation etc.

11.2.1 Construction Costs

11.2.1.1 Roadwork Costs

The roadwork cost was determined by calculating the various major cost items which can be broken down in the following groupings, which correlate with the standard specifications.

- Accommodation of traffic.
- Drainage.
- Earthworks.
- Pavement.
- Bitumen Surfacing.
- Auxiliary Roadwork.

Accommodation of traffic cost is mainly determined by the cost of the deviations. Allowance was made for various types of deviations, namely gravel roads and surfaced roads. The deviation shall be of gravel standard with a width of 8m from Mkwaja via Pangani to Tanga. For the section from the Bagamoyo - Msata road to Mkwaja, the deviation shall have a width of 6m, as the area currently has only tracks and

very few vehicles. The cost was based on the construction rates to construct a 200mm fill and a 100mm gravel wearing course.

Drainage deals with the nominal culverts and other concrete work, excluding major box culverts and bridges. On the Tanga to Horohoro project, the drainage cost was some USD 68,000 per kilometre as all the culverts are in-situ construction. On the Handeni to Mkata project, the drainage cost was USD 14,642 per kilometre where pre-cast concrete pipes were used. Since the coastal road goes through some swampy areas, the number of culverts could be more than on the Handeni to Mkata road and a rate of USD 25,000 per kilometre was used for the nominal drainage. The road works from Mkwaja to Tanga is around USD 940,000 per kilometre, but if the Pangani Bridge and Tanga bypass are included, the cost rises to about USD 1.25m/kilometre.

The Mwarongo link road is estimated at USD 532,000 per kilometre, the Ushongo Beach road at USD 643,000 per kilometre and Kipumbwi road at USD 550,000 per kilometre. The Ushongo road is more expensive due to the structure that has to be constructed.

The general project cost consists mainly of the Contractor's general items (P&G's), as well as provision, relocating and protecting of utilities and cost of resettlements.

11.3 Economic Analysis

11.3.1 Specification of upgrading sections

Table 34 below summarizes the road sections that were specified for upgrading and analysis. Also refer to Annex 4 for maps showing the investigated project alternatives.

After the Feasibility study which was completed in June 2012, the following options were selected for Detail Design and it is these options that were evaluated after completion of the Detail Design, taking into account changes in scope that occurred after completion of the Feasibility study.

11.3.2 Formulation of Alternatives

For purposes of this updating of previous feasibility study, the following Alternatives were re-evaluated relative to Alternative 0, Status Quo:

The results indicate that the overall Option D (upgrading of section Makurunge-Gama-Mkwaja-Pangani-Tanga to paved standard and construction of Kipumbwi-Segera road) is the most viable option followed by Option A (upgrading of Makurunge-Gama-Mkwaja-Pangani-Tanga to paved standard). Option D however, have the added link that increases the construction cost with about US\$70 million. Options B and C are both viable for the optimistic scenario being above 12%.

The following Detail Design project road was evaluated:

Option C: Route around Saadani National Park starting at Makurunge (three alternative alignments were investigated for Option C during the Feasibility phase and were refined in the Detail Design to arrive at the final alignment).

11.4 Traffic Analysis Inputs

The traffic volumes used for purposes of the economic evaluation were based on the traffic study detailed in the Design Report. The traffic data that was used as basis for purposes of the economic evaluation is as follows:

Table 34: Average Annual Daily Traffic per Alternative After upgrade and diversion

Section	Distance (km)	AADT per Alternative	
		Alt 0: Status Quo	Option C
Makurunge-Gama	29.5	31	31
Gama-Mkange	41.0	31	380

Section	Distance (km)	AADT per Alternative	
		Alt 0: Status Quo	Option C
Mkange-Mkwaja	63.0	31	380
Mkwaja-Pangani	40.5	122	471
Pangani Inland Route High Bridge & Bypass	12.0	153	502
Pangani-Tanga	43.0	153	502
Tanga Bypass	5.0	0	153

Traffic diversions included in the above tables were estimated in the Feasibility Study report as follows:

- Bagamoyo – Tanga traffic is 142 vehicles per day from the current Bagamoyo – Msata road (R704) and the Msata – Tanga road (T2) to the new road via alignment Option A, B, C or D;
- Dar es Salaam – Tanga traffic is 207 vehicles per day from the current Dar es Salaam – Chalinze road (T1) and the Chalinze – Msata road (T2) to the new road via alignment Option A, B, C or D.

To grow the traffic to future volumes a growth rate of 7% per annum was used in Tanzania (realistic rates from 2012):

Based on elasticity of demand and improved riding conditions, the generated traffic was estimated as 20% of normal traffic levels for only those sections which are to be upgraded to paved standards (no generated traffic was considered for rehabilitated sections, as it is believed that there is no suppressed demand due to road conditions on the sections to be rehabilitated).

Additionally, induced traffic was added in Tanzania per section of road to be upgraded from unpaved to paved standard as indicated in the table 35 below.

Table 35: Tanzania -Induced Traffic Summary

Section	Option	Articulated truck (trailer)	Bus	Car	Medium truck	Total
Makurunge-Gama	C	134	0	92	14	240
Gama-Mkange	C	133	0	92	0	225
Mkange-Mkwaja	C	133	0	92	0	225
Mkwaja-Pangani	C	133	0	92	3	228
Pangani Inland Route (High Bridge & Bypass)	C	124	0	92	3	219
Pangani-Tanga	C	124	0	92	3	219

11.4.1 Vehicle Characteristics and Economic Unit Costs

It is anticipated that the upgrading of the project road will result in a reduction of vehicle operating costs and travel time. After applying the economic vehicle operating cost inputs, different VOC Savings are calculated for the alternatives.

11.4.2 Benefits and Costs for Upgrading Option C1

The purpose of an economic evaluation is to assess the economic benefits resulting from the proposed investment. The economic evaluation of a project is assessed by comparing the proposed investment or project with the base-line project alternative or the base case. In order to perform the economic evaluation, the road upgrading alternative was compared with the base case (Alternative 0) of the road.

The relative impact of the upgrading alternative is represented by the net effect of the benefits and costs they induce. The most desirable alternative is usually the one that maximizes the net benefits.

Reduced Vehicle Operating Costs (VOCs) and reduced travel time costs due to the improved road condition were considered to represent the benefit side of the Cost-Benefit equation.

The following costs were taken into consideration:

- User Cost Inputs;
- Road Upgrading/Improvement Costs;
- Maintenance Costs;

11.4.3 Upgrading and Maintenance Cost Inputs

Apart from taking into consideration traffic scenarios and traffic growth estimates with the development of the model, improvement and/or maintenance options for each of the alternatives, as well as several cost types were also taken into consideration. These included:

- Road upgrading costs (including construction and supervision); and
- Road maintenance costs.

These are discussed in more details below:

Road Upgrading Costs

The factors used to convert the financial prices of improvement actions/construction costs to economic cost components are 0.82. The economic costs for the proposed improvement activities are indicated in the table below:

Table 36: Induced Traffic Summary

Section	Length of road in km	Total Cost (including Bridges) US\$	Cost US\$/km (Financial)	Cost US\$/km (Economic)
Makurunge-Gama	29.5	53,193,643	1,803,174	1,478,603
Gama-Mkange	41.0	56,583,339	1,380,081	1,131,667
Mkange-Mkwaja	63.0	69,157,415	1,097,737	900,144
Mkwaja-Pangani	40.5	49,215,444	1,215,196	996,461
Pangani Inland Route High Bridge & Bypass	12.0	59,185,498	4,932,125	4,044,342
Pangani-Tanga	43.0	49,180,975	1,143,744	937,870
Tanga Bypass	5.0	9,143,016	1,828,603	1,499,455

The total cost per km as per the above table was used for purposes of the HDM-4 analysis by assigning the relevant costs to the relevant sections.

Road Maintenance Costs

The following maintenance actions were specified:

Table 37: Maintenance Actions and Frequency

Action	Surface class	Economic cost	Unit	Frequency
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		(US\$/Unit)		
Re-gravel	Unpaved	6.9	m ³	Every 5 years
Grading	Unpaved	394.4	km	Every 180 days
Spot Re-gravelling	Unpaved	6.89	m ³	Maximum material less than 30/m ³ /km
Patching	Paved	17.4	m ²	Severely damaged area >- 0.2 %
Edge Repair	Paved	36.31	m ²	Edge break >- 1.5 m ² / km
Crack Seal	Paved	3.33	m ²	Wide structural cracking >- 0.2%

11.5 Base Results:

The project was evaluated over a period of 23 years (where the construction year can be assumed as 2020 being the year of commencement of the economic analysis and year 2023 being the commencement of the lifecycle of the project roads) at a discount rate of 12% per annum. It was furthermore assumed that the upgrading costs will be spent in a 33%:33%:34% proportion during those three (3) years. It was also assumed that the residual value will be 20% at the end of the analysis period.

The base case economic evaluation results are based on measures of economic viability i.e. Economic Internal Rate of Return (EIRR) and Net Present Value for the adopted investment option at 12% discount rate. Based on the costs and benefits related to the project, the evaluation of the adopted investment options at 2019 prices, resulted in a 19.0 % economic internal rate of return (which is above the opportunity cost for capital at 12% for both Countries) and an NPV of US\$ USD 108.22 million for the Project Road Sections as summarized in Table 38.

11.6 Sensitivity Analysis:

Sensitivity analysis was carried out by varying the project costs and benefits for ascertaining the robustness of the evaluation results for the selected options. The process involved increasing the project cost by 10% while the benefits remained the same, and reduction in benefits by 10%; and a worst-case scenario of simultaneous increase of the project cost by 10% and reduction in benefits by 10%. Furthermore, the process involved increasing the project cost by 20% while the benefits remained the same, and reduction in benefits by 20%; and a worst-case scenario of simultaneous increase of the project cost by 20% and reduction in benefits by 20%. The worst-case scenario of +20% cost and -20% benefits results in an economic internal rate of return (EIRR) of 12.6% and an NPV of US\$11.12 million, as summarized in Table 38. Hence, the economic analysis results indicate the Project road is economically viable.

Table 38: Economic Analysis Results – Base Case and Sensitivity Analysis Results for the Project Road

Scenario	Kenya Road Sections		Tanzania Road Sections		Project Road	
	NPV (US \$ Million)	EIRR (%)	NPV (US \$ Million)	EIRR (%)	NPV (US \$ Million)	EIRR (%)
Base Results	379.74	23.74	35.75	19.40	108.22	19.0
Sensitivity Results: (+20% costs & -20% benefits)	150.71	16.09	8.55	13.70	11.12	12.6

Source: KENHA/TANROADS/Study Consultant/ADB Appraisal Mission July 2019

11.7 Switching Value Analysis:

To test further for the robustness of the economic analysis results, switching values analysis was carried out. Switching value for investment costs indicated that the costs would have to go up by more than 86.65% before project viability is threatened and while the result with respect to benefits indicated that benefits would drop by over 60% before the project economic internal rate of return falls below the opportunity cost of capital for Kenya and Tanzania of 12% as summarized in Table 38 below.

The IRR can be used to prioritise independent projects. It should be noted that the calculation of an IRR is not always possible because its calculation is based on an iterative procedure. Therefore, due to the cash flow nature of the net-benefits, it is sometimes possible to obtain no IRR solution or more than one IRR solution. The NPV is used to determine the most feasible project within a range of mutually exclusive projects.

12 DECOMMISSIONING PLAN

12.1 Introduction

Demobilization and Decommissioning for this road project entails activities to be conducted during closure of construction activities and dismissal of the road operations. Decommissioning is not anticipated in the foreseeable future. However, if this will happen, may entail change of use (functional changes) or demolition triggered by change of land use. In view of this, specific mitigation measures pertaining to environmental impacts of decommissioning works cannot be proposed at the moment with a reasonable degree of certainty. A decommissioning plan that takes environmental issues into consideration shall be prepared by the developer prior to the decommissioning works. Should it be done, decommissioning may entail change of use (functional changes) or demolition triggered by change of land use.

Demobilization will include demolition of temporary structures, removal of temporary infrastructure, installations and equipment from workshops and campsites, rehabilitation of the workshop and stockpile yard, Rehabilitation of campsite at least to the original condition, Clearance of all sorts of waste including used oil, sewage, solid wastes (plastics, wood, metal, papers, etc). Deposit all wasted to the authorized dumping place, and Restoration of the borrow pits, water ponds and temporary quarry sites to a natural and useable condition, termination of temporary employments etc. Other permanent structures and facilities in the camp site will be handled over to the local authorities.

12.2 Preliminary decommissioning plan

This is a preliminary decommissioning plan. This plan establishes feasible decommissioning schemes that can be accomplished after 20 years of the project life span without undue risk to the health and safety of the public and decommissioning personnel, without adverse effects on the environment, and within established guides and limits of the appropriate regulatory agencies. While not a detailed document, this preliminary plan will serve the purpose of ensuring that the decommissioning and ultimate disposition of a road is considered during the initial design and construction of the road. The preliminary plan will remain a “living document,” and revisions will be made throughout the operating life of the plant. It will be reviewed periodically and revised to reflect any changes in the road construction or operation that might affect decommissioning. Prior to the initiation of actual decommissioning activities for the road, a detailed final disposition plan will be prepared.

The final plan should be based on the preliminary plan and revisions, and will define specific work activities and include safety evaluations of planned decommissioning methods, and the road status that will result from the decommissioning program. In addition, this plan must contain sufficient information to obtain any approvals needed from the appropriate regulatory agencies to proceed with decommissioning activities.

12.3 Plan Purpose

The preliminary plan serves to establish decommissioning as an important consideration from the inception of the project, during design and throughout the road operation. The plan has the following purposes:

- a) The primary purpose of the preliminary plan is to ensure that road designers are cognizant of decommissioning during the initial design of a road. Thus, where design choices that would enhance decommissioning are available for types of materials and system components, and location of components, these choices should be made.
- b) The preliminary plan seeks to identify the ultimate decommissioning options and final road status. These options would be evaluated and narrowed to the decommissioning method of choice as the end of road life is approached.
- c) The final purpose of the preliminary plan is to demonstrate to regulatory agencies that important aspects of decommissioning are considered as early as possible during the initial design of a road. The plan serves as the starting point to demonstrate that areas such as decommissioning methods, costs, schedules, and operating impact on decommissioning will be reviewed and refined throughout the operating life of the road.

12.4 Plan Content

The preliminary plan will provide a general description of decommissioning methods considered feasible for the road. The description should demonstrate that the methods considered are practical and that they protect the health and safety of the public and decommissioning personnel.

Design personnel should study the proposed decommissioning methods and take steps to ensure that the design incorporates features that will facilitate decommissioning.

Considerations include:

- a) Provisions for adequate material-handling equipment.
- b) An estimate of manpower, materials, and costs anticipated to support decommissioning.
- c) A description of the anticipated final disposition and status of the road and camp site.
- d) A discussion demonstrating that adequate financing will be programmed for decommissioning.
- e) Identification of records that should be maintained during road construction and operation which might facilitate decommissioning, including a set of “as built” drawings.

12.5 Project Removal Methodology and Schedule

TANROADS shall allocate fund and implement all aspects of project decommissioning, including but not limited to, all engineering, environmental assessment, permitting, construction, and mitigation activities associated with the removal of the road, in accordance with this Plan and the Settlement Agreement, and mitigation of project removal impacts on site TANROADS shall monitor environmental impacts during and after project removal to respond to defined events during the monitoring phase.

The Contractor shall remove the factory and ancillary structures safely and in a manner that:

- minimizes environmental impacts;
- satisfies TANROADS obligations under the Environmental Management Act (2004) CAP 191;
- restores the site to a condition suitable for multiple use; and
- pays all dues (workers, government, suppliers etc.).

Project removal will begin six months after closure and continue for six months. Within the six months from closure TANROADS will inventories all components that need to be removed and or disposed. This inventory will include building structures to be demolished, machinery to be disposed of, chemicals (cleansing and paints) including chemical waste to be disposed of, debtors and creditors to be settled. Also mode of disposal will have to be finalized. Smelters of scrap metals, experts/organizations that will handle chemicals and chemical waste will be contacted within this period. This information will assist in the preparation of the final decommissioning plan, for approval by NEMC.

After the approval of the decommissioning plan the metal parts will be removed first within the first month (this is important to ensure that they are not vandalized). Unused chemicals and chemical waste could also be disposed of in the first month. The second month of the decommissioning will be used to remove concrete structures. Debris will be used as road fills for other roads.

Any hazardous material (for example, used batteries, tyres, acids etc) discovered during decommissioning/demobilization will be cleaned up and disposed of in accordance with then current regulations. All disturbed areas including borrow pits, quarry sites and sand pits will be reinstated and areas alongside the road will be landscaped and re-vegetated using indigenous trees.

Project decommissioning has five phases: (1) pre-removal monitoring; (2) permitting; (3) interim protective measures; (4) project removal and associated protective actions; and (5) post-removal activities, including monitoring of environment and socio economic activities.

The first three phases will occur prior to removal of the Project (i.e. within the first six months). The fourth phase — project removal and associated protective actions — will take place six months after closing business. The fifth phase will begin after total removal and due to nature of the project (medium scale, with relatively moderate impacts) removal and continue for at least one year.

The description that follows outlines the activities that will occur in each phase and provides references to detailed descriptions of each activity elsewhere in this Plan.

(1) Pre-removal monitoring: Pre-removal monitoring includes environmental and socio economic status of the road project and the surrounding. This monitoring is essential to identify if there is any environmental or social liability which need to be settled before the permit for closure is given.

This period will also be used to inventories all assets and facilities that need to be disposed of and to prepare a final decommissioning plan for approval by NEMC.

(2) Permitting: TANROADS shall obtain all permits required to undertake removal of the Project. This basically will include NEMC, Pangani, Handeni and Bagamoyo District Councils, OSHA, Water Authority, Mining Authority, Forestry Authority and Local Government Authorities (Handeni, Pangani and Bagamoyo Districts Councils) etc.

(3) Interim Protective Actions: This will take care of any interim protective measure that needs to be implemented to protect human health and environment. For example draining and containing all chemicals such as asphalts, paints from process line, cleaning of process line, packing all chemicals and chemical waste.

(4) Project Removal: As noted above, the removal of the project will be completed within six months.

(5) Post-Removal Activities: Post-Project removal monitoring will continue for one year.

12.6 Reinstatement and Handing Over of the Site

During closure of construction works the reinstatement shall be done by full vegetation cover to restore the site to a productive use such as pasture/grassland or as a eucalyptus plantation for fuel wood. It shall ensure free drainage and obviate hazards by benching rock faces and grading faces in other materials. All loose materials shall be removed from rock faces to ensure that there is no danger from falling rocks. Reinstatement shall establish contours for the area such that it blends with the landscape.

The handing over of the site will include the land within the right-of-way limits. However, any property or crops found within the reserve shall be preserved by the contractor unless it will be affected by the permanent works.

Since the camp will be handed over to the community then all pit latrines and septic tanks constructed to treat sewage generated from public and office toilets during construction phase will be retained. All used oils, bituminous and lubricants to be generated during construction and operation phases will be properly handled, collected and packed in the containers and disposed in an environmentally friendly manner. All dust bins and collection stations of construction and domestic wastes at the camp site and workshops will be emptied and waste shall be transported to the authorised dumping sites located in Pirani Area along Tanga – Horohoro road.

Upon completion of construction activities the Contractor shall take down and remove all structures forming part of his own camp and shall arrange for the disconnection of water and electricity supply, remove all pavement, drains and culverts, backfill trenches, fill in all un-required latrine pits, soak-away pits and other sewage disposal excavation and generally restore the site to its original condition, leaving it neat and tidy to the satisfaction standard.

12.7 Health and Safety Measures

There will be first aid units at the campsites and workshops which will serve minor health treatments for workers, and emergency cases. The major cases will be referred to nearby government hospitals, health centres and dispensaries.

13 SUMMARY AND CONCLUSION

13.1 Summary

The ESIA study results show that the project is associated with negative environmental and social impacts despite that, the project has high socio-economic benefits to the people of, Bagamoyo, Pangani and Handeni districts and adjoining regions as well. The associated negative impacts, to a large extent can be minimized through appropriate decision, good engineering design and, envisaged construction practices and the mitigation measures proposed in this report. The mitigation measures shall offset some of the inherent adverse impacts especially those linked to land, water and air pollution. Implementing these mitigation measures would increase environmental soundness of the project.

Due to anticipated negative impacts of the proposed road on the park and its associated ecosystems, the several alternative route were evaluated namely option B, C and D as shown on the map found under Annex 4. The proposed alternative road will alleviate problems likely to affect the National Park such as pollution, wildlife poaching and accidents among others. In addition, the alternative route identified traverse areas with high potential for agricultural production and tourism development. The identified alternative routes are likely to have sub-spatial contribution towards socio-economic development compared to the Mkwaja - Saadani road, due to the fact that it shall serve a number of people and enhance the economic potential of the project area in activities such as small scale-fishing, subsistence farming and livestock keeping. The alternative routes is expected to provide services to more than 17,278 people living in the area as compared to Mkwaja - Saadani Route, that will serve a small proportion of the population residing in the area.

Road transport reduces absolute poverty by improving economic efficiency, as it decreases costs and prices and enhances trade and employment opportunities. Based on our assessment particularly in regards to the well-being of the people, it suffice to say that, the alternative route consideration has to be evaluated in order to minimize negative impact to the national resources and address socio-economic problems in this area such as serving a big proportion of people within the project area.

Furthermore, the road will promote accessibility to agricultural markets. The associated environmental and social implications of the project which, to a large extent, can be mitigated, avoided, eliminated or reduced using engineering and non-engineering solutions during the design and construction phases. Such engineering solutions include: construction of new and sustainable drainage including bridges and culverts to control erosion, provision of recommended road synergy of good standards to control road accidents, reinstatement of abandoned borrow pits after extraction of borrow materials and so forth. Non-engineering solutions will include education and awareness campaigns to address HIV/AIDS problems, Compensations for the affected properties and so forth.

All the people interviewed right across the route, from Bagamoyo through Pangani were anxiously waiting for the upgrading of the trunk road. They look to the road as a major vehicle for realizing their dream of poverty eradication and improved living standards. They all see the proposed road impacting on them very positively. Specifically, the main benefits they expect to accrue as a result of the road upgrading include:

- The road will open up inter District, inter Region, cross border to Mombasa Kenya and even export markets for their produce. Farmers, fishermen (from Tanga to Pangani) and producers of other commodities would certainly benefit.
- Farmers, and producers as a whole would get better prices for their marketed produce due to a combination of factors: likely reduction in transportation costs for goods; likely appearance of many more produce buyers (hence a more competitive market); and likelihood of purchased produce being able to reach its destination on time and in good condition.
- There would be greatly increased farm production triggered by a combination of factors: better prices of farmers' produce, availability of market; more availability of agricultural inputs at reduced prices; and also more people are likely to get engaged in farming as a career due to the attractive prices and market availability.
- Post-harvest losses now being experienced due to lack of market are likely to be reduced drastically. Prices of incoming commodities into the Districts along the proposed road will also go down because of cheaper transport costs. Better roads make transportation competitive.

- Again availability of a lot more and faster transport (as a result of the road) will reduce medical costs to people along the area who would need to be treated in the major hospitals further away: transport costs would be cheaper and time to reach hospital would be reduced, potentially saving lives.
- Employment is likely to be available during the construction and also after construction for maintenance jobs e.g. grass cutting, cleaning drainage culverts, etc; as well as some clerical/low level supervision jobs. Such employment would contribute to poverty reduction, especially for women.
- The road will attract civil service personnel to take up employment in these western Regions; and in turn improve social services delivery to the local population. To date several staff appointed for jobs in this Region had opted not to take up the appointments as they considered that the Regions offered harsh conditions in terms of transport and cost of living. When the study team visited some of the District Government offices they learnt of several unfilled staff positions, especially in the teaching and medical professions.
- The road would attract private capital investment in industry, commerce, agriculture and livestock, fishing, forestry/beekeeping, mining and tourism (tour operators and hotel investors, air transport, tented camping and so on).

13.2 Conclusions

This ESIA study concludes with consideration of environmental and socio-economic benefits that the proposed project is acceptable and viable. The proposed road project will generally have great positive environmental and socio-economic impacts as outlined above. The implementation of the proposed project will entail no detrimental impacts provided that the recommended mitigation measures are adequately and timely put in place.

This ESIA report has proved that the limited significant adverse environmental and social impacts outlined above can be eliminated or reduced by implementing the proposed mitigation measures using engineering and non-engineering methods that will be contained in a separate volume as Environmental and Social Impact Assessment (ESIA) report included with environmental and Social Management Plan (ESMP) is concerned.

13.3 Recommendations

Based on the above findings, this study recommends the following:

- i. Repair and construction of new feeder roads to cater for likely increased volume of goods from and into villages in the interior of the Regions should be stepped up. This would make the proposed road more effective.
- ii. Adequate speed checks devices should be provided for. Other safety measures proposed are for road to have sufficient clear warning signs at critical / danger points along the road. They would also like the road to have provision for pedestrian walk/crossings, bicycle ride, animal crossings etc. Further, road drains should be properly constructed so that water flowing from them does not spoil farms.
- iii. Culverts should be of sufficient number and size; they should all be wide enough to avoid a situation in which storm water would overflow and prevent traffic from passing. Foreign matter in the water flowing through them should not easily block them either.
- iv. Where construction of boreholes for water would be necessary during the construction, such should be done in such a way that the wells or boreholes should be handed over to people living in nearby villages.
- v. Measures should be built in to ensure that rocks and soil lumps are not allowed to fall on to the completed road (a thing that could cause serious accidents). In addition it is suggested that there should be involvement of villagers in the security of the road.
- vi. If possible village governments could be involved in labour contracts to their respective villagers, to assist in ensuring that proper job contracts are made and payments done as per the contracts.

- vii. Fair, timely compensation should be made for all housing that would be demolished by the road construction activities. Similarly for farmland and crops that would be taken up for the road construction.
- viii. The local people should be sensitized and provided with usable skills so that they can compete for jobs with those coming in from outside the Region. This is work for the local leadership.
- ix. The local authorities should sensitize the local people on the Land Act provisions and speed up provision of land titles to them (local population), in order that the local's prime land does not fall easily into the hands of outsiders, given that Tanzanians are free to settle in any part of the country in accordance with existing laws.
- x. The local authorities should step up measures to counter the likely spread of infectious diseases especially HIV/AIDS as a result of the likely influx of people into the Region.
- xi. Provision of social services (education, medical care, water, power, communication and others) should be stepped up considerably in order to cater for the likely increased demand.
- xii. In general, the road construction activities should be undertaken such that minimum damage is caused to people, property, land and other natural resources. Undue inconvenience to people during construction should be minimized as well.
- xiii. The contractor should be ready to construct housing/ camps for its staff, as housing is in very short supply in the Regions. After road construction, the camp buildings could be used for schools, health centers or for other social services; such uses should be born in mind during camp design and construction.
- xiv. Sensitization campaigns to the local people should be undertaken for the purpose of preparing them to take advantage of opportunities likely to come about because of the new road.

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ANNEXURES: (Volume II)

- Annex 1: Terms of Reference for ESIA study
- Annex 2: Environmental clearance certificate from NEMC
- Annex3: List of Stakeholders and Minutes of the Consultation meetings
- Annex4: Alternative Alignment
- Annex 5: Complementary Projects along Mkange – Kwamsisi – Tungamaa
Pangani Road Project.
- Annex 6(a) (b): Biodiversity (Flora and Fauna) found in Saadani and Zaraninge
Forest reserve
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