THE UNITED REPUBLIC OF TANZANIA

PRESIDENT'S OFFICE - REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT (PO-RALG)

TABORA MUNICIPAL COUNCIL

P.O BOX 174 TABORA

+255 (26) 2604639 / +255 (26) 2604286

taboramc@gmail.com

Tanzania Cities Transforming Infrastructures and Competitiveness Project (**TACTIC**)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED UPGRADING OF KANYENYE ROAD (8.109KM), SWETU ROAD (8.371KM), MAILITANO ROAD (4.132KM) AND KISARIKA ROAD (2.829KM) TO BITUMEN STANDARD IN TABORA MUNICIPALITY, TABORA REGION

Submitted to:

The National Environment Management Council,
Head Office, Kambarage Tower, 6th Floor,
P.0 Box 2724, Dodoma.
Phone: +255 26 2960098, 0713 608930.
Email Address: dg@nemc.or.tz
Website: www.nemc.or.tz

Lead Consultant

WESH Consulting Limited
Block No. 3, Plot No. 105, Makongo Juu Street,
P. O BOX 35478, Dar es Salaam, Tanzania
Mob: +255 752 575 989/ +255 754 898 592
Email: weshconsultingltd@gmail.com

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THE ESIA STUDY TEAM

NAME	POSITION	NEMC Reg. No.	SIGNATURE
Prof. Rubhera RAM Mato	Environmentalist and ESIA Team Leader	NEMC/EIA/0092	
Benjamin Fredrick Mtani	Environmentalist	EC/EE-EAI/2021/0083	
Mr. Robert Kishiki	Sociologist	Not Registered	

ABBREVIATIONS AND ACRONYMS

A.M.S.L	Above Mean Sea Level
AADT	Average Annual Daily Traffic
AAS	Atomic Absorption Spectrophotometer
AI	Area of Influence
AIDS	Acquired Immune Deficiency Syndrome
BATNEEC	Best Available Technology Not Entailing Excess Cost
BOQ	Bill of Quantities
CBD	Convention on Biological Diversity
CBO	Community Based Organization
CIA	Cumulative Impact Assessment
CIF	Cost of Insurance and Freight
CITES	Convention on International Trade in Endangered Species
CRB	Contractors Board
CTC	Care and Treatment Clinic
DBST	Double Bituminous Surfacing Treated
DEM	Digital Elevation Model
DFO	District Forest Officer
DIZ	Direct Impact Zone
DoE	Division of Environment
EAMGRS	Environmental Assessment and Management Guidelines for Road Sector
EIA	Environnemental Impacts Assessment
EIS	Environnemental Impacts Statement
EMA	Environnemental Management Act
EMP	Environnemental Management Plan
ERB	Engineering Registration Board
ESIA	Environmental and Social Impacts Assessment
ESMP	Environmental and Social Management Plan
GMP	General Management Plan
GN	Government Notice
GoT	Government of the United Republic of Tanzania
HDM	Highway and Development Management Model
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome

HSMP	Health and Safety Management Plan
IRR	Internal Rate of Return
LATRA	Land Transportation Regulatory Authority
LTBWB	Lake Tanganyika Basin Water Board
MEAs	Multilateral Environmental Agreements
MOWT	Ministry of Works and Transport
MVPL	Marginal Value Product of Labour
NACP	National AIDS Control Programme
NEMC	National Environment Management Council
NGO	Non-Governmental Organization
NPV	Net Present Value
NSGRP	National Strategy for Growth and Reduction of Poverty
OCC	Opportunity Cost of Capital
PAPs	Project Affected Persons
PAs	Protected Areas
PEDP	Primary Education Development Programme
PLHAS	People Living with HIV/AIDS
PMTCT	Prevention of Mother to Child Transmission
PO-RALG	Prime Ministers' Office Regional Administration and Local Government
RoW	Right of Way
SEA	Strategic environmental assessment
SIA	Social Impacts Assessment
STD	Sexually Transmitted Diseases
STI	Sexual Transmitted Infections
TAC	Technical Advisory Committee
TACAIDS	Tanzania Commission for Aids
TANESCO	Tanzania Electrical Company
TANROADS	Tanzania National Roads Agency
TFS	Tanzania Forest service
ToR	Terms of Reference
TTCL	Tanzania Telecommunications Company Ltd
TUWASA	Tabora Urban Water supply and Sanitation Authority
VCT	Voluntary Counseling Treatment

VOC's	Vehicle Operating Costs
WSSA	Water Supply and Sanitation Authority

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Proponent: Tabora Municipal Council

Proponent's Contact: P. O BOX 174 TABORA
+255 (26) 2604639 / +255 (26) 2604286
taboramc@gmail.com

EIA Expert: WESH Consulting Limited
Block No. 3, Plot No. 105, Makongo Juu Street,
P. O BOX 35478, Dar es Salaam, Tanzania
Mob: +255 752 575 989/ +255 754 898 592
Email: weshconsultingltd@gmail.com

INTRODUCTION

The Government of the United Republic of Tanzania through the President's Office – Regional Administration and Local Development intends to deliver improved basic infrastructure and services in participating urban local government authorities and set aside funds to undertake the Environmental and Social Impact Assessment (ESIA) including the development of the Environmental and Social Management Plan (ESMP as well as to undertake the Resettlement Action Plan (RAP) for the Tabora Municipal the proposed sub-projects infrastructures which include; upgrading of Swetu road 3.4Km, Kisarika road I&II 2.36Km and Kisarika III 0.63Km, Kisarika IV *(Nguzo Tanesco)* road 3.6km, Mailitano road 3.1Km (Mailitano I 1.10km, Mailitano road II 0.63Km, Mailitano road III 0.69km, and Mailitano road IV 0.67km), Kanyeye I road 0.15Km, Kanyenye II (*Madaraka st.*) road 0.5km, Kanyenye III (Kanoni st.) road 1.08km, and Terminal Access (*Mkunazini St.*) road 0.36km. Improvement of basic infrastructures is part of the Government's strategy to promote the socio-economic development of Tanzanian's cities and towns and to enhance urban development that is productive, inclusive, and resilient.

PO-RALG and the World Bank initiated discussions to consider upgrading of Swetu road, Kisarika road, Mailitano road and Kanyeye roads. The implementation of this TACTIC sub-project is intended to facilitate the economic growth which includes; stimulation of the Town growth through the construction of the roads sub-projects which shall provide an improved social-economic environment which will reduce traffic mobility as well as social risks.

The Environmental Impact Assessment (EIA), in this context referring to the Environmental and Social Impact Assessment (ESIA) study, was conducted as per the Environmental Impact Assessment and Audit regulations (2005) and its amendment of 2018 that implement the Environmental Management Act No. 20 of 2004. Per these Regulations, the National Environment Management Council (NEMC) is mandated to oversee the EIA process, which culminates with an award of the EIA Certificate by the Ministry responsible for Environment. The EIA Certificate is among the prerequisite approvals required before the project takes off. Without exception, this project will need the EIA certificate before the construction of the road commences. The study also made a review of the World Bank Environmental and Social Standards (ESS) of 2018 and incorporated their requirements accordingly. The study was conducted from December 2021 to January 2022.

POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

Tanzania is committed to attaining sustainable development goals. This urge is envisaged in the National Environmental Policy and other sectoral policies including;

- National Environmental Policy (NEP) of 1997
- National Transport Policy (2003)
- National Mineral Policy (1998)
- Construction Industry Policy (2002)
- National Land Policy (1995)
- Energy Policy (2003)
- National Human Settlements Development Policy (2000)
- National Gender Policy (1999)
- The National Water Policy (2002)
- National Forestry Policy (1998)
- National Investment Policy (1997)

- Agricultural and Livestock Policy (1997)
- National Strategy for Growth and Reduction of Poverty
- National Policy on HIV/AIDS (2001)
- National Park Policy (1994)
- National Health Policy (2017)

Important laws and regulations that have relevance to road development in respect of environmental management include;

- Environmental Management Act No. 20 of (2004), Cap. 191
- Environmental Impact and Auditing Regulations (2005)
- The Village Land Act (1999), R.E 2019
- and item 3.4.10 Land Act, 1999 R.E 2019The Water Utilization (Control and Regulation) Act (1974) as amended in 1981 (Act No.10)
- The Road Act, 2007
- Protected Places and Areas Act (1969)
- Antiquities Act of 1964 (as amended in 1979) and the Antiquities Rules of 1991
- The Urban Planning Act (2007)
- Land Use Planning Act (2007)
- Occupation Health Safety (2003)
- Local Government Acts No.7 & 8 of 1982
- National Land Use Planning Commission Act 3/84
- Land (Assessment of the Value of Land for Compensation) Regulations, 2001]
- Forest Act, 1957 (Revised in 2002)
- Forest Act, 1957 (Revised in 2002)
- Explosives Act, 538
- Regional and District Act No 9, 1997
- Environmental Assessment and Management Guidelines for the Road Sector
- Mining Act (1998)
- The Land Acquisition Act 1967

PROJECT DESCRIPTION

The upgrading of Swetu road 3.4Km, Kisarika road I&II 2.36Km and Kisarika III 0.63Km, Kisarika IV *(Nguzo Tanesco)* road 3.6km, Mailitano road 3.1Km (Mailitano I 1.10km, Mailitano road II 0.63Km, Mailitano road III 0.69km, and Mailitano road IV 0.67km), Kanyeye I road 0.15Km, Kanyenye II (*Madaraka st.*) road 0.5km, Kanyenye III (Kanoni st.) road 1.08km, and Terminal Access (*Mkunazini St.*) road 0.36km are located in Tabora Municipal Council, Tabora region. The existing project roads alignment transverse from the starting point to the end through different wards. Furthermore, the roads transverse through the environmentally sensitive areas and areas with high populations and numbers of public utilities of which the project shall affect. The design details of the road sub-projects are;

Pertinent features of the road design include:

- The width of the Asphalt concrete pavement carriageway will be 6.5m
- Lane width 3.25m
- Number of Lanes 2
- The width of the (paved) shoulders will be 2x1.5m
- Roadway width 9.5m
- A road reserve corridor of 30m
- Cross-drainage structures, intersections, and ancillary road works
- The road will have a 20-year design life

The major construction activities for the sub-projects include;

- Extraction and transportation of materials (gravel, sand, hard stones, aggregates, water, and bitumen)
- Clearing the Right of Way (RoW) while leaving intact the trees which do not interfere with the construction.
- Rehabilitation Partially Construction or full construction of culvert and other drainage structures.
- Formation of the road embankment, establishment of sub-base and base, road surfacing
- Pedestrian Crossings, Speed Humps, and Rumble Strips shall be provided in all built-up areas and trading centers of all villages.

- The landscaping of areas covered by the project road and establishment of vegetation for functional and aesthetic purposes on cut and fill slopes shall be following the requirements of the MOW Standard Specification for Road Works.
- The final finishing and cleaning up of the road and road reserve after construction, treating of old roads, and temporary diversion
- Detours will be required to maintain a usable route during the construction period. Wherever practicable, alternative local roads will be used. The construction and maintenance of these detours must be of a standard that ensures the safety of workers, road users, and the general public. Detours outside the road reserve will require additional permission from the landowners. At the end of the detour's period of use, the detour shall be decommissioned and the original land reinstated acceptably.

PROJECT ENVIRONMENT

Tabora Municipal

Tabora Municipality is a Headquarters of the Tabora region and covers 1092 square Kilometres. The Municipality is located between 4^{o} 52' and 5^{o} 9' latitude South and 33^{o} 00' East. Most of its part lies between 1000m above sea level. It is surrounded by Uyui District in the Western, Northern, and Eastern parties and Sikonge District in the South.

In the Municipality, rainfall decreases from west to east, in the west, the rainfall is over 1,000 millimeters while in the east it drops to 700 millimeters or less. The peak is in December followed by a slight dry spell in January.

The average temperature during the day is 22^{0} C - 26^{0} C. Highest temperature of 33.1^{0} C occurs in October just before the start of the rainy season, falls gradually in December, and remains relatively constant until May. Between May and August, the Municipality experiences cold season with an average minimum temperature of 15.7^{0} C is relatively lower compared to October.

Water sources

There are no credible water sources on the sub-projects site. However, there are two major rivers namely Walla and Igombe Rivers which are temporary rivers traversing through the municipality. Therefore, the construction of earth dams and reservoirs may be initiated during rain seasons to store water that may be used for construction purposes.

Flora

There are two main forest reserves found within Tabora Municipality owned by the central government; these include: Igombe Forest Reserve found in the North-West part of the municipality at Misha and Ikomwa wards and Urumwa Forest Reserve found in the South-West of the municipality at Itetemia and Ntalikwa wards. The nature of these forest reserves is naturally dominated by miombo woodlands.

The vegetation cover of Tabora Municipality can be classified into upland and low land or wetland vegetation. In the uplands, there are woodland, bushland, and thicket grassland. Miombo woodland (*brachystegia boehmii*) is the dominant species within the municipality, with mninga trees found in scattered patches. Miombo forests with the famous mninga hardwood are good sources of quality timber, firewood, charcoal, and for keeping beehives.

Fauna

The Fauna in the municipality includes livestock of different kinds such as; cattle, goats, sheep, and poultry. However, some of the species like birds and bees, etc, have their habitats in forest areas. The livestock are mostly indigenous breeds, a few exotic and crossbreeds are found mainly in the urban area.

PROJECT STAKEHOLDERS AND INVOLVEMENT

A simple methodology was adopted to identify key stakeholders and main environmental and social concerns. This involved physical observations and consultations (direct consultations). Other information on the project was obtained through a desk study.

Stakeholder consultations were conducted during the scoping stage. Different stakeholder levels including local government officials as well as community members in villages located along the project road were identified and consulted.

Stakeholders included government agencies, beneficiaries, commercial companies, and all other formal or informal groups associated with a project. Interviews were used in the process of stakeholder identification. From one stakeholder, the team was connected to another and another stakeholder, in a chain-like or network process. The following is a shortlist of both institutional and individual stakeholders.

The major stakeholders include:

- Ministry of Works and Transport;
- Ministry of Lands, Housing and Human Settlement Development;
- Ministry of Natural Resources;
- Ministry of Water;
- RAS-Office – Tabora
- TANROADS-Tabora
- TARURA – Tabora
- TFS-Tabora
- Tabora Municipal Council
- Fire and Rescue force-Tabora
- WEO & VEO at the sub-project site
- Utility Companies, TANESCO, TTCL, and Water Supply Authorities (TUWASA)
- Community nearby sub-project area
- LATRA-TABORA

RESULTS OF PUBLIC CONSULTATIONS

Both scoping and initial fieldwork revealed the following key issues that have been expounded in this EIA study. The main issues include;

Economic Benefits: Good road with a tarmac will bring various economic benefits to communities living along or near the road. These include; lowering of transport costs, increase of transportation passing through the roads sub-project, reduced soil erosion during the rainy season, reduced flood problems, reduced traveling time.

Proposed Road Design: The road alignment should be widened to accommodate pedestrians, communities with bicycles and motorcycles, the design of the project roads has to consider Township beautification including installation of street lights for the project roads and if possible for the Ulaya road (starting from Madafu to Kilimatinde Road) which crosses the RAS and other regional official’s residences to reduce mugging incidences. Similarly, the design should consider the flood-prone areas and drainage system.

Public Facilities: Some of the services that are being provided to the communities i.e. water supply, electricity, and telecommunication will be affected/ or disrupted by the road construction. Water supply from TUWASA is the main supply of water for residents of Tabora municipal; Therefore, the project phases should avoid pollution of the water. There are Abattoirs, health centers, and schools located along the sub-project road.

Resettlement and compensation: Expropriation of project-affected people's properties, especially houses. This issue is key and extremely sensitive since it is very costly with prevailing financial circumstances for an individual to put up a house structure. They are assets that are highly valued by the communities.

Location of Campsites: Local people should be involved in the selection of the camp site/s. The contractor's camping site/s should be constructed with permanent building materials. The idea is to use these structures for public services e.g. schools or street offices at the end of the project construction phase.

Spread of HIV/AIDS and Other Sexually Transmitted Infections: Impaired community safety and risk of disease intensifications, especially HIV/AIDS. TARURA and the proponent (PO-RALG) to officially make a formal contract with the institution that will be carrying out the HIV/AIDS preventive campaign through the dissemination of relevant and appropriate HIV/AIDS preventive awareness creation seminars, campaigns should be to both workers in particular and the communities, effective collaboration with CMACs and other stakeholders is paramount for result based HIV/AIDS awareness creation campaigns during construction of the road

Early marriage and Pregnancies: It has been insisted by stakeholders that most construction projects have been a major cause of early pregnancies for school female children. The stakeholders proposed some measures to address the situation i.e. parents should install a culture of educating their children on sex and reproductive health education, abiding by moral and ethical values, and also parents should behave responsibly as role models with whom the children can emulate them.

Awareness on road safety: It has been always observed and witnessed the increase in the number of road accidents that are fatal and leave affected with disabilities after the tarmac road is constructed; as proposed tarmac roads, will claim people's lives through accidents. The contractor/TARURA to train vill communities' leaders on Road Safety Campaign and Occupational Health and Hygiene so that they will key community educators to road users by disseminating relevant, right, and appropriate information, education, and communication to the communities' members. This goes in conjunction with placement or installation of clear and understandable road signs (preferably in Kiswahili), use of speed humps at streets, and general traffic police surveillance together with allocation of site safety signs for the workers.

Stimulate the growth of town: The project will fuel the growth of towns and streets located along the proposed sub-project roads. These towns should be assisted by the government in planning (e.g. land use and plot surveying) to curb unplanned growth of settlements which directly affect the accessibility of essential public services like supply of clean water and managing waste generated by residents of respective towns and streets along the road. However, the project should avoid disruption of public essential utilities especially during construction phase.

Employment opportunities to the local people: Each street/ward being transverse should be given priority in the provision of unskilled and semi-skilled laborers in the project. The contractor should therefore adhere to the local content policy in executing the project during recruitment of laborers and commodities and services supply chain.

Insurance of Workforce: Experience gained from other foreign contractors is that they do not provide workplace insurance for casual laborers. Following existing labor laws, TARURA and Tabora Municipal council authorities should enforce the contractors to abide with existing laws of the land in safeguarding the safety of the entire workforce at the construction site to make them well covered by appropriate insurance policies.

Improved Accessibility: The proposed sub-project will guarantee easy accessibility of transportation of goods, commodities, and people hence, therefore, enabling more physical development.

Pollution and Vibration during Construction: Dust production, noise from moving construction equipment/machines, and blasting of rocks are inherent to all road construction works. The contractor must have the means to suppress the dust, reduce the level of noise and provide early notification to the communities about the proper time of blasting rocks to obtain gravels.

Protecting constructed Infrastructures: It was urged by stakeholders that there is a need of cultivating a culture of safeguarding and protecting the project infrastructures among community members especially after the completion of sub-project construction. It has been noted in other areas that people have been vandalizing road infrastructures i.e. bolts, nuts tied in bridges by selling them as scrap metals.

Environmental Safeguard and Sustainability: Stormwater channels should not be directed to farms since such practice has damaged crops and farming land due to accelerated erosion. It should be directed to the proper water channels that are not polluting the environment. Also, leakage of diesel, oil, and other lubricants from construction equipment and machines to the road surface and in water sources should be avoided.

Environmental Beautification: Since the Tabora Municipal has had a campaign of planting trees, therefore, the contractor should make sure that the trees are planted on the road reserve areas and ensure that they grow before handling the project to the client.

Gender-Based Violence: Based on the experiences gained from the rise in incidences of GBV from other road construction projects, community members expressed their concerns that during the construction process of the sub-project, more people will come to work in the project area and hence may likely fuel gender-based violence in their communities as a result of interactions of people from different cultural backgrounds. They call upon the contractor to emphasize employees of the project respect human dignity by abiding by traditional customs and norms instead of being the cause of fuelling of GBV related issues in the project area.

POTENTIAL SIGNIFICANT ENVIRONMENTAL AND SOCIAL IMPACTS

The impacts are categorized into Pre-Construction phase impacts, Construction phase impacts, and Operational phase impacts. The main receptors of impacts associated with the anticipated upgrading of Swetu road 3.4Km, Kisarika road I&II 2.36Km and Kisarika III 0.63Km, Kisarika IV *(Nguzo Tanesco)* road 3.6km, Mailitano road 3.1Km (Mailitano I 1.1km, Mailitano road II 0.63Km, Mailitano road III 0.69km, and Mailitano road IV 0.67km), Kanyeye I road 0.15Km, Kanyenye II (*Madaraka st.*) road 0.5km, Kanyenye III (Kanoni st.) road 1.08km, and Terminal Access (*Mkunazini St.*) road 0.36km 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 were identified to be likely to occur during the pre-construction phase;

- Land expropriation, loss of property, and resettlement
- Job creation and increased income

The following impacts were identified to be likely to occur during the construction phase;

- Job creation and increased income
- Destruction of public utilities
- Soil erosion and instability of slopes
- Risk Water and Land Pollution
- Increased noise, vibration, and air pollution
- Occupational Safety and health risks
- Increase road accidents
- Increased Waste
- Increased Water Abstraction
- Loss of Definite Materials and Land Degradation
- Loss of biodiversity
- Increased HIV/AIDS
- Population Influx
- Visual Intrusion during Construction
- Increased Gender Based Violence's

The following impacts were identified to be likely to occur during the operational phase;

- Easy transport and transportation of goods
- Economic growth and trade
- Creation of job opportunities during the construction phase
- Increase of prices for goods
- Reduced traveling time and Vehicle operation cost
- Reduced operation and maintenance costs
- Reduction of road accidents
- Interference to local hydrology
- Increased Rates of Natural Resources Exploitation
- The danger of un-reinstated borrow pits

MITIGATION MEASURES AND ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The options to minimize or prevent the identified adverse social and environmental impacts as well as a monitoring plan have been suggested in this report and are contained in the ESMP. Many of them are based on good engineering practices and the timely responsiveness of the responsible institution. The ESMP describes the implementation schedule of the proposed mitigation measures as well as planning for long-term monitoring activities. It defines the roles and responsibilities of different actors of the plan. The Approach environmental and social costs amount to TSH 174,500,000 (Excluding the costs that will appear in then (BOQ) and resettlement exercise. The estimated annual costs for carrying out the proposed environmental and social motoring program amounts to TSH 144,000,000.

RESOURCES EVALUATION

This economic analysis to test the viability for the proposed road upgrading projects during the time of this consultancy. The details of the analysis will be included in the Final Report (which will be prepared after the Detailed Design has been completed and all costs known). Normally economic analysis for road construction is done using the HDM-4 model, which is an analytical framework based on the concept of pavement life cycle analysis. The model analyses the project road with different investment and maintenance options, taking into account the associated costs and benefits projected annually over the analysis period, to determine the economic and engineering viability of the project.

DECOMMISSIONING

Decommissioning is not anticipated in the foreseeable future. However, if this will happen, may entail a change of use (functional changes) or demolition triggered by the change of land use.

A detailed decommissioning plan that considers environmental issues shall be prepared by the developer before the decommissioning works. Should it be done, decommissioning may entail a change of use (functional changes) or demolition triggered by the change of land use. Therefore what is presented here is just a Preliminary Decommissioning Plan which gives light to what shall be done if the need for decommissioning arises.

CONCLUSION

It is, therefore, concluded that implementation of the upgrading of Swetu road 3.4Km, Kisarika road I&II 2.36Km and Kisarika III 0.63Km, Kisarika IV *(Nguzo Tanesco)* road 3.6km, Mailitano road 3.1Km (Mailitano I 1.1km, Mailitano road II 0.63Km, Mailitano road III 0.69km, and Mailitano road IV 0.67km), Kanyeye I road 0.15Km, Kanyenye II (*Madaraka st.*) road 0.5km, Kanyenye III (Kanoni st.) road 1.08km, and Terminal Access (*Mkunazini St.*) road 0.36km will entail no detrimental impacts provided that the recommended mitigation measures are adequately and timely put in place. The identified adverse impacts shall be managed through the proposed mitigation measures and implementation regime laid down in this EIS. PO-RALG is committed to implementing all the recommendations given in the EIS and further carrying out the environmental auditing and monitoring schedules.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

The Government of the United Republic of Tanzania through the President's Office – Regional Administration and Local Development (PO-RALG) intends to strengthen urban management performance and deliver improved basic infrastructure and services in participating urban local government authorities. At its core, the project aims to promote the economic development of Tanzania's cities and towns and its enabling infrastructure. Investments and technical assistance under the project are intended to promote urban development that is productive, inclusive, and resilient. The project will support 45 urban Local Government Associations (LGAs) spread geographically across all regions of Tanzania, ranging in population from 26,402 to 416,442 (2012).

The President's Office – Regional Administration and Local Development (PO-RALG) have retained Crown-TECH Consult Ltd, an engineering consulting firm with headquarters in Dar es Salaam, to undertake consultancy services for feasibility studies, urban design, detailed engineering designs, environmental and social instruments, and bidding documents for a pipeline of investments in 4 municipality/City councils, Arusha, Dodoma, Tabora, and Kigoma. Crown-TECH Consult Ltd in turn has involved WESH Consulting Limited, a registered firm of Environmental experts to undertake Environmental and Social Impact Assessments for the respective Roads sub-projects.

The Environmental and Social Impact Assessments for Tabora Municipal proposed sub-projects infrastructures which includes; upgrading of Swetu road 3.4Km, Kisarika road I&II 2.36Km and Kisarika III 0.63Km, Kisarika IV *(Nguzo Tanesco)* road 3.6km, Mailitano road 3.1Km (Mailitano I 1.1km, Mailitano road II 0.63Km, Mailitano road III 0.69km, and Mailitano road IV 0.67km), Kanyeye I road 0.15Km, Kanyenye II (*Madaraka st.*) road 0.5km, Kanyenye III (Kanoni st.) road 1.08km, and Terminal Access (*Mkunazini St.*) road 0.36km was conducted on December 2021.

It is anticipated that the proposed street roads will function to improve traffic mobility and enhance the town beautification through trees planting and the installation of street lights to wave off Mugs. Moreover, the construction of the roads sub-project infrastructures is expected to generate employment opportunities many of them to the locals along with the close to the respective sub-project.

Impact Assessment (ESIA) study, was conducted as per the Environmental Impact Assessment and Audit regulations (2005) and its amendment of 2018 that implement the Environmental Management Act No. 20 of 2004. Per these Regulations, the National Environment Management Council (NEMC) is mandated to oversee the EIA process, which culminates with an award of the EIA Certificate by the Ministry responsible for Environment. The EIA Certificate is among the prerequisite approvals required before the project takes off. Without exception, this project will need the EIA certificate before the construction of the road commences. The study also made a review of the World Bank Environmental and Social Standards (ESS) of 2018 and incorporated their requirements accordingly. The study was conducted from December 2021 to January 2022.

The proposed TACTIC roads sub-project is likely to cause environmental impacts of both positive and negative nature. However, PO-RALG intends to implement the project with minimum adverse environmental and social impacts. The environmental and social issues addressed in this report will be taken into account in the design (both preliminary and detailed designs stages) of the proposed sub-project as well as plans for construction and operation phases of the project through the implementation of the Environmental and Social Management Plan (ESMP).

1.2 Project Proponent and Overview

The President's Office Regional Administration and Local Government PO-RALG manage the district and regional health services, including the regional and district councils. PO-RALG oversees regional development management and administration by coordinating rural and urban development management policy and strategies as well as the activity of Regional Secretariats. PO-RALG's projects heavily feature decentralization to improve the delivery of services; their efforts involve transferring responsibilities and resources from the central government to local authorities to strengthen local institutions.

1.3 Project Objective

The objective of the proposed TACTIC roads sub-projects is to strengthen urban management performance and deliver improved basic infrastructure and services in participating urban local government authorities.

Once completed, the investments and technical assistance under the project are intended to promote urban development that is productive, inclusive, and resilient.

1.4 Scope of Service

The Consultant is required to conduct environmental and social impact assessments for the proposed TACTIC roads sub-project. The Consultant shall review all available and relevant documents, maps, previous studies if any, and conduct the environmental and social impact assessment study, field visit and investigations, public consultations, and other related works herein described to attain the stated objectives. The assignment has to develop a comprehensive ESIA study that includes ESMP to be implemented by the contractor during the project implementation.

The consultant is also required to prepare the Resettlement Action Plan (RAP) for the proposed upgrading of Swetu road 3.4Km, Kisarika road 2.99Km and kisarika 3*(Nguzo Tanesco)* road 3.6km, Mailitano road 3.1Km, Kanyenye 2 (Madaraka st.) road 0.5km, Kanyenye 3 (Kanoni st.) road 1.08km, Kanyenye 1 (mkunazini st.) road 0.35km and Kanyeye road 10.6Km where necessary by following the legal issues affecting resettlement.

The Consultancy Services has been carried out following these ToRs that are following the requirements of the applicable national legislation as well as World Bank Policy requirements.

1.5 Requirements for an ESIA

The nature and scale of the project are essential dimensions for the decision on the level of the environmental and social impact assessment required. As per the First Schedule of the Environmental Impact Assessment and Audit (Amendment) Regulations (2018), upgrading of the roads sub-projects falls under Type 'A' Projects, which is a "Mandatory Category". These types of projects are associated with adverse environmental impacts and need an in-depth study to determine the scale, extent, and significance of the impacts and to identify appropriate mitigation measures. It is therefore concluded that the proposed Construction TACTIC roads sub-project in Tabora Municipal Council falls under Category B_1 and thus requires a full ESIA study.

By the virtue source of funding, the proposed roads sub-projects are also subjected to World Bank requirements for Environmental Impact Assessment that all environmental and social risks and impacts of the project be addressed as part of the environmental and social assessment conducted following World Bank Environmental and Social Safeguards Policy, which set out the obligations of the Borrower in identifying and addressing environmental and social risks and impacts that may require particular attention. However, of the 10ESSs prescribed under the World Bank policy, only ESS9 is irrelevant to the proposed projects.

1.6 ESIA Study Objectives

The main objective of the consultancy services was to undertake the Environmental and Social Impact Assessment (ESIA) which include the development of the Environmental and Social Management Plan (ESMP) as well as to undertake the Resettlement Action Plan (RAP) for the Swetu road 3.4Km, Kisarika road I&II 2.36Km and Kisarika III 0.63Km, Kisarika IV *(Nguzo Tanesco)* road 3.6km, Mailitano road 3.1Km (Mailitano I 1.1km, Mailitano road II 0.63Km, Mailitano road III 0.69km, and Mailitano road IV 0.67km), Kanyeye I road 0.15Km, Kanyenye II (*Madaraka st.*) road 0.5km, Kanyenye III (Kanoni st.) road 1.08km, and Terminal Access (*Mkunazini St.*) road 0.36km at Tabora Municipal. The ESIA will address environmental and social impacts which may arise from planning, mobilization, construction, operation, and decommissioning activities and provide mitigation measures to prevent or minimize adverse impacts. Ultimately, ESMP and RAP will be developed as tools of which its recommendations will be used by the design consultant in the finalization of road designs and be included in the Tender Documents.

1.7 Approach and Methodology

The ESIA methodology was subject to the EIA procedures of Tanzania as per Environmental Impacts Assessment and Audit Regulations, 2005 and Regulation 17 of its amendments of 2018:

1.8 Study Team

For the Consultant to properly address the environmental issues, a team of experts was involved in undertaking the ESIA Study. The experts included Environmental Experts, sociologists, Topographical surveyors, and Valuer.

1.9 Social Impact Assessment Survey

A comprehensive SIA process was carried out by deploying different methods to meet the requirements as specified in the ToR. The Team reviewed all relevant documents, specifically those mentioned in the ToR to understand and implement the assignment as required. Secondary data focusing on the socio-economic situation of the potentially affected population were reviewed at all levels. The methodology used for carrying out the SIA study includes the following;

1.9.1 Public and Officials Consultations

Public and Officials consultations were conducted through meetings with major stakeholders of the proposed project. During the fieldwork, consultative meetings were held with TARURA and TANROADS Regional Offices Tabora, Regional Management Officials, Tabora District Council, ward and Mtaa councils along the project road are located, TFS, LATRA-TABORA and Fire and Rescue force-Tabora. Furthermore, consultation was then made to Utility Companies such as; TUWASA, TTCL, and TANESCO. Ministries and several Governmental Institutions within the project area (Figure 1.1).

Discussions with wards and Mtaa leaders focused on the existing socio-economic situation in the area and the need to identify clusters of people likely to be adversely affected by the project. The discussions provided an opportunity to introduce the project to the community leaders and identify key informers. The meetings were also intended to encourage a community consultative approach, thus fostering a community participatory approach right from the initial stages of the proposed project. The consulting team had earlier met the leaders of the major settlements along the road well before organizing the meetings. They were informed about the project and initial contacts were established, including telephone numbers.

Figure 1.1: Public consultation at Kisarika ward and consultation with TFS -Tabora

(Source: Fieldwork, December 2021)

Moreover, the participatory approach was used to identify additional key issues about the sub-projects including perceptions, knowledge, and attitudes of these communities. The public meeting was attended by different groups of people and whoever was present was allowed to participate. The outcomes were analysed, summarized, and incorporated into the report findings.

1.9.2 Observation

To obtain the existing condition along the proposed subproject road route including vegetation, settlement patterns, land use activities and accessibility to social services and present public facilities like Health center, schools, Abattoirs and other cultural areas including burial sites in the site location was noted. Physical observations were done to identify physical features, investigation, direct measurements, sample collection, and socio-economic conditions along and within the vicinity of the proposed roads sub-projects.

1.9.3 Documents Review

Various relevant documents were reviewed to obtain an overview of the project and to extract useful information required to complement the ESIA study. These included Tanzanian and World Bank policies and legislations and guidelines, project districts and Tabora municipal socio-economic profiles, and other documents relevant to the study. Important information was collected on the project background, objectives, and design of the proposed action. The collected information was helpful to the consulting team in improving their tools for data collection.

1.10 Environmental Impact Assessment

Superimposing the project's proposed structural elements and activities onto the existing social and environmental natural conditions has identified the potential environmental impacts of the proposed roads sub-projects development. The Focused Impact Mapping approach has also been used, this involved identification of all activities, structures, utilities, and natural environment that are likely to be affected by the project and vice versa at chainage along the roads sub-project alignment. Further, the environmental impact correlation matrix method has been adopted to predict impacts of major concern.

The environmental assessment has been undertaken in close interaction with the design consultant's team. Environmental impacts have been evaluated for various alternatives. Several project alternatives were considered including that of "No Go Alternative". Environmental protection strategies and environmental considerations influencing engineering design were incorporated. However, consideration of feasible technology and economic capability was taken into account. Inter alia, the assessment entailed the following:

1.10.1 Collection of Baseline Information

The collection of baseline information was conducted after defining the scope of the EIA. These data allow the study team to determine whether more detailed information on environmental conditions along with the proposed roads sub-project areas and their surroundings are needed and 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. Secondary data were obtained from various relevant sources of information such as

Ministries' reports, Tabora Municipal council profile, and many other published/non-published official and non-official documents.

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

This allowed the study team to widen their understanding of the World Bank's Environmental and Social Framework as a whole, national policies, legislation, and institutional arrangements for environmental management in Tanzania, and relevant international procedures to ascertain the optimal management of impacts.

1.10.3 Impact Identification and Evaluation

The proposed road upgrading causes a wide range of impacts on many environmental and social receptors. The ESIA identifies these impacts to mitigate the adverse ones or enhance the benefits. Impact identification is a process designed to ensure that all potentially significant impacts are identified and taken into account in the EIA process. Several 'tools' are available to assist in impact identification, in this EIA; Focused Impacts Mapping Approach and matrix were used.

Focused Impacts Mapping Approach points out where specific locations are, often concerning impacts receptors, it links the proposed design with existing activities, environment. The methodology assists in concentrating on relevant information concerning the project.

The matrix consists of a horizontal list of development activities against a vertical list of environmental factors. Thus, it identifies impacts by methodically checking each development activity against each environmental consideration to ascertain whether an impact is likely to occur.

1.10.4 Impact Significance Evaluation

Taking a step further, the ranking in all phases (mobilization, construction, and demobilization/decommissioning) signified the magnitude of each and combined phase. As a result, the more the score illustrated the severity the impact the proposed roads sub-project abstains.

1. **General**

- Magnitude
- Extent
- Non-conformity with environmental standards
- Scientific and professional evidence concerning:
    - resource loss/ecological damage

- foreclosure of land and resource use options

- Environmental loss and deterioration
- Probability and acceptability of risk
- Environmental sensitivity
- Level of public concern

2. **Ecological**

- Reduction in species diversity
- Habitat loss, degradation, or fragmentation
- Affecting threatened, rare, and endangered species
- Impairment of ecological functions

3. **Spatial Scale**-The spatial dimension encompasses the geographical spread of the impacts regardless of whether they are short-term or long-term. Table 1.1describes the ratings used in the Simple Matrix as far as spatial scale is concerned.

Table 1.1: Spatial Rating

International (I)	Trans-boundary
National (N)	Within country
Regional (R)	Within Region
Local (L)	On and adjacent to the site

4. **Temporal Scale-**Temporal boundaries refer to the lifespan of impacts. Table 1.2describes the ratings used in the Simple Matrix.

Table 1.2: Temporal Rating

Short-Term (ST)	During construction
Medium-Term (MT)	Life of project
Long–Term (LT)	Residual impacts beyond the life of the project

5. **Reversibility of the impact**- Every impact was checked if its effect can be reversed or not. Letter R was used to denote reversible impacts while IR was used to denote Irreversible impacts

6. **Cumulative Impacts**- These are Impacts that cause changes to the environment that are caused by an action in combination with other past, present, and future human actions. Table 1.3 show types of cumulative impacts;

Table 1.3: Types and Characteristics of Cumulative Impacts

Type	Characteristic	Example
Time crowding	Frequent and repetitive effects	Forest harvesting exceeds the rate of re-growth
Time lags	Delayed effects	Bioaccumulation of mercury
Space crowding	High spatial density of effects	Numerous small mining enterprises on the river
Cross-boundary	Effects occur away from the source	Atmospheric pollution and acid rain
Fragmentation	Change in landscape pattern	Fragmentation of habitat by agriculture
Compounding effects	Effects arising from multiple sources or pathways	Synergistic effect of Persistent Organic Pollutants in humans and rivers
Indirect effects	Secondary effects	Forest areas opened up as a result of new highway
Triggers and thresholds	Fundamental changes in the system functioning	Climate change

7. **Residual Impacts**- These are long-term impacts that go beyond the lifetime of the project in other words Residual impacts refer to those environmental effects predicted to remain after the application of mitigation suggested by the ESIA i.e. they are non-mitigable.
8. **Timing-** During which phase of the construction is the impact likely to occur. The phases included Mobilization, Construction, Demobilization, and Operation.

1.10.5 Identifying Mitigation and Management Options

The options for dealing with identified and predicted impacts were considered after a comprehensive evaluation. This enabled the study team to analyze proposed mitigation measures. A wide range of measures has been proposed to prevent, reduce, remedy, or compensate for each of the adverse impacts evaluated as being significant. Analysis of the implications of adopting different alternatives was done to assist in clear decision-making.

1.11 Report Structure

This report is divided into Eleven (12) 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:** describes the positive and negative environmental impacts 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 Seven:** gives the mitigation measure for the potential negative impact of the project.
- **Chapter Eight:** presents the Environmental and Social Management Plan (ESMP).
- **Chapter Nine:** 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 Ten:** gives the cost-benefit analysis of the project.
- **Chapter Eleven:** provides the decommissioning plan for the proposed project however the decommissioning is not anticipated in the foreseeable future.

- **Chapter Twelve:** gives the summary and conclusions of the study

The report structure conforms to that specified in the World Bank's Guidelines for Conducting ESIA. Appendices containing some key primary information collected during the study are attached at the end of this report.

CHAPTER TWO

2.0 PROJECT DESCRIPTION

2.1 Project Location

The construction and upgrading of Swetu road 3.4Km, Kisarika road I&II 2.36Km and Kisarika III 0.63Km, Kisarika IV *(Nguzo Tanesco)* road 3.6km, Mailitano road 3.1Km (Mailitano I 1.1km, Mailitano road II 0.63Km, Mailitano road III 0.69km, and Mailitano road IV0.67km), Kanyeye I road 0.15Km, Kanyenye II (*Madaraka st.*) road 0.5km, Kanyenye III (Kanoni st.) road 1.08km, and Terminal Access (*Mkunazini St.*) road 0.36km are located in Tabora Municipal Council, Tabora region. The Municipality is the Headquarters of the Tabora region and covers 1,092 square Kilometres. The Municipality is located between 4^{o} 52’ and 5^{o} 9’ latitude South and 33^{o} 00’ East. Most of its part lies between 1,000m above sea level. It is surrounded by Uyui District in the Western, Northern, and Eastern parties and Sikonge District in the South (Figure 2.1).

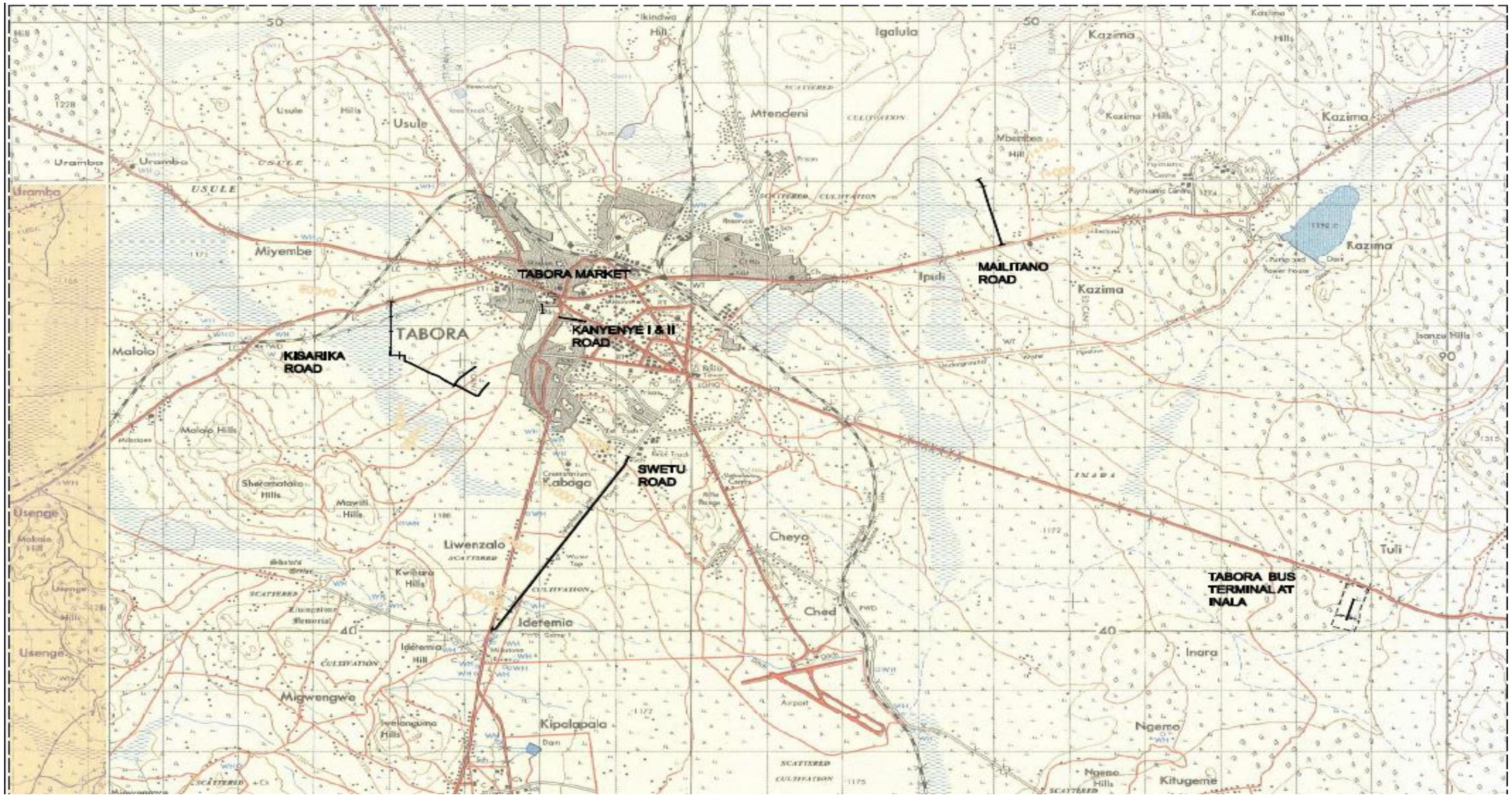

Figure 2.1: Map of Tabora showing Projects location

(Source: Consultant, 2022)

The existing project roads alignment transverse from the starting point to the end through different wards (Table2.1). Furthermore, the roads transverse through environmentally sensitive areas and areas with high populations. The proposed sub-projects road is further prescribed in the sub-sections below.

Table 2.1: The sub-project roads start and destination connectivity

Proposed Road Name	Ward	Street	Adjoining Road at S	Adjoining Road at End
Swetu Road	Kitete	Kariakoo	TaboraBoys/Girls Secondary school	Sikonge Road
Maili Tano Roads	Ipuli	Mile Tano	Nzega Road	Maili Tano Health Center
Kisarika Roads I&II	Mwinyi and and Malolo	Kisarika	Malolo Road	Kisarika Road
Kisarika IV (Nguzo Tanesco) Road	Mwinyi and and Malolo	Kwihara	Nyanja and Skanda Road	Madaraka St road
Kanyenye II (Madaraka st.) road	Chemchem	Madaraka	Ujiji road	Ali Hassan Mwinyi road
Kanyenye II (Kanoni st.) road	Isevya	Kanoni	Mwenge Road	Magereza Road
Kanyeye I (Mkunazini St.) Road	Kanyenye		Kitunda Road	Sikonge Road

2.1.1 Construction of Maili tano road 3.1km

The project road connects the Tabora-Nzega road with the newly established Maili tano health center in the Mailitano neighborhood. The first 0+800m is a gravel road with varying widths ranging from 4m to 6m in good condition while the rest of the section 0+300 is ungraded earth road. The project road consists of three drainage structures (pipe culverts with 90cm diameter) located within the existing alignment.

The electrical power supply line (33kv) runs parallel with the project road and at the end of the project road. However, at approximately 600m to 700m is a swampy area which results in flooding the road section during heavy rain season and as a result, affects accessibility to the road users and Mailitano health center (Figure 2.2).

Approximately 180m from MailiTano Health Center, the road turns left running to make mail tano road II of 629m adjacent to reserve area of TANESCO High tension powerlines from Kidatu in RHS. The proposed road at this point is running in LHS to connecting an existing path maili tano iii 692m running LHS along Ipuli-Kidatu-Mtendeni and Mlenda streets to connect the tarmac feeder road to Nzega trunk toad. However, along this path about 475m of mailitano road iii, there is other junction in left side to maili tano iv 672m is proposed to connect Maili Tano I graded gravel road.

Google Earth extract for the Maili Tano road

The starting point of the project road (Tabora-Nzega road)

Mailitano Health center-left adjacent to the project road

Building within the project alignment

The endpoint of the project road from MailiTano health Center

Bare land prepared for farming activities

The place used for illegal sand mining in the proposed project road

The proposed junction of the proposed road, RHS is the TANESCO high tension from Kidatu

An Existing path in the proposed project road. There are housed in RHS

A swampy area with stormwater stagnated along the proposed road. The places used for rice and maize cultivation

Figure 2.2: The typical proposed Maili tano road to be upgraded to asphalt

(Source: Fieldwork December 2021)

2.1.2 Construction of Swetu road 3.4km

The Swetu road is a section of the road that connects the existing constructed road under (ULGSP) with the Tabora-Sikonge road. The project road starts at Tabora boys/Tabora girl's transverse to Kariakoo neighborhood. The existing project road is in a good condition passable throughout the year. The road has varying widths ranging from 5m to 6m with drains and three pipe culverts located within the existing alignment.

On the right-hand side of the project road, there is the major Tabora Municipal abattoir which is 600m from the starting point, and within 800m there is the major Tabora Municipal damp site. The project road is also transverse within the environmentally sensitive area which is Westland primary school and Kariakoo secondary school at the Left-hand side of the project road. Moreover, there are burial sites on the right-hand side of the project road alignment (Figure 2.3).

Google Earth extract for the Swetu road

Starting point at Tabora boys/Tabora Girls High school

Cemetery site at the project road

Tabora Municipal Dumpsite

The endpoint at the Tabora-Sikonge road section

Figure 2.3: The typical Swetu road to be upgraded to asphalt

(Source: Fieldwork, December 2021)

2.1.3 Construction of Kisarika roads

The proposed project road comprised Kisarika three I&II 2.36km, Kisarika III 629km, connects the Old Kigoma road with the currently constructed road at Kisarika, Kisarika IV (*Nguzo Tanesco*) 3.6km and the Terminal Access of 360m. The distance of 1.9km of the road section is earth road, this section has a road with varying widths ranging from 4m to 6m. The rest of the 0.7km alignment is not defined but footpaths exist of which people used to pass through. The project road has only two pipe culverts and constructed drains at between 0m to 200m.

The Kisarika I&II road connects the Sikanda gravel road in 275m and then in distance of almost 1.2km the proposed road run parallel to the TANESCO powerlines. The project road is also transverse within the environmentally sensitive areas which are Skanda secondary school and Malolo hospital.

Additionally, the proposed Kisarika IV road, is accessible from Kombo Masai running along the TANESCO electric High-tension power lines/poles from Sikonge almost 2km- non-existing road, then Skanda road to gravel graded Kwihara road junction, it then turns left to Madaraka Street tarmac road junction.

Moreover, electrical networks, water pipelines, and TTCL infrastructures utilities are running parallel and some crossing the project road.

The project road site is sloping gently as the results causing floods of water during heavy rain seasons especially at a distance between km 0+000 to km 0+300 and between km 1+000 to km 1+700 (Figure 2.4).

Google Earth extract for the Kisarika roads

The starting point of the Kisarika I&II road

The endpoint of the Kisarika I&II road

Starting point of Kisarika IV road

Existing Kwihara road connected with the proposed Kisarika IV road

Non existing point where the Kisarika Iv road is proposed along the TANESCO power lines

The end point of Kisarika IV road junction with Madaraka Tarmac road

Figure 2.4: The typical Kisarika roads to be upgraded to asphalt

(Source: Fieldwork, December 2021)

2.1.4 Construction of Kanyenye roads

Kanyenye project road consists of two road sections both located within the Central Business District (CBD). The first section with a length of approximately 350m connects the Sikonge road with Kitunda road. The 350m road section transverse through business areas at Saimini area. The existing road width is 5m passable throughout the year. On the other hand, 150m road section transverse through build-up areas with a drainage system on the left side but lacking the crossing facilities. Only two culverts are present to the existing gravel road section.

Kanyenye II road 0.5km is an existing tarmac road located in Cemchem Ward, commonly known as Madaraka road. It is accessible from Ujiji roundabout toward Madaraka street road running to Town Clinic Health Centre to the playing ground of Ali Hassan Mwinyi. It is crossing Tabora-Sikongo trunk road and it is ending close to the Kenge river culvert crossing the road.

Additionally, Kanyenye III; commonly known as Kanoni Street road 1.08km in Isevya Ward. It is accessible from Kariakoo Mtaa and Bomba Mzinga in Mwenge Road Junction running to Kilimbika Mtaa connecting with Magereza tarmac road. The road has resident houses both sides and Tabora League for Children wall were also observed. In the proposed road, TANESCO poles along and water pipelines were also observed. Also, the several street junction roads (Kaombwe, Makuberi, Mafao, Kilimbika, street roads are crossing the proposed road

Google Earth extract for the Kanyenye roads

The starting point of 150m road section

The Endpoint of 150m road section

The starting point of the 350 road section (Sikonge road)

The endpoint of 350 road section (Kitunda road)

Starting point and end point of the Kanyenye II road

Existing Water supply points and Town clinic Health center along the Kanyenye II road

Starting point and end point of the Kanyenye III road (Kanoni St. road)

Existing drainage chanels, electric powelines and water pipes along the Kanyenye II road

Figure 2.4: The typical Kanyenye roads sections to be upgraded to asphalt

(Source: Fieldwork, December 2021)

2.2 Project Design

The project intends to improve of Swetu road 3.4Km, Kisarika road I&II 2.36Km and Kisarika III 0.63Km, Kisarika IV (Nguzo Tanesco) road 3.6km, Mailitano road 3.1Km (Mailitano I 1.1km, Mailitano road II 0.63Km, Mailitano road III 0.69km, and Mailitano road IV 0.67km), Kanyeye I road 0.15Km, Kanyenye II (Madaraka st.) road 0.5km, Kanyenye III (Kanoni st.) road 1.08km, and Terminal Access (Mkunazini St.) road 0.36km to 30m corridor. The Tanzania standard engineering designs and procedures and practices will be followed as provided in the Tanzania Road Manual of the Ministry of Infrastructure. Table 2.2 shows some of the key design standards.

Pertinent features of the road design include:

- The width of the Asphalt concrete pavement carriageway will be 6.5m
- Lane width 3.25m
- Number of Lanes 2
- The width of the (paved) shoulders will be 2x1.5m
- Roadway width 9.5m
- A road reserve corridor of 30m
- Cross-drainage structures, intersections, and ancillary road works
- The road will have a 20-year design life

The design speed of the road will be adjusted as necessary through street areas with a high concentration of people and animals. The following approved standards (Table 2.2) by the Ministry of Works and Transport (MOWT) shall be adopted and adhered to:

Table 2.2: Design Standards to be followed

1.	Geometric design	MoW Road Geometric Design Manual of 2011, Code of practice for Geometric Design (Draft) published by SATTC –TU, 1998
2.	Pavement and Materials	MoW Pavement and Materials Design Manual, 1999
3.	Specifications	MoW Standard Specifications for Road Works
4.	Testing Procedure	MoW Central Materials Laboratory testing Manual
5.	Structures	British Standards BS 5400
6.	Hydrology and Hydraulics	TRRL East African Flood Model
7.	Surveying	Land Survey and Mapping Standards of Tanzania (Land Surveying Regulations CAP 390)

Moreover, the upgrading works will consist mainly of:

- The exploitation of material sources for fill, sub-grade, sub-base, base, and surfacing
- Widening of the existing culvert to allow two-way traffic movement and/or provision of a new culvert. Construction of longitudinal and cross drainage structures and systems
- Asphaltic concrete overlay
- Partial reconstruction involving the removal and possible re-use of some existing soil layers
- Provision of temporary crossings and traffic diversions;
- Construction of road furniture and other incidental and appurtenant works;
- Construction of campsites and other temporary facilities

2.3 Project Schedule and Life

Site preparation for upgrading ofSwetu road 3.4Km, Kisarika road I&II 2.36Km and Kisarika III 0.63Km, Kisarika IV *(Nguzo Tanesco)* road 3.6km, Mailitano road 3.1Km (Mailitano I 1.1km, Mailitano road II 0.63Km, Mailitano road III 0.69km, and Mailitano road IV 0.67km), Kanyeye I road 0.15Km, Kanyenye II (*Madaraka st.*) road 0.5km, Kanyenye III (Kanoni st.) road 1.08km, and Terminal Access (*Mkunazini St.*) road 0.36km is expected to start soon after approval of all related studies, engineering designs, and environmental clearance and construction tender award in early 2022. The project life for the proposed sub-projects is; upgrading of the roads is expected to be 20years.

2.4 Estimated Project Cost

The proposed sub-project is estimated to cost 12.9 USD Million. This includes the cost for construction, purchasing materials, labor cost, and all miscellaneous expenses subject to the implementation of the project. The project is wholly funded by the Tanzanian government through a loan from World Bank and other Development Partners.

2.5 Project Cycle

2.5.1 Project Planning Phase

Feasibility study, ESIA and RAP, preliminary engineering planning, final engineering planning, and construction planning form the planning phase of the project.

During the planning process, the roads sub-projects are given their form and details which become more and more detailed in phases, adjusted to correspond to land use planning.

Preliminary engineering planning determines the approximate location of the roads sub-projects, the road's connections to the existing and future road network and land use, basic technical and traffic solutions, and the principles underlying the prevention of negative impacts to the environment. Planning is performed at a level of detail that ensures that the plan is technically, financially, and environmentally feasible. Since Tanzanian legislation requires an environmental and social impact assessment (ESIA), the proposed sub-project's environmental impact is assessed according to the Environmental Management Act, 2004 and its EIA and Audit Regulations, 2005 and amendments of 2018 during the preliminary engineering planning phase. The approval decision is made on the preliminary engineering plan.

During the preliminary engineering planning phase, the project design co-parties include TARURA, Tabora municipality, environmental authorities, other planning organizations, landowners, residents/communities along with the sub-projects areas and various community organizations. Extensive interaction is important during preliminary engineering planning in particular since the most important basic project solutions are decided in this phase.

Final engineering planning determines the precise location of Sub-projects, areas required for the roads, intersections of the proposed road and other road connections, solutions for pedestrian and cyclists, people with disabilities (PWDs), school children, Bodaboda drivers, and public transport, and other detailed solutions such as measures necessary to the prevention of negative traffic impacts. Because the final engineering plan settles all issues directly affecting landowners and other parties concerned, interaction is focused on issues to be agreed with them. The approval decision is made on the final engineering plan, allowing the Tabora Municipal the right to take possession of the area required for the proposed roads sub-projects.

Compensation is paid for any damage caused to external property during final engineering or construction planning and construction. Environmental certification by the National Environment Management Council (NEMC) is also done/finalized at this stage.
During the project planning phase only, paper works are involved as summarized below:

- Evaluation of project concepts and alternatives selection,
- Design of all project components,
- Topographic survey
- Geotechnical Investigations;
- Soils and Materials Investigations;
- Carrying out RAP for the affected people,
- Carrying out ESIA of the project,
- Compensations and Land Tenure
- Tendering for construction works,
- Approval of Engineering designs and Environmental Certification

2.5.2 Project Activities

The proposed sub-project will involve four phases which include: mobilization or pre-construction phase, construction phase, operation phase, and decommissioning phase.

2.5.2.1 Mobilization or pre-construction phase

Activities

This phase entails mobilization of the labor force, equipment, and construction of offices/camps as well as acquisition of various permits as required by the law. Other activities during this phase include Topographical Survey, Geotechnical Investigation, Soil and Materials Investigation, Land acquisition, material storage, and material preparation, Identification of borrow pits, quarry sites, and source of water.

Duration

The duration of this phase will be three (3) months.

Types, Amounts, and Sources of Project requirements

Types, amounts, and sources of project requirements during the pre-construction phase are shown in Table 2.3:

Table 2.3: Types, amounts, and sources of project requirements

Requirements	Type	Sources	Quantity required (shall be known after Detail design is completed)
Raw Materials	Aggregates	Tumbi	337,500m3 and 160,000m3 respectively
	Fill/Gravel	Tumbi and Tuli	120,000m3
	Sand	Inala Cheyo	
	Water	TUWASA &Boreholes	
	Cement	Dar es salaam	
	Reinforcement bars	Dar es Salaam	
	Timber	Tabora a Local vendors	
Energy	Electricity	TANESCO (National Grid)/ Generators	
	Fuel	Vending project area	
Manpower	Skilled	Contractor	
	Unskilled	Local People along the road	
Equipment	Dump Truck	• Contractor	
	Graders	• Contractor	
	Dozer	• Contractor	
	Water Boozers	• Contractor	
	Vibrators	• Contractor	
	Excavator	• Contractor	

<u>Transportation</u>

Materials (fine and coarse 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.

<u>Storage</u>

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 campsite ready for use. Cement and reinforcement bars will be stored in special storage rooms. Timber will directly be used in the required areas and consequently there will be no stockpiling of timber at the campsites. Fuel will be stored in drums at bounded areas.

Types, Amounts and treatment/disposal of Wastes

Types, amounts, and treatment/disposal of wastes during the pre-construction phase are shown in Table 2.4:

Table 2.4: Types, amounts, and treatment/disposal of wastes

Waste	Types	Amount	Treatment/ Disposal
Solid Waste (Degradable)	Vegetation (Trees, Shrubs, and Grasses) and remnants of timber.	150m^3(Clearance for campsites)	Source of energy for cooking at the campsite or nearby wards/streets.
	Food remains, cardboards and papers	20kg/day (based on generation rate of 0.2g/day/ person and 100 workers)	Collected in a large skip bucket at the campsite then to be composted and used as manure for the gardens at the campsite
Solid Waste (Non-Degradable)	Topsoils	3000m^3 (Based on removal of 10cm topsoil from the 3x(100x100)m^2 area for Contractor's and Engineer's camps erection	Backfilling material in the borrow pits, fill the diversions at the sites.
	Scrap metals and plastics	3- 10kg per day	Sold to Recyclers
	Tins, glasses	3- 5 kg per day	Taken to the Authorized dumpsite
Liquid waste	Sewage	3.2m^3 (Based on 100 people,	Septic tank –Soakaway system at the campsites

Waste	Types	Amount	Treatment/ Disposal
		40l/capita/day water consumption and 80% becomes wastewater)	
	Oils and greases	Non	Car maintenance will be done at proper garages

2.5.2.2 Construction phase

Activities

The major construction activities include;

- Extraction and transportation of materials (gravel, sand, hard stones, aggregates, water, and bitumen)
- Clearing the Right of Way (RoW) while leaving intact the trees which do not interfere with the construction.
- Rehabilitation and Partially Construction or full construction of culvert and other drainage structures.
- Formation of the road embankment, establishment of sub-base and base, road surfacing
- Pedestrian Crossings, Speed Humps, and Rumble Strips shall be provided in all built-up areas.
- The landscaping of areas covered by the project road and establishment of vegetation for functional and aesthetic purposes on cut and fill slopes shall be following the requirements of the MOW Standard Specification for Road Works and building structures.
- The final finishing of building structures and roads and cleaning up of the road and road reserve after construction, treating of old roads, and temporary diversion.
- Detours will be required to maintain a usable route during the construction period of the roads and structures. Wherever practicable, alternative local roads will be used. The construction and maintenance of these detours must be of a standard that ensures the safety of workers, road users, and the general public. Detours outside the road reserve will require additional permission from the landowners. At the end of the

detour's period of use, the detour shall be decommissioned and the original land reinstated acceptably.

- Construction of stormwater systems within the sub-project campsite depending on the landscape and catchment areas as required. Collected storm water will be directed to the existing drainage patterns around the project area.

Duration

The duration of this phase will be twenty-four (24) months.

Types, Amounts, and Sources of Project requirements

Types, amounts, and sources of project requirements during the construction phase are shown in Table 2.5:

Table 2.5: Types, amounts, and sources of project requirements

Requirements	Type	Sources	Quantity required (shall be known after Detail design is completed)
Raw Materials	Aggregates	Tumbi	337,500m3
	Fill/Gravel	Tuli and Tumbi	160,000m3 and 337,500m3 respectively
	Sand	Inala Cheyo	120,000m3
	Water	TUWASA and Boreholes	
	Bitumen	South Africa/Saudi Arabia	
	Cement	Dar es Salaam	
	Reinforcement bars	Dar es Salaam	
	Timber	Tabora Local vendors	
Manpower	Skilled	Contractor	
	Unskilled	Local People at the project area	
Equipment	Dozer	Contractor	
	Grader	Contractor	

Requirements	Type	Sources	Quantity required (shall be known after Detail design is completed)
	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	
	Asphalt Finisher	Contractor	
	Asphalt Distributor	Contractor	
	Air Compressor	Contractor	

Requirements	Type	Sources	Quantity required (shall be known after Detail design is completed)
	Generator	Contractor	
	Fuel Truck	Contractor	
	Light Vehicle	Contractor	

Transportation

Materials (fine and coarse 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.

Storage

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 crushing area (usually near the quarry site) site ready for use. Cement and reinforcement bars will be stored in special storage rooms (Bunds that do not allow moisture). Timber will directly be used in the required areas and consequently there will be no stockpiling of timber at the campsites. The asphalt will be stored in their respective containers which will be kept in the storage rooms.

Types, Amounts and treatment/disposal of Wastes

Types, amounts, and treatment/disposal of wastes during the construction phase are shown in Table 2.6:

Table 2.5: Types, amounts, and treatment/disposal of wastes

Waste	Types	Amount	Treatment/ Disposal
Solid Waste (Degradable)	Vegetation (Trees, Grasses) and remnants of timber.	Approximately more than 500m^{3}of biomass will be generated from the subproject	Source of energy for cooking in nearby wards/mtaa.

Waste	Types	Amount	Treatment/ Disposal
	Food remains, cardboards and papers	0.04Ton/day (based on generation rate of 0.2kg/day/ person for 200 people)	Collected in a large skip bucket at the campsite then to be composted and used as manure for the gardens at the campsite
Solid Waste (Non-Degradable)	Topsoil	• $24,066m^3$ (Based on removal of 10cm topsoil from the $(8,022x30)m^2$ area carriageway of the sub-projects	Backfilling material in the borrow pits, fill the diversions.
	Scrap metals, drums, and plastics	15-30kg per day	Sold to Recyclers
	Tins, glasses	15-40 kg per day	Taken to the Authorized dumpsite
Liquid waste	Sewage	$6.4m^3$/day (Based on 200 people, 40l/capita/day water consumption and 80% becomes wastewater)	Septic tank –Soakaway system at the campsite
	Oils and greases	None	Car maintenance will be done at proper garages

2.5.2.3 Demobilization phase

Activities

- Demobilization of temporary structures will be done for proper restoration of the site (e.g. removing/spreading top-soils piled along the road, restoration of borrow pits to required grades, removing all temporary structures, campsites may be left to the local governments depending on agreements that will be reached during the mobilization phase.
- Other activities include rehabilitation of the workshop and stockpile yard, rehabilitation of campsite at least to the original condition, clearance of all sorts of wastes including used oil, sewage, sewage, solid wastes (plastics, wood, metal, papers, etc.).
- Deposit all wastes to the authorized dumpsite.
- Restoration of water ponds (if any) and temporary quarry sites to a natural and useable condition, termination of temporary employment.

Duration

The demobilization stage will last for two (2) months.

Types, Amounts, and Sources of Project requirements

Types, amounts, and sources of project requirements during the demobilization phase are shown in Table 2.7:

Table 2.7: Types, amounts, and sources of project requirements

Requirements	Type	Sources shall be known during the detail design (material investigation is understudy)	Quantity required (shall be known after Detail design is completed)
Manpower	Skilled	Contractor	
	Unskilled	Local People along the road	
Equipment	Bull dozer	Contractor	
	Motor grader	Contractor	
	Roller Compactor	Contractor	
	Plate compactor	Contractor	
	Tippers	Contractor	

Types, treatment/disposal of Wastes

The demobilization of the temporary structures will result mainly in 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.

2.5.2.4 Operation phase

Activities

The actual usage of the structures the road is expected to commence after the construction works. The sub-projects will be directly managed by PO-RALG of which includes Tabora municipal and TARURA. The design period is off the roads sub-projects is 20 years, after which re-surfacing will be needed. During this time, TARURA and Tabora municipal council will carry out routine maintenance by attending to potholes, clearance of vegetation within the ROW (road reserve area), maintenance and monitoring.

Other activities include installation of road signs, thermoplastic road marking, reinforcement and replacement of road furniture, control of litter accumulation on roadsides, 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, awareness on the roads usage.

Duration

The duration of this phase will be twenty (20) years roads sub-projects.

Types, Amounts, and Sources of Project requirements

Types, amounts, and sources of project requirements during the operational phase are shown in Table 2.8:

Table 2.8: Types, amounts, and sources of project requirements (Maintenance)

Requirements	Type	Sources	Quantity required (shall be known after Detail design is completed)
Raw Materials	Aggregates/Hardstone	Tumbi	337,500m3

Requirements	Type	Sources	Quantity required (shall be known after Detail design is completed)
	Gravel	Tuli and Tumbi	160,000m3 and 337,500m3 respectively
	Sand	Inala Cheyo	12000m3
	Water	TUWASA and Boreholes	
	Asphalt	Saudi Arabia	
	Cement	Dar es salaam	
Manpower	Skilled	Contractor	
	Unskilled	Local People along the road	
Equipment	Excavator	PO-RALG/T/Contractor	
	Wheel loader	PO-RALG/T/Contractor	
	Water Boozer	PO-RALG/T/Contractor	
	Bulldozer	PO-RALG/T/Contractor	
	Motor grader	PO-RALG/T/Contractor	
	Roller Compactor	PO-RALG/T/Contractor	
	Plate compactor	PO-RALG/T/Contractor	
	Crasher	PO-RALG/T/Contractor	
	Tippers	PO-RALG/T/Contractor	

Transportation

Materials (fine and coarse 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 lorries to the maintenance site.

Storage

Most Materials like Aggregates, Sand, and Water will be used directly after delivery, and as such no piling up is expected. Cement and reinforcement bars will be stored in special storage rooms. The asphalt will be stored in their respective containers which will be kept in the storage rooms.

Types, Amounts and treatment/disposal of Wastes

Types, amounts, and treatment/disposal of wastes during the Operation phase are shown in Table 2.9:

Table 2.9: Types, amounts, and treatment/disposal of wastes

Waste	Types	Amount	Treatment/ Disposal
Solid Waste (Degradable)	Vegetation (Trees and Grasses)	2-10m^3/ month	Source of energy for cooking for villages nearby.
Solid Waste (Non-Degradable)	Scrap metals, drums	3-10kg per day	Sold to Recyclers
	Asphalt concrete, Tins, glasses, and plastics	3-10 kg per day	Taken to the Authorized Dumpsite
Liquid waste	Oils and greases	Non	Car maintenance will be done at proper garages

2.6 Construction materials

The main construction materials for the roads sub-projects 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 to identify sources for suitable construction materials including borrow pits, sandpits, construction water sources, and quarry sites.

2.6.1 Borrow Areas

During soil and materials investigation, two borrow areas were identified within the sub-project location, and samples were taken for laboratory testing to check the quality of the available construction materials. New borrow areas identified during materials investigation including any extension of the borrow area may involve the compensation cost to owners of the areas during access to it.

Table 2.10 below gives a summary of the locations of the potential borrows areas and their estimated quantities,

Table 2.10: Borrow Areas and Estimated Quantities

S/N	Chainage (km)	Name	Coordinates	Offset distance	Estimated Quantities (m^3)	Remarks / Existing
1	14+600	TUMBI	E:0471341 N:9441693	520m LHS from Tabora-Urambo	337,500	Existing
2	14+000	TULI	E:0488426 N:9440791	500m LHS from Tabora to Manyoni	160,000	Existing

2.6.2 Quarry Site

The proposed seven hard stone sources for aggregate were investigated Table 2.10. Available rock type at the named source is grey fine-grained fresh gneiss rock. Rocky outcrops and boulders are expected to be used in masonry works and pitching of drainage structures. A sample of this source was taken for laboratory tests to determine their properties for construction works. The summary of spatial locations of the quarry site is presented in figure 2.11

Table 2.11 Hard stone source and its Estimated Quantities

Chainage (Km)	Name of Hardstone	Coordinates (UTM)	Offset dist. (m)	Estimated Quantities (m^3)	Remarks
16+800	TUMBI	E:0468434 N:9439247	530m RHS from Tabora –Urambo Road	4,900,000	Existing

2.6.3 Construction Sand

A source of sandpits was found and samples were taken for laboratory testing. The first source namely Inala Cheyo found at Km 8+000 offset 8km RHS. Table 2.12 gives a summary of the spatial locations of sandpits and their estimated quantities.

Table 2.12: Location of Sand deposit and their Estimated Quantities

Chainage (Ch: km)	Name	Offset distance (m)	Coordinates (UTM)	Estimated Quantities (m^3)	Remarks
8+000	Inala Cheyo sand deposit	8Km RHS Tabora - Manyoni Road	E:0483103 N:9440928	120,000	Existing

2.6.4 Water Sources

Water for construction and maintenance of the sub-project during operation shall be obtained from TUWASA. However, to guarantee a continuous supply of water for construction, the contractor shall use deep boreholes as an alternative suitable source. The Boreholes will be determined based on demand and location/distance from the road segment under construction and may be proposed to be drilled within the sub-project at a suitable location and later be used by the beneficiaries. It is expected that approximate about 100m3 of water shall be used per day during construction.

2.6.5 Sources of manufactured materials for sub-project construction

Construction materials to be used have been tested for compliance and those manufactured materials for sub-project construction and their sources have been described hereunder: -

Cement

Cement for construction is easily available in the mainland, parked in 50kg bags, and sourced from the factory in Dar-es-Salaam, Tanga, and Mbeya.

Reinforcement Steel

Reinforcement steel for structural works is also available in the mainland from various factories in Dar-es-Salaam, Tanga, and 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 available from TPDC or external supplies. Bitumen properties need to be checked by testing representative samples in approved.

2.6.6 Power Supply for the Project

Power supply for the proposed project's construction activities will be provided by TANESCO and generators for performing hot works, lighting e.t.c. During the operation phase of the sub-project, the project ancillaries might use solar power or connected with TANESCO power lines where necessary.

2.6.7 Required Permits

Before the approval of the construction and eventual construction of the roads sub-Project, it is necessary to obtain several authorizations and permits from local and central government authorities of Tanzania, related to environmental issues, water abstraction, relocation of public utilities, resettlement. These permits and authorizations are summarized in Table 2.13, including a description of the permit/authorization and the government authority responsible for issuance.

Table 2.13: Required Permits from Regulatory Authorities

Permit/Authorization	Issuing Authority	Description
EIA Certificate	NEMC/VPO	Approval of project implementation
Resettlement Valuation Report	Government Chief Valuer	To allow compensation and resettlement procedures
TTCL Infrastructure Relocation Approval	TTCL-Regional Office	To waive away construction of the proposed sub-projects
TANESCO Infrastructure Relocation Approval	TANESCO-Regional Office	To waive away construction of the proposed sub-projects
TUWASA Infrastructure Relocation Approval	TUWASA-Regional Office	To waive away construction of the proposed sub-projects
Water Use & Discharge Permit	Lake Tanganyika Water Basin/MoW	To waive away construction of the proposed sub-projects
Clearance of vegetation at the project site	Tabora Municipa Council	To waive away construction of the proposed sub-projects

CHAPTER THREE

3.0 POLICY, ADMINISTRATIVE AND LEGAL FRAMEWORK

3.1 Overview

This section is aimed at reviewing relevant environmental resources and planning legislation and regulations to ensure ‘’ upgrading of Swetu road 3.4Km, Kisarika road I&II 2.36Km and Kisarika III 0.63Km, Kisarika IV *(Nguzo Tanesco)* road 3.6km, Mailitano road 3.1Km (Mailitano I 1.1km, Mailitano road II 0.63Km, Mailitano road III 0.69km, and Mailitano road IV 0.67km), Kanyeye I road 0.15Km, Kanyenye II (*Madaraka st.*) road 0.5km, Kanyenye III (Kanoni st.) road 1.08km, and Terminal Access (*Mkunazini St.*) road 0.36km in Tabora Municipal Council’’ meet policy and legislative criteria, and that relevant requirement is built into project design and implementation. The policy review also outlines specific procedures and measures to be carried out before, during, and after project development.

3.2 World Bank Environmental and Social Standards (ESS)

The Environmental and Social Standards (ESS) set out the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing. The Bank believes that the application of these standards, by focusing on the identification and management of environmental and social risks, will support Borrowers in their goal to reduce poverty and sustainably increase prosperity for the benefit of the environment and their citizens. The standards aim at the following: (a) support Borrowers in achieving good international practice relating to environmental and social sustainability; (b) assist Borrowers in fulfilling their national and international environmental and social obligations; (c) enhance non-discrimination, transparency, participation, accountability, and governance; and (d) enhance the sustainable development outcomes of projects through ongoing stakeholder engagement.

The Bank requires that the Borrower and the project apply the ESS through the project life cycle to manage environmental and social risks and impacts so that development opportunities are enhanced.

The Bank ESS are summarized in the box below:

The Bank Environmental and Social Standards (ESS) are outlined in the box below:

ESS 1: Assessment and Management of Environmental and Social Risks and Impacts.

ESS 2: Labour and Working Conditions.

ESS 3: Resource Efficiency and Pollution Prevention and Management. ESS 4: Community Health and Safety. ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement. ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. ESS 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities. ESS 8: Cultural Heritage. ESS 9: Financial Intermediaries. ESS 10: Stakeholder Engagement and Information Disclosure.

The Bank Environmental and Social Standards (ESS), and each of their applicability to the proposed project and this ESIA, are outlined in Table 3.1.

Table 3.1: The World Bank Environmental and Social Standards (ESS)

Environmental and Social Standards (ESS)	Applicability to project
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts - sets out the Borrower's responsibilities for assessing, managing, and monitoring environmental and social risks and impacts associated with each stage of a project supported by the Bank through Investment Project Financing, to achieve environmental and social outcomes consistent with the Environmental and Social Standards (ESSs).	• To identify, evaluate and manage the environmental and social risks and impacts of the project. • To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment. • To promote improved environmental and social performance of clients through the effective use of management systems. • To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.
ESS 2: Labour and Working Conditions - recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth.	• To promote safety and health at work. • To promote fair treatment, non-discrimination, and equal opportunity of project workers. • To protect project workers, including vulnerable workers such as women, persons with disabilities, children (of working age, following this ESS), and migrant workers, contracted workers, community workers, and primary supply workers, as appropriate.

Environmental and Social Standards (ESS)	Applicability to project
	• To prevent the use of all forms of forced labor and child labor. • To support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national law. To promote safety and health at work.
ESS 3: Resource Efficiency and Pollution Prevention and Management - recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services, and the environment at the local, regional, and global levels.	• To promote the sustainable use of resources, including energy, water, and raw materials. • To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. • To avoid or minimize project-related emissions of short and long-lived climate pollutants. • To avoid or minimize the generation of hazardous and non-hazardous waste. • To minimize and manage the risks and impacts associated with pesticide use.
ESS 4: Community Health and Safety - recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience acceleration or intensification of impacts due to project activities.	• To anticipate and avoid adverse impacts on the health and safety of project-affected communities during the project life cycle from both routine and non-routine circumstances. • To promote quality and safety, and considerations relating to climate change, in the design and construction of infrastructures.

Environmental and Social Standards (ESS)	Applicability to project
	• To avoid or minimize community exposure to project-related traffic and road safety risks, diseases, and hazardous materials. • To have in place effective measures to address emergency events. • To ensure that the safeguarding of personnel and property is carried out in a manner that avoids or minimizes risks to the project-affected communities.
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement - recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons. Project-related land acquisition or restrictions on land use may cause physical displacement (relocation, loss of residential land, or loss of shelter), economic displacement (loss of land, assets, or access to assets, leading to loss of income sources or other means of livelihood), or both.	• To avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring project design alternatives. • To avoid forced eviction. • To mitigate unavoidable adverse social and economic impacts from the land acquisition or restrictions on land use by (a) providing timely compensation for loss of assets at replacement cost and (b) assisting displaced persons in their efforts to improve, or at least restore, their livelihoods and living standards, in real terms, to pre-displacement levels or to levels prevailing before the beginning of project implementation, whichever is higher. • To improve living conditions of poor or vulnerable persons who are physically displaced, through the provision of adequate housing, access to services and facilities, and security of tenure.

Environmental and Social Standards (ESS)	Applicability to project
	• To conceive and execute resettlement activities as sustainable development programs, providing sufficient investment resources to enable displaced persons to benefit directly from the project, as the nature of the project may warrant. • To ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected.
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources - recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development.	• To protect and conserve biodiversity and habitats. • To apply the mitigation hierarchy and the precautionary approach in the design and implementation of projects that could have an impact on biodiversity. • To promote the sustainable management of living natural resources. • To support livelihoods of local communities, including Indigenous Peoples, and inclusive economic development, through the adoption of practices that integrate conservation needs and development priorities.
ESS 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities - applies to a distinct social and cultural group identified following paragraphs 8 and 9 of this ESS. The terminology used for such groups varies from country to country, and often reflects national considerations. ESS7 uses the	• In Tanzania, some groups of pastoralists and hunter-gatherers self-identify as indigenous peoples, in line with contemporary norms of international law as conceptualized and contextualized by the African Commission on Human and Peoples Rights (the African Commission). Specifically, there are five groups of Indigenous Peoples (IPs) that are recognized in Tanzania

Environmental and Social Standards (ESS)	Applicability to project
term "Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities,"1 recognizing that groups identified under paragraphs 8 and 9 may be referred to in different countries by different terms. Such terms include "Sub-Saharan African historically underserved traditional local communities," "indigenous ethnic minorities," "aboriginals," "hill tribes," "vulnerable and marginalized groups," "minority nationalities," "scheduled tribes," "first nations" or "tribal groups.	either by the International Work Group of Indigenous Affairs or the Coalition of Indigenous Pastoralist and Hunter-Gatherer Organizations (Tanzania). These include the Maasai, Barbaig, Akie, Taturu and Hadzabe. • However, in Tanzania, the use of the term 'indigenous peoples' and related recognition are controversial. The Ministry of Justice and Constitutional Affairs (MJCA) in 2011, made an official statement to the effect that "all Tanzanians of African descent, are indigenous to Tanzania," suggesting that the country's traditional communities cannot successfully use the term to describe their marginality concerning the government. The applicability of this ESS 7 was established during the environmental and social risks and impacts identification process. During the project life-cycle, <u>PO-RALG/T and contractor will consider potential project impacts to "Indigenous People" and will apply relevant provisions to respect the identity, culture, and natural resource-based livelihoods of these people and reduce exposure to impoverishment and disease.</u>
ESS 8: Cultural Heritage - recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present, and future.	• To protect cultural heritage from the adverse impacts of project activities and support its preservation. • To address cultural heritage as an integral aspect of sustainable development.

Environmental and Social Standards (ESS)	Applicability to project
	• To promote meaningful consultation with stakeholders regarding cultural heritage. • To promote the equitable sharing of benefits from the use of cultural heritage.
ESS 9: Financial Intermediaries (FI) - recognizes that strong domestic capital and financial markets and access to finance are important for economic development, growth, and poverty reduction.	• To set out how the FI will assess and manage environmental and social risks and impacts associated with the subprojects it finances. • To promote good environmental and social management practices in the subprojects the FI finances. • To promote good environmental and sound human resources management within the FI.
ESS 10: Stakeholder Engagement and Information Disclosure - recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation.	• To establish a systematic approach to stakeholder engagement that will help Borrowers identify stakeholders and build and maintain a constructive relationship with them, in particular project-affected parties. • To assess the level of stakeholder interest and support for the project and to enable stakeholders' views to be taken into account in project design and environmental and social performance. • To promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life cycle on issues that could potentially affect them.

Environmental and Social Standards (ESS)	Applicability to project
	• To ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner and format. • To provide project-affected parties with accessible and inclusive means to raise issues and grievances, and allow Borrowers to respond to and manage such grievances.

3.3 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. There are many policies and pieces of legislation on environmental management in Tanzania, the relevant ones to this project are briefly discussed below.

3.4 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. Among others, the 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 cornerstone of the present study include the following:

3.4.1 The National Environmental Policy (NEP, 2021)

The National Environmental Policy of 2021 has just been launched in February 2021. The new policy formulation is a revision of the National Environmental Policy of 1997. The Policy serves as a national framework for planning and sustainable management of the environment in a coordinated, holistic and adaptive approach taking into consideration the prevailing and emerging environmental challenges as well as national and international development issues. Effective implementation of this policy requires mainstreaming of environmental issues at all levels, strengthening institutional governance, and public participation in environmental management regimes. The long-term vision of this policy is geared towards the realization of environmental integrity, assurance of food security, poverty alleviation, and increased contribution of the environmental resources to the national economy. It also recommends strong institutional and governance measures to support the achievement of the desired objectives and goals.

The policy seeks to promote the economy and livelihoods of people while promoting sustainable utilization of natural resources in the country. The policy provides the framework for the formulation of plans, programmes, and guidelines for the achievement of sustainable development.

The policy overall objective is to provide a national framework for guiding harmonized and coordinated environmental management for the improvement of the welfare of present and future generations. The specific objectives are i) to strengthen coordination of environmental management in sectors at all levels; ii) to enhance environmentally sound management of land resources for socioeconomic development; iii) to promote environmental management of water sources; iv) to strengthen conservation of wildlife habitats and biodiversity; v) to enhance conservation of forest ecosystems for sustainable provision of environmental goods and services; vi) to manage pollution for the safe and healthy environment; vii) to strengthen the national capacity for addressing climate change impacts; viii) to enhance conservation of aquatic system for the sustained natural ecosystem; ix) to ensure safety at all levels of application of modern biotechnology; x) to promote gender consideration in environmental management; xi) to promote good governance in environmental management at all levels; and xii) to ensure predictable, accessible, adequate and sustainable financial resources for environmental management.

The revised environmental policy in Tanzania is relevant to the TACTIC project since it brings forth the foundation of environmental sustainability of development projects translated by having environmental impact assessment study a mandatory undertaking before their implementation.

3.4.2 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 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*".

The National Transport Policy acknowledges that in the rural areas of Tanzania the transport situation is highly affected by poor infrastructure, specifically roads. Hence the key objective of the transport policy is to improve the transport infrastructure to enable easier movement of agricultural and livestock inputs and outputs to and from rural and urban areas. Agricultural and Livestock inputs need to be transported into villages and surplus outputs need to be transported to markets that are normally located in urban areas. To facilitate such goals, efficient and all-weather roads are needed.

In the transport sector, 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.

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 localities instead of traveling 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 and Rural 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. This project is the implementation of this policy since the project road shall provide a reliable means of goods in a different area of the region.

3.4.3 National Mineral Policy, 2019

The Mineral Policy seeks to address the challenges of the mineral sector and increase the mineral sector's contribution to the GDP and alleviate poverty by integrating the mining industry with the rest of the economy.

One of the key policy objectives of the Policy in section 4.0 (a) is to improve the economic environment in order to attract and sustain local and international private investment in the mineral sector; Efficient and reliable infrastructure facilities such as roads accelerate commissioning of new mining projects and increase profits to be taxed by the Government. The policy emphasizes in section 5.1(ii) that the

Government in its own or in collaboration with the private sector will provide reliable infrastructure to service the mining industry where feasible.

The proposed roads sub project will lead to the achievement of the objectives of the mining policy by upgrading to bitumen standard and provide efficient road service accessible at all weather which promotes good economic environment for the development of mining sector. Either, the project is expected to use locally available sources for sand, gravel, aggregates e.t.c as part of implementation of policy's objectives.

3.4.4 National Construction Industry Policy (2003)

The sub-projects sector is among the key areas covered by this policy. Among the major objectives of the policy, which supports sustainable development in the sub-projects sector, including 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. <u>The construction team shall adopt this policy by using modern technology during construction but with emphasis on value for money for a cost-effective project.</u>

3.4.5 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*". <u>This EIA partly responds to this requirement.</u>

3.4.6 National Energy Policy (2003)

The first energy policy for Tanzania was formulated in April 1992. Since then, the energy sector has undergone several 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. To arrest this decline, the government gave priority to the upgrading of 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. The project road shall provide a smooth, well-surfaced, and well-maintained road which leads to energy savings.

3.4.7 National Human Settlements Development Policy (2000)

Among the objectives of this policy that touch the sub-projects sector 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. TACTIC Road projects are reliable and efficient transport systems that are essential to increase productivity and the establishment of small manufacturing industries.

3.4.8 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 emphasizes 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 ministry of work, PO-RALG/T, and PO-RALG have adopted the policy through the provision of equal opportunities to both men and women in road works and related activities. This project will also ensure that rural women, who are the main users of the rural infrastructure, will be adequately involved at all levels of project planning to implementation.

3.4.9 The National Water Policy (2002)

The overall objective of this policy is to develop a comprehensive framework for the sustainable management of 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 the higher cost of monitoring, supervision, management, policing, and data transfer. TACTIC sub-projects will help to alleviate accessibility problems and thus facilitate the enhancement of water resources management within the project influence area.

3.4.10 National Agricultural Policy (2013)

Agricultural development depends heavily on good infrastructures, such as roads, communication, energy, marketing facilities, and efficient transport services. Good infrastructure and transport systems are essential elements for the movement of agricultural produce, goods, and services to and from rural areas that are vital stimulants to the development of the rural economy. Infrastructure developments particularly in rural areas are vital determinants of transaction costs in agriculture and hence the absence of good infrastructure, in turn, affects the sector's competitiveness. Passable roads, adequate energy, efficient communication, and marketing infrastructure are important in stimulating agricultural growth and development in rural areas. Nevertheless, inaccessibility of rural areas due to poor rural roads; poor communication facilities; inadequate rural electrification; high transport costs; and inadequate market infrastructure affect the profitability of agriculture.

The objective of this policy regarding infrastructure states that "*Rural infrastructure and transport systems improved to reduce transaction costs that affect agricultural growth and competitiveness*." The Policy Statements includes

i. Rural road connectivity for improved agricultural development shall be facilitated in collaboration with the ministry responsible for infrastructure and the Prime Minister's Office-Regional Administration and Local Government (PO-RALG);
ii. A conducive environment for Public-Private Partnerships in infrastructure development particularly in rural areas shall be created; and
iii. Availability and accessibility to rural electrification, water, communication, transport services, and market infrastructure shall be facilitated. Enhancing agriculture in the project area is one of the main objectives of this project.

3.4.11 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 the 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 implications on social services and welfare. Thus, the policy recognizes the linkage between poverty and HIV/AIDS, as the poor section of society is the most vulnerable.

The main policy objective is reflected well in the establishment of TACAIDS. However, the policy has also set several 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 the 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.

This project can be a precursor of Incidents of HIV/AIDS due to 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.

3.4.12 The National Employment Policy (1997)

The National Employment Policy identifies two categories of employment namely wage employment and self-employment. The policy revisits the state of employment in Government, Parastatals, Private sector, and Informal Sector. This policy is the vision leading to utilization of available labor force and tapping available natural resources. The policy also identifies strategies for exploiting existing wealth, especially in sectors dealing with Industry and trade, Agriculture and livestock, Fisheries, Service sector, and small-scale mining. On top of that, it identifies special groups which require special treatment while seeking employment and proposes responsibilities of different authorities to deal with different aspects of the policy. This project shall employ local people during construction and therefore it is in line with this policy.

3.4.13 National Investment Policy (1997)

The National Investment Promotion Policy among other things also seeks to promote the development of industrialization, roads, and other infrastructures as a means to attract potential investors. The policy recognizes the significant contribution of urban infrastructures networks in stimuli the development of the country. One of the key policy objectives is the maximum promotion of export orientation on domestic production of goods and services to enhance the development of a dynamic and competitive export sector. The TACTIC sub-project shall result in increased investors in the municipality and therefore, adhere to the requirement of this policy.

3.4.14 National Health Policy, 2017

The overall objective of the National Health Policy is to improve the health and wellbeing of all Tanzania with focus on those most at risk. One of the main objective of this policy is to ensure that health services are available and accessible to all people wherever they're in the country, whether in urban and rural areas. The policy encourages safe basic hygienic practice in workplace, promote sound use of water, promote construction of latrines and their use, encourage maintenance of clean environment; working environment which are conductive to satisfactory work performance.

The policy puts more emphasis on worker's protection against all health hazards which occur in any workplace. It is the responsibility of the management to offer medical and preventive health services to their employees.

The proponent is committed to ensure that their project conform to prevail environmental regulation in order to promote good health of project occupants and the surrounding societies and ecosystem by conducting EIA. Furthermore, the project will provide health services including first aid kits, personal protection equipment, posting of safety signs in identified areas with a risk to workers during construction and the renters during operation.

3.5 Legal Framework

3.5.1 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 the implementation of international instruments on the environment; to provide for the implementation of the National Environmental Policy; to provide for the establishment of the National Environmental Fund and to provide for other related matters.

Part III, Section 15(a) states that "*in matters about the environment, the Director of Environment shall coordinate various environment management activities being undertaken by other agencies to promote the integration of environmental considerations into development policies, plans, programs, strategies projects and undertake strategic environmental assessments to ensure 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 before 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 following 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*". <u>This EIA is conducted for this project to abide by this law.</u>

Part IX of the law provides for waste management sections. Section (a) provides for Solid waste management, Section (b) provides for management of litter, Section (c) provides for liquid waste management, Section (d) provides for gaseous wastes, and section (e) provides for hazardous waste management. This part stresses waste minimization at that end of pipe treatment. It gives a mandate to local governments to create bylaws for waste management in their areas. These sections shall be observed during all phases of the project.

Part X of the law deals with Environmental Quality Standards. Section 140 of this act states that "*The National Environmental Standards Committee of the Tanzania Bureau of Standards established under the Tanzania Bureau of Standards Act, 1975 shall develop, review and submit to the Minister proposal for environmental standards and criteria concerning; water quality; discharge of effluent into the water; air quality; control of noise and vibration pollution; sub-sonic vibrations; soil quality, control of noxious smells; light pollution; and any other environmental quality standard*" Some of these standards have already been published in the government *gazette* while others are not in place. This project shall take into account all the standards specified by this act.

3.5.2 The Village Land Act (1999), R.E 2019 and item 3.4.10 Land Act, 1999 R.E 2019;

These laws declare all land in Tanzania to be "Public land" to be held by the state for public purposes. The Acts empower the President of the United Republic of Tanzania, to revoke the

"Right of Occupancy" of any landholder for the "public/national interest" should the need arise. The laws also declare the value attached to the land.

Land tenure system

The existing land ownership system has a history of more than forty years. At present, the Land Act (1999) and the Village Land Act (1999) guide land ownership in Tanzania. The laws vest all land in the President and grant occupancy rights to individuals, legal persons, and territorial communities. The President holds *land in trust* for all citizens and can acquire land for public use and benefit, for instance, to resettle people from densely populated areas to sparsely populated areas, settle refugees, and so forth. The President can also acquire land for other national projects, like road construction.

Compensation rules

Under the Government Standing Order on expropriation for public utility, the holder of a Right of Occupancy is guaranteed a free enjoyment of the land and is entitled to compensation if dispossessed by the Government for public use. In many cases whilst the holders agree to leave their land they are not happy with the amount and delay of the compensation. Often, for example, improvements that they have made to the land are omitted or underrated. The expropriation should match the price that improvements can fetch if sold in the open market. Replacement value (defined as the cost of putting up a structure equivalent to the evaluated one) makes allowance for age, state of repair, and economic obsolescence.

The compensation must therefore include: -

- The replacement value of the un-exhausted improvements
- Disturbance and transport allowance
- Loss of income
- Cost of acquiring or getting an equivalent land
- Actual value of the present property/utility available in the land and
- Any other immediate costs or capital expenditure incurred in the development of the land.

These sub-projects shall involve the resettlement of people and their properties, this law shall govern the whole process of valuation and compensation.

3.5.3 The Road Act, 2007

For purposes of this project, the Road 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 following the Land Act and any other written law'.* PO-RALG/T shall observe this law for the conservation of the road reserve.

3.5.4 The Water Resources Management Act No. 11 of 2009

This is new legislation that has repealed the Water Utilization (Control and Regulation) Act (1974). The Act provides for an 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 the participation of stakeholders and the general public in the 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 meet the basic human needs of present and future generations, prevent and control pollution of water resources, and protects biological diversity, especially the aquatic ecosystems.

Following this law, all water resources in mainland Tanzania shall continue to be public water and vested in the President as the trustee for and on behalf of the citizens. The power to confer a right to the use of water from any water resource is vested in the Minister responsible for water. This authority shall be consulted before starting working in the ponds and before the abstraction of water from the water bodies.

3.5.5 Public Health Act 2009

An Act provides for the promotion, preservation, and maintenance of public health with the view to ensuring the provision of comprehensive, functional, and sustainable public health services to the general public and to provide for other related matters. Section 54 of this law states that "*A person shall not cause or suffer from nuisance, likely to be injurious or dangerous to health, existing on land, premises, air or water*". Therefore, PO-RALG/T shall develop this project road so that nobody suffers from nuisance or cause danger to people's life.

3.5.6 Land Use Planning Act (2007)

The Act 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. TACTIC Sub-project must comply with the provisions of this act, any infringement on existing land use shall need a consultation with land use planning authorities.

3.5.7 Occupation Safety and Health Act (2003)

The law provides for safety, health, and welfare of persons at work in factories or other workplaces; to provide for the protection of persons other than persons at work against hazards to health and safety arising out of or connection with activities of persons at work, and to provide for connected matters.

Section 62 of the law states that "*wherein a workplace, workers are employed in any process involving exposure to any offensive substance or environment, effective protective equipment shall be provided and maintained by the employer for the use of the persons employed*". In these road projects, the contractor shall provide PPEs as per provision of this act including, overall dress, boots, helmets, earplugs, etc depending on the exposure.

Section 58 presents the issue of first aid box and it states that " *There shall be provided and maintained a first aid box or cupboard to the prescribed standard and the first aid box or cupboard shall be distinctively marked "FIRST AID" having only appliances or stocks of first aid equipment*". A well-stocked first-aid kit shall be provided at the campsite.

Section 24 (1) states that "a thorough pre-placement and periodic occupational medical examination for fitness for employment and employees shall be carried out by a qualified occupational health physician or where necessary a qualified medical practitioner as may be authorized by the chief inspector". The contractor shall conduct a medical examination for all those who require employment before employing them.

3.5.8 Local Government Laws (Miscellaneous Amendment) Act, 2006

The Local Government Act directs the registrar of villages to register an area as a village and issue a certificate of incorporation which enables the village council to become a corporate body with perpetual succession and official seal; in its corporate name a village is capable of suing and being sued, and a village is capable of holding and purchasing or requiring in any other way any movable or immovable property.

The Act gives authority to local governments to regulate local matters. A pertinent example of such authority to the project road is that the local government may opt to regulate the extraction of minerals or building material, through their by-laws. Despite the authority of local governments, the by-laws should not derogate any principal legislation e.g. in the case of extraction of material, the Mining Act.

3.5.9 The Standards Act No. 2 of 2009

An Act to provide for the promotion of the standardization of specifications of commodities and services, to re-establish the Tanzania Bureau of Standards (TBS) and to provide better provisions for the functions, management, and control of the Bureau, to repeal the standards Act, Cap.130 and to provide for other related matters. This act is relevant to this project as the quality of the bitumen/asphalt, and other products to be imported by the contractor during construction will have to abide by the standards set by TBS.

3. 5.10 Explosives Act, 56/63

This Act gives the Commissioner for Mines responsibility for regulating explosives. First, section 3 stipulates that no import, manufacture, possession, acquisition, or disposition of explosives is allowed unless the substance is approved for use by the Commissioner. Sections 7-9 stipulate that a person must have a license from the Commissioner for Mines to legally manufacture explosives. The penalty for failure to have a license is 5,000 and/or 2 years. Part V of the Act further requires a permit for the transport of explosives. Part VI requires a permit for the acquisition, possession, and disposal of explosives. Part VII requires a permit for the storage of explosives. Part VIII requires a permit for use of explosives. An explosives permit can give conditions. The following applications and sample permits are included in Appendix A:

- Application for Import Permit
- Import Permit
- Import Permit (General Authority to Import Explosives)
- Application for License to Purchase or Acquire Explosives
- License to Purchase or Acquire Explosives
- Magazine License
- Explosive Store License
- Application for Blasting Certificate
- Blasting Certificate
- Return of Explosives

In addition to these general permitting requirements, section 12 provides that "*the person in charge of the explosives is liable if an "unauthorized person" has access thereto or possession thereof. Section 51 establishes general penalties of Tsh. 4,000 and/or 1 year*". Also, under section 53, "*the Commissioner has authority to revoke a license or blasting certificate*". <u>For this project, this applies to the use of material from any quarries where blasting is to be employed.</u>

3.5.11 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 the 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 the coordination for all advice on environmental management in their respective region and liaison with the Director of Environment. At the 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 the proper management of the environment in their respective areas. The District Council designates each administrative area as township, ward, village, sub-street, and Environmental Management Officer to coordinate all functions and activities related to the protection of the environment in their area. The contractor shall observe all local environmental bylaws set by the Tabora Municipal Council and all the wards that will be affected by the project.

3.5.12 Mining Act of 2019 R.E 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 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.*" In additional section 50.-(1) (v) of the act states that "*The Minister shall grant an application for a mining license for minerals which has been properly made under section 49 and a successful application for a mining license made under section 71 unless the applicant has not included the relevant environmental certificate issued under the Environment Management Act*".For this project, the contractor shall apply for a mining permit before starting quarrying activities.

3.5.13 Employment and Labour Relations Act (2004) as amended 2019;

The Act makes provisions for core labor rights; establishes basic employment standards, provides a framework for collective bargaining; and provides for the prevention and settlement of disputes. Contractors shall see to it that they adhere to employment standards as provided for by the law.

3.5.14 Engineers Registration Act and its Amendments 1997 and 2007

The Acts regulate the engineering practice in Tanzania by registering engineers and monitoring their conduct. It establishes the Engineering Registration Board (ERB). Laws require any foreign engineer to register with ERB before practicing in the country. Foreign engineers working with this project shall abide by the law requirements.

3.5.15 The Contractors Registration Act (1997) as amended 2007;

The Contractors Registration Act requires contractors to be registered by the Contractors Board (CRB) before engaging in the practice. It requires foreign contractors to be registered by the Board before gaining contracts in Tanzania. TACTIC shall comply with the law requirement during the recruitment of contractors for project implementation.

3.5.16 The HIV and AIDS (Prevention and Control) Act of 2008

The law provides for public education and programs on HIV and AIDS. Section 8(1) of the law states that "The Ministry (Health), health practitioners, workers in the public and private sectors and NGOs shall provide 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 (Health) shall establish and coordinate a workplace program on HIV and AIDS for employees under his control and such programs shall include the provision of gender-responsive HIV and AIDS education". This project shall abide by HIV/AIDS Act in the fight against the disease during construction.

3.5.17 The Industrial and Consumer Chemical (Management and Control) Act, 2003

The Act provides for among other issues, importation, transportation, storage, use, and disposal of chemicals in Tanzania. Road Contractor is required by law to have a certificate from the Chief Government Chemist for importation, storage, or disposal of any chemicals (Asphalt, Lime, etc.). Furthermore, Road Contractor as any other individual dealing with chemicals is required to comply with all provisions/regulations regarding packaging, handling, storage, use, and disposal of chemicals, as set by this Act. The minister appoints an inspector from time to time to ensure compliance. Compliance failure might lead to revocation of the certificate. This law shall guide the contractors and PO-RALG/T on the importation of construction materials such as asphalt.

3.5.18 Energy and Water Utilities Authority (EWURA) Act, of 2001 as amended 2019

This Act provides guidance in EWURA administrative system by specifying roles and responsibilities of every actor and related stakeholders, power and proceedings of authority, complains and dispute resolutions, enforcement and compliance.
The provision Part II section 6(f) dictates that it shall be the duty of authority (Energy and Water Utilities Regulatory Authority) that in carrying out its functions it shall strive to enhance the welfare of Tanzanians society by taking into account the need to protect and preserve the environment.

PO-RALG/T through the contractor shall take into account the need to preserve and protect environment by ensuring good storage and transportation of fuel, control oil seepage and ensure proper re-use or disposal of waste oil.

Part IX of the law provides for petroleum supply operations which include; importation, transportation, transformation storage, and distribution. Section 33 (1) states that "*No person shall import petroleum or petroleum products unless the importation is conducted efficient procurement*" All the petroleum products to be imported for this project shall use efficient procurement as described by this act.

Section 37 deals with transportation and it states that "*No vehicle, vehicles or facility shall transport petroleum or petroleum products unless such vehicle, vessel or facility complies with the specifications made by the Minister"*. This section shall be observed during the transportation of petroleum products (especially asphalt) to the project site.

Section 43 (1) of the legislation states that "Every *person storing petroleum or petroleum products shall ensure that the petroleum products, as the case may be stored following the license issued by the authority*". A license shall be acquired for the storage of petroleum products for this project.

3.5.19 Executive Agencies Act (Cap 245)

The Tanzania Rural and Urban Roads Agency (TARURA) is established under the Executive Agencies Act Cap. 245 as an institution mandated to execute non-policy Government functions on its behalf. TARURA was officially opened by Prime Minister Kassim Majaliwa Kassim on 2nd July 2017. The launch of TARURA followed the announcement in Government Gazette No. GN 211 of 12 May 2017. TARURA draws its mandate from: -

i. The Road Act No. 13 of 2007;
ii. The Road and Fuel Tolls Act, Cap 220;
iii. The Local Government (District Authorities) Act, Cap 287; and
iv. The Local Government (Urban Authorities) Act, Cap 288.

The establishment of the Agency is part of the Government's efforts to ensure passability is improved in rural and urban roads for sustainable socio-economic development. The Agency is mandated to execute its functions by providing quality services to the public by developing, maintaining, and coordinating interventions related to the rural and urban roads and the related facilities.

The Vision of the Agency is; a leading institution in the management of rural and urban road networks and the Mission is to plan, design, construct and maintain the rural and urban road network cost-effectively for sustainable social-economic development.

Roles and functions of TARURA:

The major roles and functions of the Agency are:

v. Develop and maintain rural and urban road network;
vi. Carry out engineering traffic and economic studies for the maintenance and improvement of the road network;
vii. Establish, maintain and update road management systems;
viii. Undertake procurement and management of contracts for design, maintenance, emergency repairs, spot improvements, rehabilitation, upgrading, and construction of roads;
ix. Improve road safety and manage the environmental impact in the road network,
x. Establish and maintain appropriate rural and urban road databank;
xi. Establish and operate weighbridges and enforce axle load control in the rural and urban road network;
xii. Provide technical support, supervision, quality assurance, and control;
xiii. Negotiate an agreement with private sector entities to facilitate financing and

development of selected roads following guidelines prescribed by Minister

xiv. Adopt harmonized approach on technical standards for the promotion of the sustainable road network;

xv. Undertake research or collaborate with any research organization to facilitate the Agency's plan, development, and maintenance activities;

xvi. Demarcate and protect road reserve; and

Advise the Ministry responsible for Regional Administration and Local Government on the matter relating to rural and urban roads.

3.5.20 The Worker's Compensation Act (2008) R.E 2015;

This Act provides general provisions for rights for workers to compensations for occupational accidents and diseases. It includes worker's compensation funds, board of trustee and its responsibility, right of compensation and protection, claims for compensations and relevant procedures, determination of compensation including medical and rehabilitation benefits and the roles and responsibilities of an employers to ensure workers compensations and settling of disputes.

The provisions of Part I section 3 provides the objectives of this Act including Paragraph (a) to provide for adequate and equitable compensation for employees who suffer occupational injuries or contract occupational diseases arising out of and in the course of their employment and in the case of death, for their dependents.

The provision of Part IV section 19 (1) requires that where an employee has an accident resulting in the employee's disablement or death, the employee or the dependents of the employee shall subject to the provisions of this Act, be entitled to the compensation provided under this Act. Subject to section 20 that any accident during the conveyance of an employee to or from his place of employment for the purpose of his employment by any means of conveyance shall be compensated. Also subject to provisions of section 22 (1) Where an employee contracts a disease and the disease has arisen out of and in the course of the employee's employment, the employee shall be compensated

Subject to the provision of Part VI section 58 (I) the manner on which calculation for compensation shall be done will be through calculating the earnings of an employee in the monthly rate at which the employee was being remunerated by the employer at the time immediately before the accident.

Provisions of Part VIII section 71 (1) requires that an employer carrying on business in Tanzania within the prescribed period shall register to the Director General in the prescribed form and shall submit prescribed particulars as he may require, and section (4) that failure to do that will be conviction. Subject to the provision of this section 74 that employer will be assessed by Director General according to a tariff of assessment calculated on the basis of the percentage of annual earnings of the employer's employees as the Board may with due regard to the requirements of the Fund for the year of assessment deem necessary.

Provision of section 76(1) requires that where a mandator in the course of or for the purposes of his business enters into an agreement with a contractor for the execution by or under the supervision of the contractor of the whole or any part of any work undertaken by the mandator, the contractor shall, in respect of the employees of the contractor employed in the execution of the work, register as an employer in accordance with the provisions of this Act and pay the necessary assessment.

The provision of section 78 requires that an employer or the relevant trade union shall notify any employee who is injured in an accident or who contracts an occupational disease of his rights and the procedures to be followed in order to claim compensation under this Act.

The proposed roads subproject project will ensure to comply with the requirements of this Act by ensuring that the contractor for project execution will register as an employer and pay the necessary assessment fees as required by this Act. Also throughout project execution, employees' rights as regard to compensation in case of occupational accidents or disease will be done according to the provision of this Act.

3.5.21 The Law of Marriage Act of 1971 R.E 2019 and item 3.4.22 Law of the Child Act, 2009 R.E 2019;

This Act provides the general provisions of Marriage, marriage registration, annulments and divorces and evidence of property, rights, liabilities and status marriage as well as matrimonial proceedings and offenses.

The proposed roads sub project will ensure to comply with this Act by respecting marriage, employees will be required to respect their marital status and of others. In addition to these employees and public along the road project will be offered regular HIV and AIDS and gender education and awareness.

3.6 Relevant Regulations and Guidelines

3.6.1 The Tanzania 2025 Development Vision

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

1. 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.

2. Good governance and the rule of law moral and cultural uprightness, adherence to the rule of law, elimination of corruption.

3. 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.

Good roads are one of the most important agents to enable Tanzania to achieve its Development Vision objectives (both social and economic), such as eradicating poverty, attaining food security, sustaining biodiversity and sensitive ecosystems. <u>TACTIC projects contribute to the attainment of the 2025 Vision.</u>

3.6.2 The Explosives Regulations of 1964, GN 56/64

The Explosives Regulations of 1964, GN 56/64, establish conditions for licensing stores, magazines, and general precautions for explosives. They also stipulate the nature of work that is permissible when blasting and the requirement that storage places for explosives be at a certain distance from other buildings. A condition on all of the licenses is that the explosives must be stored in a licensed magazine or store or approved storage boxes. The contactor for this project shall apply for a license before the use of explosives for blasting.

3.6.3 Land (Assessment of the Value of Land for Compensation) Regulations, 2001

These regulations provide criteria for the assessment of compensation on land, as per market value for real property; disturbance allowance is calculated as a percentage of the market value of the acquired assets over twelve months, and transport allowance calculated at the cost of 12 tons hauled over a distance not exceeding 20 km.

The other criteria include loss of profit on accommodation based on business audited accounts and accommodation allowance equivalent to the rent of the acquired property per month over 36 months. These regulations shall guide the compensation exercise in this project.

3.6.4 Mining (Environmental management and Protection) Regulations, 1999

These regulations apart from other things give the Minister responsible for mining the mandate to exempt or ask for environmental information during application for a mining license. Section (4) of this regulation states that "*Except in cases where an exemption has been to require EIA granted under section 64 (2) of the Act, an environmental impact statement and environmental management plan must accompany applications for Mineral Rights in all special mining license applications*". These regulations require the contractor to apply for a mining license for new borrow pits/quarry sites. The application should be accompanied by EIA. For this sub-project, the existing borrow pits will be used.

3.6.5 Environmental Impact Assessment and Auditing Regulations (2005)

These regulations set procedures for conducting EIA and environmental audits in the country. The regulations also require the registration of EIA experts. This EIA has been conducted following the above-stated regulations.

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

One of NSGRP's objectives is to improve the quality of life and social wellbeing. This can be achieved through improving passable (good/fair condition) rural roads from 50% in 2003 to at least 75% in 2010. The strategy will also ensure that the health facilities are improved and accessible and drugs are made available throughout the year (NSGRP, 2003). TACTIC projects shall contribute to poverty reduction within the project area.

3.6.7 Environmental Assessment and Management Guidelines for the Road Sector (2011)

The Environmental Assessment and Management Guidelines for the Road Sector (EAMGRS) were developed in December 2004 (Signed in 2011), just after EMA (2004) was enacted. The guidelines give procedures for the EIA process as briefly explained in Table 3.1.

Table 3.1: Developed EIA Procedures in the Road Sector

EIA PROCEDURES IN THE ROAD SECTOR (as per EAMGRS 2011)
Administrative Procedures:
EIA administrative procedures vary based on the significance of the environmental impacts. The Minister for Environment is responsible for projects with potential major environmental impacts. The EIA of projects with potential non-major environmental impacts is carried out under the Ministry responsible for the road sector and the Road Sector-Environmental Section (RS-ES).
Environment Application and Screening Process:
EA procedures in the road sector are initiated when the Road Implementing Agency (RIA) submits an Environment Application Form to the RS-ES during the Project Identification or Project Planning/Feasibility Study Phase. Environmental screening of the proposed project will determine whether the project will require: An Initial Environmental Examination (IEE); a Limited Environmental Analysis (LEA); or a detailed Environmental Impact Assessment (EIA).
Environmental Screening is done based on the information presented in the Environmental Application Form. The RS-ES is responsible for screening projects and this may acquire a reconnaissance study by an environmental specialist, especially if the project traverse's sensitive areas or when there is potential for complex environmental issues.
All road projects with non-major environmental impacts shall be subject to an Initial Environmental Examination (IEE) or a Limited Environmental Analysis (LEA). Projects with

major environmental impacts are subject to EIA. The RS-ES will register non-major-impact-projects. For major impact projects, the registration is done by NEMC.

3.6.8 The Environmental Management (Air Quality Standards) Regulations, 2007

The objectives of these regulations are to set baseline parameters on air quality and emissions and enforce minimum air quality standards. They are also meant to help developers including industrialists to keep abreast with environmentally friendly technologies and ensure that public health, as well as the environment, is protected from various air pollution emissions sources. These Regulations stipulate the role and powers of the National Environmental Standards Committee. According to the regulations, the approval of a permit for emission of air pollutants shall be guided by ambient, receptor, emission, and specification standards approved by the Minister. Offenses and penalties for contraveners are also provided for in the regulations.

Emission limits of Sulphur and nitrogen dioxides, carbon monoxide, lead, ozone, black smoke, and suspended particulate matter together with their test methods are specified. Tolerance limits and test methods for dust, Sulphur dioxide, and nitrogen oxides from cement factories into the air as well as from motor vehicles are also given. TACTICS sub-project shall monitor the air quality from the project area with guidance from this law.

3.6.9 The Environmental Management (Water Quality Standards) Regulations, 2007

Among others, the object of the regulations is to enforce minimum water quality standards prescribed by the National Environmental Standards Committee, enable the National Environmental Standards Committee to determine water usages for purposes of establishing environmental quality standards and values for each user, and ensure all discharges of pollutants take into considerations the ability of the receiving water to accommodate contaminants for protection of human health and conservation of marine and aquatic environments. The Regulations elucidate the role of the National Environmental Standards Committee of the Tanzania Bureau of Standards in setting minimum quality standards for water, sewerage, etc. They also give prohibitions and prescribed minimum water quality standards. The applicant of a water right is obliged to indicate the likely impact on the environment and comply with prescribed effluent or receiving water standards, which are not below the standards specified in these regulations if the water right or permit is granted.

The regulations give NEMC the power to designate main water polluting activities for which a prior grant of the permit must be obtained from the Council. It can be observed from the regulations that, the NEMC plays a crucial role in water quality compliance and enforcement. Recording and reporting requirements, Offences, and penalties for non-compliance as well as how appeals against aggrieved decisions should be handled are stipulated. TACTIC sub-project shall monitor the water quality from the water bodies at the project area with guidance from this law.

3.6.10 Solid waste Management Regulation, 2009 GN. NO. 263

The regulation has been made under sections 114, 115, 116, 117, 118, 119, 120, 121, 122, and 230 of the Environmental Management Act, 2004. These regulations apply to all matters of solid waste management. They aimed among other things at setting the standard for a permit to dispose of solid waste and license to own or operate solid waste disposal site. These regulations shall guide all the collection and disposal of solid waste from the project area.

3.6.11 The Environmental Management (Hazardous Waste

Management) Regulations, 2021 These regulations have been made under sections 110(4) and (5), 128, 133 (4), 135, and 130 of the Environmental Management Act, 2004. These regulations apply to all categories of hazardous waste and to generate, storage, disposal, and their movement into and out of mainland Tanzania. These regulations require that any person dealing with hazardous waste in Tanzania be guided by the following principles of environmental and sustainable development:

The precautionary principle Polluter pays principle, and the producer extended responsibility TACTIC sub-project is not associated with the production of hazardous wastes. However, if hazardous wastes are produced, they shall take stock of this regulation in handling them.

3.6.12 The Environmental Management (Standards for the Control of Noise and Vibration Pollution) Regulations, 2014

Under these regulations NEMC is mandated, in consultation with the TBS, to establish criteria and procedures for the measurement of noise and vibration pollution; minimum standards for the emission of noise and vibration pollution into the environment, and guidelines for the abatement of unreasonable noise and vibration pollution emitted into the environment from any source. The Regulations provide detailed noise standards according to this provision. The purpose of these Regulations is to ensure the maintenance of a healthy environment for all people in Tanzania, the tranquility of their surroundings and their psychological well-being by regulating noise levels, and generally, to elevate the standard of living of the people by prescribing the maximum permissible noise levels from a facility or activity to which a person may be exposed; providing for the control of noise and for mitigating measures for the reduction of noise.

The permissible limits are provided for in the Schedule to the Regulations. Construction of the abattoir and production activities shall produce too much noise and vibrations owing to the use of heavy machinery.

3.6.13 Environmental Code of Practice for Road Works 2009

Under this code of practice, the construction site's temporary installations must be adequately located to avoid or minimize environmental disturbance. Use previously cleared or disturbed areas to the extent possible or sites that will need to be cleared in the future for other purposes. The Contractor must observe the following conditions:

- The construction site's access paths, storage, and parking facilities, workers' camp, site offices, and other temporary installations must be located at least 60 m from permanent watercourses (including irrigation and drainage canals) or lakes and more than 30 m from intermittent watercourses;
- Workers' camps must be located at least 150 m from the road reserve of the main road to reduce the harmful effects of noise and more than 500 m from inhabited zones;
- Sites of exceptional interest (e.g., ecological or archaeological) must be avoided;
- The workers' camp must be located at least 10 km from classified forests to avoid the illegal harvest of wood for domestic purposes;

• The operation of the construction campsite must not lead to conflicts with the local population over the use of local resources for domestic purposes.

3.7 Institutional Framework

3.7.1 Overall Management Responsibility

The institutional arrangement for environmental management in Tanzania is well spelled 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 of the administration of all matters relating to the environment.

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

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 sectors and civil society. The committee advises the Minister on any matter related to environmental management.

Relevance: TAC reviews and advises the minister regarding this EIA if it complies with the law.

3.7.3 Minister Responsible for Environment

The Minister is responsible for matters relating to the 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.

Relevance: Shall issue a certificate for this EIA.

3.7.4 Director of Environment

The Director of Environment heads the Office of the Director of Environment and is appointed by the President of the United Republic of Tanzania.

Relevance: TAC reviews and advice the minister regarding this EIA if it complies with the law.

3.7.5 National Environment Management Council (NEMC)

The NEMC's purpose and objective are to undertake enforcement, compliance, review, and monitoring of EIA’s and to facilitate public participation in environmental decision-making.

Relevance: Register and oversee the whole process of this EIA; Controls the implementation of the Environmental Management Plan (EMP) during and after construction of the road; Monitors the effects of activities on the environment during and after construction;

3.8 The Overall Management of the Project

From an institutional point of view, Tabora Municipal council and TARURA have the responsibility of maintaining and developing the projects.

CHAPTER FOUR

4.0 BASELINE ENVIRONMENTAL AND SOCIAL CONDITIONS

4.1 Overview

Baseline study was required to establish benchmark for environmental and socio-economic condition of the project are before project's implementation so as to determine change at the intervention during the project execution and being able to establish and identify social economic and environmental impacts that will result from the change of the sub-project development during and after construction phase. Project socio-economic and environmental impacts are anticipated to affect a greater geographical area. The baseline study area for the socio-cultural- economic study corresponds to the extent of the communities in which the proposed project will be located.

The proposed sub-project's environmental baseline study was conducted in December 2021. The baseline study was done in areas of direct and indirect zone of influence of the proposed project. Gathering of baseline data was done to meet the following objectives:

- To understand key biological, physical, ecological, social, cultural, economic, and political conditions in areas potentially affected by the proposed project;
- To understand the expectations and concerns of a range of stakeholders on the proposed development;
- To inform the development of mitigation measures;
- To benchmark future socio-economic changes/ impacts and assess the effectiveness of mitigation measures.

Sources & Methodologies for Data Collection

Primary Sources: Result of the field and laboratory data collected and analyzed directly

Secondary Sources: Data collected indirectly from published records or documents such as project documents, Regional profile, maps and photos etc.

Methods of data collection:

General Methods: Literature review, map interpretation, checklists (e.g. scaling and questionnaire checklists, matrices etc)

Resource -Based Methods: Scientific instruments and techniques

4.2 Identified zones of Impacts

This section covers the baseline environmental situation along the sub-projects area. Most of the information provided in this section was gathered through observation and measurements during the field survey. Some of the data were obtained through a literature search. The baseline information provided below belongs to three zones;

i. Direct Impact Zone (DIZ) - This is the Right of Way of the proposed project road which includes 75m from the centreline (150m in total), 150m on both sides for the four major junctions, borrow pits, quarry sites, campsites, etc.
ii. Immediate Impact Zone (IIZ): These are immediate surrounding areas about 500m on both sides of the proposed subprojects (mitaa at the project areas)
iii. Area of Influence (AI) - This includes the wider geographical areas that are influenced by this project.

4.3 Synopsis of Tabora region

Physical Environment

4.3.1. History and Geographic setting

Tabora Municipal Council was established in August 1988. The history of Tabora Town can be traced back to the time before 1830 when the area was known as Unyamwezi by the first slave traders from the coast referring to the inhabitants as “The people of the moon”. These traders were mainly Arabs and they established their base at Kazell hill in 1840. When the Germans took control of East Africa they changed the name Unyamwezi to Tabora. It is said that it was a mispronunciation of the word MATOBOLWA which literally in Nyamwezi it means dried pieces of cooked sweet potatoes. The Chiefdom of Unyamwezi is known as Unyanyembe.

4.3.2 Location

Tabora Municipality is a Headquarters of the Tabora region and covers 1092 square Kilometres. The Municipality is located between 4^{o} 52’ and 5^{o} 9’ latitude South and 33^{o} 00’ East. Most of its part lies between 1000m above sea level. It is surrounded by Uyui District in the Western, Northern, and Eastern parties and Sikonge District in the South (Figure 4.1).

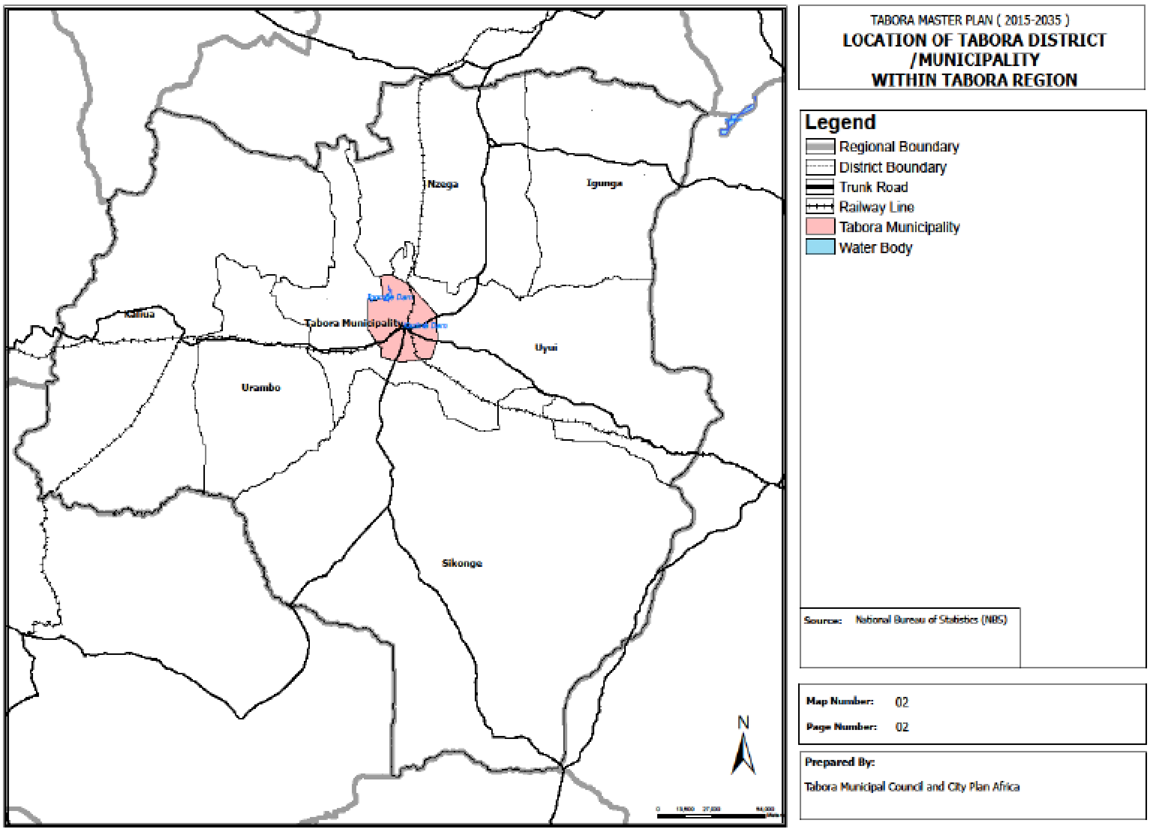

Figure 4.1: Map of Tabora region showing the Tabora Municipal Council

(Source: Tabora Master plan (2015-2035))

4.3.2.1 Area Size and Administration

Tabora Municipal Council covers an area of 1092.26 sq Km of which urban area covers about 84.49 square km of the region area. The Municipal Council has an area of 527 square kilometers. Administratively, Tabora Municipal Council is divided into 2 Divisions, 21 wards, 116 "Mitaa", 41 Villages, and 119 hamlets. Also, the Council has one constituency which is Tabora Urban.

4.3.2.2 Population

According to the Annual Population and Housing Census, 2012 Tabora Municipal Council had a total population of about **226,999** (Men 111,361 and women 115,638) with an average of 4.7 people per household. The Master Plan report (2015-2035) the expected increase in the population of Municipal to 328,752 in the year 2025, with the Population growth is 2.9 percent per annum.

4.4 Topography and Drainage

Tabora Municipal Council is characterized by different forms of the vast central plateau of Tanzania, with areas of flat and gently undulating plains and hills. It lies between 1,115 meters to 1,395 meters above sea level and is drained by the Igombe and Wall rivers, which flows westwards into the Malagalasi basin. Neither of these rivers is perennial, they only exist during the rainy season.

The implementation of the roads sub project might lead to the interference of the local hydrology which can cause the effects on the storm water drainage in the area. Precautions should be taken especially during design and construction phase.

4.5 Geology and Soils

Five soil groups in the Municipality occur in association with the various individual types of the terrain, variations characterized by slope positions. The main soil groups are Lugulu, Isenga, Kikungu, Ipwisi, and Mbuga soils.

The geology of the municipality is characterized by intrusive granite and granodiorite formed during the archaic era. These coarse to fine-textured crystalline rocks are mainly in rich feldspars and quartz's composition. The rocks are well jointed and often deeply weathered, but rock outcrops are commonly found within the area.

4.6 Climate

4.5.1 Rainfall

In Tabora Municipality, rainfall decreases from west to east, in the west, the rainfall is over 1,000 millimeters while in the east it drops to 700 millimeters or less. The peak is in December followed by a slight dry spell in January. According to the observed data of 2013 from TMA, the maximum mean rainfall in December 2013 was 321.2 millimeters and January 121.5 millimeters. A second lower peak occurs in April and the rains fade off in April/May. The minimum mean rainfall recorded in April 2013 was 105.6 millimeters and no rainfall was recorded June- August and October 2013. The rainfall pattern in the region is extremely variable and unpredictable (Figure 4.2).

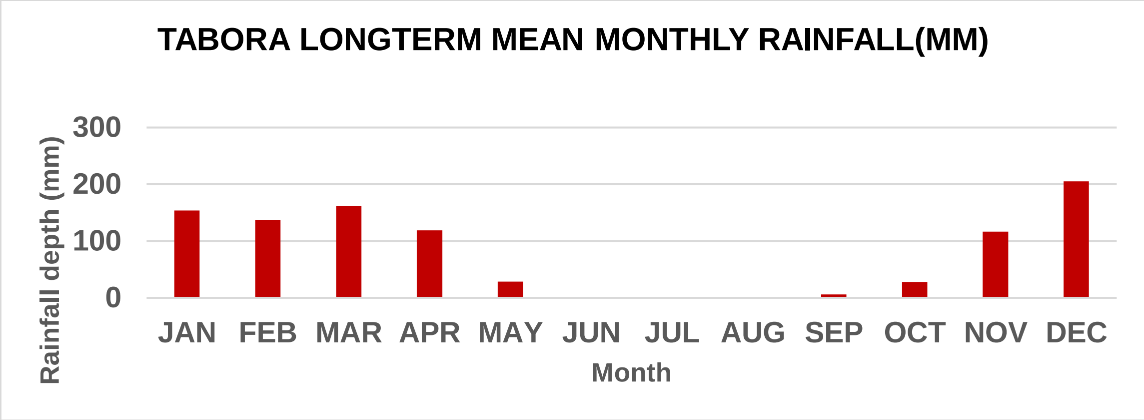

Figure 4.2: The Rainfall variability in the Municipality

(Source: Hydrology Report, 2022)

During operation of the road, abrupt changing in climatic characteristics i.e. increased in rainfall are expected to affect road infrastructures, especially overloading drainage structures and likely to influence accidents. Precautions should be made to the designers especially during hydrological years.

4.5.2 Temperature

The average temperature during the day is 22^0 C - 26^0 C. Highest temperature of 33.1^0 C occurs in October just before the start of the rainy season, falls gradually in December, and remains relatively constant until May. Between May and August, the Municipality experiences cold season with an average minimum temperature of 15.7^0 C is relatively lower compared to October (Figure 4.3)

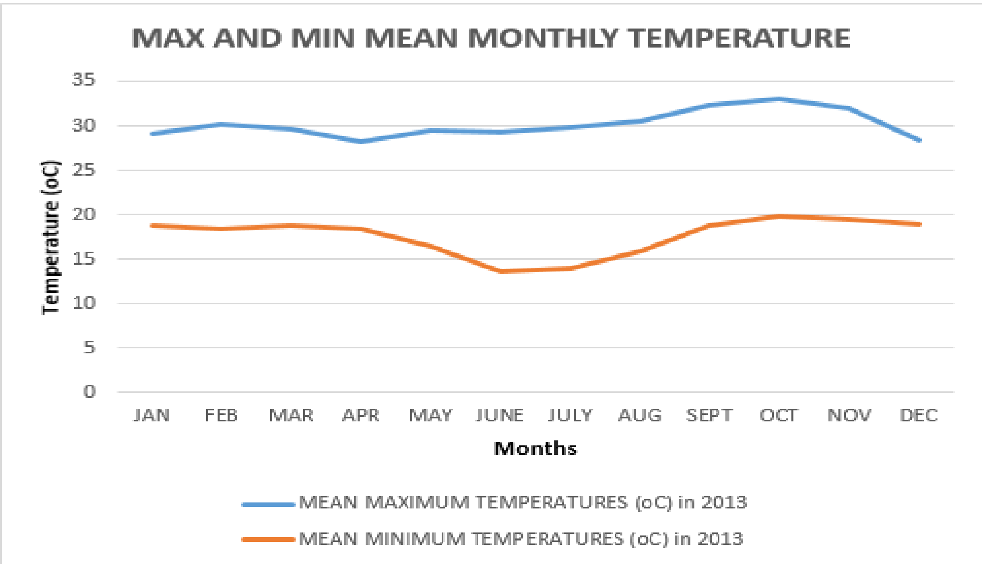

Figure 4.3: The Temperature variability in the Municipality

(Source: Tabora Municipal Master Plan 2015-2035)

4.5.3 Humidity

Tabora Municipal Council lying in the Central African Plateau experiences monsoon winds. The month of July is marked by the onset of dry winds which continue until October. The wind blows from the southeast direction except in January when the direction changes to the northeast.

4.5.4 Sunshine and Evaporation

Normally the sun rises in the morning at six hours and fifty-one minutes and falls during eighteen hours and forty-nine minutes in the evening, the number of hours of sunshine does not change throughout the year. Potential evaporation tends to decrease with altitude this being predominantly a reflection of the variation of clouds covered with height.

Sunshine especially UV is among the climate variable that will contribute to early aging of the bitumen for project roads. Climatic adaptation measures should be considered with regard to the effect of Ultra Violet on bitumen roads.

4.6 Water Bodies

In Tabora Municipality there are two major rivers namely Walla and Igombe Rivers. These are temporary rivers traversing through the municipality; Igombe river act as the boundary separating Tabora Municipal Council and Uyui District Council pouring its water into Kigozi River which is a tributary of Malagarasi River. Walla River pouring its water into Ugalla River where they are collected and finally poured into Malagarasi River. Other water bodies found within the municipality are seasonal streams distributed within the municipality.

4.7 Existing Air quality, and Noise and vibration

Typical environmental parameters identified during the field survey include PM10, PM2.5, TVOC, NO2, SO2, H2S, CO2, O2, CO, noise, and ground vibration measurements. The sampling(SP) location was selected based on the climatic status of the area and the different activities taking place within and across the area of dust and gases that might disperse to the surrounding environment. The measurement was performed and observed in eleven different sampled locations within the sub-projects areas (Figure 4.4).

Figure 4.4: Air quality and Noise sampling activities

(Source: Fieldwork, December 2021)

4.7.1 Air Quality

Particulate Matter (PM10 and PM2.5) levels were determined by using an environmental kit instrument with a very fast response known as an Environment Air quality tester ECO-12 model. The used portable air sampler complies with Electromagnetic compatibility. Generic emissions standard, Residential, commercial and light industry (EN50081-1:1992 and EN 50081-2:1993), the manual determination of mass concentration of particulate matter (ISO 9096:2003) and meets the requirements of Air Quality General Considerations TZS 836-part 1:2004 and Manual determinations of mass concentration of particulate matter; TZS 837 parts 3:2004.

The typical air pollutants from the sub-projects are Carbon Monoxide (CO), Nitrogen Dioxide (NO2), Sulphur Dioxide (SO2), volatile compounds; and particulate matter (dust). The average measured concentration for PM10 and PM2.5 ranges between 2 µg/m3 and 142 µg/m3 and 1 µg/m3 to 52 µg/m3 respectively. The highest concentrations at other roads (142 µg/m3) were associated with vehicular movements, while the lowest concentration was observed at Kisarika (Figure 4.5).

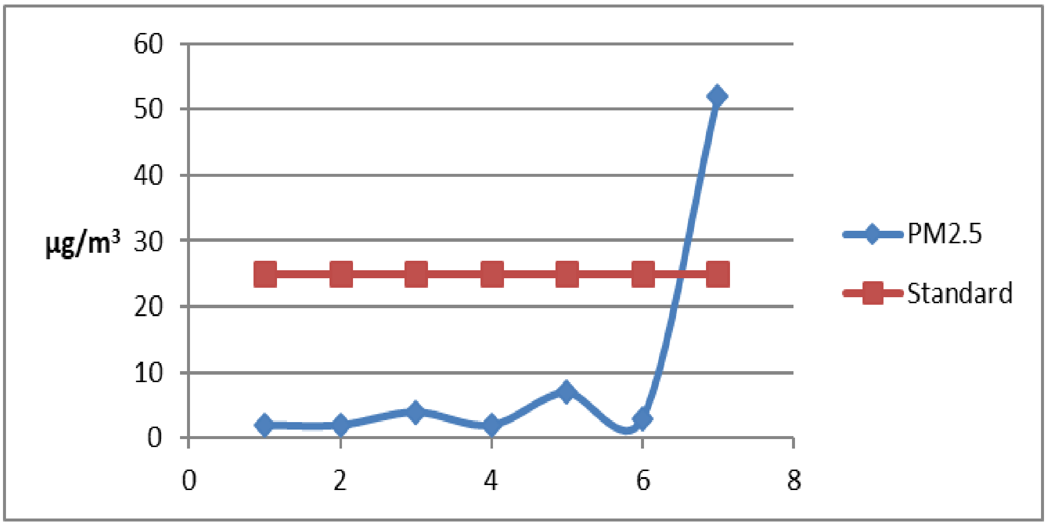

Figure 4.6: $PM_{2.5}$ Concentrations in different locations

(Source: Fieldwork, December 2021)

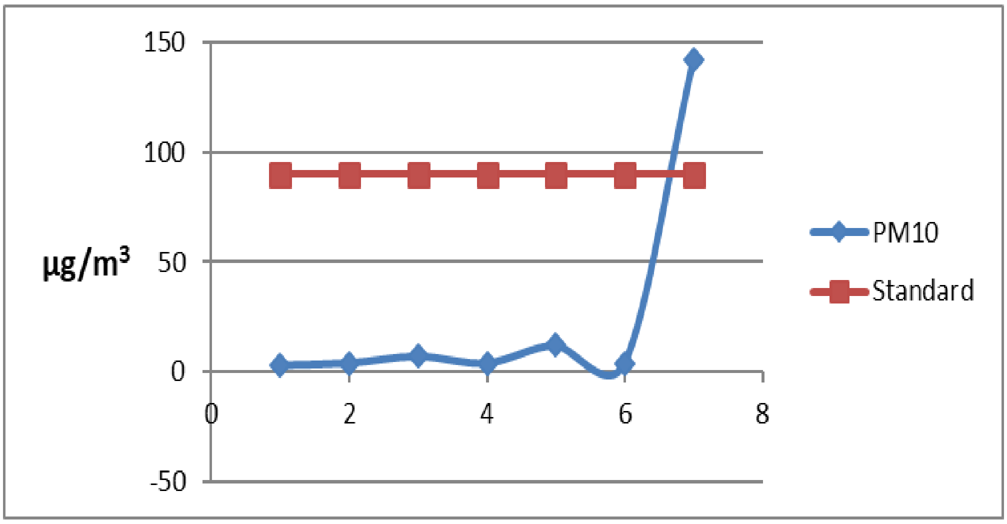

Figure 4.7: PM_{10} Concentrations in different locations

(Source: Fieldwork, December 2021)

However, SO2 concentrations recorded for most monitoring locations were all below the Tanzania Bureau of Standards and WHO standards guideline value of 0.5mg/m3 but the area around Tabora girls at Sikonge road was found to have 0.7mg/ m3 to be above the standards.

Generally, the average PM10 and PM2.5 concentrations measured at most of the locations were found to be below the respective guidelines stipulated by WHO and below that stipulated by Tanzanian Ambient Air Quality standards

4.7.2 Noise and Vibrations

Based on the sampling stations taken during the field works, the recorded levels were between 52.55 – 76.4 dBA. The sample measured at Kanyenye road (76.4dBA) among all other samples was found to exceed the standard (75dBA). It was noted that the main sources of the measured noise are vehicles, noise from people, and motorcycles passing through the project site or near the proposed project area.

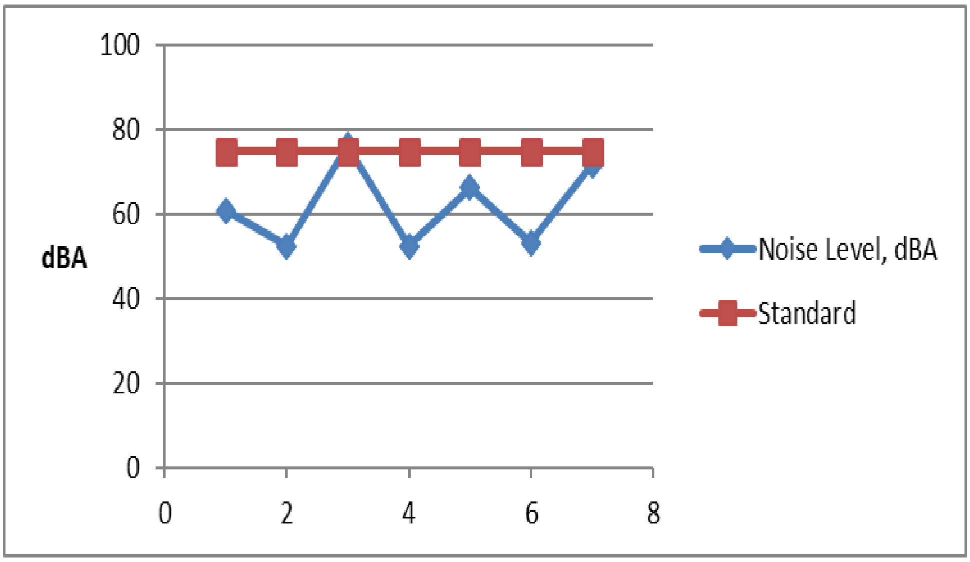

Figure 4.8: Existing Noise Levels at the Proposed Sites

(Source: Fieldwork, December 2021)

It is anticipated that the night and evening noise levels will be higher, considering the high population densityof these areas, high frequency of vehicles during the night, and the fact that the population mainly work in the urban areas, stimulate the facts that the noise and vibration level will be higher in the areas of Kanyenye roads, Mailitano, except in Swetu and Kisarika roads which are near the town.

4.8 Biological Environment

4.8.1 Flora

There are two main forest reserves found within Tabora Municipality owned by the central government; these include: Igombe Forest Reserve found in the North-West part of the municipality at Misha and Ikomwa wards and Urumwa Forest Reserve found in the South-West of the municipality at Itetemia and Ntalikwa wards. The nature of these forest reserves is naturally dominated by miombo woodlands.

The vegetation cover of Tabora Municipality can be classified into upland and low land or wetland vegetation. In the uplands, there is woodland, bushland, and thicket grassland. Miombo woodland (*brachystegia boehmii*) is the dominant species within the municipality, with Mninga trees found in scattered patches. Miombo forests with the famous Mninga hardwood are good sources of quality timber, firewood, charcoal, and for keeping beehives.

4.8.2 Fauna

The Fauna in the municipality includes livestock of different kinds such as; cattle, goats, sheep, and poultry. However, some of the species like birds and bees, etc., have their habitats in forest areas The livestock are mostly indigenous breeds, a few exotic and crossbreeds are found mainly in the urban area (Figure 4.9).

Figure 4.9: The livestock and vegetation along the Swetu road

(Source: Fieldwork, December 2021)

4.9 SOCIO-ECONOMIC BASELINE CONDITIONS

4.9.1 Socio-Economic Survey

The socio-economic survey was conducted in all main seven (7) wards located along the sub-project. In each ward seven wards, ten (10) households were interviewed. Therefore, the information analyzed in this report is based on the above background. That means other wards located in the sub-project area but not located directly to the project are excluded in the sampled wards.

4.9.1.1 Composition of the households

The average family size in the sampled wards is six (6) members per household though there are some families with more than six or fewer members. The consultation showed that women are the head of the majority of families and are normally widows, divorced, or never-married women. Orphans and disabled persons were also found among the household interviewed.

The extended family is the predominant structure of the household; the male is the head of the household. Only in a few cases whereby females head the house mainly in widowed families. Only 5.2% of the household heads were elder children in the family. The majority 80.4% of household heads were males. The rest 14.4% of the household heads were females (Figure 4.10).

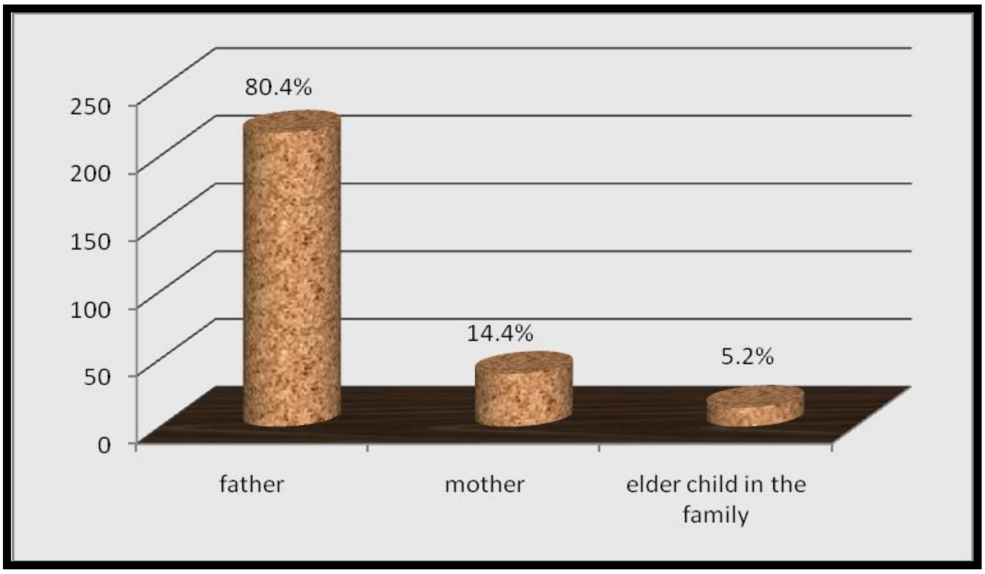

Figure 4.10: Head of Households interviewed

(Source: Socioeconomic survey; 2021)

4.9.1.2 Gender status in the Household

The interview with women revealed that women are socially excluded from their proportionate share of the health and wealth of their societies, weakly represented in decision-making, and disproportionately burdened with task loads. The relationship between men and women, able and disabled, children, youth and old aged is of Para amount for National harmony and stability and social-economic development. However, the ward governments in the project area try to involve all groups and empower them in decision-making to make an effective economic development. With all these effort women shy off to participate in decision making.

Economically, it was revealed that (75%) of economic development is made by women. Women are constrained with a lot of other responsibilities including reproduction and other household chores (Figure 4.11). The challenge that faces women is limited land ownership which limits their advancement.

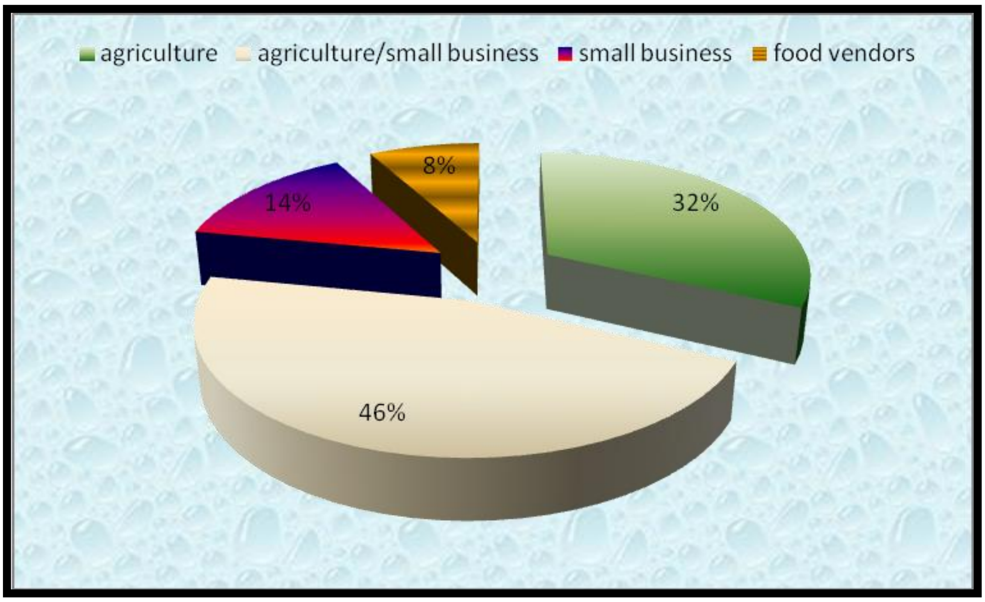

Figure 4.11: Economic activities performed by women

(Source: Socioeconomic survey; 2021)

4.9.1.3 Ethnicity and Religion

The main ethnic groups in the project area are Wanyamwezi who resided in all wards along with the sub-projects. Other small ethnic groups include the Waha, Wasukuma, Wachaga, Wanyakyusa. Most of the ethnic groups are predominantly agriculturalists and livestock-keeping.

Regarding religion, 48% of residents are Christians and 36% are Moslems and the rest never indicated their religion.

4.9.1.4 Language

In Tanzania, Swahili is the national language and also the language is spoken by a majority including the population in rural areas. However, in some instances, the elder population is more conversant in their mother tongues and this may be the case encountered in many rural areas. Hence, in this project area, Swahili is the main language spoken though you still find some using the local dialects. The ethnic languages spoken in the project area include Kinyamwezi, Kisukuma, and Kiha languages.

4.9.1.5 Dependency Ratio within households

Considering the competing household needs *vis a vis* the income levels, the majority of over 65% of the interviewed household are a dependant of 35 of the working age. The dependent group includes children at school or pre-school age as well as the elderly group above 65 years.

4.9.1.6 Settlement

The roads route corridor is densely populated. Settlement patterns include dispersedly (though by no means isolated) dwelling nucleated wards and small urban centers.

Buildings in the densely populated centers of large wards do face the sub-projects but are set back at least ten meters, though some wards like Ipuli, Kitete, Ifucha, Mwinyi, and Malolo some of the houses in these wards are located near the sub-projects. As one moves towards the peripherals of the wards houses is not oriented to the sub-projects. Rural parts of the ward have their morphology, with many internal paths and tracks.

4.9.2 Land tenure

4.9.2.1 Tenure and Land Use

There are different systems of land tenure found along with the project sub-projects. This includes; customary right-inherited from parents, ward government allocation, buying as well as self-allocation. The primary data from the socio-economic survey revealed that 11% of the interviewed households acquired land through buying while 47% inherited landform their parents the rest 39% reported to have been given land by the ward government. Only 3% of the interviewed households have been allocated land themselves. During the selling of land, the ward government normally witnesses the transaction and keeps records for future reference in case of a problem between a seller and a buyer (Figure 4.12).

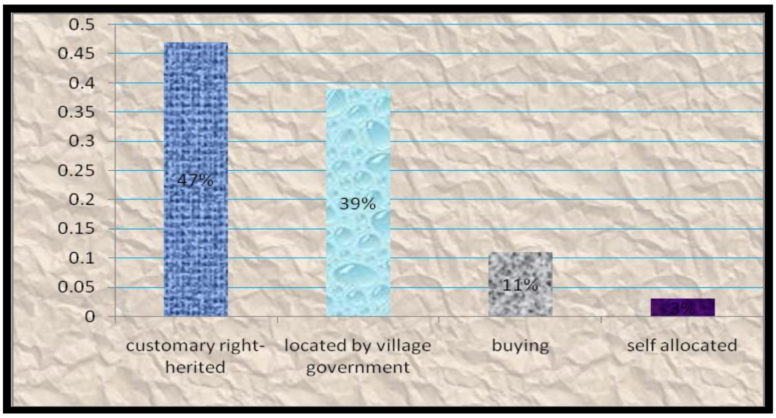

Figure 4.12: Land Tenure systems

(Source: Socioeconomic survey; 2021)

Regarding land ownership, the majority of households hold 12 and above acres of land (64.8%). The majority of the respondents are of the view that the government should support PAP's in the process of land acquisition. Concerning relocation, most of the affected people would prefer to remain in their present wards (86%). The rest would not mind relocating elsewhere.

The most widespread land use in the study area is small-scale, rain-fed agriculture. Use of the drier upland areas by local farmers is limited; most cultivation is concentrated on the more fertile, black clay soils of the river valleys, which in some cases can support year-round cropping.

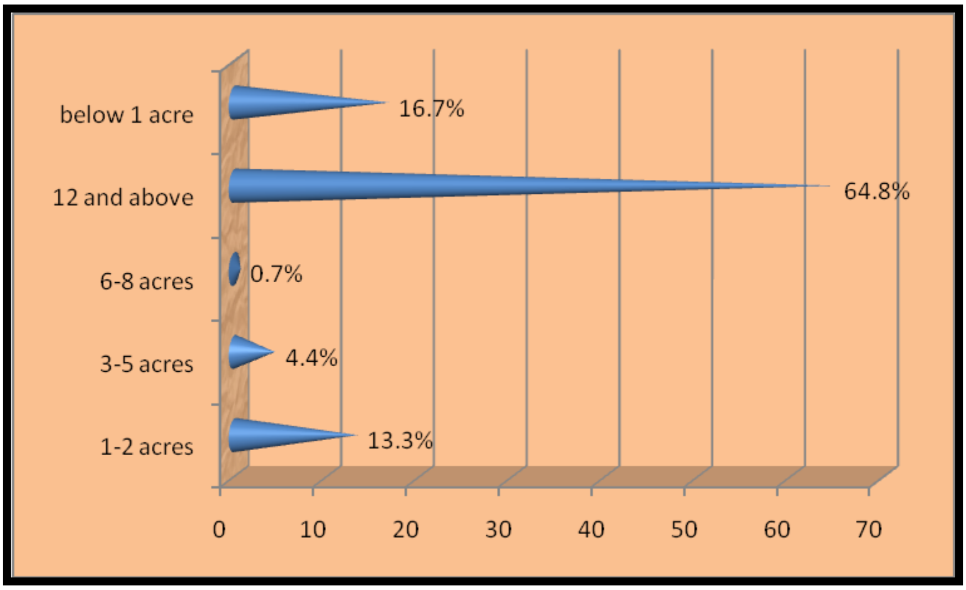

Figure 4.13: Land size owned by members of the household
(Source: Socioeconomic survey; 2021)

4.9.3 Economic activities

4.9.3.1 Employment / Household

The informal sector is the main employment of residents along with the project sub-projects. Other common activities include livestock keeping and petty business. Only 4.4% of the respondents are employed in the formal sector.

4.9.3.2 Agriculture

The majority of the people in the study area are predominantly subsistence farmers. Minorities are engaged in poultry and livestock keeping. The agricultural production system in the wards seems to be based on shifting cultivation using mainly traditional, and thus labor-intensive, methods and technology.

Few inputs are used, as only a minority of the wealthier farmers can afford to hire a tractor; similarly, pesticides and fertilizers are both expensive and difficult to obtain. However, the councils have been distributing fertilizers that support the agricultural system conducted within the Council. The cropping cycle follows the rainfall pattern for the area with December, January, and February being the main crop growing season and harvesting starts at the end of March to May. The principal food crops grown in the area are maize, sweet potatoes, rice, and maize.

4.9.3.3 Livestock keeping

Livestock keeping is one of the main components of the economy in the project area. This includes cattle, goats, pigs, sheep, and chickens. 94.8% of the respondents own livestock. Out of 94.9 of the respondents reported owning chicken/duck/turkeys. Only 1.9% own cattle and 0.4% own goats/sheet (Table 4.1).

Table 4.1: Type of livestock kept in the household

Item	Frequency	Percent
Cattle	251	92.6
goats/sheep	1	0.4
chicken/ducks/turkeys	5	1.9
not owning livestock	13	5.2
Total	270	100.0

(Source: Socioeconomic survey; 2021)

4.9.3.4 Households Source of income

The socio-economic survey reveals that 87.8% of the interviewed households solely depend on agriculture as their source of income. Other groups depend on agriculture but also are involved in other activities like small business, formal employment (teachers, ward government officials) as well as livestock keeping.

Table 4.2: Source of income for the interviewed households

Item	Frequency	Percent
Agriculture/Livestock	25	33
small business	17	22
formal employment/agriculture	10	14
agriculture/small business	17	22
agriculture/bodaboda	7	9
Total	75	100.0

(Source: Socio economic survey; 2021)

Eighty percent of the respondents reported earnings below 100,000 Tshs per month, followed by 9% who earn between (100,000 to 500,000 Tshs per month) and (500,001/- - 1,000,000/- per month). Lastly, 2% reported earnings above 1,000,000/- Tshs per month. Please refer to figure 4.14 below:

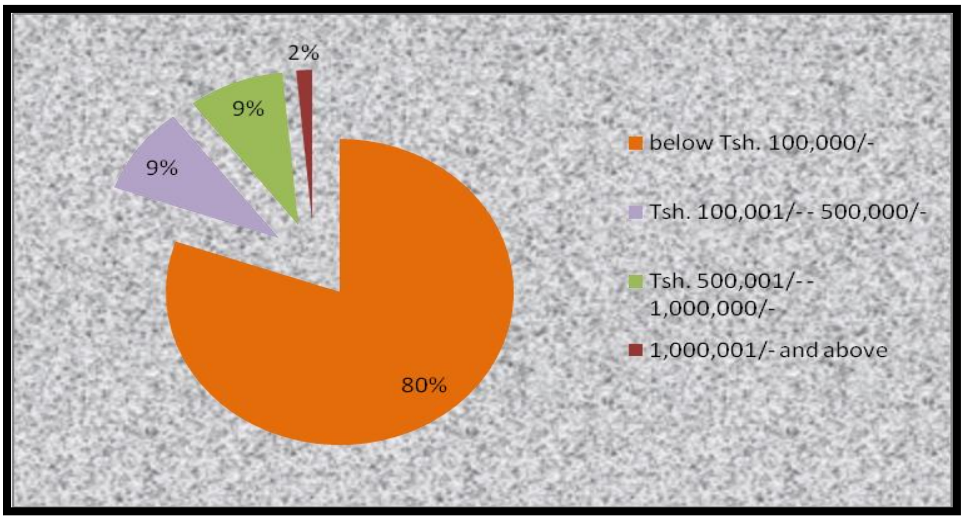

Figure 4.14: Total cash income for the last month

(Source: Socioeconomic survey; 2021)

On the other hand, 30.7% of the respondents reported earnings below 500,000 Tshs per annum, followed by 38.5% who earn between 500,000 to 1,000,000 Tshs per annum. The rest 23% their income is between 1,000,001/- - 5,000,000/- per annum (Figure 4.15).

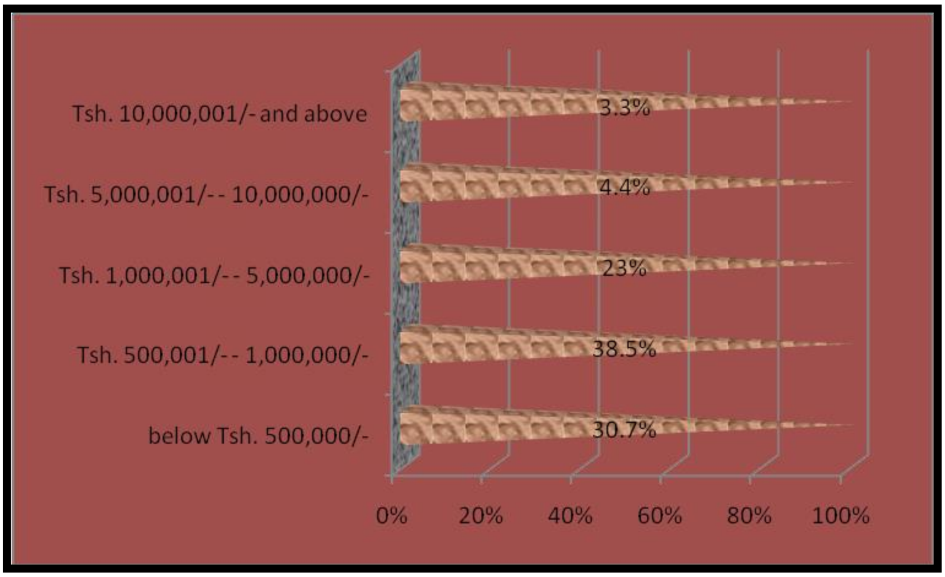

Figure 4.15: Total cash income for the last month

(Source: Socioeconomic survey; 2021)

4.9.4 Social services

4.9.1.1 Water Supply

There are different sources of water in the project area. This includes in-house connections and water wells. During the socio-economic survey, it was reported by water users that there is water problem especially in wards of Mwinyi, because of this majority get water from water vendors but other wards have enough water

Generally, water used in all wards is are safe; as a result, water-related diseases attack water users. During the survey, wards reported experiencing water-related diseases such as diarrhea, intestinal worms, and typhoid

4.9.4.2 Sanitation (Solid and liquid waste)

Sanitation facilities indicate health status, as well as socio-economic development. Most of the households use pit latrines without permanent structures including walls and roofs. Good solid waste management was observed during the survey. The majority of the household dispose of the waste in pit holes (97.8%), although in some households they throw in farms (2.2%). Poor solid waste disposal results in air pollution.

Table 4.3: Solid and liquid waste disposal

Item	Frequency	Percent
Farm	14	18
pit hole	61	82
Total	75	100.0

(Source; socio-economic survey; 2021)

4.9.4.3 Energy

Some of the households are connected with electricity under the REA program while others are not. Only 62% of the interviewed households are connected with electricity while the rest 38% use kerosene as a source of light.

The main source of energy for cooking in the project area, both in the urban and rural areas is firewood (87.4%), followed by charcoal (5.9%), while 6.7% use both charcoal and firewood.

Table 4.4: source of cooking for the households

Item	Frequency	Percent
Firewood	66	87.4
Charcoal	4	5.9
charcoal/firewood	5	6.7
Total	75	100.0

(Source: socio-economic survey; 2021)

4.9.4.4 Telecommunications

The entire three networks are available along with the sub-projects, although the signals in some areas are weak particularly in valleys. These Cellular phones include Vodacom, Tigo, Zantel, Halotel and Airtel. As well as access TTCL. Post office, Internet, and fax services are available at Tabora Town.

4.9.4.5 Health services

The accessibility to health facilities in the project area is good since almost every ward consulted has a dispensary. Inhabitants do walk about 1 – 5 km to reach a dispensary. The hospitals are found at MailiTano, Chemchem ward (Town Clinic Health Center) and Kanyenye wards. In the course of the survey, the Consultant learned that access to modern treatment was inaccessible to many households due to the high cost of treatment. The medical personnel is inadequate and under-qualified.

4.9.4.6 Education

Education services are well developed. Almost in each ward, there is a secondary school. This includes Ipuli, Kitete, and Mwinyi wards. The problem that was observed is the distance of walking to reach those secondary schools. For instance, students from Kitete and Mwinyi wards do walk more than two kilometers to reach a place where the secondary school is located.

On part of the level of education of the members of the household, the results are presented in figure 4.16;

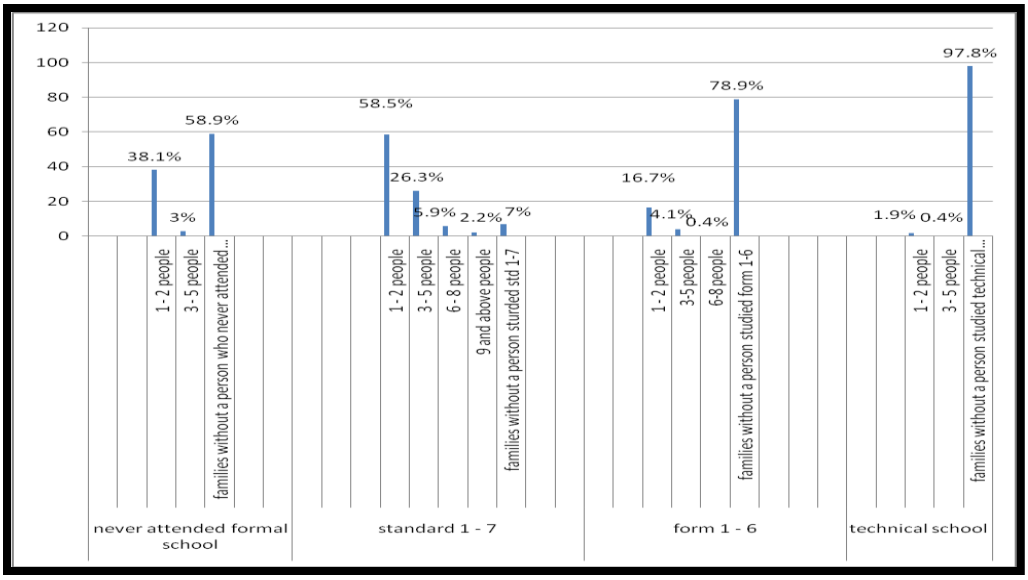

Figure 4.16: Level of Education of members of households
(Source; socio-economic survey; 2021)

It is anticipated that the sub-projects improvement will have an impact on the quality of education by making it easier to construct schools of durable materials and to attract teachers to work in otherwise remote locations. However, it is unlikely to have a positive impact on school attendance, this is because most of the families do not have enough money to send their children to school.

4.9.4.7 Diseases / HIV/AIDS Prevalence Rates

The major diseases found in communities along the sub-projects corridor include malaria, diarrhea, respiratory infections including coughing, TB, pneumonia, and skin diseases. Malaria is a main killer disease in the project area. Almost all the household interviewed reported that for the last six months one of their members suffered from malaria. The second to malaria is diarrhea.

Concerning HIV/AIDS infection in Tabora District, the HIV/AIDS infection rate is low (5.1%). Based on the information gathered, the prevalence is 5.1%. Several measures have been undertaken which contributed to the success of reducing transmissions of HIV/AIDS. These include the establishment of voluntary counselling and testing centers and home-based services through mobile clinics and the distribution of condoms.

4.9.4.8 Houses

In urban communities, block bricks are the usual walling materials. Good numbers of houses are roofed with corrugated iron sheets. These houses are normally owned by wealthier members of the community. The proportion of houses built with durable materials is significantly found at all wards. All houses are either square or rectangular. All houses are single story and have two to three rooms. Houses are almost exclusively owner occupies, few houses are rented by employees working in these wards including ward executive officers, agricultural officers, teachers, and other extension officers

4.9.4.9 Use of structures located in the RoW

The majority of the structures found in the project area as indicated in the figure below are used for sleeping purposes (85.9%), while another 3% is used for multifunctional purposes that residential and businesses.

Table 4.5: Main purpose of building

Item	Frequency	Percent
multifunctional residential	6	8.5
Sleeping	64	85.9
kitchen only	1	1.1
toilet/shower	3	.4
combined residential	2	3.0
business only	1	1.1
Total	75	100.0

(Source: Socio economic survey: 2021)

CHAPTER FIVE

5.0 STAKEHOLDER CONSULTATIONS AND PUBLIC INVOLVEMENT

5.1 Courtesy call to Regional and District Commissioner's Offices

The courtesy visits helped the team to introduce themselves to the regional and Municipal security chairman and establish the right contacts in the project area, which in turn facilitated the study at the community level. The visits provided an opportunity to learn and share salient information about the proposed project with the authorities at the district and regional levels. In addition, the team obtained important socio-economic secondary data about the project area.

5.2 Consultations and key stakeholder's identification

A simple methodology was adopted to identify key stakeholders and main environmental and social concerns. This involved physical observations and consultations (direct consultations). Other information on the sub-project was obtained through a desk study.

Stakeholder consultations were conducted during a scoping stage, Figure 5.1 and Figure 5.2. Different stakeholder levels including local government officials as well as community members in villages located along the sub-project road were identified and consulted (a list is appended).

Stakeholders included government agencies, beneficiaries, commercial companies, and all other formal or informal groups associated with a sub-project. Interviews were used in the process of stakeholder identification. From one stakeholder, the team was connected to another and another stakeholder, in a chain-like or network process. The following is a shortlist of both institutional and individual stakeholders.

The major stakeholders include:

- Ministry of Works and Transport;
- Ministry of Lands, Housing and Human Settlement Development;
- Ministry of Natural Resources;
- Ministry of Water;
- RAS-Office – Tabora
- TANROADS-Tabora
- TARURA – Tabora
- TFS-Tabora

- Tabora Municipal Council
- Fire and Rescue force-Tabora
- WEO & VEO at the sub-project site
- Utility Companies, TANESCO, TTCL, and Water Supply Authorities (TUWASA)
- Community nearby sub-project area
- LATRA-TABORA

During consultative Meetings, consultations were done through direct interviews and focus group discussions. Typically, the Agenda for these consultations included:

- informing stakeholders
- gaining their views, concerns, and values
- taking account of public inputs in decision making
- influencing project design
- obtaining knowledge local communities
- increasing public confidence in the proposed project
- improving transparency and accountability in decision-making; and
- reducing conflict among the beneficiaries to the implementation of the project

Figure 5.1 Consultative meeting with Tabora Municipal Council officials

(Sources: Field work December,2022)

5.3 Phase I Engagement and Consultation (December 2021)

The phase I round consultations were conducted by the ESIA team in December 2021 within the sub-projects areas. The main stakeholders consulted and key issues of concerns that were rise are presented in table 5.1A for the response of Government Institutions and Table 5.1B for the concerns of the villagers concerning the proposed project.

5.3.1 Major Issues raised by stakeholders

Economic Benefits: Good road with a tarmac will bring various economic benefits to communities living along or near the road. These include; lowering of transport costs, increase of transportation passing through the roads sub-project, reduced soil erosion during the rainy season, reduced flood problems, reduced traveling time.

Proposed Road Design: The road alignment should be widened to accommodate pedestrians, communities with bicycles and motorcycles, the design of the project roads has to consider Township beautification including installation of street lights for the project roads and if possible for the Ulaya road (starting from Madafu to Kilimatinde Road) which crosses the RAS and other regional official's residences to reduce mugging incidences. Similarly, the design should consider the flood-prone areas and drainage system.

Public Facilities: Some of the services that are being provided to the communities i.e. water supply, electricity, and telecommunication will be affected/ or disrupted by the road construction. Water supply from TUWASA is the main supply of water for residents of Tabora municipal; Therefore, the project phases should avoid pollution of the water. There are Abattoirs, health centers, and schools located along the sub-project road.

Resettlement and compensation: If the expropriation of the project will affect people's properties, especially houses. This issue is key and extremely sensitive since it is very costly with prevailing financial circumstances for an individual to put up a house structure. They are assets that are highly valued by the communities.

Location of Campsites: Local people should be involved in the selection of the camp site/s. The contractor's camping site/s should be constructed with permanent building materials. The idea is to use these structures for public services e.g. schools or street offices at the end of the project construction phase.

Spread of HIV/AIDS and Other Sexually Transmitted Infections: Impaired community safety and risk of disease intensifications, especially HIV/AIDS. TARURA and the proponent (PO-RALG) to officially make a formal contract with an institution that will be carrying out the HIV/AIDS preventive campaign through the dissemination of relevant and appropriate HIV/AIDS preventive awareness creation seminars, campaigns should be to both workers in particular and the communities, effective collaboration with CMACs and other stakeholders is paramount for result based HIV/AIDS awareness creation campaigns during construction of the road

Early marriage and Pregnancies: It has been insisted by stakeholders that most construction projects have been a major cause of early pregnancies for school female children. The stakeholders proposed some measures to address the situation i.e. parents should instill a culture of educating their children on sex and reproductive health education, abiding by moral and ethical values, and also parents should behave responsibly as role models with whom the children can emulate them.

Awareness on road safety: It has been always observed and witnessed the increase in the number of road accidents that are fatal and leave affected with disabilities after the tarmac road is constructed; as proposed tarmac roads, will claim people's lives through accidents. The contractor/TARURA to train well communities' leaders on Road Safety Campaign and Occupational Health and Hygiene so that they will key community educators to road users by disseminating relevant, right, and appropriate information, education, and communication to the communities' members. This goes in conjunction with placement or installation of clear and understandable road signs (preferably in Kiswahili), use of speed humps at streets, and general traffic police surveillance together with allocation of site safety signs for the workers.

Stimulate the growth of town: The project will fuel the growth of towns and streets located along the proposed sub-project roads. These towns should be assisted by the government in planning (e.g. land use and plot surveying) to curb unplanned growth of settlements which directly affect the accessibility of essential public services like supply of clean water and managing waste generated by residents of respective towns and streets along the road.

Employment opportunities to the local people: Each street/ward being transverse should be given priority in the provision of unskilled and semi-skilled laborers in the project. The contractor should therefore adhere to the local content policy in executing the project during recruitment of laborers and commodities and services supply chain.

Insurance of Workforce: Experience gained from other foreign contractors is that they do not provide workplace insurance for casual laborers. Following existing labor laws, TARURA and Tabora Municipal council authorities should enforce the contractors to abide with existing laws of the land in safeguarding the safety of the entire workforce at the construction site to make them well covered by appropriate insurance policies.

Improved Accessibility: The proposed sub-project will guarantee easy accessibility of transportation of goods, commodities, and people hence, therefore, enabling more physical development.

Pollution and Vibration during Construction: Dust production, noise from moving construction equipment/machines, and blasting of rocks are inherent to all road construction works. The contractor must have the means to suppress the dust, reduce the level of noise and provide early notification to the communities about the proper time of blasting rocks to obtain gravels.

Protecting constructed Infrastructures: It was urged by stakeholders that there is a need of cultivating a culture of safeguarding and protecting the project infrastructures among community members especially after the completion of sub-project construction. It has been noted in other areas that people have been vandalizing road infrastructures i.e. bolts, nuts tied in bridges by selling them as scrap metals.

Environmental Safeguard and Sustainability: Storm water channels should not be directed to farms since such practice has damaged crops and farming land due to accelerated erosion. It should be directed to the proper water channels that are not polluting the environment. Also, leakage of diesel, oil, and other lubricants from construction equipment and machines to the road surface and in water sources should be avoided.

Environmental Beautification: Since the Tabora Municipal has had a campaign of planting trees, therefore, the contractor should make sure that the trees are planted on the road reserve areas and ensure that they grow before handling the project to the client.

Gender-Based Violence: Based on the experiences gained from the rise in incidences of GBV from other road construction projects, community members expressed their concerns that during the construction process of the sub-project, more people will come to work in the project area and hence may likely fuel gender-based violence in their communities as a result of interactions of people from different cultural backgrounds. They call upon the contractor to emphasize employees of the project respect human dignity by abiding by traditional customs and norms instead of being the cause of fuelling of GBV related issues in the project area.

Table 5.1A: Issues Response Table for Government Institutions

STAKEHOLDERS VIEWS AND CONCERNS				
Institution	**Name**	**Position**	**Issues/ concerns**	**Responses**
RAS Office Tabora	Rukia S. Manduta	AAS PC	○ TARURA should be involved at all project phases to avoid double efforts on the same road ○ Gender violence issues should be observed by the contractor during the construction phase of the sub-projects ○ The design of the project roads has to consider Township beautification including installation of street lights for the project roads and if possible for the Ulaya road (starting from Madafu to Kilimatinde Road) which crosses the RAS and other regional officials residences because there have been mugging incidences.	○ The issue of GBV & gender discrimination in construction project shall be monitored closely during construction phase ○ The design shall consider environmental beautification
Tabora Municipal Council Office	Mr Nyanja P.M	DED-TMC	○ For beautification purposes, *Trichilia emetica* (Mitimaji) should be planted along the project road at 10m intervals on both sides. The trees are sold at 2500 to 3000 Tshs for 12'' to 20'' tall.	○ The design shall consider environmental beautification and types of trees to be planted shall be specified in the design report

STAKEHOLDERS VIEWS AND CONCERNS				
			○ Photos of the condition of existing houses close to the project road should be taken at the inception stage to avoid unnecessary compensation due to so-called cracks which might have been there before the Construction of the project road. ○ the proposed additional roads, are within the municipality ownership, thus, no compensation will be required	○ The contractor shall make records of the condition of the building near the project vicinity before construction to avoid conflicts
TUWASA-Tabora Urban Water Supply and Sewerage Authority	▪ Eng. John Mazura ▪ Eng. Thomas Msenyele	▪ Environmental Engineer ▪ Network and Distribution Engineer	○ Along and across the project roads there are existing pipeline infrastructures, some are marked with mark posts and some are not, therefore during details picking and construction phase the TUWASA Engineers should be consulted	○ The design shall involve other water Agency to mreallocate the infrastructures.
TTCL Tabora Regional Office	Venance V Assey	ARMN	○ There are underground infrastructures along the proposed project roads (Kisarika road, Swetu road, Maili Tano road, and Kanyenye road), the TTCL surveyor should be consulted at all project phases	○ The design shall involve other water Agency to mreallocate the infrastructures.

STAKEHOLDERS VIEWS AND CONCERNS				
TFS-TABORA	Lucas S, Nyambala	Ass.Resources Management	○ The design should consider the presence of ornamental and shed trees for beautification ie. Ashock trees, trichilia emetic (midodoma), and Thuja tree	○ The design shall consider environmental beautification and types of trees to be planted shall be specified in the design report
TANROADS-TABORA	Eng. Raphael Mlimaji	Ag RM	○ At Swetu road, consider the presence of dumpsite which might have affected the soil ○ Consider the presence of drainage infrastructures in all roads and large ones in flood-prone like Kisarika area ○ Waste collection facilities the near the roads where necessary ○ The contractor should provide HIV/AIDS and health and safety awareness during the construction phase ○ Due to construction activities, there is a possibility of early marriage and pregnancies. Awareness should be provided to the communities. ○ The contractor should use air quality and vibration pollution control measures since	○ Quartely awareness meetings on HIV/Aids, GBV and Road Safety with street people, students and construction workers shall be conducted by the contractor ○ Among the strategies is communities' consultation and involvement during design.

STAKEHOLDERS VIEWS AND CONCERNS				
			the project lies in a populated area to avoid infection to the beneficiaries ○ The location of the campsite should follow the criteria and simulate the impacts before decisions.	
Isevya Ward	Gatty Mwita	WEO	○ The main challenge is the water pipes crossing the road, thus, its reallocation shall be considered ○ Implementation shall include the crossing structures towards the houses ○ The road is crossing the residents and business centers, thus, community safety and road safety signs should observed	○ The design shall involve other water Agency to mreallocate the infrastructures. ○ The road shall be installed with all safety signs, markings and speed calming measures
Ipuli Ward	Asha Mohamed	WEO	○ In case of any house close to the proposed Maili Tano road, compensation shall be done in before construction ○ Involvement of the Mtaa Chairperson is very important during planning of the project ○ Care shall be taken for the utilities crossing the road	○ Compensation shall be done before project implementation ○ Among the strategies is communities' consultation and involvement during design. ○ The design shall involve other water Agency to mreallocate the infrastructures.

STAKEHOLDERS VIEWS AND CONCERNS				
Chemchem Ward	Mbugama J. Salehe	WEO	○ The Road is very old which require an improvement ○ During rehabilitation, the contractor should observe the water supply pipes crossing the road, water Kiosk close to Town Clinic Health Center ○ The area also TANESCO power lines poles along and crossing the road ○ The road is likely to cause traffic congestion,	○ The design shall involve other water Agency to mreallocate the infrastructures. ○

5.3 Separate Meetings with Mtaa and Ward Leaders

Brief meetings were held with local leaders including ward and mtaa officials. Leaders from 7 Wards (Ipuli, Isevya, Chemchem, Mwinyi, Malolo, Kanyenye and Kitete) were consulted. Discussions focused on the existing socio-economic situation in the area and the need to identify clusters of people likely to be adversely affected by the project. The discussions provided an opportunity to introduce the project to the community leaders and identify key informers. The meetings were also intended to encourage a community consultative approach, thus fostering a community participatory approach right from the initial stages of the proposed sub-projects. The social study team had earlier met the leaders of the major settlements along the proposed road, during the scoping exercise. These leaders were informed about the project and initial contacts were established, including telephone numbers and other address exchanges. The questionnaire was provided to Mtaa and ward executive officers to fill in the relevant secondary data available in the Mtaa and ward.

5.4 Public Consultations

In the study area, the team conducted several consultation meetings with the general public. The public meetings were attended by all sub wards including women, youth, old people, and even children. Whoever was available in the sub ward was allowed to attend. Figure 5.2 below shows conducted meeting with the community members of Kisarika ward. The minutes of the meetings are attached as appendix IV.

Figure 5.2 Consultative meeting with Kisarika wards communities

(Source: socio-economic survey, 2021)

5.3.1 Informal discussions

Informal discussions were held with key members of the community such as elderly people; influential persons; women/youth group leaders; and community-based resource persons.

5.3.2 Household questionnaire

Recruited and trained enumerators administered a total of 75 household questionnaires from 7 wards; (10 questionnaires for each ward) along the project area to capture relevant baseline data from the project impacted communities in the project areas using well-designed questionnaires. Both quantitative data and qualitative information were obtained through this tool which enriched the Impact Assessment report. The analysis of the questionnaire survey is presented in chapter 4.

5.3.3 Major Issues raised by the stakeholders

Through conducting a series of public meetings in the sub-project area, stakeholders provided several views concerning the development of the sub-projects in the Municipal and within their areas. Therefore, the following issues were raised by the public;

Demolition of Houses and Market kiosk: There will be no demolition of Houses or Kiosks before the construction unless there the alignment is determined and approved by the community members affected

Spread of HIV/AIDS and other sexually transmitted infections: Impaired community safety and risk of disease intensifications, especially HIV/AIDS. The contractor is required to conduct relevant preventive awareness creation seminars and campaigns on HIV/AIDS to both workers in particular and the communities at large.

Accidents: It has been always observed and witnessed the increase in several road accidents that are fatal and leave affected with disabilities after the tarmac road is constructed. This prompts fear that the proposed tarmac road will claim people's lives through accidents. Advise the contractor/PO-RALG/T to carry out Road Safety Campaign to road users by disseminating the right and appropriate information, education, and communication in conjunction with placement or installation of clear and understandable road signs (preferably in Kiswahili), use of speed humps at Mitaa and general traffic police surveillance.

Growth of town/Mitaa: The project will be a precursor for towns and Mitaa growth. These towns should be assisted by the government in planning (e.g. land use and plot surveying) to curb unplanned growth of settlements which directly affect the accessibility of essential public services like supply of clean water and managing waste produced by residents of respective villages along the road.

Improved Accessibility: The roads will guarantee easy accessibility of road transportation of goods, commodities, and people hence, therefore, enabling more physical development.

Dust during construction: Dust production is inherent to all road construction works. The contractor must have means to avoid pollution by the dust particles otherwise conditions may be intolerable.

Recruitment of Labourers during the construction phase: Each Mitaa being transverse should be given priority in the provision of unskilled and semi-skilled laborers in the sub-project. The contractor should therefore address the issue of local content policy in executing the sub-project.

Environmental Safeguard and Sustainability: stormwater channels should not be directed to farms as such practice has damaged crops and farming land due to accelerated erosion. It should be directed to the proper water channels that are not polluting the environment.

5.3.4 People's Attitudes towards the Sub-projects

The communities along the proposed sub-project roads are looking forward to seeing that the roads sub-project are under construction. However, all the communities along the sub-project roads are quite worried about the compensation issues of the affected properties. Communities would like the government to compensate all the properties that will be affected by the sub-projects construction, although most of the properties are out of road reserve.

Table 5.1B: Issue response Table for Community

Ward	Ward Design and Implementation Issues and Opinions	Responses
Mwinyi and Malolo	• The road should have a proper drainage system as the area of Malolo and Mwinyi has especially during the rainy season. Also, road safety measures and signs should be include	The design shall provide the drainage systems in all roads where necessary
Kitete	• Strom water system should be big, and should not be open • Security plan to make sure there is no stealing of construction materials • Water drainage should not be directed to people's houses.	The design shall provide the drainage systems in all roads where necessary The contractor shall ensure high security in the camps and sites
Kanyeye	• The road will beautify the area and will help the neighbour with casual works	The design shall consider tree plant measures during construction
Ipuli	• Presence of street lights will ensure security and reduce darkness during night, • It will help patients when moving to the MailiTano hospital	The design shall provide street lights in roads
Chemchem	• An alternative bypass will be Ali Hassan Mwinyi road closes to Ali Hasan Mwinyi Playing gı	The design shall see how to consider the opinion

Ward	Ward Design and Implementation Issues and Opinions	Responses
Isevya	• The reallocation of the utilities will be done in collaboration with the specific institution, h the community affected will be informed five days before the execution of the activities • The contractor will make sure that, the suggested crossings and accessible structu constructed to connect the roads and the resident houses	The design team shall make consultation with the Utilities Authorities and even during construction process

CHAPTER SIX

6.0 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF ALTERNATIVES

This chapter outlines the potential negative and positive impacts that will be associated with the project. The impacts are related to activities to be carried out during the pre-construction, construction, and operation phases of the sub-projects. In addition, the closure and decommissioning phase impacts of the project have been highlighted.

The impacts of the have been categorized into each of its life cycle stages; construction, operation and decommissioning.

6.1 Impact Zones

This section covers the baseline environmental situation on where the Sub-projects are located (The methodology for Impact Identification and evaluation has been provided in section 1.10.3). Most of the information provided in this section was gathered through observation and measurements during the field survey. Some of the data were obtained through a desk review. The baseline information on the sub-project provided below belongs to three zones;

- **Primary Corridor of Impact** – This is the core Impact zone where the road sub-projects works will concentrate. The site of the construction is the existing RoW, 30m throughout the project area and the area immediately bordering it. The road's carriageway width is 15 m; the width encompasses shoulders, drainage, median at the canter of dual carriageway, and drainage on either side of the sub-project roads.
- **Secondary Impact area**- These are off-site locations linked to the sub-project construction works including i.e. borrow areas, quarries, and other sources of materials such as sand, gravel, aggregates, fill materials, water, etc. Involving civil works/extraction activities done by/or on behalf of the project. Other sites will be waste disposal sites, campsites (if so requires), or other locations were chosen for the accommodation of crew and equipment and material storage. These areas will be located across/within wards and *mitaa* where sub-projects are located or traversed.

- **The general project area of Influence** - This includes the wider geographical areas that are influenced by subprojects (e.g. Kitete, Ipuli, Isevya, Chemchem, Mwinyi, Malolo and Kanyenye).

6.2 Impact Identification

6.2.1 Methodologies for Identification of Impacts

Matrix

For identification of environmental impacts, the Consultants team used the matrix method (screening matrix), which is based on identifying and qualifying actions of the Project comparing them to natural and social environmental conditions. This gave a list of anthropomorphic actions with impacts to the environment including health and safety to project's communities. The latter was carried out through the use of a cause-effect relationship matrix.

Focused Approach – Impacts Mapping

The approach was used to identify and locate all possible impacts' receiving environments from roads sub project. Odometer was used to measure distance and cameras were used to capture real time pictures.

Experts Knowledge

Expert or knowledge-based system were used to assist diagnosis, problem solving and decision-making.

The impacts are categorized into Pre-Construction phase impacts, Construction phase impacts, and Operational phase impacts.

The main receptors of impacts associated with the Sub-projects (Upgrading of Kanyenye, Maili Tano, Swetu and Kisarika roads) 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 sections identify the impacts based on the Road sub-projects which includes;

The following impacts were identified to be likely to occur during the pre-construction phase;

- Job creation and increased income
- Land expropriation, loss of property, and resettlement

The following impacts were identified to be likely to occur during the construction phase;

- Job creation and increased income
- Destruction of public utilities
- Soil erosion and instability of slopes
- Risk Water and Land Pollution
- Increased noise, vibration, and air pollution
- Occupational Safety and health risks
- Increase road accidents
- Increased Waste
- Increased Water Abstraction
- Loss of Definite Materials and Land Degradation
- Loss of biodiversity
- Increased HIV/AIDS
- Visual Intrusion during Construction
- Increased Wildlife route interference
- Gender-Based Violence and Equality

The following impacts were identified to be likely to occur during the operational phase;

- Easy transport and transportation of goods
- Economic growth and trade
- Creation of job opportunities during the construction phase
- Easy access to and expansion of the markets
- Increase of prices for goods
- Reduced traveling time and Vehicle operation cost
- Reduced operation and maintenance costs
- Reduction of road accidents
- Interference to local hydrology
- The danger of un-reinstated borrow pits

The interaction between the intended project activities and the different environmental receptors is summarized in a simplified matrix presented in Table 6.1-6.4.

6.3 Impact Significance Evaluation

Taking into account the criteria stated in methodology section 1.10.3, A simple matrix with the following ratings was used to determine the significance of the identified impacts stated in section 6.2 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 6.1: Environmental and Social Impacts Matrix for the Upgrading of MailiTano Road

S/N	Environmental parameters/Impacts	Impact Rating Criteria					Impact Significance Rating			
		Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Mobilization Phase	Construction Phase	Demobilization Phase	Operation and Maintenance
1.	Job creation and increased income	N	MT				+2	+3	+1	+2
2.	Land expropriation, loss of property, and resettlement	L	ST	R			-3	-2	0	0
3.	Destruction of public utilities	L	ST	R			-1	-2	0	0
4.	Increased Soil erosion	L	ST	R	✓		0	-2	-1	0
5.	Risk Water and Land Pollution	L	ST	R			-1	-2	-1	-1
6.	Increased noise, vibration, and air pollution	L	MT	R	✓		-1	-2	-1	-2
7.	Increased spread of HIV/AIDS	L	LT	IR	✓	✓	-1	-3	-1	-1
8.	Safety and health risks	L	ST	R			-1	-2	0	+1
9.	Increase road accidents	L	MT	R	✓		-1	-2	-1	-2
10.	Increased water abstraction	R	ST	R			-1	-2	0	-1
11.	Increased Waste	L	ST	R			-1	-2	-1	0
12.	Gender-Based Violence and Equality	L	ST	R			-1	-2	-1	0
13.	Interference to local hydrology	L	LT	R		✓	0	-3	0	-1
14.	Loss of definite materials and land degradation	R	LT	IR		✓	-1	-3	-1	-1
15.	Loss of Biodiversity	R	LT	R	✓	✓	-1	-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	Demobilization Phase	Operation and Maintenance
16.	Enhanced socio-cultural interaction	L	LT			✓	+1	+2	0	+2
17.	Improved transportation within the regions	R	MT				0	+1	+1	+3
18.	Improved community life and services	L	MT				0	+1	+1	+3
19.	Improved accessibility to agricultural markets	N	MT				0	+1	+1	+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);

Table 6.2: Environmental and Social Impacts Matrix for the Upgrading of Swetu Road

S/N	Environmental parameters/Impacts	Impact Rating Criteria					Impact Significance Rating			
		Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Mobilization Phase	Construction Phase	Demobilization Phase	Operation and Maintenance
1.	Job creation and increased income	N	MT				+2	+3	+1	+2
3.	Destruction of public utilities	L	ST	R			-1	-2	0	0
4.	Increased Soil erosion	L	ST	R	✓		0	-2	-1	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	Demobilization Phase	Operation and Maintenance
5.	Risk Water and Land Pollution	L	ST	R			-1	-2	-1	-1
6.	Increased noise, vibration, and air pollution	L	MT	R	✓		-1	-2	-1	-2
7.	Increased spread of HIV/AIDS	L	LT	IR	✓	✓	-1	-3	-1	-1
8.	Safety and health risks	L	ST	R			-1	-2	0	+1
9.	Increase road accidents	L	MT	R	✓		-1	-2	-1	-2
10.	Increased water abstraction	R	ST	R			-1	-2	0	-1
11.	Gender-Based Violence and Equality	L	ST	R			-1	-2	-1	0
12.	Increased Waste	L	ST	R			-1	-2	-1	0
13.	Interference to local hydrology	L	LT	R		✓	0	-3	0	-1
14.	Loss of definite materials and land degradation	R	LT	IR		✓	-1	-3	-1	-1
15.	Loss of Biodiversity	R	LT	R	✓	✓	-1	-3	0	0
16.	Enhanced socio-cultural interaction	L	LT			✓	+1	+2	0	+2
17.	Improved transportation within the regions	R	MT				0	+1	+1	+3
18.	Improved community life and services	L	MT				0	+1	+1	+3
19.	Improved accessibility to agricultural markets	N	MT				0	+1	+1	+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);

Table 6.3: Environmental and Social Impacts Matrix for the Upgrading of Kisarika Road

		Impact Rating Criteria					Impact Significance Rating			
S/N	Environmental parameters/Impacts	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Mobilization Phase	Construction Phase	Demobilization Phase	Operation and Maintenance
1.	Job creation and increased income	N	MT				+2	+3	+1	+2
3.	Destruction of public utilities	L	ST	R			-1	-2	0	0
4.	Increased Soil erosion	L	ST	R	✓		0	-2	-1	0
5.	Risk Water and Land Pollution	L	ST	R			-1	-2	-1	-1
6.	Increased noise, vibration, and air pollution	L	MT	R	✓		-1	-2	-1	-2
7.	Increased spread of HIV/AIDS	L	LT	IR	✓	✓	-1	-3	-1	-1
8.	Safety and health risks	L	ST	R			-1	-2	0	+1
9.	Increase road accidents	L	MT	R	✓		-1	-2	-1	-2
10.	Increased water abstraction	R	ST	R			-1	-2	0	-1
12.	Gender-Based Violence and Equality	L	ST	R			-1	-2	-1	0
13.	Increased Waste	L	ST	R			-1	-2	-1	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	Demobilization Phase	Operation and Maintenance
14.	Interference to local hydrology	L	LT	R		✓	0	-3	0	-1
15.	Loss of definite materials and land degradation	R	LT	IR		✓	-1	-3	-1	-1
16.	Loss of Biodiversity	R	LT	R	✓	✓	-1	-3	0	0
17.	Enhanced socio-cultural interaction	L	LT			✓	+1	+2	0	+2
18.	Improved transportation within the regions	R	MT				0	+1	+1	+3
19.	Improved community life and services	L	MT				0	+1	+1	+3
20.	Improved accessibility to agricultural markets	N	MT				0	+1	+1	+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);

Table 6.4: Environmental and Social Impacts Matrix for the Upgrading of Kanyenye Road

		Impact Rating Criteria					Impact Significance Rating			
S/N	Environmental parameters/Impacts	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Mobilization Phase	Construction Phase	Demobilization Phase	Operation and Maintenance
1.	Job creation and increased income	N	MT				+2	+3	+1	+2
3.	Destruction of public utilities	L	ST	R			-1	-2	0	0
4.	Increased Soil erosion	L	ST	R	✓		0	-2	-1	0
5.	Risk Water and Land Pollution	L	ST	R			-1	-2	-1	-1
6.	Increased noise, vibration, and air pollution	L	MT	R	✓		-1	-2	-1	-2
7.	Increased spread of HIV/AIDS	L	LT	IR	✓	✓	-1	-3	-1	-1
8.	Safety and health risks	L	ST	R			-1	-2	0	+1
9.	Increase road accidents	L	MT	R	✓		-1	-2	-1	-2
10.	Increased water abstraction	R	ST	R			-1	-2	0	-1
11.	Gender-Based Violence and Equality	L	ST	R			-1	-2	-1	0
12.	Increased Waste	L	ST	R			-1	-2	-1	0
13.	Interference to local hydrology	L	LT	R		✓	0	-3	0	-1
14.	Loss of definite materials and land degradation	R	LT	IR		✓	-1	-3	-1	-1
15.	Loss of Biodiversity	R	LT	R	✓	✓	-1	-3	0	0
16.	Enhanced socio-cultural interaction	L	LT			✓	+1	+2	0	+2

		Impact Rating Criteria					Impact Significance Rating			
S/N	Environmental parameters/Impacts	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Mobilization Phase	Construction Phase	Demobilization Phase	Operation and Maintenance
17.	Improved transportation within the regions	R	MT				0	+1	+1	+3
18.	Improved community life and services	L	MT				0	+1	+1	+3
19.	Improved accessibility to agricultural markets	N	MT				0	+1	+1	+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);

6.4 Sub-Projects Roads

6.4.1 Maili Tano Roads

6.4.1.1 Pre- Construction Phase

<u>Positive impacts</u>

Job Creation and Increased Income to Local Communities

During this phase, people shall be employed by the contractor to do mobilization works such as the construction of campsites, quarrying and material extraction, transportation activities, etc. It is anticipated that the sub-project will provide more than 100 employment opportunities to the local people during this phase. The local people from the sub-project roads of Ipuli wards shall be given priorities in recruitment processes to increase their income. This shall increase the income to all those who have direct and indirect opportunities to be employed by the contractor.

<u>Negative Impacts</u>

Land expropriation, loss of property, and resettlement

The use of land for road construction or improvement may entail the voluntary sale or compulsory acquisition (expropriation) of homes, property, businesses, farms, and other productive resources. In Tanzania expropriation method is common, which by its nature causes social disruption and economic loss for the affected individuals and their families. The impacts of expropriation are not only social and economic but also psychological and in most cases complex or devastating. A participatory approach and dialogues to solving such issues have proved fruitful in previous road development projects in Tanzania.

Currently the people dwelling close to the proposed Mailitano II&IV are involving in cultivation of maize and rice. In the proposed mailitano road II along the TANESCO high tension, there are illegal sand mining. Implementation of the road project will entail the loss of this land, inhibit the agricultural practices in the area as well as cut the sand quarrying and selling.

Figure 6.1:land used for farming activities and sand mining along the mailitano II and IV
(Source: Fieldwork December 2022)

On the other hand, the construction would most likely involve among other things, demolition of Auction Centers and business premises affecting all communities along with the project road Figure 6.1. The risk of compulsory resettlement is however not very high since most of the people who will be affected know that they will be relocated if the improvement of the road is to take place.

Figure 6.2: Households close to the Maili Tano I project roads at Mail Tano Health center

(Source: Fieldwork December 2021)

During consultations with the communities and Municipal authorities/leaders, it was very clear that compensation must be made before the implementation of the sub-project. Failure of implementing the compensation plan can result in social friction with local communities that can cause a delay in the construction schedule. The design team is still in the process of locating the alignment for the road; therefore, it is not possible now to give accurate data on the number of properties to be affected by the sub-project road.

6.4.1.2 Construction Phase Impacts

<u>Positive impacts</u>

Job Creation and Increased Income to Local Communities

Upgrading of MailiTano road in the sub-project areas is among the strategies for poverty alleviation. The improved sub-project roads will open more opportunities for self-employment income-generating activities for youth through the use of motorcycles (*BodaBoda and Bajaji)* and even gaining new insight and employment to the contractors. More than 200 people will be employed during the construction phase of the project.

Most of the casual laborers and some skilled workforce will be absorbed from within the Tabora Municipal from their respective wards and *Mtaa* where the sub-projects construction will take place, and the opportunities shall consider the casual laborers from nearby Wards and *Mtaa*. 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 know-how from the more qualified personnel towards the local personnel.

<u>Negative Impacts</u>

Gender-Based Violence & Equality

The proposed construction of roads sub-project is expected to employ several individuals from local communities along the road, other parts of Tanzania, and overseas for executing the project. The vast majority of those employed in unskilled, semi-skilled, and skilled jobs will be younger males as well as those that are married. While they are away from their homes, these workers may exhibit inconsistent social behaviors that can potentially lead to sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors (individuals below the age of 18 years i.e. school children) from the local community. Additionally, as the proposed sub-project, for the most part, traverses rural settings, the presence of law enforcement is low and consequently, the risk of sexual harassment for local women is likely to be higher, particularly for younger women and girls and, to certain extent boys.

Gender and equality biases in road sub-projects may be the basis of differential treatment of persons based on their sex roles, ethnicity, status, religion, race, age, beliefs, and disability among other attributes. However, the impact magnitude is expected to be low of long-term duration

Destruction of Public Utilities

The present utilities along the MailiTano sub-project roads are expected to be affected by the project since the infrastructure is located close to the sub-project road. Power lines and TTCL communication lines were observed along with the whole MailiTano road profile. Figure 6.2. Any relocation of service lines will result in the serious disruption of service provision.

Figure 6.2: Powerlines parallel to the Maili Tano sub-project road

(Source: Fieldwork December 2021)

Soil Erosion and Instability of Slopes

Construction works would accelerate erosion problems in most cut sections taking into consideration that the soil along the sub-project road is very loose containing clay-loamy soil. The removal unsuitable top soil of the area during the rainy season would entail the soil erosion impact of the area. Also, in the place used for the sand mining, the impact is expected to increase. Nevertheless, all cuts in the sloping grounds should be refurbished firmly and provided with vegetation cover to reduce the effect of soil erosion. Major soil erosion is expected at the quarry sites and borrows pits.

Increase water soil pollution

Construction MailiTano sub-projects are associated with pollution of soil and water on varying scales depending on the construction methods that shall be used. Siltation of water resources will result from earthworks and the construction of drainage structures and Culvert. 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 construction takes place within a few years. The Impact will be more on Perennial streams, irrespective of seasonal rivers.

Noise, Vibration, and Air Pollution during Construction Phase

Dust will arise from road construction work due to excavation work, movement of vehicles, stockpiling of materials, operation of crusher and asphalt plants, and general earthworks at the site. Exhaust fumes will mainly come from construction plants, machinery, and vehicles in operation. Fumes will also come from the processing of asphalt. Dust and fumes will have major direct but short-term impacts during the project construction phase. Along the sub-project road, the adjacent areas are relatively open, without impediment to air movement hence enhancing the dilution of air pollutants. For areas away from the road, leafy vegetation 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. Moreover, a sprinkling of the road with water during construction work will further lessen the generation of dust and consequently, alleviate the air pollution problem. The quality of air and noise in the project area is satisfactory. However, the pollution is expected to double during the construction phase due to more activities that will be taking place at the site.

Noise and vibration will be produced by construction vehicles, plants, and machinery during the delivery of materials, processing of materials, and actual construction work. The pollution is expected to increase during the construction phase in all sub-projects areas and will tend to impact the communities and animals in areas. Vibration may even cause physical damage to properties near the construction site. The vegetation and loose soil along the roads in the sub-project area has the potential for damping noise and vibration. As such, noise and vibration impacts will have a short-range – near the construction site in the dry season.

Increased spread of HIV/AIDS

The most health risk is on HIV/AIDS epidemic. Considering the socio-economic as well as geographical characteristics of the roads sub-project area, there exist some problems that either may influence a high infection rate, or deter efforts to combat the epidemic since the project will involve the interaction of different people. For example, the problem of low or irregular incomes among young women aged 15 – 45 years is HIV/AIDS risk factor, which can influence high infection rate in the project area. At the same time, poor sub-project road networks in villages along the project road hinder the transmission 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 increased pressure and demand for social services.

To some extent, the improved roads are expected to stimulate the creation of self-employment activities for unemployed women which will make them economically powerful to get away from commercial sex work. This will reduce the HIV/AIDS infections in the project areas, especially in sexually active women. The road project is also expected to facilitate the easy reaching of the majority of people living in the villages for HIV/AIDS education and prevention methods. Generally, the road will be very useful for saving the lives of people who might die of HIV/AIDS including economically active young people.

Safety and Health Risks

Road construction exposes the laborers and the general public to bronchial and other respiratory tract diseases due to specks of dust. Also, poor use (or not using at all) of the safety gears during the construction phase will result in loss of lives or injuries during construction. In the MailiTano roads, the incidence rate of water-borne diseases such as cholera and diarrhea will increase if there will be no proper sanitation practices at the camps.

Increased Road Accidents

Increased traffics during construction and poor road safety measures like the absence of diversion (where necessary) during construction and road safety awareness campaigns will result in unnecessary road accidents to livestock and people especially to people using the MailiTano health center. The MailiTano health center is very close to the sub-project roads (Figure 6.3). The presence of public facilities close to the roads will make vulnerable to the risk of accidents during the construction phase.

Figure 6.3: The MailiTano Health center close to MailiTano road

(Source: Fieldwork December 2021)

Increased water abstraction

Improving the MailiTano sub-Project road will entail significant water consumption from TUWASA. This impact can be easily minimized if the contractor decides to abstract water from boreholes and the construction of dams. However, this will be controlled by the Lake Tanganyika Basin Water Board which is responsible for regulating water use in that basin. The contractor will have to apply for a permit before any abstraction.

Increased Wastes

Construction activities are associated with the production of waste. These wastes can either be a solid waste or liquid waste. The waste streams are Construction activities and Domestic activities of the workers at the camp and site. The solid waste includes Spoil, rubbles, Tree logs, metals, glasses, papers, etc. while the liquid waste includes Sewage, oils, etc. The quantities of materials will be known during the detailed design phase. 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 of oils.

Interference with Local Hydrology

The road design shall provide culverts to all points along the project roads about the local hydrology. At some crossing rivers and drifts, siltation has taken place to the extent of covering the pipe culverts opening thus leading to overtopping (Figure 6.4). This will entail the construction of side drains which in essence modify the local hydrology. The bituminous surfacing will also improve drainage of the area, especially with the improvement of roadside drainage and cross drainage.

Figure 6.4: Siltation of the culvert and drainage structure at MailiTano road

(Source: Fieldwork December 2021)

Loss of Definite Materials and Land Degradation

Construction of the road will have direct impacts related to 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, excavating, and transporting the material. Thus, borrowing and quarrying activities will cause habitat change, land degradation (due to the removal of fertile topsoil), 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, the establishment of detour routes during construction may damage some species.

Scenic quality deterioration will occur due to stockpiling 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 the presence of construction vehicles, plants, 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, despite everything, be manageable given proper site operation and prior warning as well as the issuance of site operation guidelines.

6.4.1.3 Operational Phase Impacts

Positive Impacts

Job Creation and Increased Income to Local Communities

There would also likely be employment availability during the operation phase about road maintenance such as 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.

Enhanced Socio-Cultural Interaction

The implementation of the sub-project will bring many people from different cultural backgrounds. Such interactions may bring about social changes in the communities along the MailiTano sub-project road. Interaction with technocrats will stimulate the adoption of new technologies. Also, local people will acquire skills from the road workers during construction and after implementation, they will get from visitors. The skills might be sources of development in the MailiTano sub-project area and the Municipality at large.

Improved Transportation within the Region

The MailiTano sub-project road will facilitate easy transportation within the municipal as well as increase communication among the communities along the MailiTano sub-project road. The improved MailiTano roads would be particularly beneficial to the communities (Figure 6.5).

Figure 6.5: Vehicles using the Maili Tano sub-project road

(Source: Fieldwork December 2021)

The improved MailiTano road is expected that will attract more investment on vehicles providing services along the MailiTano roads, therefore, prices of travel will be lowered and will save time spent on the journey.

Improved Community Life and Services

Several social-related advantages will accrue from the project. Improved transportation will enable to transport of patients to health care facilities during night and day time frequently. Health workers will enjoy easier access to work than before in the municipal. The MailiTano sub-projects roads will facilitate easy access to health centers especially during night hours, and thus lives of some patients will be saved.

Bitumen roads will reduce the current level of specks of dust experienced in the streets and settlement centers. In so doing quality of settlement will increase and the health of people living and towns will be protected.

Negative Impacts

Increased Noise, Vibration and Air Pollution at Operation Phase

Pollution will be evident during the operation life of the road due to fuels and other chemicals associated with vehicular traffic and maintenance works. 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 MailiTano 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 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 the workday. For these sub-project roads, 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 of the increased traffic flow is considered to be significant if no maintenance program will be installed. Under a good maintenance schedule, traffic exhaust emissions will be intermittent and atmospheric dispersal of exhaust emissions will maintain the air quality. However, a concerted effort to check engine performance is needed to deter vehicles not road-worthy from using the road.

Increased Road Accidents

Road deaths, injuries, and property damage are the most tangible negative impacts on the community environment and may be reduced or increased as a result of the use of the MailiTano road sub-projects. The MailiTano road transverse street and the effects the road causes on safety in these settlements and schools are dependent on location.

Increased traffic and speed driving will result in unnecessary road accidents especially for 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 pedestrians, animal crossing and cyclists, and unqualified drivers.

Vehicles traveling at increased speeds will make it difficult for road users to cross the road, particularly untied animals, children, elderly people, and people with physical and mental disabilities will be at risk of accidents.

6.4.2 Swetu Road

6.4.2.1 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 the construction of campsites, quarrying and material extraction, transportation activities, etc. The local people from the Swetu sub-project roads of Kitete ward shall be given priorities in recruitment processes to increase their income. The project is anticipated to provide more than 200 employment opportunities. This shall increase the income to all those who have the opportunity to be employed by the contractor.

1.4.2.2 Construction Phase Impacts

Positive impacts

Job Creation and Increased Income to Local Communities

Upgrading of roads in the Swetu road sub-project areas is among the strategies for poverty alleviation. The improved roads will open more than 200 opportunities for self-employment income-generating activities for youth through the use of motorcycles (*BodaBoda and Bajaji)* and even gaining new insight and employment to the contractors.

Most of the casual laborers and some skilled workforce will be absorbed from within the Tabora Municipal from their respective Kitete ward and *Mtaa* where the sub-projects construction will take place. The Project is expected to employ several casual laborers from nearby Wards and *Mtaa*. 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 know-how from the more qualified personnel towards the local personnel.

Negative Impacts

Gender-Based Violence & Equality

The proposed construction of roads sub-project is expected to employ several individuals from local communities along the road, other parts of Tanzania, and overseas for executing the project. The vast majority of those employed in unskilled, semi-skilled, and skilled jobs will be younger males as well as those that are married. While they are away from their homes, these workers may exhibit inconsistent social behaviors that can potentially lead to sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors (individuals below the age of 18 years i.e. school children) from the local community. Additionally, as the proposed sub-project, for the most part, traverses rural settings, the presence of law enforcement is low and consequently, the risk of sexual harassment for local women is likely to be higher, particularly for younger women and girls and, to certain extent boys.

Gender and equality biases in road sub-projects may be the basis of differential treatment of persons based on their sex roles, ethnicity, status, religion, race, age, beliefs, and disability among other attributes. However, the impact magnitude is expected to be low of long-term duration

Destruction of Public Utilities

The present utilities along the MailiTano sub-project roads are expected to be affected by the project since the infrastructure is located close to the Swetu sub-project road. Power lines and TTCL communication lines were observed along with the whole road profile of the Swetu roads. Figure 6.6. Any relocation of service lines will result in the serious disruption of service provision.

Figure 6.6: Powerlines parallel to the Swetu sub-project road

(Source: Fieldwork December 2021)

Soil Erosion and Instability of Slopes

Construction works would accelerate erosion problems in most cut sections taking into consideration that the soil along the Swetu sub-project road is very loose. Nevertheless, all cuts in the sloping grounds should be refurbished firmly and provided with vegetation cover to reduce the effect of soil erosion. Major soil erosion is expected at the quarry sites and borrows pits.

Increased water and soil pollution

Construction of the Swetu sub-project will be associated with pollution of soil and water resources on varying scales depending on the size of the project and the construction methods used. Siltation of water resources will result from earthworks and the construction of culvert and drainage structures. 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 construction takes place within a few years. The perennial rivers are likely to be affected irrespective of the seasonal rivers.

Noise, Vibration, and Air Pollution during Construction Phase

Dust will arise from road construction work due to excavation work, movement of vehicles, stockpiling of materials, operation of crusher and asphalt plants, and general earthworks at the site. Exhaust fumes will mainly come from construction plants, machinery, and vehicles in operation. Fumes will also come from the processing of asphalt. Dust and fumes will have major direct but short-term impacts during the project construction phase. Along the Swetu sub-project roads, the adjacent areas are relatively open, without impediment to air movement hence enhancing the dilution of air pollutants. For areas away from the Swetu sub-project road, leafy vegetation 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. Moreover, a sprinkling of the road with water during construction work will further lessen the generation of dust and consequently, alleviate the air pollution problem. The Swetu roads at Tabora girls at Sikonge road found to have 0.7mg/ m3 which is above Tanzania standards. The air pollution is expected to double during the construction phase due to more activities that will be taking place at the site.

Noise and vibration will be produced by construction vehicles, plants, and machinery during the delivery of materials, processing of materials, and actual construction work. The air pollution in the Swetu sub-project roads is satisfactory. However, the pollution is expected to increase during the construction phase of the sub-project and will tend to impact the communities and animals in areas. Vibration may even cause physical damage to properties near the construction site. The vegetation and loose soil along the sub-project road in the project area has the potential for damping noise and vibration. As such, noise and vibration impacts will have a short-range – near the construction site in the dry season.

Increased spread of HIV/AIDS

The most health risk is on HIV/AIDS epidemic. Considering the socio-economic as well as geographical characteristics of the roads sub-project area, there exist some problems that either may influence a high infection rate, or deter efforts to combat the epidemic since the project will involve the interaction of different people. For example, the problem of low or irregular incomes among young women aged 15 – 45 years is HIV/AIDS risk factor, which can influence high infection rate in the project area.

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 increased pressure and demand for social services.

To some extent, the improved Swetu roads are expected to stimulate the creation of self-employment activities for unemployed women which will make them economically powerful to get away from commercial sex work. This will reduce the HIV/AIDS infections in the project areas, especially in sexually active women. The road project is also expected to facilitate the easy reaching of the majority of people living in the villages for HIV/AIDS education and prevention methods. Generally, the road will be very useful for saving the lives of people who might die of HIV/AIDS including economically active young people.

Safety and Health Risks

Construction of the Swetu road sub-project exposes the laborers and the general public to bronchial and other respiratory tract diseases due to specks of dust. Also, poor use (or not using at all) of the safety gears during the construction phase will result in loss of lives or injuries during construction. The incidence rate of water-borne diseases such as cholera and diarrhea will increase if there will be no proper sanitation practices at the camps.

Increased Road Accidents

Increased traffics during construction and poor road safety measures like the absence of diversion (where necessary) during construction and road safety awareness campaigns will result in unnecessary road accidents to livestock and people especially school children and old people. The Swetu sub-project road has got several schools just adjacent to the sub-project road, many of them are very close to the road, and this will make school children more vulnerable to the risk of accidents.

Figure 6.7: The schools along the Swetu road

(Source: Fieldwork December 2021)

Increased water abstraction

Improving the Swetu sub-Project road will entail significant water consumption from TUWASA. This impact can be easily minimized if the contractor decides to abstract water from boreholes and the construction of dams. However, this will be controlled by the Lake Tanganyika Basin

Water Board which is responsible for regulating water use in that basin. The contractor will have to apply for a permit before any abstraction.

Increased Wastes

Construction activities are associated with the production of waste. These wastes can either be a solid waste or liquid waste. The waste streams are Construction activities and Domestic activities of the workers at the camp and site. The solid waste includes Spoil, rubbles, Tree logs, metals, glasses, papers, etc while the liquid waste includes Sewage, oils, etc. The quantities of materials will be known during the detailed design phase. 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 of oils.

Interference with Local Hydrology

The design of Swetu roads shall provide culverts to all points along the project roads about the local hydrology. At some crossing rivers and drifts, siltation has taken place to the extent of covering the pipe culverts opening thus leading to overtopping (Figure 6.8). This will entail the construction of side drains which in essence modify the local hydrology. The bituminous surfacing will also improve drainage of the area, especially with the improvement of roadside drainage and cross drainage.

Figure 6.8: Culvert and drainage structure along Swetu road
(Source: Fieldwork December 2021)

Loss of Definite Materials and Land Degradation

Construction of the Swetu sub-project road will have direct impacts related to 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, excavating, and transporting the material. Thus, borrowing and quarrying activities will cause habitat change, land degradation (due to the removal of fertile topsoil), 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, the establishment of detour routes during construction may damage some species.

Scenic quality deterioration will occur due to stockpiling 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 the presence of construction vehicles, plants, 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, despite everything, be manageable given proper site operation and prior warning as well as the issuance of site operation guidelines.

6.4.2.3 Operational Phase Impacts

Positive Impacts

Job Creation and Increased Income to Local Communities

There would also likely be employment availability during the operation phase about Swetu road maintenance such as 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.

Enhanced Socio-Cultural Interaction

The implementation of the Swetu road sub-project will bring many people from different cultural backgrounds. Such interactions may bring about social changes in the communities along the sub-project road. Interaction with technocrats will stimulate the adoption of new technologies. Also, local people will acquire skills from the road workers during construction and after implementation, they will get from visitors. The skills might be sources of development in the Kitete wards and the Municipality.

Improved Transportation within the Region

The Swetu sub-project road will facilitate easy transportation within the municipal as well as increase communication among the communities along the sub-project road. The improved sub-project roads would be particularly beneficial to the communities (Figure 6.9).

Figure 6.9: Vehicles using the Swetu sub-project road

(Source: Fieldwork December 2021)

The improved road is expected that will attract more investment in vehicles providing services along the Swetu sub-project road, therefore, prices of travel will be lowered and will save time spent on the journey.

Improved Community Life and Services

Several social-related advantages will accrue from the project. Improved transportation will enable to transport of patients to health care facilities during night and day time frequently. Health workers will enjoy easier access to work than before in the municipal. The sub-projects roads will facilitate easy access to health centers especially during night hours, and thus lives of some patients will be saved.

Bitumen roads will reduce the current level of specks of dust experienced in the streets and settlement centers. In so doing quality of settlement will increase and the health of people living and towns will be protected.

Negative Impacts

Increased Noise, Vibration and Air Pollution at Operation Phase

Pollution will be evident during the operation life of the road due to fuels and other chemicals associated with vehicular traffic and maintenance works. 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 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 the workday. For these sub-project roads, 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 of the increased traffic flow is considered to be significant if no maintenance program will be installed. Under a good maintenance schedule, traffic exhaust emissions will be intermittent and atmospheric dispersal of exhaust emissions will maintain the air quality. However, a concerted effort to check engine performance is needed to deter vehicles not road-worthy from using the road.

Increased Road Accidents

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

Increased traffic and speed driving will result in unnecessary road accidents especially for 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 pedestrians, animal crossing and cyclists, and unqualified drivers.

Vehicles traveling at increased speeds will make it difficult for road users to cross the road, particularly untied animals, children, elderly people, and people with physical and mental disabilities will be at risk of accidents.

6.4.3 Kisarika Road

6.4.3.1 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 the construction of campsites, quarrying and material extraction, transportation activities, etc. The local people from the Kisarika sub-project roads shall be given priorities in recruitment processes to increase their income and livelihood. It is anticipated that the project will provide several employment opportunities during this phase. This shall increase the income to all those who have the opportunity to be employed by the contractor.

Negative Impacts

Loss of vegetation and biodiversity

The kisarika IV road (nguzo za Tanesco road) is crossing the bare land along TANESCO power lines, with sparse grass. During the implementation the available vegetation will be cleared wchich will be associating with the loss of biodiversity. Although the area is under TMC but the people along the area do use it for maize cultivation. Thus, this will no longer be cultivated and available plants will be removed

Figure 6.10: The existing land with the sparce vegetation in proposed Kisarika IV road

(Source: Fieldwork December 2021)

6.4.3.2 Construction Phase Impacts

Positive impacts

Job Creation and Increased Income to Local Communities

Upgrading of the Kisarika road in the sub-project areas is among the strategies for poverty alleviation. The improved Kisarika road will open more opportunities for self-employment income-generating activities for youth through the use of motorcycles (*BodaBoda and Bajaji)* and even gaining new insight and employment to the contractors.

Most of the casual laborers and some skilled workforce will be absorbed from within the Tabora Municipal and the respective wards during the phase. 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 know-how from the more qualified personnel towards the local personnel.

Negative Impacts

Gender-Based Violence & Equality

The proposed construction of roads sub-project is expected to employ several individuals from local communities along the road, other parts of Tanzania, and overseas for executing the project. The vast majority of those employed in unskilled, semi-skilled, and skilled jobs will be younger males as well as those that are married. While they are away from their homes, these workers may exhibit inconsistent social behaviors that can potentially lead to sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors (individuals below the age of 18 years i.e. school children) from the local community. Additionally, as the proposed sub-project, for the most part, traverses rural settings, the presence of law enforcement is low and consequently, the risk of sexual harassment for local women is likely to be higher, particularly for younger women and girls and, to certain extent boys.

Gender and equality biases in road sub-projects may be the basis of differential treatment of persons based on their sex roles, ethnicity, status, religion, race, age, beliefs, and disability among other attributes. However, the impact magnitude is expected to be low of long-term duration

Gender and equality biases in road sub-projects may be the basis of differential treatment of persons based on their sex roles, ethnicity, status, religion, race, age, beliefs, and disability among other attributes. However, the impact magnitude is expected to be low of long-term duration.

Destruction of Public Utilities

The present utilities along the Kisarika project road are expected to be affected by the project since the infrastructure is located close to the project road. Power lines and TTCL communication lines were observed along with the whole road profile especially close to Kisarika road. Figure 6.10. Any relocation of service lines will result in the serious disruption of service provision.

Figure 6.11: Powerlines parallel to the Kisarika sub-project road

(Source: Fieldwork December 2021)

Soil Erosion and Instability of Slopes

Construction works of the Kisarika road I would accelerate erosion problems in most cut sections taking into consideration that the soil along the project road is very loose. In the Kisarika IV road, there are pits left from the people who were excavated soil material for brick making, the may be accolated with soil erosion during project implementation.

Figure 6.12: borrow pits left after soil taken for brick making in Kisarika IV(Nguzo Tanesco) road

(Source: Fieldwork, December 2022)

Nevertheless, all cuts in the sloping grounds should be refurbished firmly and provided with vegetation cover to reduce the effect of soil erosion. Major soil erosion is expected at the quarry sites and borrows pits.

Increased water and soil pollution

Roads construction projects are associated with pollution of soil and water resources on varying scales depending on the size of the project and construction methods used. Siltation of water resources will result from earthworks and the construction of drainage structures. In proposed Kisarika IV road, parallel to the power lines there is drainage channel with water flowing, this is likely to be affected during road and drainage construction.

Figure 6.12: an existing drainage channel along the proposed Kisarika IV road
(Source: Fieldwork, December 2022)

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 construction takes place within a few years. Perennial streams are likely to be affected irrespective of the seasonal rivers.

Noise, Vibration, and Air Pollution during Construction Phase

Dust will arise from road construction work due to excavation work, movement of vehicles, stockpiling of materials, operation of crusher and asphalt plants, and general earthworks at the site. Exhaust fumes will mainly come from construction plants, machinery, and vehicles in operation. Fumes will also come from the processing of asphalt. Dust and fumes will have major direct but short-term impacts during the project construction phase. In the project areas for example along Kisarika IV road running to Madaraka road junction is located adjacent to the Tanzania Deeper Life Church, Tabora, pharmacy, business, shops and residence houses along the road. These are likely to be affected directly by dusts and noise pollution during project implementation

Figure 6.12: Existing church, houses and shops close to the proposed Kisarika IV road
(Source: Fieldwork December 2022)

Along the project roads, the adjacent areas are relatively open, without impediment to air movement hence enhancing the dilution of air pollutants. For areas away from the road, leafy vegetation 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. Moreover, a sprinkling of the road with water during construction work will further lessen the generation of dust and consequently, alleviate the air pollution problem. The air pollution is expected to double during the construction phase due to more activities that will be taking place at the site will tend to impact the communities and animals in areas.

Noise and vibration will be produced by construction vehicles, plants, and machinery during the delivery of materials, processing of materials, and actual construction work. Vibration may even cause physical damage to properties near the construction site. The vegetation and loose soil along the roads in the project area has the potential for damping noise and vibration. As such, noise and vibration impacts will have a short-range – near the construction site in the dry season.

Increased spread of HIV/AIDS

The most health risk is on HIV/AIDS epidemic. Considering the socio-economic as well as geographical characteristics of the roads sub-project area, there exist some problems that either may influence a high infection rate, or deter efforts to combat the epidemic since the project will involve the interaction of different people. For example, the problem of low or irregular incomes among young women aged 15 – 45 years is HIV/AIDS risk factor, which can influence high infection rate in the project area.

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 increased pressure and demand for social services.

To some extent, the improved roads are expected to stimulate the creation of self-employment activities for unemployed women which will make them economically powerful to get away from commercial sex work. This will reduce the HIV/AIDS infections in the project areas, especially in sexually active women. The Kisarika road project is also expected to facilitate the easy reaching of the majority of people living in the villages for HIV/AIDS education and prevention methods. Generally, the road will be very useful for saving the lives of people who might die of HIV/AIDS including economically active young people.

Safety and Health Risks

Kisarika roads construction shall expose the laborers and the general public to bronchial and other respiratory tract diseases due to specks of dust. Also, poor use (or not using at all) of the safety gears during the construction phase will result in loss of lives or injuries during construction. The incidence rate of water-borne diseases such as cholera and diarrhea will increase if there will be no proper sanitation practices at the camps.

Moreover, the design will provide an alternative way to avoid safety risk to the people living near the kisarika roads, which might either be affected by the storm water which results to flooding of the housing areas. However, there will be provision of drainage structure and access road.

Increased Road Accidents

Increased traffic during construction and poor road safety measures like the absence of diversion (where necessary) during construction and road safety awareness campaigns will result in unnecessary road accidents to livestock and people especially school children and old people. Some *mtaa* along the sub-project road have got either a primary school or a secondary just adjacent to the sub-project road, many of them are very close to the road, and this will make school children more vulnerable to the risk of accidents. At the sub-project, the kisarika and Swetu roads transverses near the schools which are adjacent to the road.

Figure 6.13: Sikanda secondary school close at Kisarika roads

(Source: Fieldwork December 2021)

Increased water abstraction

Improving the Project road will entail significant water consumption from TUWASA. This impact can be easily minimized if the contractor decides to abstract water from boreholes and the construction of dams. However, this will be controlled by the Lake Tanganyika Basin Water Board which is responsible for regulating water use in that basin. The contractor will have to apply for a permit before any abstraction.

Increased Wastes

Construction activities are associated with the production of waste. These wastes can either be a solid waste or liquid waste. The waste streams are Construction activities and Domestic activities of the workers at the camp and site. The solid waste includes Spoil, rubbles, Tree logs, metals, glasses, papers, etc while the liquid waste includes Sewage, oils, etc. The quantities of materials will be known during the detailed design phase. 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 of oils.

Interference with Local Hydrology

The road design shall provide culverts to all points along the project roads about the local hydrology. At some crossing rivers and drifts, siltation has taken place to the extent of covering the pipe culverts opening thus leading to overtopping (Figure 6.14). This will entail the construction of side drains which in essence modify the local hydrology. The bituminous surfacing will also improve drainage of the area, especially with the improvement of roadside drainage and cross drainage.

Figure 6.14: Siltation of the culvert and drainage structure at Kisarika I &IV road

(Source: Fieldwork December 2021)

Loss of Definite Materials and Land Degradation

Construction of the road will have direct impacts related to 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, excavating, and transporting the material. Thus, borrowing and quarrying activities will cause habitat change, land degradation (due to the removal of fertile topsoil), 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, the establishment of detour routes during construction may damage some species.

Scenic quality deterioration will occur due to stockpiling 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 the presence of construction vehicles, plants, 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, despite everything, be manageable given proper site operation and prior warning as well as the issuance of site operation guidelines.

6.4.3.3 Operational Phase Impacts

<u>Positive Impacts</u>

Job Creation and Increased Income to Local Communities

There would also likely be employment availability during the operation phase about road maintenance such as 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.

Enhanced Socio-Cultural Interaction

The implementation of the sub-project will bring many people from different cultural backgrounds. Such interactions may bring about social changes in the communities along the sub-project road. Interaction with technocrats will stimulate the adoption of new technologies. Also, local people will acquire skills from the road workers during construction and after implementation, they will get from visitors. The skills might be sources of development in the sub-project area and the Municipality.

Improved Transportation within the Region

The Kisarika sub-project road will facilitate easy transportation within the municipal as well as increase communication among the communities along the Kisarika sub-project road. The improved and open up of new roads (e.g. Kisarika IV) and other sub-project roads would be particularly beneficial to the communities living at this area. The place will be easily accessible and hence facilitate transportation and open up of the new businesses (Figure 6.15).

Figure 6.15: Vehicles using the Kisarika I sub-project road and existing pass in proposed Kisarika IV road

(Source: Fieldwork December 2021)

The 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 the journey.

Improved Community Life and Services

Several social-related advantages will accrue from the project. Improved transportation will enable to transport of patients to health care facilities during night and day time frequently. Health workers and other municipal employees will enjoy easier access to work than before in the municipal. The sub-projects roads will facilitate easy access to health centers especially during night hours, and thus lives of some patients will be saved.

Bitumen roads will reduce the current level of specks of dust experienced in the streets and settlement centers. In so doing quality of settlement will increase and the health of people living and towns will be protected.

<u>Negative Impacts</u>

Increased Noise, Vibration and Air Pollution at Operation Phase

Pollution will be evident during the operation life of the road due to fuels and other chemicals associated with vehicular traffic and maintenance works. 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 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 the workday. For this sub-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 of the increased traffic flow is considered to be significant if no maintenance program will be installed. Under a good maintenance schedule, traffic exhaust emissions will be intermittent and atmospheric dispersal of exhaust emissions will maintain the air quality. However, a concerted effort to check engine performance is needed to deter vehicles not road-worthy from using the road.

Increased Road Accidents

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

Increased traffic and speed driving will result in unnecessary road accidents especially for 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 pedestrians, animal crossing and cyclists, and unqualified drivers.

Vehicles traveling at increased speeds will make it difficult for road users to cross the road, particularly untied animals, children, elderly people, and people with physical and mental disabilities will be at risk of accidents.

6.4.4 Kanyenye Roads

6.4.4.1 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 the construction of campsites, quarrying and material extraction, transportation activities, etc. The local people from Kanyenye and Isevya, and Chemchem wards shall be given priorities in recruitment processes to increase their income. This shall increase the income to all those who have the opportunity to be employed by the contractor.

Negative Impacts

Land expropriation, loss of property, and resettlement

The use of land for road construction or improvement may entail the voluntary sale or compulsory acquisition (expropriation) of homes, property, businesses, farms, and other productive resources. In Tanzania expropriation method is common, which by its nature causes social disruption and economic loss for the affected individuals and their families. The impacts of expropriation are not only social and economic but also psychological and, in most cases, complex or devastating. A participatory approach and dialogues to solving such issues have proved fruitful in previous road development projects in Tanzania.

The construction would most likely involve among other things, demolition of house fence, Auction Centres and business premises affecting all communities along with the project road Figure 6.16. The risk of compulsory resettlement is however not very high since most of the people who will be affected know that they will be relocated if the improvement of the road is to take place.

Figure 6.16: The House along Kanyenye road

(Source: Fieldwork December 2021)

During consultations with the communities and Municipal authorities/leaders, it was very clear that compensation must be made before the implementation of the sub-project. Failure of implementing the compensation plan can result in social friction with local communities that can cause a delay in the construction schedule. The design team is still in the process of locating the alignment for the road; therefore, it is not possible now to give accurate data on the number of properties to be affected by the project road.

6.4.4.2 Construction Phase Impacts

Positive impacts

Job Creation and Increased Income to Local Communities

Upgrading roads in the sub-project areas is among the strategies for poverty alleviation. The improved roads will open more opportunities for self-employment income-generating activities for youth through the use of motorcycles (*BodaBoda and Bajaji)* and even gaining new insight and employment to the contractors.

Most of the casual laborers and some skilled workforce will be absorbed from within the Tabora Municipal from their respective wards and *Mtaa* where the sub-projects construction will take place. The Project is expected to employ more casual laborers from nearby Ward and *Mtaa*. 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 know-how from the more qualified personnel towards the local personnel.

Negative Impacts

Gender-Based Violence & Equality

The proposed construction of roads sub-project is expected to employ several individuals from local communities along the road, other parts of Tanzania, and overseas for executing the project. The vast majority of those employed in unskilled, semi-skilled, and skilled jobs will be younger males as well as those that are married. While they are away from their homes, these workers may exhibit inconsistent social behaviours that can potentially lead to sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors (individuals below the age of 18 years i.e. school children) from the local community. Additionally, as the proposed sub-project, for the most part, traverses rural settings, the presence of law enforcement is low and consequently, the risk of sexual harassment for local women is likely to be higher, particularly for younger women and girls and, to certain extent boys.

Gender and equality biases in road sub-projects may be the basis of differential treatment of persons based on their sex roles, ethnicity, status, religion, race, age, beliefs, and disability among other attributes. However, the impact magnitude is expected to be low of long-term duration

Destruction of Public Facilities

The present utilities along the project roads are expected to be affected by the project since the infrastructure is located close to the project road. Power lines, water pipelines (at Kanoni St.), water kiosk (at Madaraka St.) and TTCL communication lines were observed along with the whole road profile especially close to the sub-project roads of Kanyenye. Figure 6.16. Any relocation of service lines will result in the serious disruption of service provision.

Figure 6.16: Public facilities to the Kanyenye I sub-project road (350m section) and Kanyenye III road

(Source: Fieldwork December 2021)

Moreover, the house with poor condition are likely to be affected by the machinery during compaction and grading of the roads. Therefore, the contractor will have to find a way that will be safe to the public infrastructure near the project site (Figure 6.17).

Figure 6.17: Powerlines parallel to the Kanyenye sub-project road (150m section)
(Source: Fieldwork December 2021)

Soil Erosion and Instability of Slopes

Construction works would accelerate erosion problems in most cut sections taking into consideration that the soil along the project road is very loose. Nevertheless, all cuts in the sloping grounds should be refurbished firmly and provided with vegetation cover to reduce the effect of soil erosion. Major soil erosion is expected at the quarry sites and borrows pits.

Increased water and soil pollution

Roads construction projects are associated with pollution of soil and water resources on varying scales depending on the size of the project and construction methods used. Siltation of water resources will result from earthworks and the construction of drainage structures. 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 construction takes place within a few years.

Noise, Vibration, and Air Pollution during Construction Phase

Dust will arise from road construction work due to excavation work, movement of vehicles, stockpiling of materials, operation of crusher and asphalt plants, and general earthworks at the site. Exhaust fumes will mainly come from construction plants, machinery, and vehicles in operation. Fumes will also come from the processing of asphalt. Dust and fumes will have major direct but short-term impacts during the project construction phase. Along the Kanyenye sub-project road, the adjacent areas are relatively open, without impediment to air movement hence enhancing the dilution of air pollutants. For areas away from the road, leafy vegetation 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. Moreover, a sprinkling of the road with water during construction work will further lessen the generation of dust and consequently, alleviate the air pollution problem. The air pollution is expected to double during the construction phase due to more activities that will be taking place at the site.

Noise and vibration will be produced by construction vehicles, plants, and machinery during the delivery of materials, processing of materials, and actual construction work. The Noise pollution at Kanyenye road (76.4dBA) is above the standards, among all other road sub-projects. The pollution is expected to increase during the construction phase in all sub-projects areas and will tend to impact the communities and animals in areas. Vibration may even cause physical damage to properties near the construction site. The vegetation and loose soil along the roads in the project area has the potential for damping noise and vibration. As such, noise and vibration impacts will have a short-range – near the construction site. in the dry season.

Increased spread of HIV/AIDS

The most health risk is on HIV/AIDS epidemic. Considering the socio-economic as well as geographical characteristics of the roads sub-project area, there exist some problems that either may influence a high infection rate, or deter efforts to combat the epidemic since the project will involve the interaction of different people. For example, the problem of low or irregular incomes among young women aged 15 – 45 years is HIV/AIDS risk factor, which can influence high infection rate in the project area. At the same time, poor sub-project road networks in villages along the project road hinder the transmission 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 increased pressure and demand for social services.

To some extent, the improved roads are expected to stimulate the creation of self-employment activities for unemployed women which will make them economically powerful to get away from commercial sex work. This will reduce the HIV/AIDS infections in the project areas, especially in sexually active women. The road project is also expected to facilitate the easy reaching of the majority of people living in the villages for HIV/AIDS education and prevention methods. Generally, the road will be very useful for saving the lives of people who might die of HIV/AIDS including economically active young people.

Safety and Health Risks

Road construction exposes the laborers and the general public to bronchial and other respiratory tract diseases due to specks of dust. Also, poor use (or not using at all) of the safety gears during the construction phase will result in loss of lives or injuries during construction. The incidence rate of water-borne diseases such as cholera and diarrhea will increase if there will be no proper sanitation practices at the camps.

Increased Road Accidents

Increased traffic during construction and poor road safety measures like the absence of diversion (where necessary) during construction and road safety awareness campaigns will result in unnecessary road accidents to livestock and people especially school children and old people. Along the sub-projects roads, there are numerous houses which have got many residents just adjacent to the sub-project road, many of them are which will make more vulnerable to the risk of accidents.

Figure 6.18: Children playing at the Kanyenye road

(Source: Fieldwork December 2021)

Increased water abstraction

Improving the Project road will entail significant water consumption from TUWASA. This impact can be easily minimized if the contractor decides to abstract water from boreholes and the construction of dams. However, this will be controlled by the Lake Tanganyika Basin Water Board which is responsible for regulating water use in that basin. The contractor will have to apply for a permit before any abstraction.

Increased Wastes

Construction activities are associated with the production of waste. In Madaraka street, Kanyenye II tarmac road, will be rehabilitated and improved to suit the current design. The expected wastes will include construction none degradable wastes, and other a solid waste or liquid waste. The waste streams are Construction activities and Domestic activities of the workers at the camp and site. The solid waste includes Spoil, rubbles, Tree logs, metals, glasses, papers, etc while the liquid waste includes Sewage, oils, etc. The quantities of materials will be known during the detailed design phase. 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 of oils.

Interference with Local Hydrology

The road design shall provide culverts to all points along the project roads about the local hydrology. At some crossing rivers and drifts, siltation has taken place to the extent of covering the pipe culverts opening thus leading to overtopping (Figure 6.19). This will entail the construction of side drains which in essence modify the local hydrology. The bituminous surfacing will also improve drainage of the area, especially with the improvement of roadside drainage and cross drainage.

Figure 6.19: Siltation of the culvert and drainage structure at Kanyenye I&IIroad

(Source: Fieldwork December 2021)

Loss of Definite Materials and Land Degradation

Construction of the road will have direct impacts related to 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, excavating, and transporting the material. Thus, borrowing and quarrying activities will cause habitat change, land degradation (due to the removal of fertile topsoil), 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, the establishment of detour routes during construction may damage some species.

Scenic quality deterioration will occur due to stockpiling 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 the presence of construction vehicles, plants, 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, despite everything, be manageable given proper site operation and prior warning as well as the issuance of site operation guidelines.

6.4.4.3 Operational Phase Impacts

Positive Impacts

Job Creation and Increased Income to Local Communities

There would also likely be employment availability during the operation phase about road maintenance such as 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.

Enhanced Socio-Cultural Interaction

The implementation of the Kanyenye sub-project road will bring many people from different cultural backgrounds. Such interactions may bring about social changes in the communities along the sub-project road. Interaction with technocrats will stimulate the adoption of new technologies. Also, local people will acquire skills from the road workers during construction and after implementation, they will get from visitors. The skills might be sources of development in the sub-project area and the Municipality.

Improved Transportation within the Region

The Kanyenye sub-project roads will facilitate easy transportation within the municipal as well as increase communication among the communities along the sub-project road. The improved sub-project roads would be particularly beneficial to the communities (Figure 6.20).

Figure 6.20: Vehicles using the Kanyenye sub-project road

(Source: Fieldwork December 2021)

The 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 the journey.

Improved Community Life and Services

Several social-related advantages will accrue from the project. Improved transportation will enable to transport of patients to health care facilities during night and day time frequently. Health workers will enjoy easier access to work than before in the municipal. The sub-projects roads will facilitate easy access to health centers especially during night hours, and thus lives of some patients will be saved.

Bitumen roads will reduce the current level of specks of dust experienced in the streets and settlement centers. In so doing quality of settlement will increase and the health of people living and towns will be protected.

Negative Impacts

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Pollution will be evident during the operation life of the road due to fuels and other chemicals associated with vehicular traffic and maintenance works. 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.

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

Increased Road Accidents

Road deaths, injuries, and property damage are the most tangible negative impacts on the community environment and may be reduced or increased as a result of road sub-projects. The sub-project road transverses at streets and the effects the road causes on safety in these settlements and schools are dependent on location.

Increased traffic and speed driving will result in unnecessary road accidents especially for 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 pedestrians, animal crossing and cyclists, and unqualified drivers.

Vehicles traveling at increased speeds will make it difficult for road users to cross the road, particularly untied animals, children, elderly people, and people with physical and mental disabilities will be at risk of accidents.

Additionally, the proposed roads have street roads crossing the roads, lacking accessible crossings to their houses close to the road, these will contribute into road congestion and unnecessary accidents during operation of the road

6.5 Cumulative Impact Assessment

The cumulative impact assessment (CIA) of the Upgrading of Swetu road 6.95Km, Kisarika road 5.2Km, Mailitano road 3.5Km and Kanyeye road 10.6Km sub-Projects comprises the potential cumulative impacts of the sub-Project concerning other identified significant projects being developed within or near the sphere of influence of the sub-Project ("Sub-Project Area"). The cumulative impacts specify the risks and impacts from (i) other existing projects or conditions, and (ii) other future developments (including future stages of the project itself) that are realistically defined at the time the ESIA is undertaken and for within the sphere of influence of the various projects or developments may overlap. Cumulative impacts are thus defined for this ESIA as impacts that result from incremental changes caused by the Project together with other presently ongoing, or reasonably foreseeable future planned actions/projects within the sub-Project Area. Depending on the type/characteristics of other identified projects and their specific impacts, the main issues of concern concerning the CIA can thus include any type of impact that is considered in the ESIA.

The CIA focuses on environmental and social components rated as "critical" by the affected communities and the scientific community (Valued Environmental and Social Components [VECs]), which are cumulatively impacted by the project, other projects, and sources of external pressure. The development of a CIA requires the identification of VECs based on the area of influence (AoI) of the Project; other existing, planned, and future projects; sources of external social and environmental pressure; and the results of consultation with stakeholders (see the table 6.7 below).

Table 6.7: Valued Environmental Components and Associated Potential Cumulative Impacts

S/No.	Description of VEC	Potential Impacts
1.	Humans –land and property owners at the sub-project area to expropriation	▪ Reduced access to potential drainage issues physical relocations of residents, businesses ▪ Noise and Air pollution during the construction and operation phase ▪ Increased safety risk during construction and operation: Accidents, injuries ▪ Increased health problems: HIV/ AIDS and other STDs.
2	Humans – Property users and Residents living near the project roads alignment and construction areas/access roads (outside of the boundaries of resettlement area)	▪ Noise, emissions during construction ▪ Increased safety risk during construction and operation: Accidents, injuries ▪ Noise/emissions from operations ▪ Disturbed access to local infrastructure and properties ▪ Risk for accidents during operation – pedestrian crossings
3	Fauna and Avifauna terrestrial and aquatic	Fragmentation of habitat: ▪ Destruction of natural habitat
4	Flora at the area terrestrial and aquatic	▪ Physical destruction, deterioration ▪ Loss of biodiversity
5	Soils	▪ Erosion, compaction ▪ Pollution from construction equipments
6	Air Quality	▪ Local pollution through dust, smoke, and other emissions
7	Socio-economic	▪ Benefits due to jobs and growth of regional business base and trade ▪ The temporary influx of workers ▪ In-migration/influx of people from other areas

S/No.	Description of VEC	Potential Impacts
		▪ Increased spread of diseases (worker's camps) ▪ Increased crime/ violence (worker's camps) ▪ Increased accidents when crossing the road ▪ Future traffic congestion in towns Centers
8	Historical Sites e.g Kariakoo Cemetery at Swetu road	▪ Improved access to the grave ▪ Historical knowledge cementing

6.6 Analysis of Alternatives

In the EIA process, it is important to consider different alternatives, or options, which will achieve the project's objectives. It is also important to include a consideration of what would happen without the project – that is the no-project alternative. Environmental assessment for each alternative is also carried out, since each alternative is likely to have a different set, or degree, of impacts. In this EIA consultations with stakeholders and site visits provided the basis for identifying alternatives. The following types of alternatives are presented for consideration:

6.6.1 Re-gravelling the entire road

This is a cheaper option than upgrading the sub-project road to bituminous standards. However, this alternative is rendered untenable due to a huge recurrent maintenance cost especially during or after rainy seasons; the environmental cost of obtaining gravel. Additionally, this option has a host of attendant environmental and social concerns such as land uptake for borrow areas, landscape/scenic blight due to borrowing pits, erosion, and siltation of water bodies, and dust nuisance to the road users and the public. Therefore, this alternative is not tenable considering its cost and recurrent negative environmental and economic impacts due to reliance on ever increasingly scarce gravel resources.

6.6.2 Design Alternative

Three evaluation alternatives ALT0-ALT3 were employed in the analysis, ALT0 being the base case or "Do nothing" scenario. The ALT1-ALT3 was "Do something" scenarios, representing Gravel Road Rehabilitation, Upgrading the road to DBST surface and AC surface. The results show that the of Swetu road 6.95Km, Kisarika road 5.2Km, Mailitano road 3.5Km and Kanyeye road 10.6Km to Bitumen Standard is economically viable, with a positive NPV and IRR greater than the test discount rate of 12%. Two pavement options (DBST and AC) are both economically viable. The DBST (double surface dressing) option has higher NPV and IRR values than the AC option. The DBST option is therefore recommended as the most preferred option.

6.6.3 Different route

An alternative to realign the road was considered. This entails diverging from the existing alignment to prevent the destruction of properties. The costs involved in compensation and biological destruction would be extremely very high. However, minor realignment is expected to improve the geometric layout of the road and avoid extreme compensation.

6.6.4 No Project Alternative

The no-project alternative entails retaining the current status quo without a tarmac road. Adopting this option would mean avoiding most of the negative impacts associated with the project and missing all the positive benefits such as increased economic growth in Tabora Regions. Therefore, adopting a no-project alternative would mean failure to implement the transport policy.

6.6.5 Road Design Alternatives

6.6.5.1 Vehicle Centred Road Design

This type of design generally use a design approach that primarily draws from vehicle dynamics and driver safety but ignores costs incurred because of road construction such as disconnected land use and lack of attention to pedestrians and bicyclists (e.g. the removal of sidewalks to provide wider vehicle lanes). Communities are severely damaged by this type of road design and construction and that non-motorized road users such as pedestrians and cyclists suffer from improper road designs. Accidents from this type of design and construction accounts to about 5.4% of the Tanzanian GDP.

6.6.5.2 People Centred Road Design

This type of design brings people into this process, brings people in and then researching with them, conceptualizing with them, testing with them.

People-centered road design is expected to promote healthy travel such as walking, while conventional road design is expected to primarily serve automobiles, which are resource-consuming and degrade the environment. Thus, the active use of people-centered road design should result in more walkable and environmentally sensitive communities.

This option provides an opportunity for the country's economic growth through reduction of road accidents that currently defined as the stumbling block for the national economic growth.

6.6.5 Road Alignment Alternative

6.6.5.1 Extent of Impact on Road Safety

Consideration was given with regard to the proposed road alignment to reduce the risk of road accidents occurring, compared to the existing road sub project. This was done with regard to identified existing road safety concerns established using road accident histories. The estimated road geometry and sight distances of the alignment options shall be reviewed on the all proposed roads sub projects

CHAPTER SEVEN

7.0 IMPACTS MITIGATION MEASURES

7.1 General Considerations

This chapter is devoted to describing measures or actions that shall be implemented to minimize any of the potential impacts identified in the preceding chapter. Many of the mitigation measures put forward are nothing more than good engineering practices that shall be adhered to during the design and construction phases of the roads sub-project. The developer is committed to the implementation of mitigation measures contained in this report.

7.2 Mitigation Measures for Roads Sub-Project

The mitigation measure for the road sub-projects entails that of pre-construction, construction, and operation phase throughout the project periods. However, for the roads sub-project the mitigation measure is similar in both road sub-project due to the similarities in their negative impacts (*refer to section 6.4 of the report*). Therefore, the following sections provide the mitigation measure for the roads sub-project.

7.2.1 Mitigation Measures for Pre-Construction Phase Impacts

7.2.1.1 Land Expropriation, Loss of Property and Resettlement

These mitigation measures entail on for the Maili Tano sub-project roads which have the possibility of having the Resettlement Action Plan (RAP) irrespective of other sub-project roads

- The designs shall try as much as possible to stick on the existing road realignment
- Compensation shall be done according to Tanzania laws governing resettlement before the commencement of the construction activities.
- Resettlement Action Plan (RAP) shall be prepared and implemented

7.2.2.2 Loss of Employment and Incomes

- Skilled and unskilled job opportunities arising from project activities should be given to affected people as a priority. This will also reduce the influx of job seekers and speculators from outside the project area.
- Women food vendors shall be promoted in place to uplift their income flow. Hygiene of the service providers should be emphasized

7.2.2 Mitigation Measures for Construction Phase Impacts

7.2.2.1 Destruction of Public Utilities

- TANESCO, TTCL communication trunk, and the Water supply authority (TUWASA) shall be involved from the early stages of this project to have integrated planning. The contractor shall develop a utility management plan.
- Early notice shall be given to the community before any service interruption
- The funds for the relocation of these infrastructures shall be part and parcel of the project if need be.
- The contractor shall be emphasized to minimize the damage of public utilities

7.2.2.2 Soil Erosion and Instability of Slopes

- Unnecessary ground clearance and sensitive re-alignments shall be avoided in the sub-project.
- Lined drainage channels at sensitive terrains shall be provided to control the speed and volumes of stormwater. The discharge points must be carefully chosen to avoid erosion of arable land and the creation of gullies.
- The contractor should plant grass or any other vegetation cover to minimize exposed soil surface
- Proper grading to promote sheet flow and minimize flow concentration on unconsolidated soil.
- Directing flow to properly designated channels.
- Measures shall be taken to ensure that the topsoil and subsoil excavated from the construction site are properly managed.
- Denuded areas shall be surfaced as soon as possible to minimize soil erosion

7.2.2.3 Increased water and soil pollution

- Refueling of plants or transfer of materials should not be carried out near water bodies, and any local spillage to soil should immediately be remedied.
- Good housekeeping shall be practiced within material storage compounds or vehicle maintenance yards where the possibility of spillage is great. This can easily be done by provision of Spill tanks and Secondary containment at vehicle maintenance yards.
- The contractor should Plant *vetiver* grasses to minimize exposed soil surface area where necessary
- The use of silt fences and hay bales to remove suspended solids from surface water runoff

7.2.2.4 Noise, Vibration, and Air Pollution

- The nuisance of noise, vibration, and dust will be transient and good work practice can minimize them. In addition, these impacts are already being experienced due to the existing sub-project segments.
- The impacts of noise and dust emissions will further be minimized by proper choice of plant and machinery (i.e. fitted with noise and dust silencers or reducers) and locating quarry areas away from human habitations (at least 500 m away).
- Dust at workplaces 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. Also, the trucks carrying construction materials shall be covered.
- Watering should be practiced regularly at all active work sections of the sub-project; along the road site and all quarries and borrow sites for the protection of workers. In addition, sections of roads heavily traversed by construction vehicles should also be regularly watered.
- The contractors shall provide working gear to the workers to avoid pollution contamination.
- The contractor shall ensure all areas to be demolished are covered to avoid pollution to the nearby residents.

7.2.2.5 Increased outbreak of diseases

- Since construction camps will attract many job seekers and trade mongers, the contractor shall enforce a code of conduct in the camp to encourage respect for the local community and to maintain the cleanliness of the camp at all times.
- The contractor shall deploy locally available labor to reduce the risk of spreading communicable diseases (especially STDs).
- A safety, health, and environment induction course shall be conducted for all workers, putting more emphasis on HIV/AIDS, which has become a national disaster.
- To prevent more HIV/AIDS infections, during the implementation phase, the project should include an information education and communication component (IEC) in its budget. This will help to raise more awareness on HIV/AIDS and means to suppress its incidence.
- The contractor should provide safety gears to prevent workers from health problems
- The contractor should provide good housekeeping in the campsites and ensure suitable environmental sanitation

7.2.2.6 Safety and Health Risks

- Appropriate working gear (such as nose, ear mask, and clothing) and good camp management shall be provided.
- During construction, the contractor shall ensure that the campsite is fenced and hygienically kept with adequate provision of facilities including waste disposal receptacles, sewage, firefighting, 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, quarry site, and each active work section along the road.
- 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.

7.2.2.7 Increased Road Accidents

- The road design shall take account of safety concerns especially at human habitation crossings e.g. installation of bus stops at settlement centers.

- The traffic management plan shall be incorporated in the designs to include for example details of signs, markings, intersection layouts, access restrictions, bus stops, crossings, footpaths, etc.
- The traffic management plans shall be presented both in English and Swahili.
- Maximum speed during construction shall be set at 40m/s.
- Speed humps shall be installed in all settlements and near the schools
- Provision of Education to road users especially drivers to avoid drunk driving. This will be accompanied by testing for any alcohol intake in the course of driving
- In towns and village centers, there should be the provision of separate special pedestrian and untied animal crossings.
- Crossing and accessibility structures/passage ways should be constructed to easy the community to cross their houses
- Flagmen should be stationed at all specified untied animals' crossings and at places where physically and mentally disabled people are likely to cross the project road.
- The construction corridor should be properly fenced to prevent any possible crossing at an unspecified location

7.2.2.8 Increased water abstraction

- The contractor shall obtain water right from Lake Tanganyika Basin Offices before any abstraction of water in the project area.
- The amount of water given to the contractor shall consider the local community around the project road and downstream of the watercourse.
- Watering should be done to those places with significant dust levels and near the villages to minimize water wastage.

7.2.2.9 Increased Waste

- Disposal of wastes shall be done following clause 1713 of the Standard Specifications for Road Works 2000. An adequate number of waste bins shall be provided at the campsite
- Only inert materials or readily decomposable materials shall be disposed of by burial.
- No burning of waste materials that produces black smoke shall be approved. Plastics shall not be burned.
- No open burning of oils shall be done

- The campsites shall have adequate toilets with a septic tank-soak away treatment system

7.2.2.10 Interference with Local Hydrology

- Good design features shall be adopted to ensure that the changes of the hydrological regimes are minimized and that any impacts are insignificant.
- The design will provide controlled and effective stormwater dispersion by the installation of adequate and appropriate drainage structures.
- The discharge points shall be well designed to avoid accelerating erosion downstream.

7.2.2.11 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 will be officially negotiated with the government to avoid conflicts. The contractor may be compelled to pay a small fee from the government.
- All borrow pits and quarries shall be rehabilitated and proper landscaping is done after completion of the construction processes of the sub-project. Pits shall not be left with steep or vertical sides.
- The topsoil shall be stockpiled for later use in reinstating the pit. 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.
- The contractor should plant grass or any other vegetation types to minimize exposed soil surfaces, especially at embankments slopes.

7.2.2.12 Loss of vegetation

- Close supervision of earthworks shall be observed to confine land clearance within the proposed roads reserve boundaries.
- Topsoil shall be stockpiled and used for reinstating flora along the road.
- The contractor shall be instructed to give the uprooted trees in the road reserve area to the street provided he does not contravene the Forest Acts 2002.
- Consultation with the Municipal Council Forest Officers shall be made before clearing trees/ thickets. The contractor shall plant the proposed Tree species for sub-project

Beautification; Finger Palm, *Ficus Benjamin*, Ashok trees, *trichilia emetic* (*midodoma*), and Thuja tree.

7.2.2.13 Gender-Based Violence and Equality

- Gender Policy shall be implemented as it also provides guidelines to ensure gender-sensitive plans, programs, and strategies in the Road sector are highly committed to gender mainstreaming through the provision of equal opportunities to both men and women in road works and related activities.
- Gender balance shall be observed during the provision of employment
- Women food vendors shall be promoted in place to uplift their income flow. Hygiene of the service providers should be emphasized

7.2.2.14 Increased population influx

O The contractor should provide public health awareness to the workers to avoid eruption of diseases

- Contractor to educate his or her workers not to interfere with local people's norms and customs
- Awareness campaigns to the local communities
- The contractor should conduct sensitisation on the community around the project area on the HSE

7.2.2.15 Loss of scenic quality

- The contractor should provide water boozer in order to reduce dust during construction phase
- The contractor should provide the workrs with safety gears such as masks to prevent them from dust
- 7.2.2.16 Increase Traffic cpngestion The contractor should provide services roads during construction phase to reduce traffics in the urban areas
- The contractor should work at night so that to fasten the project due to congestion of traffics.

7.2.3 Mitigation Measures for Operational Phase Impacts

7.2.3.1 Increased Noise, Vibration, and Air Pollution during the Operation Phase

- Steep grades at critical locations shall be avoided to reduce noise from acceleration, braking, and gear changes.
- Cut sections shall be used (where appropriate) to decrease noise in nearby residences.
- Speed limit and exhaust controls shall be enforced, especially in towns.

7.2.3.2 Increased Road Accidents

- Capacity building of district policies (traffic) offices
- 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

7.5 Mitigation Measures for Decommission Phase Impacts

7.5.1 Increased Noise, Vibration, and Air Pollution

- Watering shall be practiced by the contractor regularly at all active work sections within the site.
- The contractors shall provide working gear to the workers to avoid pollution contamination.
- The contractor shall ensure all areas to be demolished are covered to avoid pollution to the nearby residents.

7.5.2 Increased waste Material

- Wastes arising will be used wherever possible in the reinstatement of the site such as concrete, gravel, and sand. Any excess stored material will be disposed on off-site in full accordance with Environment Agency guidance to minimize the risk of pollution and degradation of habitats
- The contractor shall follow health and safety regulations and best practice guidelines to ensure that risks to personal safety and equipment on site are minimized.

CHAPTER EIGHT

8.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Environmental and Social Management Plan

The Environmental and Social Management Plan (ESMP) presents the implementation schedule of the proposed mitigation measures to both environmental and social impacts as well as planning for long-term monitoring activities. For the proposed upgrading of the roads works, the ESMP is given in Table 8.1. The ESMP also includes the associated environmental costs needed to implement the recommended mitigation measures. The engineering designs have already included some of the mitigation measures recommended in this report. Additional recommendations are provided in the ESMP to enable the road facility to be more environmentally friendly. The implementation steps will involve the contractor, the Resident Engineer, Municipal Councils, Road agencies (TARURA), road users, and the local communities at large.

8.2 Environmental Monitoring

The national EIA guidelines require the developer to prepare and undertake a 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 9.2). The ESMP also assigns responsibilities for monitoring activities. However, the divisional/ward/village environmental committees and district environmental committee will participate in the long-term daily monitoring of the Sub-projects.

8.3 Environmental Audit

It is recommended that 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 program. 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. As per operative ESIA documents in Tanzania, environmental audits would be the responsibility of the developer (PO-RALG).

8.4 Implementation of the ESMP

PO-RALG as sub-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 an 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 the Consultant (Resident Engineer) and monitored by PO-RALG.

The ESHS Code is a set of Guidelines attached to the Bidding Document and Contract to be adopted by the 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 following 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 a violation of law that may result in civil and/or criminal penalties to Contractors, Supervisors, or Firm.

According to the Code, the Contractor is obliged to prepare various safeguard documents before 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

The environmental and social mitigation and enhancement measures incorporated in the detailed engineering design will be attached to the Contract Documents. The Contractor shall take stock of the contents of the Environmental and Social Impact Assessment Statement of the Project. The contractor will have an Environmental Expert with at least 5 years of experience in projects of similar nature. The expert will be familiar with the scientific measurement of environmental and social impacts and remedies and enhancement.

As for all other large construction projects, the contractor will be supervised by a selected consulting firm (Engineer). One of the team members of the supervision team will be an Environmental Specialist who is an expert in Environmental Management issues especially of a construction project (with at least 10 years of experience in projects of similar nature). One of his tasks will be to oversee the contractor implement the mitigation measures proposed by the ESMP during the construction phase. His other duties will be to assist the contractor in the implementation of the Environmental Monitoring Plan during the construction period. Figure 8.1 provides the organization chart of the ESMP implementation.

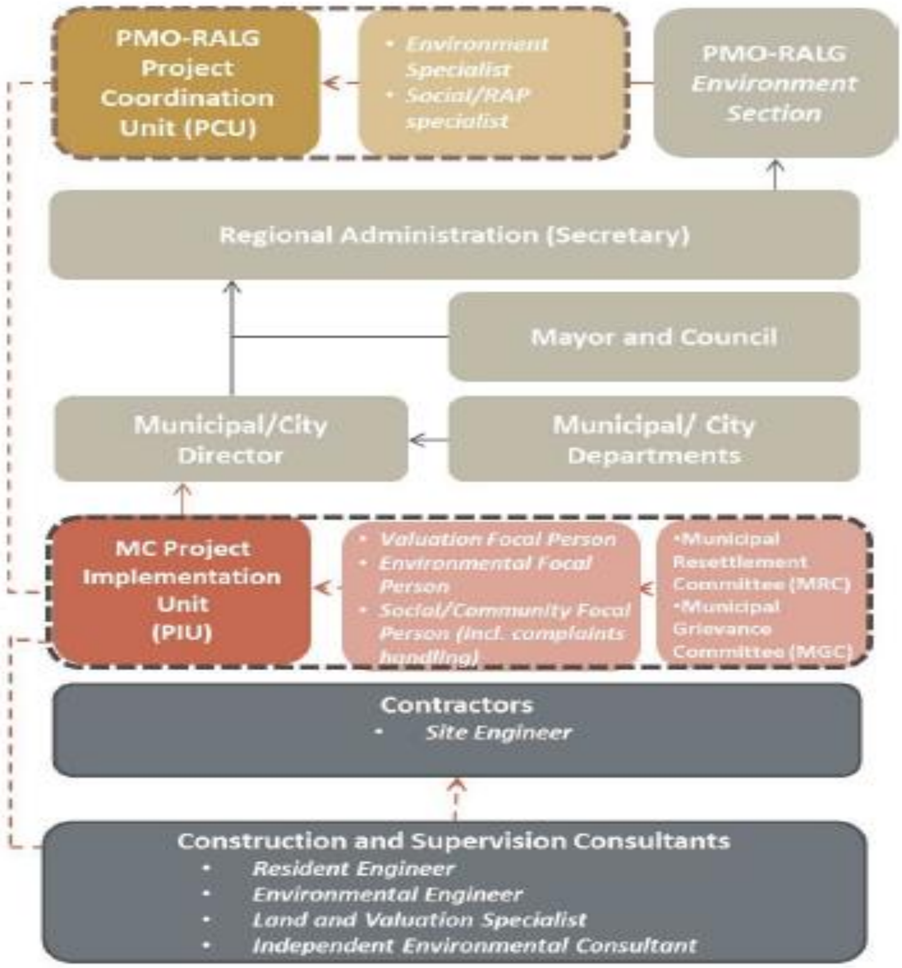

Figure 8.1: Environmental and Social Management Organization Chart

8.5 Personnel and Responsibilities

Table 8.1 provide the personnel to be involved in ESMP and implementation and their respective responsibilities

Table 8.1: Personnel and their responsibilities

Personnel	Responsibilities
Resident Engineer	• Has ultimate responsibility for compliance with the specification and resource consent conditions; • Reports to Consultant’s senior management, PO-RALG on environmental compliance
Engineer’s Environmental Specialist	• Develops, implements, and reviews environmental management systems and plans • Provides leadership to ensure all staff comply with environmental management systems; • Co-ordinates environmental management interfaces with external agencies and stakeholders; • Notifies the consent authorities of any non-compliance; • Responsible for reporting major defects and non-compliances and arranging appropriate corrective actions; • Primary contact for environmental complaints and inquiries.
Employer’s Representative	• Undertakes compliance inspections as necessary • Attends initial early meeting to contribute to the development of ESMP • Attends environmental review meetings
Contractors Project Manager	• Ensures staff are adequately inducted and trained in site environmental procedures including emergency procedures. The same applies to sub-contractors. • The overall overseer on the contractor's side for the implementation of ESMP

Personnel	Responsibilities
Contractors Environmental Manager	• Develops, implements, and reviews environmental management systems and plans • Provides leadership to ensure all contractor’s staff comply with environmental management systems; • Works with Site Engineer to develop appropriate Site-Specific Environmental Plans which comply with Standard Specifications 1700; • Notifies the Engineers’ Environmental Specialist of any non-compliance; • Responsible for reporting major defects and non-compliances and arranging for appropriate corrective actions; • Initiates and coordinates monitoring and auditing; • Monitors the effectiveness of Environmental Management Plan; and • Trains contractor’s staff in environmental objectives and procedures.;
Contractor’s site engineer (Environmental)	• Designs site-specific Environmental Plans in collaboration with Contractor’s Environmental Manager, Site Engineer, and other subcontractors; • Conducts and coordinates monitoring and auditing and maintains relevant records; • Conducts daily / weekly site inspections of Measuring devices • Monitors the effectiveness of Environmental Management System • Monitors and carries out routine maintenance of measuring facilities and the various management measures required to ensure their ongoing effectiveness;

Personnel	Responsibilities
	• Ensures staff onsite are aware of lay down of environmental requirements at all times. • Conducts daily/weekly site inspections of Measuring devices and co-ordinates maintenance where necessary; • Monitors effectiveness of Environmental Management System
Engineer's advisors Contractor's site supervisor	• Provide input to Engineer's Environmental Specialist regarding aspects of the ESM • Participate in monitoring and audits of the contractor's compliance with the ESMP • Provide ongoing advice to address environmental issues raised during construction. • Ensures Environmental works are implemented and maintained; • Leads the emergency response crew with advice from the Environmental Manager ; • Reviews the need to use a water cart to control dust.
Contractor's staff	• Responsible for reporting incidents, defects, and other problem areas to senior site staff as they arise on site. Special forms will be used for all incident reporting; • Carry out routine maintenance and emergency work when directed; • Care for all environmental works;

Personnel	Responsibilities
	• Ensure the site is kept tidy and litter is placed in bins; • Act in an environmentally responsible manner at all times to reflect the contractor's commitment to environmentally responsible environmental practices.

8.6 Training and Induction

It is essential to the success of environmental management that personnel receive appropriate training to effectively undertake their duties and to raise their awareness of environmental issues on the project. Training and awareness tools methods will include:

- Inductions
- Formal skill training
- On the job training and experience
- Tailgate meetings and discussions
- Training and Awareness literature e.g. posters and leaflets.

An environmental induction shall be provided to all Main-Contractor staff and subcontractors before starting work on site. The induction will include information on environment commitment and obligations as well as the requirements of all aspects of the ESMP and Standard Specifications for Road works in Tanzania (i.e. SS 1700). Where needed, key staff members shall attend target training courses outside the Construction Site.

Table 8.2 below provides examples of the basic training programs for safeguards during project implementation. The training programs will be developed and delivered by the Contractor and approved by Resident Engineer for the implementation of safeguards. The TARURA trained staff for the implementation of safeguards will provide the training to contractors and other entities concerned.

Other more specific and tailored training will be developed for the implementation of safeguards during project implementation based upon a reassessment of needs and the status of safeguards implementation.

- *Target groups for the training:* PO-RALG (Tabora Municipal Staff), Contractors, and community representatives in the sub-project area.
- *Training schedule:* at least 1 month before the construction of the first contract. The training can be adjusted in line with the implementation schedule of the sub-project/contracts.
- *Training frequency*: The basic training programs proposed in the table below will take place every six months every year and its content updated and adapted to implementation issues. Training frequency and the content will be reassessed during implementation depending on

needs. It is foreseen that the training program for Tabora Municipal staff will continue until the year-end of the construction period. Three days of training for contractors are also planned to take place twice a year on an annual basis for at least one year.

Table 8.2: Training Programs for Capacity Building in Environmental Supervision and Management

Target Group	**Tabora Municipal Staff**
Course Title	Environmental supervision, monitoring, and reporting
Participants	Environmental staff and technical staff (10 Tabora Municipal Staff)
Training Frequency	Soon after project effectiveness but at least 1 month before the start of construction of the first contract. Follow-up training will be scheduled as needed.
Time	Four days of training, to be held twice a year, and then to be repeated every year until year three of implementation.
Content	• General environmental management relating to the project, • General aspects of environmental supervision; • Implementation and supervision of mitigation measures; • Community participation in environmental supervision monitoring. • Guidance and supervision of contractors, Subcontractors, and community representatives in the implementation of environmental supervision. • Use of forms for environmental supervision; • Risk response and control; • Receipt and submission of reporting forms • Other areas of training needs, as determined
Responsibilities	Tabora Municipal Staff for the implementation of safeguards.
Target Groups	**CONTRACTORS, SUBCONTRACTORS, WARDS AUTHORITIES, COMMUNITY REPRESENTATIVES**
Course Title	Implementation of mitigation measures
Participators	On-site construction management staff; environmental staff of contractors; ward/group authorities.

Target Group	Tabora Municipal Staff
Training frequency	After bidding, and determining based on needs
Time	3 days of training for contractors and 2 days of training for others, to be repeated twice a year on an annual basis depending on needs
Content	Overview of environmental monitoring; Requirements of environmental monitoring; Role and responsibilities of contractors Scope and methods of environmental monitoring; Response and risk control; Propagate monitoring forms and guide how to fill in the forms and risk report; Preparation and submission of reports Other areas to be determined.
Responsibilities	Tabora Municipal Staff for the implementation of safeguards
Target Groups	**COMMUNITIES AND WORKERS**
Course Title	Environmental sanitation and safety
Participators	Representatives of community and/or worker leaders (as appropriate)
Training frequency	As appropriate
Time	One-day presentation and one-day on-the-job training twice a year, to be repeated on an as-needed basis
Content	• Preliminary presentation on environmental protection and environmental overview • Key issues that require communities' and workers' attention to minimize safety risks (roads, waterways, equipment, machines, open excavations, etc.) as well as reduce pollution (dust, fumes, gases, oil/grease spills, waste management, etc.) • Management of environmental safety and sanitation on work sites; • Mitigation measures at construction sites;

Target Group	Tabora Municipal Staff
	• Safety measures on electricity, mechanical, transportation, air pollution; • Procedures to deal with emergencies; • Other areas to be determined.
Responsibilities	Contractor and Tabora Municipal

Training and induction routines etc described above are not an exhaustive list. It should be noted that these need to be developed jointly by the Contractor and the Engineer's Environmental specialists.

8.7 Gender Based Violence (GBV) Action Plan

8.7.1 Basis of GBV Action Plan

Gender-based violence is a health, social, human rights, and development issue that transcend class, culture, age, race and religion which affects every community in every corner of Antigua and Barbuda. Globally, it has been estimated that at least one in every three women around the world has been beaten, coerced in to sex, or otherwise abused in her lifetime. The public health implications of this violence are enormous: according to a World Development report, violence —is more serious a cause of death and incapacity among women of reproductive age as cancer, and greater cause of ill-health than traffic accidents and malaria combined. Gender-based violence also diminishes women's abilities to protect themselves against HIV. As such, violence against women is both an outcome and an expression of women 's subordinate status in relation to men in societies around the world.

The differences in the roles, responsibilities, opportunities, privileges, expectations, and limitations prescribed to males and to females in any culture are socially constructed, context based, and learned through socialization. They determine many aspects of the relationships between males and females, as well as among females and among males. Although gendered roles and responsibilities can change over time within and across cultures, they are often deeply rooted in long-standing assumptions societies hold about women, men, boys, and girls. (Strategic Action Plan to End Gender-based Violence Antigua and Barbuda 2011-2015)

8.7.2 Implementation Approach

To reduce the risk of such behavior taking place, TARURA and Tabora Municipal council will review the risks associated with GBV prior to project construction and, if deem necessary, will instruct the Contractor and all its project personnel, including foreign workers and international consultants, to sign codes of conduct.

Mechanisms for reporting offensive incidents and redressing related complaints must accompany these measures and to form part of project monitoring for the TARURA and Tabora Municipal council and the Contractor. The Contractor must review the GNP and the guidelines for a GBV ESSs. Upon signing, the Contractor, its managers, and all workers will be committed to preventing, reporting and addressing GBV within the work site and in its immediate surrounding communities.

8.7.3 Implementation Responsibilities

- Prepare GBV action Plan and seek Bank approval prior to project mobilization. Refer to GNP – TARURA and Tabora Municipal council
- Prepare and implement approved GBV action Plan. Refer to requirements for GBV in GNP for guidance - TARURA and Tabora Municipal council
- Sign Codes of Conduct for Contractor, Managers and other personnel. Refer to GNP for draft Codes of Conduct – CONTRACTOR
- Establish GBV Compliance Team; Refer to GNP for guidance - TARURA and Tabora Municipal council
- Respond to GBV events as a matter of priority: CONTRACTOR, TARURA and Tabora Municipal council
- Abide to reporting requirements as per Codes of Conduct. - TARURA and Tabora Municipal council

8.8 Redress and Grievance Mechanism

A grievance mechanism must be made available to parties who have grievances or are not satisfied with any part of the resettlement and compensation process. These grievances could relate to the valuation of assets, amount of compensation paid, level of consultation, non-fulfilment of contracts, and timing of compensation, amongst others. Complaints and grievances also concern issues related to construction safety and nuisances caused by construction. Grievances will be handled through negotiation aimed at achieving consensus.

8.8.1 Grievance Committee

In order to address grievances, a Grievance Committee will be formed for dealing with any grievances as they arise. This will include a representative of the RAP team, representative of the Tabora Municipal's Lands Departments, representative of the Ward and Mtaa Council, as well as a representative of the PAPs. It should also include an independent valuer. If the grievance is in relation to compensation amounts. The grievance procedure will be simple and will be administered as far as possible by the Grievance Committee at the Municipal and Ward and Mtaa levels.

8.8.2 Grievance Mechanism Procedures

At the beginning of the individual RAP processes, PAPs will be informed about how to register grievances or complaints, including specific concerns about relocation. The PAPs should also be informed about the dispute resolution process, specifically about how the disputes will be resolved in an impartial and timely manner.

All attempts shall be made to settle grievances amicably. The grievance redress mechanism is designed with the objective of solving disputes at the earliest possible time, which will be in the interest of all parties concerned and therefore, it implicitly discourages referring such matters to the National level government authorities or National level courts for resolution.

Compensation and resettlement plans (contracts) will be binding under statute. The Grievance Committee shall maintain records where grievances and complaints, including minutes of discussions, recommendations and resolutions made, will be recorded.

The procedure for handling grievances should be as follows:

- The affected part or person should file his grievance in writing, to the ward leader. The grievance note should be signed and dated by the aggrieved person. Where the affected person is unable to write, he should obtain assistance to write the note and emboss the letter with his/her thumbprint. Moreover, other methodology to handle grievances shall be used which includes email, suggestion boxes as well as Municipal website

- The ward leader should notify the Grievance Committee and respond within 14 days during which any meetings and discussions to be held with the aggrieved person should be conducted. If the grievance relates to valuation of assets, an independent valuer should be requested to revalue the assets, and this may necessitate a longer period. In this case, the aggrieved person must be notified by the Ward Leader that his/her complaint is being considered.

- If the aggrieved person does not receive a response or is not satisfied with the outcome within the agreed time, s/he may lodge his/her grievance to the Municipal grievance committee.

- The Grievance Committee will then attempt to resolve the problem (through dialogue and negotiation) within 14 days of the complaint being lodged. If no agreement is reached at this stage, then the complaint can be taken through the formal court process, i.e. to the Ward Tribunal where relevant, Municipal Tribunal and the High Court (Land Division) at the National level.

- The complainants will be exempted from all administrative and legal fees that might be incurred in the resolution of their grievances and complaints. The Grievance Committee will prepare a report-containing summary of all grievances and will make this available to TARURA and Tabora Municipal council on a quarterly basis.

8.9 ESMP Sub-Plans for the Project

The Contractor shall prepare specific Health and Safety Management Plan (HSMP), Specific Environmental and Social Management Plan (ESMP), HIV/AIDS awareness programme, Road Safety Awareness Programme, Traffic Management Plan (TMP), Borrow pit and Quarry Operation Plan, Occupational Health and Safety Awareness Programme of the proposed sub- project prior to the actual execution of the construction works based on the Design and Environmental and Social Impact Assessment Report.

8.9.1 Health and Safety Management Plan (HSMP)

The plan should detail the measures taken by the project Contractor to manage the hygiene conditions and medical care in each of the worker's camps. It should also address occupational health & safety in alignment with Labour law of Tanzania, ILO recommendations, Good Industry Practices. This plan should include (but not limited to) the following topics: (i) Health and safety policy and commitment from management, (ii) Description of organization; human resources, definition of roles and responsibilities, (iii) workers accommodation, hygiene facilities and food supply, (iv) Description of material resources including Personal Protective Equipment (PPE) to be used by workers, (v) Health and safety procedures, (vi) Risk assessment , (vii) Pollution prevention and protection, (viii) Health and safety training, (ix) Monitoring of health and safety performance, and (x) Medical checks.

8.9.2 Air Quality Management Plan

A detailed Air Emissions and Dust Control Management Plan should be prepared and implemented as part of the construction ESMP. The plan should detail all site-specific measures the project Contractor will implement during the construction period to identify and manage and reduce all nuisances caused by air emissions and dust production resulting from the construction activities including from project's traffic along the access roads. The plan should also include specific measures for the reduction of the greenhouse gas emissions in compliance with the national standards and proportionate to the potential impacts referring to greenhouse gas emissions.

8.9.3 Noise & Vibration Management Plan

A detailed Noise & Vibration Control Plan should be prepared and implemented as part of the construction ESMP. The plan should describe how the project Contractor will minimise and manage noise and vibration impacts during construction.

8.9.4 Effluent Management Plan

Effluents consist of liquid discharges from Worksite, transporting a pollutant (dissolved, colloidal or particles). A detailed Effluent Management Plan should be prepared and implemented as part of the construction ESMP. The plan should detail all site-specific measures the project Contractor will implement during the construction period to identify, drain and treat all effluents generated on site from the construction activities.

8.9.5 Waste Management Plan

A detailed Waste Management Plan should be prepared and implemented as part of the construction ESMP. The plan should detail all site-specific measures the project Contractor will implement during the construction phase to identify, collect, transport and treat all waste produced on the Worksites by its personnel.

8.9.6 Hazardous Materials Management Plan

A detailed Hazardous Materials Handling and Storage Management Plan should be prepared and implemented as part of the construction ESMP. The plan should detail all site-specific measures the Contractor will implement during the construction phase to identify and manage hazardous materials planned for use on the Worksite and their disposal.

8.9.7 Soil Erosion & Vegetation Management Plan

A detailed Soil Erosion & Vegetation Management Plan should be prepared and implemented as part of the construction ESMP. The plan should detail all site-specific measures the project Contractor will implement during the construction phase to minimize vegetation clearing and prevent an increase in sediment loads being exported from the site.

8.9.8 Materials Management and Spoil Disposal Plan

The project Contractor should prepare and submit a Materials Management Plan that documents how excavated soils and materials are to be handled.

8.9.9 Quarry and Borrow Areas Management Plan

A detailed Quarry and Borrow Areas Management Plan should be prepared and implemented for areas planned to be exploited for rockfill material, aggregates and rip rap material as well as for the other borrow areas (sand, gravel) that details all the environmental and social measures to be implemented for the operation of these sites.

8.9.10 Traffic Management Plan

A detailed Traffic Management Plan should be prepared and implemented as part of the construction ESMP. The plan should (i) define the characteristics of the construction fleet of vehicles and site machinery, (ii) describe the expected Project's traffic (frequency of trips between Worksites, working hours, convoys) and (ii) detail all site specific measures the project Contractor will implement during the construction period to minimize the nuisances to neighborhoods generated by its fleet and reduce the risk of accident.

8.9.11 Site Rehabilitation Plan

A detailed Site Decommissioning and Rehabilitation Plan should be prepared and implemented as part of the construction ESMP. The plan should detail all site-specific measures the project Contractor will implement at the end of the construction period to rehabilitate all temporary areas disturbed by the works.

8.9.12 Community Safety Plan

The project contractor should prepare and implement Community Safety Plan, which includes regular community meetings on safety & construction hazards, announcement in advance of heavy construction activities, restriction of access to working sites, awareness campaigns on traffic related risks, including school children.

8.9.13 Recruitment and Local Labour Management Plan

A detailed Recruitment and Labour Management Plan should be prepared and implemented as part of the construction ESMP. The plan will detail the manpower needs for the entire construction period, the local recruitment process and the approach planned to maximize local employment and local content opportunities.

8.9.14 Environmental Permitting

The project Contractor should conduct the environmental and social investigations required to obtain the environmental permit and any other authorizations as required by the authorities for the Project components that might not be covered by the ESIA or the construction permit. It should include: - but does not limit to – (i) the electrical transmission lines (ii) TTCL lines (iii) TUWASA watr supply pipes

8.9.15 Emergency Preparedness Plan

A detailed Emergency Preparedness Plan will be prepared and implemented as part of the construction ESMP. The EPP for Common Hazards and Emergency Situations during construction should be structured as such but not limited to:

- Identification of potential emergencies based on hazard assessment
- Procedures to respond to the identified emergency situations;
- Procedures to shut down equipment;
- Procedures to contain and limit pollution;

- Procedures for decontamination;
- Procedures for rescue and evacuation, including a designated meeting place outside the construction camps;
- Location of alarms and schedule of maintenance;
- List and location of equipment and facilities for employees responsible for responding to the emergency (fire-fighting equipment, spill response equipment, personal protection equipment for the emergency response teams, first aid kits and stations);
- Protocols for the use of the emergency equipment and facilities;
- Schedule for periodic inspection, testing and maintenance of emergency equipment;
- Clear identification of evacuation routes and meeting points;
- Schedule of trainings (drills), including with local emergency response services (e.g. fire fighters);
- Procedures for emergency drills;
- Emergency contacts and communication protocols, including with affected communities when necessary, and procedures for interaction with the government authorities;
- Procedures for periodic review and update of emergency response plans.

8.10 Environmental and Social Cost

The principal environmental and social cost includes the cost for implementing the mitigation measures proposed and that for carrying out monitoring of specific environmental and social parameters. These costs are indicated in Table 8.3. It should be noted that most of the costs for mitigation measures are included in the bills of quantities of the overall works. The costs for the environmental and social supervisor shall be included in the overall supervision cost of the works. The supervisors shall be engaged for at least 15 man-days a month over the entire construction period.

8.11 Stakeholder Involvement Plan

Inherently ESIA needs and involves different stakeholders from project conception, feasibility, detailed engineering design stage, implementation, operation, and finally decommissioning. All the preceding stages have involved stakeholder considerations and even the remaining stages shall include stakeholders. The following are the levels of stakeholder involvement in this ESIA study;

- Scoping Stage – stakeholders were identified, consulted, and involved. They were allowed to raise concerns and issues that were included in the scoping report.
- Detailed ESIA study stage – This was conducted after knowing the preliminary alignment of the road and basic facilities that would be constructed. The identified stakeholders during the scoping stage and more others were consulted.
- Disclosure – After the ESIA Report has been approved by the National Environment Management Council (NEMC) the report shall be disclosed for all stakeholders to view. An advertisement shall be served in the media for the public to view and procedures for sending additional comments will also be stated.

The Environmental and Social Monitoring plan shall consist of different responsible institutions in the implementation of the mitigation measures. Since the environmental impacts for the sub-projects are similar, the matrix below provides the Mitigation measures for the TACTIC sub-projects upgrading of kanyenye, swetu, kisarika, and MailiTano roads and their responsible institutions that shall be involved. However, TARURA shall only be involved in road sub-projects together with the contractor and Tabora Municipal council shall be in place in both six sub-project to oversee the implementation of the Plan (Table 8.3).

Table 8.3: Environmental and Social Management Plan (ESMP) for upgrading of Swetu road 6.95Km, Kisarika road 5.2Km, Mailitano road 3.5Km and Kanyeye road 10.6Km.

Impact	Mitigation measure	Responsible institution	Estimated One Time Cost (TSH)	Estimated Annual cost (TSH)
Pre-construction phase				
Land expropriation, Loss of property and Resettlement	○ Compensation shall be done according to Tanzania laws governing resettlement before the commencement of the construction activities. ○ Resettlement Action Plan (ARAP) has been prepared and shall be adhered to	○ Tabora Municipal Council	Valuation in Progress	
Loss of Employment and Incomes	○ Skilled and unskilled job opportunities arising from project activities should be given to affected people as a priority. This will also reduce the influx of job seekers and speculators from outside the project area. ○ Women food vendors shall be promoted in place to uplift their income flow. Hygiene of the service providers should be emphasized	○ Tabora Municipal Council	Valuation in Progress	
Construction phase				

Impact	Mitigation measure	Responsible institution	Estimated One Time Cost (TSH)	Estimated Annual cost (TSH)
Destruction of Public Utilities	○ TANESCO, TTCL communication trunk, and the Water supply authority (TUWASA) shall be involved from the early stages of this project to have integrated planning. ○ Early notice shall be given to the community before any service interruption ○ The funds for the relocation of these infrastructures shall be part and parcel of the project if need be.	○ Tabora Municipal Council	Valuation in Progress	
Soil Erosion and instability of Slopes	○ Unnecessary ground clearance and sensitive re-alignments shall be avoided. ○ Lined drainage channels at sensitive terrains shall be provided to control the speed and volumes of stormwater. The discharge points must be carefully chosen to avoid erosion of arable land and the creation of gullies.	○ Tabora Municipal Council		9,000,000

Impact	Mitigation measure	Responsible institution	Estimated One Time Cost (TSH)	Estimated Annual cost (TSH)
	○ The contractor should Plant vetiver grasses to minimize exposed soil surface. ○ Proper grading to promote sheet flow and minimize flow concentration on unconsolidated soil. ○ Directing flow to properly designated channels. ○ Measures shall be taken to ensure that the topsoil and subsoil excavated from the construction site are properly managed. ○ Denuded areas shall be surfaced as soon as possible to minimize soil erosion			
Increased water and soil pollution	○ Refueling of plants or transfer of materials should not be carried out near water bodies, and any local spillage to soil should immediately be remedied. ○ Good housekeeping shall be practiced within material storage compounds or vehicle	Tabora Municipal Council		

Impact	Mitigation measure	Responsible institution	Estimated One Time Cost (TSH)	Estimated Annual cost (TSH)
	maintenance yards where the possibility of spillage is great. This can easily be done by provision of Spill tanks and Secondary containment at vehicle maintenance yards. ○ The contractor should Plant vetiver grasses to minimize exposed soil surface area where necessary ○ The use of silt fences and hay bales to remove suspended solids from surface water runoff			
Noise pollution	○ Provide working gear to workers ○ Proper choice of equipment which offers environmental advantages	○ Tabora Municipal Council		10,000,000
Air pollution	○ Watering road section (near human habitation) ○ Proper choice of equipment which offers environmental advantages	○ Tabora Municipal Council		15,000,000
Vibration	○ Advance notice to local communities ○ Proper location of quarry sites	○ Tabora Municipal Council		10,000,000

Impact	Mitigation measure	Responsible institution	Estimated One Time Cost (TSH)	Estimated Annual cost (TSH)
Increased outbreak of diseases	○ Safety, Health, and Environment (SHE) induction course ○ Support HIV/AIDS campaigns ○ Provision of condoms ○ The contractor should provide safety gears to prevent workers from health problems ○ The contarctor should provide good housekeeping in the campsites and ensure suitable environmental sanitation	○ Tabora Municipal Council		20,000,000
Safety and health risks	○ Appropriate working gear (such as nose, ear mask, and clothing) and good camp management shall be provided. ○ A well-stocked First Aid kit (administered by medical personnel) shall be maintained at each camp, quarry site, and each active work section along the road.	○ Tabora Municipal Council		15,000,000

Impact	Mitigation measure	Responsible institution	Estimated One Time Cost (TSH)	Estimated Annual cost (TSH)
Increased road Accidents	○ The road design shall take account of safety concerns especially at human habitation crossings e.g. provide pedestrial. ○ The traffic management plan shall be incorporated in the designs to include for example details of signs, markings, intersection layouts, access restrictions, bus stops, crossings, footpaths, etc. ○ The traffic management plans shall be presented both in English and Swahili.	○ Tabora Municipal Council		10,000,000
Increased water abstraction	○ The contractor shall obtain a water right from Lake Tanganyika Basin Offices before any abstraction of water in the sub-project area. ○ The amount of water given to the contractor shall consider the local community around the project road and downstream of the watercourse.	○ Tabora Municipal Council		25,000,000

Impact	Mitigation measure	Responsible institution	Estimated One Time Cost (TSH)	Estimated Annual cost (TSH)
	○ Watering should be done to those places with significant dust levels and near the residents to minimize water wastage.			
Increased Waste	○ An adequate number of waste bins shall be provided at the campsite ○ Only inert materials or readily decomposable materials shall be disposed of by burial. ○ No burning of waste materials that produces black smoke shall be approved. Plastics shall not be burned. ○ No open burning of oils shall be done ○ The campsites shall have adequate toilets with a septic tank-soak away treatment system	○ Tabora Municipal Council		9,000,000
Interference to local hydrology	○ Good design and engineering practice ○ Efficient drainage system	○ Tabora Municipal Council		15,000,000

Impact	Mitigation measure	Responsible institution	Estimated One Time Cost (TSH)	Estimated Annual cost (TSH)
	○ Control alien species			
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 will be officially negotiated with villagers and/or village government to avoid conflict. ○ All borrow pits and quarries shall be rehabilitated and proper landscaping is done after completion of the road construction. ○ The topsoil shall be stockpiled for later use in reinstating the pit. ○ 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.	Tabora Municipal Council		10,000,000

Impact	Mitigation measure	Responsible institution	Estimated One Time Cost (TSH)	Estimated Annual cost (TSH)
Loss of Vegetation	○ Close supervision of earthworks shall be observed to confine land clearance within the proposed roads reserve boundaries. ○ Topsoil shall be stockpiled and used for reinstating flora along the road. ○ The contractor shall be instructed to give the uprooted trees in the road reserve area to the street provided he does not contravene the Forest Acts 2002. ○ Consultation with the Municipal Council Forest Officers shall be made before clearing trees/ thickets. ○ Planting of the proposed Tree species for sub-project Beautification; Finger Palm, Ficus Benjamin, Ashock trees, trichilia emetic (midodoma), and Thuja at sub-project areas	○ Tabora Municipal Council		5,000,000
Operation phase				

Impact	Mitigation measure	Responsible institution	Estimated One Time Cost (TSH)	Estimated Annual cost (TSH)
Noise, vibration, and air pollution	○ Good design practice ○ Provide side-hedges ○ Enforce speed and exhaust limits	○ Tabora Municipal Council		9,000,000
Increased Road accidents	○ Capacity building of district policies (traffic) offices ○ 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 ○ Install accessibility structures/crossing to resident houses	○ Tabora Municipal Council		15,000,000
Decommissioning Phase				
Increased Noise, Vibration and Air Pollution	○ Watering shall be practiced by the contractor regularly at all active work sections within the site.	○ Tabora Municipal Council		6,000,000

Impact	Mitigation measure	Responsible institution	Estimated One Time Cost (TSH)	Estimated Annual cost (TSH)
	○ The contractors shall provide working gear to the workers to avoid pollution contamination. ○ The contractor shall ensure all areas to be demolished are covered to avoid pollution to the nearby residents.			
Increased waste material	○ All materials which can be reused shall be reused ○ Materials that cannot be reused shall be sent to an authorized dumpsite	○ Tabora Municipal Council		5,00,000
Increased population influx	○ The contractor should provide public health awareness to the workers to avoid eruption of diseases ○ Contractor to educate his or her workers not to interfere with local people's norms and customs ○ Awareness campaigns to the local communities	○ Tabora Municipal Council		4,50,000

Impact	Mitigation measure	Responsible institution	Estimated One Time Cost (TSH)	Estimated Annual cost (TSH)
Loss of scenic quality	○ The contractor should provide public health awareness to the workers to avoid eruption of diseases ○ Contractor to educate his or her workers not to interfere with local people's norms and customs ○ Awareness campaigns to the local communities ○ The contractor should conduct sensitisation on the community around the project area on the HSE ○ The contractor should provide water boozer in order to reduce dust during construction phase ○ The contractor should provide the workrs with safety gears such as masks to prevent them from dust	○ Tabora Municipal Council		7,00,000

Impact	Mitigation measure	Responsible institution	Estimated One Time Cost (TSH)	Estimated Annual cost (TSH)
Increase Traffic congestion	○ The contractor should provide services roads during construction phase to reduce traffics in the urban areas ○ The contractor should work at night so that to fasten the project due to congestion of traffics.	○ Tabora Municipal Council		5,00,000
Total Cost				**174,500,000/=**

CHAPTER NINE

9.0 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

9.1 Environmental and Social Monitoring

Monitoring of the anticipated environmental and social impacts in the receiving environments is important. It helps in determining the effects of the project activities on the environments enhancing understanding of cause-effect relationships between human activities and environmental changes and verifies the accuracy of prediction about the environmental impacts. It ensures compliance with regulatory measures and understanding the degree of implementation of EPM and its effectiveness. The monitoring results are also used extensively during environmental auditing.

The EIA regulations require the developer to prepare and undertake a 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 9.1). The ESMP also assigns responsibilities for monitoring activities. However, the divisional/ward/village environmental committees and district environmental committee will participate in the long-term daily monitoring of the sub-projects.

9.1.1 Objectives of Environmental Monitoring

The overall objectives of the monitoring activities are to:

- Ensure regulatory requirements are met;
- Check that impacts do not exceed national environmental standards
- Verify predictions made in the ESIA by obtaining real time measurements;
- Verify that mitigation measures are effective and implemented in the manner described in Chapter 7;
- Provide early warning of potential environmental impacts; and
- Inform future operations and contribute to continuous improvement in the management of environmental and social issues related to the project.

Monitoring will be carried out by the project contractor pursuant to her contractual obligations to undertake inspections, monitoring and reporting.

9.2 Environmental Monitoring and Audit

It is recommended that 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 program. The audits will unveil the actual performance of mitigation measures and will allow effective measures to be included in future projects based on the legislation in force.

Continuing monitoring should be a continuous control, monitoring both process and method to detecting compliance risk issues associated with project's operations. The monitoring programs shall be include keeping current with changes in rules, regulations, and applicable laws; developing internal controls, policies, and procedures to comply with them; training staff on these rules; and taking steps in monitoring or verifying compliance with new guidelines. Monitoring programs should be designed to test for inconsistencies, duplication, errors, policy violations, missing approvals, incomplete data, or other possible breakdowns in internal controls. Monitoring techniques may include sampling protocols that permit program managers to identify and review variations from an established baseline.

Auditing entails reviewing the ongoing monitoring process and verifying it is effective in achieving the desired outcome. When it comes to high-risk compliance areas within an operation, audit objectives are to: (1) verify that contractor is meeting her obligations for ongoing monitoring; and (2) validate that the process is achieving desired outcomes. This includes confirming that controls are in place and functioning as intended or identifying weaknesses in the program that need to be addressed.

An audit must be an independent and objective review, which means it should be done by people external to the project area to be audited. External reviewers can be used, such as consultant experts or project auditors. In any case, the project implementor should ensure that both the monitoring and auditing is taking place and doing what it should be doing. As per operative ESIA documents in Tanzania, environmental audits would be the responsibility of the developer (PO-RALG) and the National Environment Management Council (NEMC).

9.2.1 Project's Inspections and Monitoring

The following four types of inspections and monitoring must be employed.

Inspections planned and conducted on a regular basis to ensure that mitigation measures and commitments are properly maintained and implemented, and that specific management procedures are followed.

Receptor monitoring undertaken to verify predictions made in the ESIA and to confirm that the activities at the site are not resulting in an unacceptable deterioration i.e.monitoring disturbance to affected residents through a grievance mechanism).

Compliance monitoring involving periodic sampling or continuous recording of specific environmental quality indicators or discharge levels to ensure compliance of discharges and emissions with project standards.

Auditing (internal and external) to assess compliance of the site activities with both regulatory and site management system requirements.

Monitoring results will be presented in regular reports and reviewed at monthly and quartely site meetings. The results of the inspection and monitoring activities will be reported to PO-RALG.

9.3 Monitoring Parameters

The selection of the parameters to be monitored is based on the high likelihood of occurrences of the selected parameters. Monitoring of these parameters will be done in various stages of the sub-projects as follows;

- *Pre-construction stage* – Monitoring of the parameters at this stage is meant to establish the baseline information of the target parameters in the project area.
- *Construction stage* - Monitoring at this stage is meant to establish the pollution levels that arise from the construction activities.
- *Operation stage* - Monitoring at this stage is meant to check on the impacts that might arise as the result of the normal use of the infrastructures.
- *Decommissioning* - Decommissioning is not anticipated in the foreseeable future for the road sub-projects.

Table 9.1: Environmental and Social Monitoring Plan for upgrading of Swetu road 6.95Km, Kisarika road 5.2Km, Mailitano road 3.5Km and Kanyeye road 10.6Km

Parameters		**Monitoring frequency**	**Sampling Area**	**Measurement Units**	**Method**	**Target level/ Standard**	**Responsibility for monitoring**	**Annual costs estimates (TSH)**
Pre-construction stage								
Air quality	Dust	Once before the construction starts	Near settlements (streets)	µg/m^3	*Micro Dust Pro*	<0.01	Tabora Municipal Council	6,000,000
Noise Baseline	Noise level	Once before the construction starts	Near settlements (Streets)	dBA	Noise Level Meter	<110	Tabora Municipal Council	5,000,000
Water Quality	Turbidity	Once before the construction starts (During the rainy season)	TUWASA and Boreholes	NTU	Spectrophotometer	<50	Tabora Municipal Council	5,000,000
Biodiversity	Baseline information on biodiversity	Once before the construction work starts	All Vegetated area	type and number of	Counting and Observation	Vegetation within and along	Tabora Municipal Council	4,000,000

Parameters		Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility for monitoring	Annual costs estimates (TSH)
				living organisms		with the project		
Construction stage								
Air pollution	Dust	Once Per week	Near settlements (villages)	µg/m^3	*Micro Dust Pro*	0.01	Tabora Municipal Council	9,000,000
Noise pollution	Noise level	Once Per week	Near settlements (villages)	dBA	Measurements	110	Tabora Municipal Council	8,000,000
Impact on Soil Structure/Topography	Cutting Speed & Depth	Monthly	Borrow Pits & Quarry Sites	Volume	Grid	N/A	Tabora Municipal Council	12,000,000.00

Parameters		Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility for monitoring	Annual costs estimates (TSH)
Water Quality	Turbidity	Once Per week during the dry season Every day during the rainy season	TUWASA and Boreholes	NTU	Spectrophotometer	<50	Tabora Municipal Council	9,000,000
Soil erosion	Soil erosion along the road	Once in three Months	Project road sites	Level of erosions	Site inspection	No erosion	Tabora Municipal Council	9,000,000
Vegetation	Biomass	Once in three months for the construction period	Vegetated area	-	Inspection	Clearance confined in CoI	Tabora Municipal Council	4,000,000

Parameters		Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility for monitoring	Annual costs estimates (TSH)
Biodiversity	Biodiversity	Once year	Vegetated area	type and number of living and organisms	Inspection	Clearance confined in CoI	Tabora Municipal Council	5,000,000
Vibration	Vibration levels	Once per Month	Project road sites	No per time	Records	No Vibrations	Tabora Municipal Council	9,000,000
Frequency of illness of construction workers	Illness of construction workers	Once a month for the construction period	Project sites	Number of cases	Health records	No Illness	Tabora Municipal Council	9,000,000
Employment opportunity	Percentage of local construction laborers	Three times a year	Project site	Number of local people employed	Records, inquiries, and observation	More than 6000 people have contracts	Tabora Municipal Council	6,000,000

Parameters		Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility for monitoring	Annual costs estimates (TSH)
				in the project				
Safety and health risks	Number and type of safety equipment such as mask, helmet gloves, and earplugs. Health and sanitation facilities in camps.	Once in three month	Project site	Number of safety measures provided	Actual injuries and illness statistics	All employees have Protective gears	Tabora Municipal Council	10,000,000
Dust Suppression	Water sprinkling	Everyday	Project site	Frequency of water sprinkling	Inquiries and observation	Minimum dust emission	Tabora Municipal Council	9,000,000
Operation stage								

Parameters		Monitoring frequency	Sampling Area	Measurement Units	Method	Target level/ Standard	Responsibility for monitoring	Annual costs estimates (TSH)
Air pollution	Dust	Once in three Months	Near settlements (villages)	μg/m^3	*Micro Dust Pro*	0.01	Tabora Municipal Council	8,000,000
Noise pollution	Noise level	Once in three Months	Near settlements (villages)	dBA	Measurements	110	Tabora Municipal Council	8,000,000
Safety of human beings in the sub-project area	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 accidents and a sufficient no of road signs	Tabora Municipal Council	8,000,000
Total monitoring costs								**144,000,000**

9.4 Institutional Arrangements and Reporting Procedures

PO-RALG, assisted by environment specialists, will be responsible for reviewing civil works contracts following the ESIA report; coordinating the implementation of the ESMP among the contractors, local environmental authorities (e.g., Municipal Councils, monitoring the implementation of the ESMP and the civil works contracts in collaboration with NEMC and Ministry of Works and Transport; and, preparing annual environmental progress reports.

The purpose of environmental and social monitoring is to quantitatively measure the environmental effects of the road sub-project. The environmental monitoring program will operate through the preconstruction, construction, and operation phases. It will consist of several activities, each with a specific purpose, key indicators, and significance criteria.

The monitoring of mitigation measures during design and construction will be carried out by an Environmental/Social Specialist. 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 TARURA and Municipal.

TARURA will provide the Ministry of Works and Transport and NEMC with reports on environmental compliance during implementation as part of their annual progress reports and annual environmental monitoring reports. Depending on the implementation status of environmentally sensitive areas of the project, NEMC will perform annual environmental reviews in which environmental concerns raised by the sub-project will be reviewed alongside project implementation.

The Contractor for sub-project will be required to report any environmental or social incidents to the (TARURA and Tabora Municipal council safeguard focal officer) through the project Engineer. The TARURA and Tabora Municipal Council Manager through the Project Engineer, will advise the contractor about appropriate mitigation measures and will direct the contractor to undertake these mitigation measures. If there are complaints from the public during the construction phase, the TARURA and Tabora Municipal Council Manager is to be notified immediately. The following information should be recorded by the Project Engineer/Consultant.

- Time, date and nature of the incident / report;

- Type of communication (e.g. telephone, personal meeting);
- Contact details with telephone number of person making the complaint. If this person wishes to remain anonymous then “not identified” is to be recorded;
- Details of response and investigation undertaken as a result of the incident / complaint;
- Name of person undertaking investigation of the incident / complaint;
- Corrective action taken as a result of the incident / complaint.

The Project Engineer/Consultant will prepare and submit weekly, monthly and quarterly monitoring reports to the TARURA and Tabora Municipal Council Manager

CHAPTER TEN

10.0 RESOURCES EVALUATION

10.1 Introduction

This economic analysis to test the viability for the rupgading of Swetu road 6.95Km, Kisarika road 5.2Km, Mailitano road 3.5Km and Kanyeye road 10.6Km during the time of this consultancy. The details of the analysis will be included in the Final Report (which will be prepared after the Detailed Design has been completed and all costs known). Normally economic analysis for road construction is done using the HDM-4 model, which is an analytical framework based on the concept of pavement life cycle analysis. The model analyses the sub-project road with different investment and maintenance options, taking into account the associated costs and benefits projected annually over the analysis period, to determine the economic and engineering viability of the project.

10.2 Factors causing road deterioration

Once a road is constructed and opened to traffic, its pavement deteriorates as a consequence of several factors, most notably:

- Traffic loading
- Environmental weathering
- Effect of inadequate drainage systems

The rate of pavement deterioration is directly affected by the standards of maintenance applied to repair defects on the pavement surface such as cracking, raveling, potholes, etc., or to preserve the structural integrity of the pavement (for example, surface treatments, overlays, etc.), thereby permitting the road to carry traffic following its design function. The overall long-term condition of road pavements directly depends on the maintenance or improvement standards applied to the road. When a maintenance standard is defined, it imposes a limit to the level of deterioration that pavement is permitted to attain. Consequently, in addition to the capital costs of road construction, the total costs that are incurred by road agencies will depend on the standards of maintenance and improvement applied to road networks.

The impacts of the road condition, as well the road design standards, on-road users are measured in terms of road user costs, and other social and environmental effects.

10.3 DEMAND ASSESSMENT (TRAFFIC STUDY)

The objective of the Demand Needs Assessment will be to identify and quantify the existing volume of users of the existing priority infrastructure earmarked for improvement in Tabora LGA. The exercise is primarily carried out for the study for a series of technical and engineering requirements. The input on demand will be used as a key input for the economic analysis for the purpose of establishing the justification of the proposed investments.

The general approach followed for undertaking the economic analysis exercise of the TACTIC project will be based on the "Cost-Benefit Analysis", i.e., considering all the "costs" of proposed interventions including mitigation activities, and the "benefits" attributable to the investments in different project components. The cost components of all the proposed interventions will be incorporated in the analysis in monetary terms. It is important to note that some of the benefits identified in the study will be qualitative in nature and will be suitably highlighted, but not considered in the estimates of the analysis

10.3.1 Traffic Demand Analysis

This section will review Traffic Data provided by Tanzania Rural and Urban Roads Agency (TARURA), which was collected during the first week of November in 2019. The review of the traffic data will specifically focus on Manual Classified Counts and will be confined to the road sub-projects sections in Tabora Municipality.

10.3.2 Vehicle Classification

The vehicle classification used in this study followed the latest classification used for HDM-4 analysis in Tanzania and synchronized with Tanzania Low Volume Roads Manual, 2016. The categorization was aimed at bringing out details of the traffic stream. This classification enables the determination of vehicle operating costs (VOCs) and other benefits of a typical spectrum of vehicle types currently using the TACTIC project roads. The Consultant has adopted the following vehicle categorization as shown below.

Table 10.1: Vehicle Classification

Class	Type	Axle	Description
A	Car	2	Passenger cars and taxis.
B	Pick-up/4-wheel drive	2	Pick-up, minibus, Land Rovers, Land
C	Small bus	2	<= 25 seats
D	Large bus/coach	2	> 25 seats
E	Light Goods Vehicle	2	<= 3.0 tones empty weight
F	Medium Goods Vehicle (MGV)	2	> 3.0 tones empty weight
G	Heavy Goods Vehicle (HGV)	3-4	> 3.0 tones empty weight
H	Very Heavy Goods Vehicle VHGV)	>=4	> 3.0 tones empty weight
I	2-axled trailer	2	Trailers towed by MGVs HGVs or VHGVs.
J	3-axled trailer	3	
K	4-axled trailer	4	
L	Tractor	2	
M	Motorcycles, motor cycle taxis		
N	Bicycles		
O	Other NMT		
P	Pedestrians		

Source: Tanzania Low Volume Roads Manual, 2016

The above classification consists of ten vehicle classes including the motorcycle and tractors/equipment class. The classification adopted in this study will aim at refining the benefit computations as dictated by HDM-4 requirements for estimating vehicle-operating costs (VOCs) for the wide array of vehicle types currently the existing TACTIC priority road projects.

10.3.3 Traffic Survey Period and Duration

The traffic count data availed to the Consultant by TARURA was collected during the first week of November 2019. The data for each road section was collected for a minimum of seven (7) days for a minimum duration of 12 hours for 5 days and 24 hours for 2 days. The data provided to the Consultant was for the following road sections:

- Kanyenye I (0.363km)

- Kanyenye II (0.146km)
- Swetu (3.391km)
- Maili Tano (1.132km)
- Kisarika (2.36km + 0.63km)

10.3.4 Average Daily Traffic

The consultant carried out a detailed review and analysis of the traffic data provided by TARURA. The data provided was linked to the above mentioned road sections. The Table below illustrates the ADT results for the Roads in Tabora Municipality obtained from the analysis of the traffic data obtained from TARURA.

Table 10.2: ADT for Road Sections in Tabora Town Council

Vehicle Type	Road Section ADT				
	Kanyenye I (0.363km)	Kanyenye II (0.146km)	Swetu (3.391km)	Maili Tano (1.132km)	Kisarika (2.36km + 0.63km)
Motorcycles	268	268	614	351	805
3 Wheelers (Bajaji)	17	17	38	42	72
Cars (Saloon + RAV4)	18	18	27	79	229
Pick Ups & Vans (All other 4WDs)	5	5	0	7	23
Small Buses (Under 25 Seats)	0	0	156	1	4
Large Buses (Over 25 Seats)	0	0	0	0	0
Small Lorries (Under 5 Tones)	0	0	0	0	0
Medium Lorries (Over 5 Tons)	0	0	1	1	0
Heavy Lorries (With 3-4 Axles)	0	0	0	0	0
Very Heavy Lorries	0	0	0	0	0
Other Vehicles (Tractors)	0	0	0	0	0
Total	**308**	**308**	**836**	**481**	**1,133**

Source: TARURA 2021

10.3.5 Application of Seasonal Variation Factors

The study applied seasonal variation factors generally caused by factors such as harvesting, rain and other commercial activities which tend to influence traffic significantly. The study employed the Seasonal Adjustment Factors (SAFs) from the TANROADS study- Consultancy Services to Carrying out Baseline Traffic Counts in Tanzania Mainland & Establishment of a Comprehensive Traffic Census Methodology. The SAF was used to convert ADT to AADT in the road sections in Tabora Town Council.

Table 10.3: Seasonal Adjustment Factors

Region	Town	Light Passenger Vehicle	Heavy Passenger Vehicle	Goods Vehicle	NMT
Tabora	Urambo	1.00	1.01	1.03	1.01

Source: TANROADS 2009

This study employed the Month Wise Traffic Adjustment Factors for the towns in the respective Regions covered by the Town Councils from the Baseline Traffic Count Study to convert short-term traffic count ADT to AADT.

10.3.6 Annual Average Daily Traffic

The seasonal adjustment factors as worked out in the Table above were applied to the ADT data for the Traffic Census results to derive the Annual Average Daily Traffic (AADT). Summary results of the AADT along each particular road section in Tabora is shown in the Table below.

Table 10.4: Annual Average Daily Traffic for the TACTIC Roads in Tabora Municipal

Vehicle Type	Road Section ADT				
	Kanyenye I (0.363km)	Kanyenye II (0.146km)	Swetu (3.391km)	Maili Tano (1.132km)	Kisarika (2.36km + 0.63km)
Motorcycles	269	269	617	352	808
3 Wheelers (Bajaji)	17	17	38	42	72
Cars (Saloon + RAV4)	18	18	27	79	230
Pick Ups & Vans (All other 4WDs)	5	5	0	7	23

Vehicle Type	Road Section ADT				
	Kanyenye I (0.363km)	Kanyenye II (0.146km)	Swetu (3.391km)	Maili Tano (1.132km)	Kisarika (2.36km + 0.63km)
Small Buses (Under 25 Seats)	0	0	158	1	4
Large Buses (Over 25 Seats)	0	0	0	0	0
Small Lorries (Under 5 Tones)	0	0	0	0	0
Medium Lorries (Over 5 Tons)	0	0	1	1	0
Heavy Lorries (With 3-4 Axles)	0	0	0	0	0
Very Heavy Lorries	0	0	0	0	0
Other Vehicles (Tractors)	0	0	0	0	0
Total	**309**	**309**	**841**	**483**	**1,138**

(Source: Consultant 2022)

Note:

- The AADT provided for the roads in Tabora Town Council will be projected to Year 2022, which will be the Base Year of the study.
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10.3.7 Traffic Development Analysis

The key ingredients for traffic forecasting include Normal Traffic, Generated Traffic and Diverted Traffic. The above forms of traffic apart from normal traffic are mainly considered in the with project option. Normal traffic is considered in without and with project options. The economic analysis for the project roads in Tabora Town Council will be based on projected traffic.

The traffic growth factors applied on normal traffic, generated traffic, and diverted traffic will form part of future traffic assessment and will be crucial for estimating benefits of the proposed TACTIC road projects in Tabora Municipality.

10.3.7.1 Normal Traffic

This comprises traffic that is currently using the Tabora Municipality Roads in the Without Project Case (WoP) and which will continue to use the road after improvement of the Roads under the TACTIC project. Essentially, this traffic is also referred to as the Base Year (2022) Traffic that has been adjusted for daily, weekly, and monthly variations. Table 10.4 shows the Normal Traffic Surveyed in 2019 along the project roads in Tabora Town Council.

10.3.7.2 Generated Traffic

This is traffic generated as a result of a reduction in overall transport costs as a response to the provision or improvement of a road transport infrastructure or improvement in traffic flow. This type of traffic usually is not present in the Without Project Case (WoP) and only appears after improvement of a road section or improving traffic flow in the with Project Case (WP).

The improvement of the project roads in Arusha Tabora Council will contribute towards the improvement of Arusha Town Council Roads under TACTIC Project. This will trigger more motorists to use the project roads as a result of an improvement in traffic flow and reduction in roughness.

The reduction in travel time as a result of an improvement in traffic flow will stimulate additional trips. Where road users made two trips per day for shopping/market purposes, they may undertake one additional trip per day or make more frequent private visits more frequently from two to three times per week or two to 3 times per day as the case may be.

Generated traffic along the project roads in Tabora Municipal council will mainly arise from the following:

- Improved traffic flow along the project road and junctions, which would entice travellers to use the project routes. Improved traffic flow will make driving relatively more attractive.
- Destination change as a result of improved access on the project roads and junctions would stimulate land use changes and lead to urban fringe development; and
- Improvement in traffic flow along the project roads in Tabora Town Council would lead to an increase in vehicle ownership as well as an increase in public transport services for the low-income segment of the population.

In order to estimate generated traffic, some minimum level of normal traffic which forms the basis from which to estimate generated traffic trips or additional trips must be present. If there is very little normal traffic, then estimating generated traffic can be problematic and inaccurate. Given that the roads in Tabora Town Council have a well-established flow of normal traffic, changes in transport costs will definitely influence the growth of generated traffic.

For the case of the TACTIC Project, generated traffic will mainly result from an increase in the number of trips as a result of the improvement of traffic flow in Tabora Town Council which will lead to reduced transportation costs. Given the urban nature of the project, Tabora Town Council residents will be able to access different parts of the City, such as shopping malls, primary and secondary markets, schools, industries, hospitals, government offices, sports centres, and cultural sites in the with Project Case.

According to Hymel, Small and Van Dender (2010)[1], improvement in City wide road densities increases Vehicle Miles Travelled (VMT) by 1.9% to 9.3% in the long run. For TACTIC project, a higher generated traffic factor would cause a significant increase in vehicle growth in the short run, which eventually would decline when the roads reach capacity and become congested and saturated in the long run.

Trip generation factors are supported by the principle that generated traffic is generally minimal for small road improvement projects with an already developed transport system but large for major road improvement projects or new road construction projects, which allow access to hitherto undeveloped areas (Todd Litman, 20132). The Table below shows the Generated Traffic Factors by vehicle type adopted for the TACTIC study for the roads in Tabora Municipality.

[1] Hymel, Kent & Small, Kenneth & Van Dender, Kurt. (2010). Induced demand and rebound effects in road transport. Transportation Research Part B: Methodological. 44. 1220-1241. 10.1016/j.trb.2010.02.007.

[2] Todd Litman (2013), Transport Elasticities: Impacts on Travel Behaviour: Understanding Transport Demand To Support Sustainable Travel Behavior, Technical Document #11, Sustainable Urban Transport Project (www.sutp.org) and GIZ (www.giz.de); at www.sutp.org/index.php/en-dn-tp.

Table 10-5: Generated Traffic Trip Factors

Vehicle Type	Generated Traffic Factor
Motorcycle	5.0%
Small Car	5.0%
Pick-up/4-Wheel Drive	2.5%
Small Bus	3.0%
Large Bus/Coach	3.0%
Light Goods Vehicle	2.5%
Medium Goods Vehicle (MGV)	2.5%
Heavy Goods Vehicle (HGV)	2.5%
Very Heavy Goods Vehicle VHGV)	2.5%

It is assumed that the trip generation factors in the WP case will apply only once-and-for-all during the first year of operation in 2026.

- Private Cars (Standard Cars/Sedan & Station Wagons) will have the greatest increase. These vehicles are used considerably for short trips along the project road for private purposes, such as shopping, government business, and work trips, among others. This category of traffic will benefit to the greatest extent from the road improvement so that the number of trips they make will increase by 5%.
- Public Transport Vehicles (Small Bus and Large Bus) are mainly used for transporting passengers. These vehicles are managed on a schedule and operate on established routes within Tabora Municipality. Given the expected population increase in Tabora Municipality, demand for public transport on various routes will also increase. Therefore, the study assumed a 3% trip factor for public transport vehicles along the project road routes.
- Commercial Vehicles {Pick-up, LGV (2 Axles), MGV (2 Axles), HGV (3-4 Axles) & Articulated Truck (>4 Axles)} are mainly used to transport bulky goods within Addis Ababa. Some of the goods transported in the City by Commercial Vehicles include construction materials, consumer retail products, consumer durable products, petroleum oil and garbage, among others. This category of traffic is mainly restricted

to daylight operation thus having a curtailed demand. Therefore, the study assumed atrip generation factor of 2.5% for commercial vehicles as a result of improvement of the project road.

The trip generation factors will only occur in the with Project Case and will only apply once during the first year of operation (2026). The trip generating factors shown in the Table above will be applied to the normal traffic volume in year 2025 to derive generated traffic volume.

10.3.7.3 Diverted Traffic

The traffic currently observed on several roads in the network of Tabora Municipality could be stated as the traffic moving under without project situation. But, after having improved the project roads in Tabora Town Council under the TACTIC project, some of the traffic would be diverted to these roads due to availability of a better road system resulting in savings in VOC, travel time, comfort, etc., which is termed as the traffic in the with project situation. Such traffic is known as diverted traffic.

For the purpose of this study, diverted traffic was not considered as a realistic proposition. Benefits of diverted traffic accrue from the difference in costs between the current existing route and the alternative route. The TACTIC project will mainly focus on improving four roads within Tabora Town Council. The other road network in Tabora Town Council will continue to complement the project roads when traffic saturates. This will see traffic reassigned to other routes so as to enhance the level of service within the project road corridors.

10.4 FORECAST AND PROJECTION

Overview

Having carried out the demand assessment for the prevailing traffic and market, this section will assess the level of future demand for the proposed facilities. This section, among others, aims at establishing the forecast model, which would be the basis for working out the growth rates for the market and traffic under different economic development considerations. The outcomes of the forecast and projection will form a basis for the design of the project roads, design of the bus stand and design of Tabora CBD market all located in Tabora Municipality. This information will be crucial for undertaking the economic analysis for the proposed projects.

10.4.1 Traffic Forecasting

For estimating the future traffic on the project roads, the Consultant worked out the traffic growth rates for different passenger and freight carrying vehicles, and also for different time periods in years to come. Major factors that influence traffic demand in cities, such as Tabora in Tanzania are listed as follows:

- Changes in Demography: City population growth, natural and migration from different regions including rural areas.
- Changes in City Land Use: Due to continued increase in activities, viz. commercial, government & private offices, residential, schools & colleges, medical & hospital facilities, open areas, recreational (stadiums, theatres, auditoriums, amusement parks, tourist attractions, etc.), manufacturing units (small /medium/ large), warehouses & storages, shopping malls, traditional wholesale & area markets, improvement in transport infrastructure including airport, city expansion plan, etc.
- Dynamics of Macro-Economic Performance Indicators.
- City's Socio-economic Performance Indicators.
- Presence of efficient transport infrastructure leading to generated and the induced traffic in future on account of reduced vehicle operating cost and savings in travel time.
- Traffic capacity constraints and lack of transport infrastructure and plans; and

- Availability of alternative transport modes for sharing traffic loads rationally, as per their availability and efficiency.

The above-mentioned major factors are responsible for changes in traffic demand in any city. It may be noted that traffic demand analysis refers to the movement pattern of different transport modes between different pairs of points, which mainly depends on the travel distance, time taken and cost of travel by any specific mode. It also depends on the purpose and socio-economic status of the different transport mode users. A brief note on the above issues is given in Chapter 5: Economic Development Perspective of Tanzania.

10.4.2 Changes in Demography of Tabora Region

According to the NBS, the population of Tabora Region in 2012 was approximately 2.291 million and it was projected to increase to 3.019 million in 2021, 3.924 million in 2030, 5.172 million in 2040 and 6.817 million in 2050. The population growth of Tabora Municipality was estimated to increase from 226,999 in 2012 to 299,070 in 2021, 388,705 in 2030, 512,332 in 2040 and 675,278 in 2050. The increasing urbanization and concentration of socio-economic activities in Tabora Municipality would lead to further migration of persons from the rural areas to the City in years to come.

Table 10.6: Tabora Region & Tabora Municipality Population Growth

Item	2012	2021	2030	2040	2050
Tabora Region	2,291,623	3,019,202	3,924,098	5,172,148	6,817,138
Tabora Municipality	226,999	299,070	388,705	512,332	675,278

Source: NBS & Consultants Estimates

The study applied the national population growth rates for Tanzania Mainland to Tabora Region and Tabora Municipal population. The growth rate adopted was a gradual declining rate divided into four periods as shown below:

- Period 1: 2012-2021: 3.1%
- Period 2: 2022-2026: 3.0%
- Period 3: 2027-2030: 2.9%
- Period 4: 2031: 2.8%

10.4.3 Changes in Land Use

It is important to note that the traffic problems in the city are due to the existing land use and the available transportation system. Any changes in land use in the city or any parts of the city would either further increase the traffic problem or reduce it depending on the purpose of interventions. In brief, existing land use and planned land use would have an influence on the transport demand resulting in higher level of traffic. Therefore, transport planning and land use planning should ideally go hand in hand, rather complimenting each other to avoid any unexpected transport and movement problems.

10.4.4 GDP Growth Rate in Tanzania

The GDP is one of the most important indicators of economic growth, therefore the performance of GDP has been considered as an important indicator influencing the transport demand in the analysis. For obvious reasons, growing income in an economy would also result in an increase in demand for transportation of goods and services, and improvement in modes of transport. Considering the above concept, the Consultant collected the GDP data with growth rates in previous years to appreciate the dynamics of Tanzania economy, and its likely performance in future. The figures presented in the Table below refer to the trend of annual real GDP growth.

Table 10.6: Annual GDP Growth Rate in Tanzania

Year	Real GDP Growth (%)
2015	6.2
2016	6.9
2017	6.8
2018	7.0
2019	7.0
2020	4.8

Source: NBS 2021

As shown in the Table above, Real GDP for Tanzania contracted to 4.8% in 2020 from 7.0% in 2019. This contraction was mainly attributed to the global COVID-19 pandemic which ravaged the world economies in 2020.

NOTE: It is difficult to predict the economic effect of COVID in the long run. Growth estimates are being revised on a monthly basis and normalcy will return to economies upon successful containment of the virus.

10.4.5 Growth Methodology

The basis of the scenario was from the declared intention of Tanzania Vision 2025, which aims at achieving a growth rate of 8.0% per annum or more by the year 2025.

- The population growth rate for Tabora Region and Tabora Municipality was estimated to average 2.8% from 2022-2050.
- Recent GDP growth rates from 2014 show that the growth trend has averaged 6.5% per annum.

Therefore, the Consultant derived the expected growth rates from the moving averages of the two growth scenarios (Population and GDP) described above.

Considering the above methodology, the consultant adopted a Growth Rate of 4.7% which was well within the targeted GDP growth rate of the Tanzania Vision 2025. This estimate was slightly within the range of the 2020 GDP growth rate of 4.8%.

The above growth forecast considers the probable negative shocks likely to be experienced from COVID-19 Global Pandemic, which has severely affected the entire globe since 2020. It should be noted that this growth is an estimate and actual growth may differ and will mainly depend on the successful containment of COVID-19 Global Pandemic.

10.4.6 Growth Forecasts

The hypothesized growth rate adopted was not uniform and constant throughout the analysis period, but was observed to change over time. The growth forecasts incorporated short-term effects of COVID-19 pandemic by showing slow growth during the initial period and higher growth estimates in the long-run to signal economic recovery.

Considering a 20-year analysis period for the project road, the study developed a three-period growth profiles as shown below:

- Growth Period I: 2022 – 2024
- Growth Period II: 2025 – 2034 (20[3]% Higher than that of Period I)
- Growth Period III: 2035 Onwards (10[4]% Higher than that of Period II)

These periods were maintained for both Low[5] and High[6] growth scenarios. The growth rates that were estimated were assigned to the Medium Growth scenario (Most Likely Scenario). The table below illustrates the derived growth rates under the different growth scenarios from the various growth parameters.

Table 10.6: Growth Forecasts and Scenarios

Period	Years	LOW	MED	HIGH
Period I	2022-2024	3.8%	4.7%	5.6%
Period II	2025-2034	4.5%	5.6%	6.8%
Period III	2035 Onwards	5.0%	6.2%	7.4%

Source: Consultant Estimates

10.4.7 Vehicle Elasticity with Respect to GDP

Different vehicles categories respond differently to growth in incomes and GDP. Past empirical studies have shown that transport sector performance tends to be higher than GDP performance. The responsiveness of vehicle use to GDP is also known as Growth Elasticity with respect to GDP. The elasticity values of the transport sub-sector with respect to GDP as detailed in the report on Baseline Traffic Counts in Tanzania Mainland and establishment of a Comprehensive Traffic Census Methodology for TANROADS (2009) was applied in this analysis. The result was slightly modified by adopting an elasticity of 0.9 for public transport vehicles. This is because Demand for public transport generally has negative income elasticity. That is an increase in incomes leads to lowering of demand for public transport use. As incomes rise, time used in travel becomes more expensive. A more expensive good is always substituted. Travelers will tend to economize on bus travel and opt for faster transport modes. The Table below shows the adopted vehicle elasticity values with respect to GDP.

[3] Economic recovery factor.
[4] Economic stabilization factor
[5] Low Growth is 20% lower Medium Growth Scenario
[6] High Growth is 20% higher Medium Growth Scenario

Table 10.7: Adopted Vehicle Elasticity Values With Respect to GDP

Vehicle	Passenger Carrying	Freight Carrying	Public Transport Vehicles (Adopted)
2010-2015	1.2	0.9	
2015-2020	1.1	1	
Beyond 2020	1.1	1	0.9

Source: TANROADS 2009 & Consultant 2021

10.4.8 Adopted Traffic Growth Rates for the Study

The proposed elasticity values for transport sub-sector with respect to GDP were associated with the three-growth rate scenarios (Low, Medium and High) previously described to obtain corresponding traffic growth rate scenarios by vehicle type. The Table below shows the summary of the three growth scenarios (Low, Medium and High). In each scenario, the three growth periods were well illustrated as well as the different vehicle categories.

Table 10.8: Traffic Growth Rates: Low-Medium & High Growth Scenarios

LOW	TACTIC Zone 1 Project	Motorcycles	3 Wheelers (Bajaji + Toyo)	Cars (Saloon + RAV4 + Escudo)	Pick Ups & Vans (All other 4WDs + Noah+carry)	Small Buses (Under 25 Seats +Coaster+DCM+Hiace)	Large Buses (Over 25 Seats + Fuso Buses)	Small Lorries (Under 5 Tones)	Medium Lorries (Over 5 Tons + Fuso)	Heavy Lorries (With 3-4 Axles)	Very Heavy Lorries (Semi Trailer & Lorries with Trailers)
	2022-2024	4.20	4.20	4.20	3.80	4.20	4.20	3.80	3.80	3.80	3.80
	2025-2034	5.00	5.00	5.00	4.50	5.00	5.00	4.50	4.50	4.50	4.50
	2035 Onwards	5.50	5.50	5.50	5.00	5.50	5.50	5.00	5.00	5.00	5.00
MEDIUM	TACTIC Zone 1 Project	Motorcycles	3 Wheelers (Bajaji + Toyo)	Cars (Saloon + RAV4 + Escudo)	Pick Ups & Vans (All other 4WDs + Noah+carry)	Small Buses (Under 25 Seats +Coaster+DCM+Hiace)	Large Buses (Over 25 Seats + Fuso Buses)	Small Lorries (Under 5 Tones)	Medium Lorries (Over 5 Tons + Fuso)	Heavy Lorries (With 3-4 Axles)	Very Heavy Lorries (Semi Trailer & Lorries with Trailers)
	2022-2024	5.20	5.20	5.20	4.70	5.20	5.20	4.70	4.70	4.70	4.70
	2025-2034	6.20	6.20	6.20	5.60	6.20	6.20	5.60	5.60	5.60	5.60
	2035 Onwards	6.90	6.90	6.90	6.20	6.90	6.90	6.20	6.20	6.20	6.20
HIGH	TACTIC Zone 1 Project	Motorcycles	3 Wheelers (Bajaji + Toyo)	Cars (Saloon + RAV4 + Escudo)	Pick Ups & Vans (All other 4WDs + Noah+carry)	Small Buses (Under 25 Seats +Coaster+DCM+Hiace)	Large Buses (Over 25 Seats + Fuso Buses)	Small Lorries (Under 5 Tones)	Medium Lorries (Over 5 Tons + Fuso)	Heavy Lorries (With 3-4 Axles)	Very Heavy Lorries (Semi Trailer & Lorries with Trailers)
	2022-2024	6.20	6.20	6.20	5.60	6.20	6.20	5.60	5.60	5.60	5.60
	2025-2034	7.50	7.50	6.80	6.80	7.50	7.50	6.80	6.80	6.80	6.80
	2035 Onwards	8.20	8.20	7.40	7.40	8.20	8.20	7.40	7.40	7.40	7.40

Source: Consultant

10.4.9 Traffic Forecast by Road Section

The project road Sections have been presented in Table 4-5. The traffic observed on each road section was forecasted for a minimum period of 25 years to establish the future demand, which will likely utilize the road sections. The forecast was carried out taking into consideration the following key assumptions.

Table 10.9: Key Forecasting Assumptions

No	Item Description	Assumption
001	TACTIC Road Project-Zone 1: Tabora Implementation Schedule	Design Year 1: 2022
		Tendering: 2023
		Construction Year 1: 2024
		Construction Year 2 +DLP Phase: 2025
		Project Opening Year: 2026

Source: Consultant

From the Table above, it was assumed that most of the project roads in the project area of influence would be constructed and opened to traffic by 2026. The projected AADT traffic forecasts for the different types of vehicles and road sections are shown in the tables below.

Table 10.10: Kanyenye I (0.363km) Road Traffic Forecast

Period	Year	Motorcycles	3 Wheelers (Bajaji)	Cars (Saloon + RAV4)	Pick Ups & Vans (All other 4WDs)	Small Buses (Under 25 Seats)	Large Buses (Over 25 Seats)	Small Lorries (Under 5 Tones)	Medium Lorries (Over 5 Tons)	Heavy Lorries (With 3-4 Axles)	Very Heavy Lorries	Other Vehicles (Tractors)	TOTAL MCs only	TOTAL
Base Year	2022	298	19	20	6	0	0	0	0	0	0	44	298	342
1st Year	2026	390	25	26	7	0	0	0	0	0	0	57	390	448
5 Year	2031	527	33	35	9	0	0	0	0	0	0	77	527	605
10 Year	2035	680	43	45	11	0	0	0	0	0	0	99	680	779
15 Year	2041	1014	64	67	16	0	0	0	0	0	0	147	1,014	1,162
20 Year	2045	1324	83	88	21	0	0	0	0	0	0	192	1,324	1,516
25 Year	2050	1,849	116	123	28	0	0	0	0	0	0	267	1,849	2,116
30 Year	2055	2,581	162	172	38	0	0	0	0	0	1	373	2,581	2,954

Source: Consultants Estimates

Table 10.11: Kanyenye II (0.146km) Road Traffic Forecasts

Period	Year	Motorcycles	3 Wheelers (Bajaji)	Cars (Saloon + RAV4)	Pick Ups & Vans (All other 4WDs)	Small Buses (Under 25 Seats)	Large Buses (Over 25 Seats)	Small Lorries (Under 5 Tones)	Medium Lorries (Over 5 Tons)	Heavy Lorries (With 3-4 Axles)	Very Heavy Lorries	Other Vehicles (Tractors)	TOTAL MCs only	TOTAL
Base Year	2022	298	19	20	6	0	0	0	0	0	0	44	298	342
1st Year	2026	390	25	26	7	0	0	0	0	0	0	57	390	448
5 Year	2031	527	33	35	9	0	0	0	0	0	0	77	527	605
10 Year	2035	680	43	45	11	0	0	0	0	0	0	99	680	779
15 Year	2041	1014	64	67	16	0	0	0	0	0	0	147	1,014	1,162
20 Year	2045	1324	83	88	21	0	0	0	0	0	0	192	1,324	1,516
25 Year	2050	1,849	116	123	28	0	0	0	0	0	0	267	1,849	2,116
30 Year	2055	2,581	162	172	38	0	0	0	0	0	1	373	2,581	2,954

Source: Consultants Estimates

Table 10.12: Swetu (3.391km) Road Traffic Forecasts

Period	Year	Motorcycles	3 Wheelers (Bajaji)	Cars (Saloon + RAV4)	Pick Ups & Vans (All other 4WDs)	Small Buses (Under 25 Seats)	Large Buses (Over 25 Seats)	Small Lorries (Under 5 Tones)	Medium Lorries (Over 5 Tons)	Heavy Lorries (With 3-4 Axles)	Very Heavy Lorries	Other Vehicles (Tractors)	TOTAL MCs only	TOTAL
Base Year	2022	682	42	30	0	175	0	0	1	0	0	248	682	931
1st Year	2026	894	55	39	0	223	0	0	1	0	0	318	894	1,212
5 Year	2031	1,208	74	53	0	301	0	0	2	0	0	430	1,208	1,638
10 Year	2035	1,557	95	68	0	388	0	0	2	0	0	554	1,557	2,111
15 Year	2041	2324	142	101	0	579	0	0	3	0	0	826	2,324	3,150
20 Year	2045	3034	186	132	0	757	0	0	4	0	0	1,079	3,034	4,114
25 Year	2050	4,236	260	185	0	1,056	0	0	6	0	0	1,506	4,236	5,742
30 Year	2055	5,914	363	258	0	1,475	0	0	8	0	1	2,104	5,914	8,017

Source: Consultants Estimates

Table 10.13: Maili Tano (3.2km) Road Traffic Forecast

Period	Year	Motorcycles	3 Wheelers (Bajaji)	Cars (Saloon + RAV4)	Pick Ups & Vans (All other 4WDs)	Small Buses (Under 25 Seats)	Large Buses (Over 25 Seats)	Small Lorries (Under 5 Tones)	Medium Lorries (Over 5 Tons)	Heavy Lorries (With 3-4 Axles)	Very Heavy Lorries	Other Vehicles (Tractors)	TOTAL MCs only	TOTAL
Base Year	2022	390	47	88	8	1	0	0	1	0	0	144	390	534
1st Year	2026	511	61	114	10	1	0	0	1	0	0	187	511	698
5 Year	2031	691	82	154	13	2	0	0	2	0	0	252	691	943
10 Year	2035	890	106	198	16	2	0	0	2	0	0	325	890	1,215
15 Year	2041	1328	157	296	23	4	0	0	3	0	0	483	1,328	1,812
20 Year	2045	1735	206	387	29	5	0	0	4	0	0	630	1,735	2,365
25 Year	2050	2,422	287	540	39	7	0	0	6	0	0	878	2,422	3,300
30 Year	2055	3,381	401	754	53	9	0	0	8	0	1	1,225	3,381	4,606

Source: Consultants Estimates

Table 10.14: Kisarika (2.36km + 0.63+3.6km) Road Traffic Forecast

Period	Year	Motorcycles	3 Wheelers (Bajaji)	Cars (Saloon + RAV4)	Pick Ups & Vans (All other 4WDs)	Small Buses (Under 25 Seats)	Large Buses (Over 25 Seats)	Small Lorries (Under 5 Tones)	Medium Lorries (Over 5 Tons)	Heavy Lorries (With 3-4 Axles)	Very Heavy Lorries	Other Vehicles (Tractors)	TOTAL MCs only	TOTAL
Base Year	2022	895	80	254	25	4	0	0	0	0	0	364	895	1,259
1st Year	2026	1,172	104	330	31	6	0	0	0	0	0	471	1,172	1,644
5 Year	2031	1,584	140	446	41	8	0	0	0	0	0	636	1,584	2,220
10 Year	2035	2,041	181	575	52	10	0	0	0	0	0	818	2,041	2,859
15 Year	2041	3046	270	858	75	15	0	0	0	0	0	1,218	3,046	4,264
20 Year	2045	3978	352	1121	95	19	0	0	0	0	0	1,588	3,978	5,566
25 Year	2050	5,554	492	1,565	128	27	0	0	0	0	0	2,212	5,554	7,766
30 Year	2055	7,753	687	2,185	173	38	0	0	0	0	1	3,084	7,753	10,837

Source: Consultants Estimates

CHAPTER ELEVEN

11.0 DECOMMISSIONING

11.1 Decommissioning

As decommissioning is not foreseen to take place in the remote future for the road sub-project, the specific conditions for mitigation are generally inherently uncertain. Because of this, specific mitigation measures about the environmental impacts of decommissioning of the roads sub-project can not be proposed at the moment with a reasonable degree of certainty.

A detailed decommissioning plan that considers environmental issues shall be prepared by the developer before the decommissioning works. Should it be done, decommissioning may entail a change of use (functional changes) or demolition triggered by the change of land use. Therefore what is presented here is just a Preliminary Decommissioning Plan which gives light to what shall be done if the need for decommissioning arises.

11.2 Preliminary Decommissioning Plan

This section provides a brief outline of the works required to demolish the Proposed infrastructures on the site in case it happens. This Plan will be used as a reference document that provides the framework to ensure that demolition activities on the site do not adversely affect the health, safety, traffic, or the environment of the public and neighboring properties.

The Contractor will be required to prepare a detailed Demolition Plan and Construction Management Plan to the satisfaction of the Proponent and relevant Authorities before the commencement of works on site.

11.2.1 Demolition Methods

It is anticipated that the Contractor will prepare a detailed Demolition Plan before the commencement of work on-site, however, the indicative demolition methodology will be as follows:

- The strip out and removal of non-structural elements will be undertaken utilizing manual labor and small plant including – bobcats, 3-5t excavators, and dingo-type loaders.
- The materials will be removed from the site using small to medium-sized trucks.
- The structures will be demolished using larger plants and equipment including 15-40t hydraulic excavators. These machines will be equipped with rock breakers, pulverizers, and the like which would be used sequentially.
- During the demolition process erosion control measures will be established. These will include the treatment of dust and potential discharge into stormwater systems.

11.2.2 Materials Handling

Materials handling will be by a mechanical plant (including excavators and bobcats) loaded into trucks (bogie tippers and semi-trailers). The debris will be carted offsite to an approved waste facility or recycling center.

The contractor shall submit a Demolition Waste Management Plan to Tabora Municipal Council depending on the building structure and roads sections, such plan should outline the objectives of:

- maximization, reuse, and recycling of demolition material
- minimization of waste disposal
- evidence of implementation for specified arrangements of waste management

On-site storage of reusable materials will occur at the Site. Recycling and disposal containers will also be accommodated at this location for collection vehicles. Hazardous materials will be treated separately. A hazardous materials inspection will be undertaken by an accredited consultant and a report issued. Hazardous materials will be removed following EMA 2004. A final clearance report will be provided by the hygienist which will include the provision of tip dockets from waste centers.

11.2.3 Proposed Sequence

The Contractor will be required to prepare the following documentation before the commencement of demolition and/or excavation works:

- Dilapidation Survey
- Construction Waste Management Plan
- Demolition Management Plan

11.2.4 Protective Measures

An A-Class hoarding will be erected around the perimeter of the construction site before the commencement of demolition works. Additionally, wherever the risk arises of material falling into public areas, overhead protection will be provided in the form of a B Class hoarding. Scaffolding will be erected to facades where materials could fall more than 4m. The scaffolding will be clad with chain wire and shade cloth to enclose debris and dust onto the site. During the demolition, dust control measures will be used to minimize the spread of dust from the site. The Contractor will have a senior representative on-site at all times to ensure compliance with the safety guidelines and agreed-on work methods.

11.2.5 Traffic Management

The management of construction traffic during the decommissioning phase will be subject to the provision of a detailed traffic management plan. This plan will be prepared by the Contractor for the various stages of demolition. During demolition, all traffic will be held within the site boundaries. The site will remain closed to pedestrian traffic and will be generally manned by security.

11.2.6 Occupational Health and Safety

A detailed OH&S Policy will be provided by the Contractor before work commencement. A detailed Site Safety Plan will be prepared for the specific project.

11.2.7 Environmental Management Plan

A detailed Environmental Management Plan will be provided by the Contractor before the commencement of the work.

11.2.8 Potential Impacts and Mitigation Measures

Dust and Noise Pollution

The demolition activities for the remained part (foundation structure) shall be accompanied by the emission of a lot of specks of dust since the demolition works are expected to be carried out by conventional method using mechanical breakers and jackhammers. However, alternative methods of demolition including explosive techniques can be used.

Mitigation Measures

- Water sprinkling shall be applied to open the earth to reduce dust emission.
- Trucks transporting construction materials shall be covered if the load is dry and prone to dust emissions.
- The demolition area shall be fenced by iron sheets; this will prevent the dust on the ground to be picked up by the wind.
- Community notification shall be undertaken where appropriate where work is likely to cause dust impact on the public and nearby residents.
- Sound construction equipment, with noise sinks, shall be used
- Machine operators in various sections with significant noise levels shall be provided with noise protective gear.
- Construction equipment shall be selected, operated, and maintained to minimize noise.

Increased Waste

A lot of demolition waste is expected as a result of the demolition of these blocks. These shall include blocks, concrete, reinforcements, pipes, fixtures, storm waste drains, etc. Most of the block materials shall be salvaged and recycled.

Mitigation Measures

- All materials which can be reused shall be reused
- Materials that cannot be reused shall be sent to an authorized dumpsite

11.2.9 Costs for Undertaking the Mitigation Measures

The cost for undertaking Mitigation measures during decommissioning is estimated to be TShs 50,000,000/=

CHAPTER TWELVE

12.0 SUMMARY AND CONCLUSION

The Government of the United Republic of Tanzania through the President's Office – Regional Administration and Local Development (PO-RALG) undertake consultancy services for feasibility studies, urban design, detailed engineering designs, environmental and social instruments, and bidding documents for a pipeline of investments in Tabora Municipal Council for the proposed upgrading of Swetu road 6.95Km, Kisarika road 5.2Km, Mailitano road 3.5Km and Kanyeye road 10.6Km. The President's Office – Regional Administration and Local Development (PO-RALG) have retained Crown-TECH Consult Ltd and in turn, CrownTech Consult Limited has sub-consulted WESH Consulting Limited to carry out Environmental & Social Impact Assessment. Improvement of infrastructure is part of the Government's strategy to develop its road network to support the Socio-Economic development of the country.

The sub-projects infrastructures involved include; upgrading of Swetu road 6.95Km, Kisarika road 5.2Km, Mailitano road 3.5Km and Kanyeye road 10.6Km.

The upgrading of Swetu road 6.95Km, Kisarika road 5.2Km, Mailitano road 3.5Km and Kanyeye road 10.6Km will improve easy transportation within Tabora Municipal and consequently stimulate the growth of the town.

This ESIA study runs parallel with the preliminary design work. In broad terms of upgrading of Swetu road 6.95Km, Kisarika road 5.2Km, Mailitano road 3.5Km and Kanyeye road 10.6Km will involve a combination of overlaying the existing road, partial reconstruction, and/or total reconstruction of road sections as necessary. Moreover, the rehabilitation and/or replacement of existing drainage structures and the construction of new, additional drainage structures are also important features of the proposed works.

The options to minimize or prevent the identified adverse social and environmental impacts as well as a monitoring plan have been suggested in this report and are contained in the ESMP. Many of them 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 the roles and responsibilities of different actors of the plan. The Approach environmental and social costs amount to TSH 50,000,000 (Excluding the costs that will appear in then (BOQ) and resettlement exercise. The estimated annual costs for carrying out the proposed environmental and social motoring program amounts to TSH 144,000,000.

Decommissioning has not been anticipated in the foreseeable future for the roads sub-project. However, it may entail a change of use (functional changes) or demolition triggered by a change of land use.

It is, therefore, concluded that implementation of the upgrading of Swetu road 6.95Km, Kisarika road 5.2Km, Mailitano road 3.5Km and Kanyeye road 10.6Km will entail no detrimental impacts provided that the recommended mitigation measures are adequately and timely put in place. The identified adverse impacts shall be managed through the proposed mitigation measures and implementation regime laid down in this EIS. PO-RALG is committed to implementing all the recommendations given in the EIS and further carrying out the environmental auditing and monitoring schedules.

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APPENDICES

Appendix I: ToR Approved Letter

THE UNITED REPUBLIC OF TANZANIA

VICE PRESIDENT'S OFFICE
UNION AND ENVIRONMENT

NATIONAL ENVIRONMENT MANAGEMENT COUNCIL
(NEMC)

In reply please quote:
Ref: **EC/EIA/2022/8106** Date: **07/06/2022**

MunicipalExecutive Director,
Tabora Municipal Council,
P.O. Box 174,
Tabora.

RE: **SCOPING REPORT AND TERMS OF REFERENCE FOR THE PROPOSED UPGRADING OF SWETU ROAD 6.95KM, KISARIKA ROAD 5.2KM, MAILITANO ROAD 3.5KM AND KANYEYE ROAD 10.6KM LOCATED IN TABORA MUNICIPAL COUNCIL, TABORA REGION**

Reference is made to the above heading

2. The Council acknowledges receipt of your Scoping report amd Terms of Reference for the above mentioned project submitted on 31st March 2022. The project has been registered and assigned with **Application Reference No. EC/EIA/2022/8106.**

3. With regard, to the above, the Terms of Reference were reviewed and found generally to be adequate and therefore can guide the EIA study of the named project. Also you will be required to ensure that:

i. All key stakeholders are consulted and their views and concerns addressed. records of meetings, communication and comments should be provided. Consultation forms should bear **date** and each consulted stakeholder should **sign** against his/her **name** as the law requires. Submission of documents which do not observe this requirement will be sent back to the proponent for corrections;

ii. All experts involved in the study should sign the EIA report with their original signatures (not scanned signatures or forged signatures) and indicated whether he/she is a registered or non-registered environmental expert. Failure to observe this requirement, will constitute to an offense as per Environmental Management Act, 2004;

iii. All copies of relevant documents/certificates including the land acquisition process documents showing properties to be impacted by the project are appended to the report;

iv. Ensure the EIS should clearly showing the source of the construction materials, quarry sites, borrow pits as well as the number, location and design of the campsites;

Headquarters, 35 Regent Street, P.O Box63154, 11404 Dar es Salaam, Phone: +255 22 2774852; +255 22 2774889: 0713 608930/0735 608930Fax: +255 22 2774901 Email Address: dg@nemc.or.tz Website: www.nemc.or.tz

v. Ensure to provide quantitative and qualitative baseline data for air, water, soil quality, particulate matters and noise level of the sensitive areas to be passed through by the road are provided as baseline data in the EIS;

vi. The EIS should include information on erosion potential areas, natural drainage areas as well as historical and archeological potentials;

vii. The EIS should clearly provide the preliminary engineering design of the road and its appurtenances, design period of the project, man power, machinery/ equipment, technologies as well as utilities to be used during project phases;

viii. The EIS should clearly show the disposal locations of the overburden/ demolished materials, disposal site characteristics/conditions as well as nature of the disposed materials;

ix. The EIS should clearly discuss and provide the estimated quantification of the pollutants or waste to be generated during all project phases and its management;

x. The EIS should clearly discuss and provide geotechnical, hydrological studies and topographical survey of the area where the road will pass;

xi. Flora and Fauna experts are engaged in the study in order to provide clear baseline information about flora and fauna along the project area;

xii. The study should involve specialists with background of Civil, Environmental, Municipal and Industrial Service Engineering; Sociology, Geometrics, and Public Health; and

xiii. Registered Experts' EIA certificate, Business licence and current annual fee receipt of the expert engaged in the study should be appended in the EIS.

4. Upon submission of the EIA report and payment of the review charges, the Council will arrange for a technical review of the document by the Technical Advisory Committee (TAC). Prior to this review, representatives of the TAC will visit the project site to inspect and verify the adequacy of the EIS with respect to the proposed project's operation and surrounding environment. You will be required to **incur transportation costs** for the site verification team to and from the project site.

5. Looking forward for your cooperation.

A. N. Sembeka
For: **Director General.**

Cc: WESH Consulting Limited
P. O. Box 35478,
Dar es Salaam

Headquarters, 35 Regent Street, P.O Box63154, 11404 Dar es Salaam, Phone: +255 22 2774852; +255 22 2774889: 0713 608930/0735 608930Fax: +255 22 2774901 Email Address: dg@nemc.or.tz Website: www.nemc.or.tz

Appendix II: List of Stakeholders Consulted

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR TANZANIA CITIES TRANSFORMING INFRASTRUCTURE AND COMPETITIVENESS PROJECT (TACTIC ZONE 1 PROJECT-ARUSHA, DODOMA, TABORA AND KIGOMA COUNCILS)

LIST OF CONSULTED STAKEHOLDERS-TABORA MUNICIPAL COUNCIL

SN	DATE/TAREHE	NAME/JINA	INSTITUTION/TAASISI	POSITION/CHEO	PHONE NO./SIMU	SIGNATURE/SAINI
01	07/12/2021	FRANK A. CHACHA	TANESCO	K/MEM-JA	0628076393	[signature]
02	10/12/2021	RUKIA S. MANDUTA	RS - TABORA	AAS PC	0786561357	[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR TANZANIA CITIES TRANSFORMING INFRASTRUCTURE AND COMPETITIVENESS PROJECT (TACTIC ZONE 1 PROJECT-ARUSHA, DODOMA, TABORA AND KIGOMA COUNCILS)

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	07/12/2021	VENANCE . V. ASSEY	TTCL	ARMN	0738262251	[signature]
	07/12/2021	BENEDICT KIMARO	TTCL	TECH	0738262252	[signature]
	07/12/2021	Emanuel J. Kaali	TTCL	ARM/Comm	0738262246	[signature]

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SN	DATE/TAREHE	NAME/JINA	INSTITUTION/TAASISI	POSITION/CHEO	PHONE NO./SIMU	SIGNATURE/SAINI
1.	6.12.2021	DR. PETER NANGA NYANJA	TABORA MC	M.D. Mkurugenzi	0620-224693	[signature]
2.	6/12/2021	SEIF Salum	TABORA MC	HEAD - BEEKEEPING UNIT	0754-043307	[signature]
3	6/12/2021	Gredy B. Malulu	Tabora MC	AFISA UTUMISHI wa manispaa	0784424937	[signature]
4	6/12/2021	Theodora J. Chuma	Tabora Mc	Mwanasheria	0717517021	[signature]
5	6/12/2021	William D. Mpangala	Tabora MC	MEMO	0715050606	[signature]
6	6/12/2021	CHARLES BUNZALI	TABORA MC	MHASIBU	0754411089	[signature]

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1.	6/12/2021	HAPPY C. MTUWA	TMC	PSSNC	0755.878715	[signature]
2	06/12/2021	Heem G. Kapesa	TMC	MLTO	0763993668	[signature]
3.	06/12/2021	FESTO NASHON	TMC	MTO	0759779267	[signature]
4	06/12/2021	KWANGU CORNEL	TMC	MKUU WA MASOKO	0685-195640	K. Cornel
5.	06.12.2021	DOTTO G. SIMON	TMC	Ag. A/UTAMADUNI	0756-038762	[signature]
6	06.12.2021	JOSEPHAT S. LEMA	TMC	CHIEF INTERNAL AUDITOR	0767 640479	[signature]

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1	06/12/2021	STEPHANO IRANGA	TABORA MC	KAIMU MHANDISI	0748369686	[illegible]
2.	06/12/2021	LEODEGADIUS KATABA	TABORA MC	KAIMU AFISA MAZINGIRA	0786932931	[illegible]
3	6 DEC 2021	PASCHAL R. MATHIAS	TABORA MC	MHO	0754383785	[illegible]
4.	6 DEC 2021	DR BARAKA MSUMI	TABORA MC	MGANGA MKUU	0755019242	[illegible]
5	6 DEC, 2021	MSEKWA P. MBWELWA	TABORA MC	KAIMU MKUU WA KITENGO CHA TEHAMA	0766313568	[illegible]
6	6/DEC/2021	JOEL KAMUGISHA	TABORA MC	AFISA ARDHI MAINGI	0784572509	[illegible]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR TANZANIA CITIES TRANSFORMING INFRASTRUCTURE AND COMPETITIVENESS PROJECT (TACTIC ZONE 1 PROJECT-ARUSHA, DODOMA, TABORA AND KIGOMA COUNCILS)

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7	06/12/2021	JUMANNE MGAYA	TABORA MC	AFISA MAENDELEO YA JAMII MANISPAA	0754065013	
8	06/12/2021	JONAS KILAVE	TABORA MC	AFISA UCHAGUZI	0757144867	
9.	06/12/2021	GAITAN MKENGE	TABORA MC	FUNDI MKUU MITAMBO	0754202302	

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	06/12/2021	ROSEMARY PETER	SECONDARY EDC - TMC	AG. MEO	0784379403	[signature]
	06/12/2021	HAPPINESS NNKO	AGRICULTURE IRRG COOPERATIVES AG MAICO	AG MAICO	0766050760	[signature]
	06/12/2021	ALEX SIRIYAKO	TABORA MC	AFISA HABARI	0788886991	[signature]
	6/12/2021	JOHN HABALO	TABORA MC	C C	0768215925	[signature]
	06/12/2021	HUSSEIN M. LUZIGA	TABORA MC	C C	0783-898959	[signature]

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01	07/12/2021	M/S.JIHADI-SACF	FIRE & RESCUE FORCE	RFO TBR	0718713621 tabora@tfrf.go.tz	
02	07/12/2021	M P.MGOMBELEAHAP	-"-	O C S	0756037330	
03	07/12/2021	A/INSP. V. MACHECHU	-"-	HR	0754563387	
04	07/12/2021	SGT. T. KIPETA	-"-	MHASIBU	0754825460	
05	07/12/2021	FC J. MALIMWENE	-"-	AFISA HABARI	0679916032	

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01	07/12/2021	FRANK A. CHACHA	TANESCO	K/MENEJA	0628076393	[signature]

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01	07/12/2021	FEDRICK G. MBIRU	STENDI KUU	K/MENEJA	0765108154	[signature]
02	07/12/2021	HASSAN MANDE	STENDI KUU	SGT /ZIMAMOTO	0758-050139	[signature]
03	07/12/2021	Eng Juma Kasekwa	TUWASA-TBR	AGTM	0765793455	[signature]
04	07/12/2021	ENG THOMAS MSENYELE	- " -	NET & DISTRIBUTION	0752855326	[signature]
05	07/12/2021	Eng. John Mazawa	TUWASA	ENVIRONMENTAL ENGINEER	0620738112	[signature]
06	07/12/2021	TECH ADAM SHAURI	TUWASA	NET & DISTRIBUTION	0658505759	[signature]

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1.	06/12/2021	MARIETHA K JOHN	TABORA MC	Ag MT	0767557445	[signature]
2	06/11/2021	PAUL. M. KIJAMBE	TABORA MC	MUNICIPAL INGR	0767666264	[signature]
3.	06/11/2021	DED D. Msilu	TABORA MC	Mg. MnB	0761-739055	[signature]
4.	06/11/2021	Nehemiah Chacha	TARURA - TMC	Engineer - TARURA	0713 768 308	[signature]
	6/11/2021	SHABANI MHINA	MKITI MASOKO	MASOKO YOTE	0754509474	[signature]
	6/11/2021	OMARY ABDALLA	KATIBU BANDA(A)	SOKO KUU BANDA(A)	0759-372929	[signature]

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1	20/12/2021	WINIFRIDA P. LUDOVICK	STANDI KUU YA MABASI	MANAGER	0764593402	
02	20/12/2021	FEDRICK K. MBEWE	— " —	K/MENEJA	0765108154	
03	20/12/2021	HASSAN MANDE	JESHI LA ZIMAMOTO & UOKOAJI	SGT	0758050139	
04	20/12/2021	JM.3997 FE - MAGAMBO M. NDAMB	JESHI LA ZIMAMOTO NA UOKOAJI	FE	0692995846	
05	20/12/2021	COSTA MSIGWA	JESHI LA ZIMAMOTO NA UOKOAJI	FE	065313576	
06	20/12/2021	EMMANUEL MANOSO	STANDI KUU YA MABASI	MHASIBU MAPATO	0757599064	

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR TANZANIA CITIES TRANSFORMING INFRASTRUCTURE AND COMPETITIVENESS PROJECT (TACTIC ZONE 1 PROJECT-ARUSHA, DODOMA, TABORA AND KIGOMA COUNCILS)

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01	21-12-2021	NASIR ISSA MINENGE	HALMASHAURI YA MANISPAA YA TABORA	DIWANI MWINYI	0755963662	[signature]
02	21-12-2021	FRANCISCO V. MKUNGU	HALMACHAURI YA MANISPAA YA TABORA	MTENDAJI KATA YA MWINYI	0769801213	[signature]
03	21-12-2021	NEEMA J. HASHIM	HALMASHAURI YA MANISPAA YA TABORA	MTENDAJI MTAA	0769-928026	[signature]
04	21/12/21	FATUMA CHAMA	HALMASHAURI YA MANISPAA YA TBR	M/KITI MTAA WA IKUNJI	0787384675	[signature]
05	21/12/2021	ROSE J. KIMARO	MANISPAA YA TABORA	M/KITI MTAA WA SIMBAMWENE	0762514655	[signature]
06	21/12/2021	EMMANUEL M. TENGWE	MANISPAA YA TABORA	M/KITI SIKANDA	0783-800741	[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR TANZANIA CITIES TRANSFORMING INFRASTRUCTURE AND COMPETITIVENESS PROJECT (TACTIC ZONE 1 PROJECT-ARUSHA, DODOMA, TABORA AND KIGOMA COUNCILS)

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6	21/12/2021	CRESENTIA RUKATI	M/JAMII KANYENYE	MAENDELEO YA JAMII	0757 554531	Rukati
7.	21/12/2021	STELLA J. ANTHONY	EDUCATION	AFISAELIMU KATA	0784375558	[illegible]
8	21/12/2021	MARIANA S. KAPELEZI	UTAWALA	MTENDAJI-MTAA KAZEMBE	0752924742	[illegible]
9.	21/12/2021	A.M. MAKWAYA	CCM	K/ KATA	0752128915	[illegible]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR TANZANIA CITIES TRANSFORMING INFRASTRUCTURE AND COMPETITIVENESS PROJECT (TACTIC ZONE 1 PROJECT-ARUSHA, DODOMA, TABORA AND KIGOMA COUNCILS)

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SN	DATE/TAREHE	NAME/JINA	INSTITUTION/TAASISI	POSITION/CHEO	PHONE NO./SIMU	SIGNATURE/SAINI
1.	21/12/2021	Zubeda B. Chadamaze.		Afisa Mt-	0785 617667	[signature]
2	21/12/2021	Mabuv R. Rwegha		Mtendaji Kata	0785-854667	[signature]
3	21/12/2021	Geofrey D. Paul		Mtendaji-Kahama	0758 091629	[signature]
3	21/12/2021	Isabela R. Tibanzinda		Mtendaji-Mkuwazini	0719971557	Raphael
4		Robert, Kajuna K		Mtendaji-Kombo	0753 226124	[signature]
5		Maulidi Jicanda		Mtendaji. Katcola	0787673898	[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR TANZANIA CITIES TRANSFORMING INFRASTRUCTURE AND COMPETITIVENESS PROJECT (TACTIC ZONE 1 PROJECT-ARUSHA, DODOMA, TABORA AND KIGOMA COUNCILS)

LIST OF CONSULTED STAKEHOLDERS-TABORA MUNICIPAL COUNCIL

SN	DATE/TAREHE	NAME/JINA	INSTITUTION/TAASISI	POSITION/CHEO	PHONE NO./SIMU	SIGNATURE/SAINI
1.	21/12/2021	GODFREY F. MSUMTAU	A, N CLASSIC	MSIMAMIZI	0786444490	[signature]
2.	—"—	ZABRON MAGOMA	NBS Classic co LTD	Supervisor	0762661944	[signature]
3.	—"—	ANDREA DAUD	MTOTO GEMA	—"—	0753369437	[signature]
4.	21/12/2021	LUCAS S. NYAMBALA	TFS-WR-Tabora	Ass. Resource Management	0752006161	[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR TANZANIA CITIES TRANSFORMING INFRASTRUCTURE AND COMPETITIVENESS PROJECT (TACTIC ZONE 1 PROJECT-ARUSHA, DODOMA, TABORA AND KIGOMA COUNCILS)

LIST OF CONSULTED STAKEHOLDERS-TABORA MUNICIPAL COUNCIL

SN	DATE/TAREHE	NAME/JINA	INSTITUTION/TAASISI	POSITION/CHEO	PHONE NO./SIMU	SIGNATURE/SAINI
	21/12/2021	MUSSA J. KAHYOLO	TMC	DIWANI	0754360485	[signature]
2	21/12/2021	GODWIN N. KAYOKA	TMC	MTENDAJI KATA	0752731499	[signature]
3	21/12/2021	ZENA ALLY	TMC	MTEMANI-KARIAKOO	0683026427	[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR TANZANIA CITIES TRANSFORMING INFRASTRUCTURE AND COMPETITIVENESS PROJECT (TACTIC ZONE 1 PROJECT-ARUSHA, DODOMA, TABORA AND KIGOMA COUNCILS)

LIST OF CONSULTED STAKEHOLDERS-TABORA MUNICIPAL COUNCIL

SN	DATE/TAREHE	NAME/JINA	INSTITUTION/TAASISI	POSITION/CHEO	PHONE NO./SIMU	SIGNATURE/SAINI
1.	21-12-2022	SHABANI H. MIHINDA	M/KITI MASOKO	MW/KITI	0754529470	[signature]
		AHMAD R. CHIGULA	M/KITI SOKO KUU	M/KITI	0787559907	[signature]
		OMARY A. ATHUMANI	KATIBU SOKO KUU	KATIBU	0789-372929	[signature]

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR TANZANIA CITIES TRANSFORMING INFRASTRUCTURE AND COMPETITIVENESS PROJECT (TACTIC ZONE 1 PROJECT-ARUSHA, DODOMA, TABORA AND KIGOMA COUNCILS)

LIST OF CONSULTED STAKEHOLDERS-TABORA MUNICIPAL COUNCIL

SN	DATE/TAREHE	NAME/JINA	INSTITUTION/TAASISI	POSITION/CHEO	PHONE NO./SIMU	SIGNATURE/SAINI
01.	22/12/2021	FESTO NASHON	TMC	TRADE OFFICER	0759779267	
02	22/12/2021	ENG RAPHAEL MLIMAJI	TANROADS	Ag RM	0755158328	
03	22/12/2021	LEONARD DAUDI MZUKILA	TMC	WEO IPULI	0769 553121	
04	22/12/2021	Rehema Shija	TMC	Mg- Mmiliki [illegible]	0692023717	
05	22/12/2021	Mallo Juma Mallo	TMC	DIWANI KATA	0754542025	
06	22/12/2021	[illegible]	TMC	DED	[illegible]	

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR TANZANIA CITIES TRANSFORMING INFRASTRUCTURE AND COMPETITIVENESS PROJECT (TACTIC ZONE 1 PROJECT-ARUSHA, DODOMA, TABORA AND KIGOMA COUNCILS)

LIST OF CONSULTED STAKEHOLDERS-TABORA MUNICIPAL COUNCIL

SN	DATE/TAREHE	NAME/JINA	INSTITUTION/TAASISI	POSITION/CHEO	PHONE NO./SIMU	SIGNATURE/SAINI
1	22/12/2024	DEOGRATIUS KAMAGI	MANISPAA-TABORA	Afisa Usafi [illegible]	0755475732	Kamagi
2.	22/12/2024	NELSON MWAFRI	LATRA-TABORA	AFISA MFAWIDHI (M)	0734 000042	[illegible]

FEASIBILITY STUDY, URBAN DESIGN, DETAILED ENGINEERING DESIGN, ENVIRONMENTAL AND SOCIAL DUE DILIGENCE, PREPARATION OF COST ESTIMATES AND BIDDING DOCUMENTS FOR URBAN INFRASTRUCTURE INVESTMENTS

TANZANIA CITIES TRANSFORMING INFRASTRUCTURE AND COMPRTITIVENES PROJECT (TACTIC) ZONE 1

LIST OF STAKEHOLDERS CONSULTED TABORA MUNICIPAL COUNCIL

S/N	DATE/ TAREHE	NAME/ JINA	INSTITUTION/ TAASISI	POSITION/ CHEO	PHONE NO./ SIMU	SIGNATURE/ SAHIHI
1.	13.12.2022	NYANJA A.M	TABORA TMC	MKURUGENZI	0784705044	[signature]
2.	13.12.2022	MWALUKASA F.S	TABORA TMC	MWEKA HAZINA	0767888145	[signature]
3.	13.12.2022	BARAKA J. MANUELO	TABORA TMC	AFISA AFYA	0625031554	[signature]
4.	13/12/2022	Nehemiah Chacha	TABORA TMC	Engineer	0713 768308	[signature]
5.	13/12/2022	Eng. Astena Shija	TMC	Engineer (Coordinator)	0693879049	[signature]
6.	13/12/2022	Eng. Myakiriga Waride	TMC	Engineer	075987134	[signature]
7.	13/12/2022	ISSA S. LUGILIMBA	TMC	MIPANGOMIJI	0765736677	[signature]

FEASIBILITY STUDY, URBAN DESIGN, DETAILED ENGINEERING DESIGN, ENVIRONMENTAL AND SOCIAL DUE DILIGENCE, PREPARATION OF COST ESTIMATES AND BIDDING DOCUMENTS FOR URBAN INFRASTRUCTURE INVESTMENTS

TANZANIA CITIES TRANSFORMING INFRASTRUCTURE AND COMPRTITIVENES PROJECT (TACTIC) ZONE 1

LIST OF STAKEHOLDERS CONSULTED TABORA MUNICIPAL COUNCIL

S/N	DATE/ TAREHE	NAME/ JINA	INSTITUTION/ TAASISI	POSITION/ CHEO	PHONE NO./ SIMU	SIGNATURE/ SAHIHI
01	13/12/2022	GATTY MWITA	TMC	WEO - ISEMYA	0746769286	
02	13/12/2022	ASHA MOHAMED	OFISI YA KATA IPULI	WEO - IPULI	0719712899	
03	13/12/2022	CRASIANA KOWERO	SACDO IPULI	SACDO - IPULI	0759162076	
04	13.12.2022	MBUGUMA J. SAHE	OFISI YA KATA CHEMCHEM	WE - CHEMCHEM	0787141218	
05	13/12/2022	ZEPHANIA OMAHE	OFISI YA KATA CHEMCHEM	ME - MATOLA	0719297809	
06	13/12/2022	ELIZABETH B JOHN	OFISI YA KATA CHEM	ME - MNUBI	0753334788	
07	13/12/2022	EDELBERT RUZIJU	OFISI YA MTENDAJI	ME - KALAMATA	068771641	

Appendix III: Minutes of the Meetings Conducted

Mtaa: Mwinyi

MRADI WA MABORESHO YA MIUNDOMBINU KUENDANA NA KASI YA UKUAJI WA MIJI (TACTIC) MKUTANO NA WADAU KUHUSU ATHARI ZA MAZINGIRA NA JAMII PAMOJA NA MPANGO WA FIDIA NA MAKAZI MRADI WA BARABARA YA KISARIKA KM 2.6 KATA YA MWINYI NA KATA YA MAZOLO 21/12/2021

AJENDA:

1. KUFUNGUA MKUTANO
2. MAELEZO KUHUSU MRADI WA BARABARA PAMOJA NA TATHIMINI YA MAZINGIRA NA JAMII
3. MASWALI/MAONI KUTOKA KWA WADAU.
4. KUAHIRISHA MKUTANO

AFISA MTENDAJI WA MTAA
MTAA WA SIMBAMWENE
KATA YA MWINYI

1. KUFUNGUA MKUTANO

Mkutano ulifunguliwa mnamo saa na mwenyekiti ndugu ambapo aliwakaribisha wananchi na wataalam washauri ili kuweza kuzungumza na kujadiliana masuala ya ujenzi wa barabara kwa kiwango cha lami, aliwataka wananchi kuwa watulivu, wasikilize kwa makini na pale ambapo watakuwa hawajaelewa basi waulize maswali lakini pia watoe maoni yao namna ambavyo wangependa barabara hiyo ijengwe.

2: MAELEZO KUHUSU MRADI

Mtaalam mshauri ndugu Robert Kishiki kutoka kampuni ya Crown Tech Consult Ltd alianza kwa kuseme kuwa wizara ya Tawala za Mikoa na Serikali za Mitaa (TAMISEMI) inaratibu ujenzi wa miundombinu ili iendane na kasi ya ukuaji wa miji (TACTIC) ambapo katika kata ya Muungi na Malolo kuna uboreshaji wa barabara ya Kisarite yenye urefu wa km 2.6 ambapo barabara hii itajengwa kwa kiwango cha lami, barabara hii inategemea kuboresha maeneo ya kata hii mbili hivyo basi wananchi hasa wanaoishi katika barabara hii (pembezoni) ni wadau muhimu sana katika kuhakikisha kuwa mradi unajengwa kulingana na mahitaji ya jamii katika mahusiano.

AFISA MTENDAJI WA MTAA
MTAA WA SIMBAMWENE
KATA YA KIWANJA

Mradi huu uko katika miezi 6 utakamilika kuhusu ambapo baada ya miezi na makazi mbadala iwapo masuala ya fidia na makazi mbadala iwapo basi itaonekana kuwa kuna wananchi mali zao yaani nyumba, ardhi, mazao ya kudumu na makaburi, mpango wa fidia utafanyika kwa mujibu wa Sheria za Tanzania za sera za masuala ya makazi za ~~world~~ Benki ya Dunia, na vitu vitatambuliwa na kurekodiwa na kufanyika uthamini na kulipwa fidia kabla mradi haujaanza.

Pia kutaundwa kamati za malalamiko iwapo kutaonekana kwa namna moja au nyingine taratibu hazikufuatwa kwa ajili ya ujenzi wa barabara hii.

~~Hii~~ Hivyo basi wananchi wawe wahuru na waendelee na kazi zao kama kawaida.

3. MASWALI / MAONI KUTOKA KWA WADAU

MCH MAHUNA

Mimi nimesikia maelekezo, lakini kwanini sisi tumepewa kilometa 2?

MAJIBU

MH DIWANI.

Ni kweli kilisahaulika sana, ila tumeshukuru. Mungu sana kwa kweli tumepewa nusu ya kilometer ambazo halmashauri imepatik imepatwa kama km 06.

SIIEBEMEI JUMA

Je kwa bahati mbaya ikitokea mtu kaweka kipande atalipwa fidia ya kipande hicho au eneo lote?

JIBU

Huku hatuna hifadhi ya barabara kama miradi ya TANROADS ila tutaangalia uhalisia wa barabara au makazi yaliyopo. Na ikibainika nyumba ipishe barabara haitaondolewa kabla ya fidia.

Angalizo:

Tumeshapima na hatutegemei mtu aongeze chochote kwenye eneo la mradi

HAMISI MHOZYA

Mwinyi hatuna mifereji ya kutosha na tunapata athari ya mifereji na barabara. Hichi ni kilio chetu

JIBU

Kuna mradi wa halmashauri utakuja wa kutengeneza mfereji mkubwa mwinyi maji hakuwi historia

AFISA MTENDAJI WA MTAA
MTAA WA SIMBAMWENE
KATA YA MWINYI

MH DIWANI
Barabara itakuwa na miti ngapi

JIBU
Itakuwa na miti 15 kwa ujumla wake

MARY LUCAS MBONJE
Mimi nawaomba wataalamu wetu mwenyekiti kwenye shughuli ndogondogo zitakazo kuwa kwenye mradi. Pia kama kutakuwa na tatizo tutawapatia ushirikiano

ANGALIZO
Kabla mradi haujaanza tutatembelea tutaangalia hali za nyumba kama kuna athari zitakazotokea zitakazo sababishwa na mradi tutafanya utaratibu wa kuziba nyufa baada ya mradi

BARIDI TRANSIT
Kuna baadhi ya wakandarasi hawatengenezi madaraja vizuri. Tunaomba madaraja yawekwe vizuri ili tuangalie athari za baadae zitakazo letwa na maji ya mvua.

JIBU
Tumelitambua na michoro maji hiyo tutaweka angalizo hili

AFISA MTENDAJI WA MTAA
MTAA WA SIMBAMWENE
KATA YA MWINYI

MAOM MH DIWANI
Hapa kata ya Mwinyi ndio mapitio ya maji kwa unamba hupatikana hata mifereji ya maji kwa kuwa tunachangamoto kubwa, usafiri kata yetu iko chini sana. Tadri mnavyopata fursa ya kukwamua tunaomba mwendeleze kutukwamua. Hali hii ni kwa kata nzima ni hali mbaya sana
Tunamshukuru Mh Mama Samia pamoja na viongozi wote kwa mradi huu

Na kama tutafaulu na masuala ya mradi tunaomba muendelee kutukumbuka.

KATIBU WA CHAMA CCM

Tunamshukuru Mungu baada ya miaka 10 tulitaka maendeleo kama haya ukiacha barabara hii ya lami, kuna kilo 2 na tunatarajia barabara nyingine kwa kiwango cha lami.

Kama chama kupitia Ilani ya Chama tunatekeleza kutatua changamoto ya miundo mbinu. Nashauri pia wananchi watoe ushirikiano hasa wanaokaa pembezoni mwa eneo lenye mradi.

AFISA MTENDAJI WA MTAA
MTAA WA SIMBAMWENE
KATA YA MWINYI

04: KUAHIRISHA MKUTANO

Baada ya neno la shukrani Mwenyekiti aliahirisha mkutano kwa kutoa neno la msisitizo kwa wananchi kutoa ushirikiano wakati wa mradi kuhusu kuhakikisha mnemo majira ya saa 13:00 kamili

AFISA MTENDAJI WA MTAA
MTAA WA SIMBAMWENE
KATA YA MWINYI

ROSE J. KIMARO
MKITI
0762-514655
21/12/2021

NEEMA J. MAHIMI
KATIBU
0769-928026
21/12/2021

MRADI WA MABORESHO YA MIUNDOMBINU KUENDANA NA KASI YA UKUAJI WA MIJI KANDA 1(MANISPAA YA TABORA)-MKUTANO NA WADAU KUHUSU ATHARI ZA MAZINGIRA NA JAMII PAMOJA NA MPANGO WA FIDIA NA MKAZI

MAHUDHURIO

TAREHE 21/12/2021

WILAYA YA TABORA

KATA MWINYI

MTAA SIMBAMWENE/IKINJI/VIWANDA

SN	JINA	CHEO	ATOKAKO	NAMBA YA SIMU	SAHIHI
01	NASSIR ISSA MNENGE	DIWANI	MWINYI	0755963463	[illegible]
02	FRANCISCO V. MKUNGU	WEO	MWINYI	0769301813	Mkungu
03	NEEMA J MASHIMI	MEO	MWINYI	0769-928826	[illegible]
04	PASCHAL MTATI	MJUMBE	IKINJI	0784763437	[illegible]
05	SIMON MNATTA	— " —	— " —	0682149096	SimonT.
06	VEDASTUS LUZIGIJA	— " —	— " —	0684512401	[illegible]
07	MASHAKA HASSAN	— " —	MWINYI	0764149467	[illegible]
08	SITE GEMEI JUMA	MJUMBE	MWINYI	0783129383	[illegible]
09	ASIA ATHUMANI	MJUMBE	MWINYI	0764015[illegible]	[illegible]
10	AMINA FUSI	Mjumbe	Mwinyi	0756038827	[illegible]
11	ZABIBU SHABANI	Mjumbe	Mwinyi	0688927989	[illegible]
12	TATU MASUDI	Mjumbe	Mwinyi	—	[illegible]
13	JUMA CHAMARI	Mjumbe	IKINJI	0784348327	[illegible]
14	NYASUMA MARO	MJUMBE	MWINYI	0797505031	[illegible]
15	ROBERT [illegible]	Mjumbe	Mwinyi	0788-84[illegible]	[illegible]
19	HAMISI DIGUBHE	MJUMBE	IKINJI	0767[illegible]5532	[illegible]
20	GABRIEL C. SOMBA	MJUMBE	SIMBAMWENE	075[illegible]	[illegible]
21	KASSIM KAPUNI	K/KITONGOJI	MWINYI	0785172779	[illegible]
22	Kulwa Mayembe	Mkazi	— " —	0754[illegible]	[illegible]
23	TATU BAKARI	MJUMBE	MWINYI	0785206413	[illegible]
24	SALEHE H. ASAZI	Mwenyekiti	Mwinyi	0784976996	J.Mwinyi
25	MOSHI H. MAMBA	MJUMBE	MWINYI	0754383759	[illegible]

AFISA MTENDAJI WA MTAA
MTAA WA SIMBAMWENE
KATA YA MWINYI

MRADI WA MABORESHO YA MIUNDOMBINU KUENDANA NA KASI YA UKUAJI WA MIJI KANDA 1(MANISPAA YA TABORA)-MKUTANO NA WADAU KUHUSU ATHARI ZA MAZINGIRA NA JAMII PAMOJA NA MPANGO WA FIDIA NA MKAZI

MAHUDHURIO

TAREHE 21/12/2021

WILAYA YA TABORA

KATA MWINYI

MTAA SIMBAMWENE Mwinyi Tabora

SN	JINA	CHEO	ATOKAKO	NAMBA YA SIMU	SAHIHI
1	FATUMA I. CHAMBI	M/KITI	MWINYI	0789384675	[illegible]
2.	ROSE J. KIMARO	M/KITI	MWINYI	0762514466	[illegible]
3.	SELEMANI N MAHUNA	MJUMBE	MWINYI	0787-111344	[illegible]
4	EMMANUEL M. TINDE	M/KITI	MWINYI	0753-800701	[illegible]
5	SAID MRONGO	MJUMBE	—"—	0682 565281	[illegible]
6	MOHAMED M. MASUDA	M/KITI OPERESHENI	MWINYI	[illegible]	[illegible]
7	HAMISI S. MHERYA	MJUMBE	MWINYI	0766[illegible]744	[illegible]
8	JOSEPH MWAM	MJUMBE	MWINYI	075616300	[illegible]
9.	FLORA EMMANUEL	MJUMBE	MWINYI	0789979838	[illegible]
10	ESTERIA NTIBAHEZWA	MJUMBE	MWINYI	0787476969	[illegible]
11	MARY L. MBOTE	MJUMBE	MWINYI	0789550799	[illegible]
12	SHABANI ISSA	MJUMBE	MWINYI	0678952443	[illegible]
13.	MALABE S. A	—"—	—"—	0625895728	Malabe
14	REV. CHARLES MAHUMA	—"—	MWINYI	0756607602	[illegible]
15	MARIAMU JULIUS	—	MWINYI	0782 [illegible]	MJ
16	REHEMA SALUM	—	MWINYI	0628829677	R. Salum
17	SWED J. SWED	—"—	MWINYI	0773810810	[illegible]
18	MFAUME ADAM	—"—	—"—	0768205416	[illegible]
19	ADAM K SHABANI	—"—	—do—	0767442869	[illegible]
20	BARIDI TRANSIS	MJUMBE	MWINYI	0784595041	[illegible]
21	NYASIAGA AMARO	MJUMBE	MWINYI	0757575031	[illegible]
22	Amina M Nziyimo	Mjumbe	Mwinyi	0755572822	[illegible]
23	Thomas malale	balozi	mwinyi	0682874664	Malale
24	HURUMA K NSEME	mjumbe	mwinyi	0687000241	H.S. Nseme
25	YOHANA ROBERT	—	Mwinyi	Simbamwene	[illegible]

AFISA MTENDAJI WA MTAA
MTAA WA SIMBAMWENE
KATA YA MWINYI

Ward: Kitete

MPANGO WA MABORESHO YA MIUNDOMBINU KUENDANA NA KASI YA UKUAJI WA MJI (TACTIC ZONE 1)

MKUTANO NA WADAU KUHUSU ATHARI ZA MAZINGIRA NA JAMII PAMOJA NA MPANGO WA FIDIA NA MAKAZI

MRADI WA UJENZI WA BARABARA YA SWETU 2KM

KATA YA KITETE. 21/12/2021

AJENDA

1. KUFUNGUA MKUTANO
2. MAELEZO KUHUSU UJENZI WA BARABARA NA MAMBO YA MAZINGIRA
3. MASWALI/MAONI KUTOKA KWA WADAU
4. KUAHIRISHA MKUTANO

WARD EXECUTIVE
KITETE WARD
TABORA MUNICIPALITY

1: KUFUNGUA MKUTANO

Mkutano ulifunguliwa mnamo saa 11:00 jioni na mwenyekiti: ndugu SAMWEL MALEMA ambapo aliwakaribisha wananchi hao wanaoishi na kufanya biashara katikati ya barabara ya SWETU, ambapo aliwataka kuwa watulivu kuwasikiliza pamoja na yote kwani kuna baadhi wananchi hawajapokea bado walipwe mapunjo ambavyo wana maoni basi wayatoe ili kumaliza ambayo mgeni huu wa barabara ya SWETU.

Hivyo mwenyekiti aliwakaribisha wataalamu washauri ili waweze kuendelea na maelezo kuhusu mradi na pia kutoa ufafanuzi pale itakapohitajika zaidi

Hivyo wataalamu washauri kutoka kampuni ya Crown Tech Consult Ltd walitambulisha kwa ujumla ya kuendelea na mada zinazofuata.

2: MAELEZO KUHUSU MRADI WA BARABARA

Mtaalam mshauri ndugu Robert Kisukuli alianza kwa kuelezea kuwa Serikali kupitia Wizara ya Tawala za Mikoa na Serikali za Mitaa (TAMISEMI) imefanya kazi ya utafiti wa uboreshaji wa miundombinu katika miji ili kuendana na kasi ya ukuaji wa miji hiyo, hivyo barabara hii ya SWETU ni mojawapo ya miradi ambayo imetakiwa kuboreshwa ili wananchi waweze kutumia huduma hiyo kwa urahisi.

Aliendelea kusema kuwa kwa sasa wataalamu washauri wanaendelea kufanya uainifu na pia wanafanya tathmini ya mazingira na masuala ya Kijamii pia masuala ya makazi mbadala kama yatahitajika kwa ukosefu wa makazi mbadala utaandaliwa. Hivyo wananchi wawe watulivu na kila hatua watashirikishwa.

3: MASWALI / MAONI KUTOKA KWA WADAU.

Mjumbe kutoka Lwanzali alishauri kuhusu kuwekwa matuta ya kupunguza mwendo kwa waendesha vyombo vya moto barabarani ili kuepuka na kupunguza ajali za barabarani kwa kuwa watumiaji wa barabara hiyo wengi ni watoto wa shule kwani katika barabara hiyo tunazungukwa na shule nyingi. Mheshimiwa Diwani wa Kata ya Kitete aliwapongeza wananchi kwa mahudhurio yao. Na kusema tuendelee kumshukuru Mhe. Rais wa Jamhuri ya Muungano wa Tanzania kwa kutuona na kutupatia barabara hii hivyo tuendelee kutoa ushirikiano kwa wataalamu wetu kwa kuwa barabara hii itakuwa kiunganishi na [illegible]. Hivyo aliwahakikishia wataalamu usalama wa kutosha wakiwa katika kata hii wakati wa kutimiza majukumu yao.

WARD EXECUTIVE
KITETE WARD
TABORA ... LITY

4: KUAHIRISHA MKUTANO.

Mwenyekiti aliahirisha mkutano mnamo majira ya saa 11:31 jioni kwa kuwashukuru wananchi kwa mahudhurio yao na maoni pamoja na ushauri wao mzuri uliofanikisha mkutano huu na kuahidi wataalamu kuwa watapata ushirikiano wa kutosha kutoka kwa wananchi.

Umethibitishwa na

KATIBU

JINA GODWIN N'ICAYOKA

SAHIHI

NA YA SIMU. 0752731499.

WARD EXECUTIVE
KITETE WARD
TABORA MUNICIPALITY

MWENYEKITI

JINA

SAHIHI

NA YA SIMU - 0754360485

MRADI WA MABORESHO YA MIUNDOMBINU KUENDANA NA KASI YA UKUAJI WA MIJI KANDA 1(MANISPAA YA TABORA)-MKUTANO NA WADAU KUHUSU ATHARI ZA MAZINGIRA NA JAMII PAMOJA NA MPANGO WA FIDIA NA MKAZI

MAHUDHURIO

TAREHE 21/12/2021

WILAYA YA TABORA

KATA KITETE

MTAA.......................

SN	JINA	CHEO	ATOKAKO	NAMBA YA SIMU	SAHIHI
1	MUSSA J. KAHYOLO	DIWANI	KITETE	0K4360483	[illegible]
2	GODWIN N. KAMBA	WEO KITETE	TMC KITETE	0752727495	[illegible]
3	ZENA ALLY	MTENDAJI	KITETE	0683026429	[illegible]
4	SAMWEL MALEMA	AFISA ...	KARIAKOO	0754527943	[illegible]
5	AMINA A. MAKUTIKA	MKI KIGAMBONI	KIGAMBONI	0753905735	[illegible]
6	WESTLAND PRE-P/1	SHULE	KARIAKOO	0759174203	[illegible]
7	FELISIA MSAFIRI	MJUMBE	KARIAKOO	0782411271	[illegible]
8	MATHIAS KAYONGO	MJUMBE	KARIAKOO	0784 [illegible]	[illegible]
9	SIMON G. TOYI	MJUMBE	KARIAKOO	0784658104	[illegible]
10	PRISCA K. M[illegible]	MJUMBE	KARIAKOO	0754695316	[illegible]
11	SEVERINA SIMON	MJUMBE	KARIAKOO	—	S. [illegible]
12	HALIDI A. N[illegible]	MJUMBE	LWANZALI	0787-166807	[illegible]
13	DENIS H. Halidi	MJumbe	Lwanzali	0769 852289	[illegible]
14	ASHA S. SALUMU	MJUMBE	KARIAKOO	0683971641	A. SAIDI
15	Ramadhani Mjanga	MJUMBE	KARIAKOO	0654 [illegible]	[illegible]
	[illegible] Kilumba	Mwenyekiti	″	0784517796	[illegible]

WARD EXECUTIVE
KITETE WARD
TABORA MUNICIPALITY

Mtaa: MailiTano

MRADI WA MABORESHO YA
YA UKUAJI WA MIJI (TACT
MKUTANO WAKWADAU KUTOKA A
PAMOJA NA MPANGO WA FID
MRADI WA UJENZI WA B
KATA YA IPULI

AJENDA
1: KUFUNGUA MKUTANO
2: MAELEZO KUTOKA UJENZI
WA BARABARA NA MAMBO
YA MAZINGIRA
3: MASWALI/MAONI KUTOKA
WADAU
4: KUAHIRISHA MKUTANO

1: Kufunguliwa mkutano

Mkutano ulifunguliwa
na mwenyekiti mlaga
Wananchi hapa wanaoi
katika barabara ya Mai
walielewa kuendelea pamoja
wananchi hawajaelewa. bu
wana maoni bali waya
ugeni huu wa barabara.
Hivyo mwenyekiti aliwa
zi wanaweze kuendelea
na kutoa ufafanuzi pale
Hivyo walitaalamu wa
Arem Tech Consult
Kuendelea na mada

MRADI WA MABORESHO YA MIUNDOMBINU KULINGANA NA KASI YA UKUAJI WA MIJI (TACTIC ZONE 1)

MKUTANO WA WADAU KUHUSU ATHARI ZA MAZINGIRA NA JAMII PAMOJA NA MPANGO WA AFYA NA MAKAZI

MRADI WA UJENZI WA BARABARA YA MAILI TANO 1.2KM KATA YA IPULI

09/10/2021

AJENDA

1: KUFUNGUA MKUTANO

2: MAELEZO KUHUSU UJENZI WA BARABARA NA MAMBO YA MAZINGIRA

3: MASWALI/MAONI KUTOKA KWA WADAU

4: KUAHIRISHA MKUTANO

M.E MAILI TANO
KATA- IPULI

1: Kufungua mkutano

Mkutano ulifunguliwa majira ya saa [illegible] na mwenyekiti [illegible] ambapo aliwakaribisha wananchi hasa wananchi wanaofanya biashara katika bambua ya Maili tano ambapo alitambulisha wataalamu [illegible]

8: MAELEZO KUHUSU MRADI WA BARABARA

Mwalimu mhasibu ndugu Robert Kihiki alianza kwa kueleza kuwa Serikali kupitia Wizara ya Tawala za Mikoa na Serikali za Mitaa (TAMISEMI) inafanya kazi ya utekelezaji wa ~~mradi~~ uboreshaji wa miundombinu katika miji iliyoendelea na kasi ya ukuaji wa miji huyo, hivyo barabara hii ya Maili Tano ni mojawapo ya miradi ambayo imetakiwa kuboreshwa ili wananchi waweze kunufaika huduma hiyo kwa urahisi.

Aliendelea kusema kuwa kwa sasa wataalamu washauri wanaendelea kufanya usanifu na pindi watakapokamilisha tathmini ya mazingira na masuala ya kijamii pia masuala ya makazi mbadala kama yanatokea basi utaratibu wa makazi mbadala utaandaliwa. Hivyo wananchi wawe watulivu na kila hatua watashirikishwa.

9: MASWALI/MAONI KUTOKA KWA WADAU.

KUAHIRISHA MKUTANO

Mkutano uliahirishwa majira saa 5:20 asubuhi kwa mwenyekiti kuwashukuru wajumbe na kuwataka wananchi kutoa ushirikiano.

KATIBU

Jina: REHEMA SHEIKA

NAMBA YA SIMU 0692 023717

SAHIHI:

M/E [illegible] LITONO
KATA - IPULI

MWENYEKITI

JINA: MASUDI JUMANNE TEREZA

NAMBA: 0789 694487

SAHIHI: [illegible]

MRADI WA MAEORESHO YA MIUNDOMBINU KUENDANA NA KASI YA UKUAJI WA MIJI KANDA 1(MANISPAA YA TABORA)-MKUTANO NA WADAU KUHUSU ATHARI ZA MAZINGIRA NA JAMII PAMOJA NA MPANGO WA FIDIA NA MKAZI

MAHUDHURIO

WILAYA YA TABORA.

TAREHE 22/12/2021

KATA IPULI

MTAA MAILITANO

SN	JINA	CHEO	ATOKAKO	NAMBA YA SIMU	SAHIHI
1	MASUDI ITEKELA	MKITI MAITANO	MAILI TANO	0789694487	[illegible]
2	REHEMA SHIJA	MC	MAILITANO	0692023777	[illegible]
3	EMMANUEL SHIJA	Afisa Seri	MAILITANO	0753362479	[illegible]
4	LEONARD MAJUKIA	WEO	IPULI	0769555121	[illegible]
5	ADAM ABDALLAH [illegible]	Mjumbe	MAILITANO	0764215025	[illegible]
6	Katala [illegible]	Mkulima	Ipuli		[illegible]
7	Shabani Sapula	Mkulima	Ipuli	- - -	[illegible]
8	Selele Ramadhi	mkulima	Ipuli	- - -	Chabani
9	[illegible]	CO	Ipuli		[illegible]
10	FATUMA NASORO	Mjumbe			[illegible]
11	MWAJUMA NASORO	mjumbe	MAILITANO		F.N.
12	KHADIJA SHABANI	mkulima	MAILITANO		HADIJA
13	KABICHE SHABANI	mkulima	MAILITANO		K.S
14	MWASI SHABANI	— // —	MAILITANO	—	KaBiche
15	KALUNDIME SALUM	— // —	MAILITANO		K. Shabani
16	MARIAM ISSA	— // —	MAILITANO		K. Salum
17	HAWA SAID	— // —	MAILITANO		H. SAID
18	HAMIDA SAKARI	— // —	MAILITANO		[illegible]
19	HAMISA BAKARI	— // —	MAILITANO		[illegible]
20	KHADIJA RIAM	— // —	MAILITANO		H.B. [illegible]
21	MAGRETH YASSIN	— // —	MAILITANO		HADIJA
22	VERONICA ABEL	— // —	MAILITANO		Z.A
23	NEZIA ABULMAN	— // —	MAILITANO		V. ABEL
24	ZAINAB ESCALIGA	— // —	MAILITANO		[illegible]
25	MAYASA JUMA	— // —	MAILITANO		[illegible]
26	ZUHURA MRISHO	— // —	MAILITANO		[illegible]
27	JULIANA NAWESE	— // —	MAILITANO		[illegible]
28	Joseph S. Nkolosha	— // —	MAILITANO		Zuhura
29	BUTOE MANYAMA	— // —	MAILITANO		[illegible]
30	SOPHIA S KAMIZULA	MTAALAMU	MAILITANO	0686382302	S.S.Kamizula
31	MARY KIPANDACHA	—		0784[illegible]	[illegible]
32	ELIZABETH DAUDI	—			
33	HALIMA ZAMZAMI	—	MAILITANO	0788705892	[illegible]
34	REHEMA SAIDI	—	MAILITANO	—	[illegible]
35	HAPPINES ELIA	—	MAILITANO	0692543645 / 068[illegible]	R.S.M / H.E

M.E MAILITANO
KATA- IPULI

Mtaa: Mkunazini

MRADI WA MABORESHO YA MIUNDOMBINU KUENDANA NA KASI YA UKUAJI WA MIJI (TACTIC ZONE 1) MKUTANO WA WADAU KUHUSU ATHARI ZA MAZINGIRA NA JAMII PAMOJA NA MPANGO WA FIDIA NA MAKAZI MRADI WA UJENZI WA BARABARA YA KANYENYE 0.5 Km KATA YA KANYENYE.

AGENDA

1. KUFUNGUA MKUTANO
2. MAELEZO KUHUSU UJENZI WA BARABARA NA MAMBO YA MAZINGIRA.
3. MASWALI / MAONI KUTOKA KWA WADAU
4. KUFUNGA MKUTANO

1. KUFUNGUA MKUTANO

Mkutano ulifunguliwa na Mwenyekiti mnamo saa 8:00 Kamili Mchana. Aliwakaribisha Wananchi hasa Wanaoishi na Kufanya biashara Katika barabara ya Kanyenye, ambapo aliwataka kuwa watulivu na wasikivu pamoja na yote kama kuna sehemu Wananchi hawa-Wana maoni basi waulize maswali au kama Wana maoni basi wa... Maswali wayatoe ili kuweza kufanikishwa ujenzi huu wa barabara ya Kanyenye.

Hivyo Mwenyekiti aliwakaribisha Wataalam washauri ili waweze kutoa maelezo kuhusu mradi na pia kutoa ufafanuzi na pale itakapohitajika zaidi. Hivyo wataalam washauri kutoka Kampuni ya Crown Tech

AFISA MTENDAJI KATA YA KANYENYE TABORA

Consult Ltd walikaribishwa kuwaagiza ya Kuendelea na Mada ~~Zifuatazo~~ Zinazofuata.

2. MAELEZO KUHUSU MRADI WA BARABARA

Mtaalam Mshauri Ndugu Robert Keshiki alianza kwa kueleza kuwa Serikali kupitia Wizara ya Tawala za Mikoa na Serikali za Mitaa (TAMISEMI) inafanya kazi ya uratibu wa uboreshaji wa Miundo Mbinu katika miji ili kuendana na kasi ya ukuaji wa Miji hiyo, Hivyo barabara hii ya Kanyenye ni Mojawapo ya Miradi ambayo ina takiwa kuboreshwa ili wananchi waweze kutumia huduma hiyo kwa urahisi

Pia aliendelea kusema kuwa kwa sasa Wataalam Washauri Wanaendelea kufanya usanifu na pia wanaangalia tathimini ya Mazingira na Masuala ya kijamii. Pia masuala ya makazi mbadala kama yatatokea basi utaratibu wa makazi mbadala utaandaliwa. Hivyo wananchi wawe watulivu na kila hatua watashirikishwa

3. MASWALI / MAONI KUTOKA KWA WANANCHI

(i) MASWALI

Mh. Diwani aliuliza ni kwanini Barabara ni moja inayowekewa rami au kutengenezwa ampapo ilikua ni Barabara ya Mtaa wa Mkuwazu na Barabara ya Mtaa wa Kahama(?)

AFISA MTENDAJI MTAA WA MKUWAZU KANYENYE-TABORA

JIBU

Mtaalamu wa Mradi alijibu kuwa kipande

kwa nguvu kazi, ambayo Elimu hiyo itakua ya Afya kuusu kujikinga na Ukimwi pia na Zana zitakuwa zinagaiwa au kutolewa kwa nguvu kazi ya Mradi.

4. SWALI

Mwananchi mmoja aliuliza Je? nguvu kazi ya Mradi watapata wazawa wakaa-karibu na Mradi.

JIBU

Mtaalam alijibu kuwa nguvu kazi kama vibarua watatoka katika Maeneo yanayozunguka mradi yaani wazawa. Pia kwa zile kazi zinazohitaji ujuzi wale wenye sifa waombe pia watakokua wanasifa wata-fanyiwa usaili na wakipita watafanya kazi katika Mradi.

MAONI NA MAOMBI

(1) Mzee Makwaya aliomba kuwekewa makalavati ya kuvuka watu na Magari kwenye msingi kwaajili ya kuvuka Magari na watu kuingia nyumbani kwao.

Mtaalam alijibu kuwa ombi limepo-kelewa pia kuwa msingi wote utafunikwa kwa Mkaravati hivyo wasiwe na wasiwasi.

(2) Isekela aliomba kuwa AFISA MTENDAJI KATA WA MKUGOZWI KANYENYE-TABORA wawe wanamaliza Miradi kwa wakati kuweka Matuta ili kuweza kuepusha ajali za

Kimoja cha barabara ya Kanyenye kinasomeka au kinachamishiwa kata ya Chemchem ata hivyo watanyalia jinsi ya kufanya kwasu hicho kipande cha barabara ya Mtaawa Kahama kata ya Kanyenye.

2. SWALI

Ramadhani Sungura aliuliza kuwa je? kutakua na fidia kwa wananchi watakao pata athari na je? fedha hiyo kama ipo italipwa kwa wakati au itachukua muda.

JIBU

Mtaalam alijibu kuwa fidia itakuepo kwa nyumba ambazo zitapata athari kama kubomoka au kupata nyufa ila endapo itathibitika kweli imepatikana kutokana kazi za mradi hivyo basi wale wote ambao nyumba zao zina ufa waanze kuziba mapema kabla ya mradi kuanza. Pia aliwambia fedha italipwa mara moja kwa mlengwa endapo itathibitika athari imetokana na mradi.

3. SWALI

Mwananchi mmoja aliuliza kwenye mradi kutakua na Elimu yoyote ya Afya itakayotolewa kwa nguvu kazi ya mradi kutoka na kata ya Kanyenye kuwa na wimbi la madada poa.

AFISA MTENDAJI MTAA WA MKWAJUNI KANYENYE-TABORA

JIBU

Mtaalamu alisema kuwa Elimu itatolewa

barabarani hasa akoangalia barabara ya Rehani iliyowekewa rami pia inakona ambayo waendesha vyombo vya moto kama bodaboda wanakimbia sana.

Mtaalam alimjibu kuwa wamelipokea na watafanyia kazi katika mradi huu unaoanza.

4. KUFUNGA MKUTANO

Mwenyekiti aliwashukuru Wataalam na Wananchi kwa Mahudhurio mazuri ya Mkutano, pia aliwashukuru wananchi kwa kuridhia na kupokea Mradi. Hivyo basi kulingana na Maelezo ya Mtaalam kuwa Mradi utakuwa na miezi (6) ya mwanzo ya kufanya usanifu pia ujenzi utaanza rasmi mwezi wa 7/2022 ambao utakuwa mwaka 2022/2023. Alifunga Mkutano mnamo saa 9:00 kamili Alasiri.

Imethibitishwa na

Raphael
AFISA MTENDAJI
MTAA WA MKUANZWI
KANYENYE-TABORA
21/12/2021

MRADI WA MABORESHO YA MIUNDOMBINU KUENDANA NA KASI YA UKUAJI WA MIJI KANDA 1(MANISPAA YA TABORA)-MKUTANO NA WADAU KUHUSU ATHARI ZA MAZINGIRA NA JAMII PAMOJA NA MPANGO WA FIDIA NA MKAZI

MAHUDHURIO

WILAYA YA TABORA

TAREHE 21/12/2021

KATA KANYENYE

MTAA MKUNAZINI

SN	JINA	CHEO	ATOKAKO	NAMBA YA SIMU	SAHIHI
1	ZUBEDA A. CHAMBAROZE	AGANT	KANYENYE	0785 617667	[illegible]
2	PHILLIP PNGOWA	MIKTI-KANYENYE	KANYENYE	0754360457	[illegible]
3	CRESENTIA RWEKITI	MJAMII	KANYENYE	0757554531	C. Rwekiti
4	GEORGE D. PAUL	ME-KANYENYE	KANYENYE	0758041628	[illegible]
5	MARIANA E KARERERI	ME-KAZEMBE	KANYENYE	0752924742	[illegible]
6	FRANCIS KIBADA	ME-UHAZILI	KANYENYE	0687 193464	[illegible]
7	NASIBU RUKEMA	WE- KANYENYE	KANYENYE	0985-854869	[illegible]
8	STELLA J. ANTHONY	AEK-KANYENYE	KANYENYE	0784375558	[illegible]
9	MOSHI A. YOGUKO	MIKATA	——	0787 555997	[illegible]
10	REMIGIUS D. KAUBA	[illegible]	KATA KANYENYE	0783309626	[illegible]
11	JUMA H. YUSUFU	MJUMBE	KANYENYE	065 747961	[illegible]
12	ISEULA R. NZOTA	MSUMBE	KANYENYE	0787-009975	I. NZOTA
13	JULIUS E LULE	MJUMBE	KANYENYE	0756815655	[illegible]
14	RAMADHANI M. ABDALLAH	MJUMBE	KANYENYE	0699673466	[illegible]
15	SHABANI MAGENO	MJUMBE	KANYENYE	0788-528415	[illegible]
16	ALLY MSAFIRI	MJUMBE	KANYENYE	0687972685	[illegible]
17	SHAFII TUFOUTIKE	MJUMBE	KANYENYE	0766107984	[illegible]
18	FASNET JACOB	ME-MKUNAZINI	MKUNAZINI	—	[illegible]
19	FATUMA ALLISHO	ME-MKUNAZINI	MKUNAZINI	—	F. Allisho
20	HAWA JUMA	ME-MKUNAZINI	MKUNAZINI	—	H. Juma
21	MKOLA NZAGAMBA	AFISA UGANI	KANYENYE	—	[illegible]
22	MARIAM ALLY	—"—	—"—	—	ALLY
23					

AFISA MTENDAJI
MTAA WA MKUNAZINI
KANYENYE - TABORA

MRADI WA MABORESHO YA MIUNDOMBINU KUENDANA NA KASI YA UKUAJI WA MIJI KANDA 1(MANISPAA YA TABORA)-MKUTANO NA WADAU KUHUSU ATHARI ZA MAZINGIRA NA JAMII PAMOJA NA MPANGO WA FIDIA NA MKAZI

MAHUDHURIO
WILAYA YA TABORA

TAREHE 21/12/2021

KATA ....

MTAA MKUNAZINI

SN	JINA	CHEO	ATOKAKO	NAMBA YA SIMU	SAHIHI
1	Mauke Mocdi	MKAZI	MKUNAZINI	0767784481	[illegible]
2	MWANAIDI OMARI	MJUMBE	MKUNAZINI	0682856376	[illegible]
3	ZENA MWAKASANGA	MJUMBE	MKUNAZINI	0752155520	[illegible]
4	TABITHA AMOS	MJUMBE	MKUNAZINI		T. A
5	AMISA NASOLO		MKUNAZINI	0692787251	M. A
6	MARIAM IDRISA				
7	MAUNAHNS RAMADHANI		MKUNAZINI	0787866466	M Ramadhani
8	CHIKU RASHID		MKUNAZINI		[illegible]
9	MAIMUNA HASSAN		MKUNAZINI	0788415833	M. hassan
10	LAILATI YUSUFU		MKUNAZINI	0	[illegible]
11	CRISTINA LUCASI		MKUNAZINI		
12	DIANA OTAYO		MKUNAZINI	0656486331	[illegible]

AFISA MTENDAJI
MTAA WA MKUNAZINI
KANYENYE-TABORA

Appendix IV: Consultation meetings Photos

Photo 1; *Consultation with CMT-Tabora Municipal council*

Photo 2; *Consultation with Fire and Rescue Force-Tabora Municipal council*

Photo 3: *Consultation meeting with TFS-TABORA*

Photo 4: *Consultation meeting with Ag.DED-TABORA Municipal Council Office*

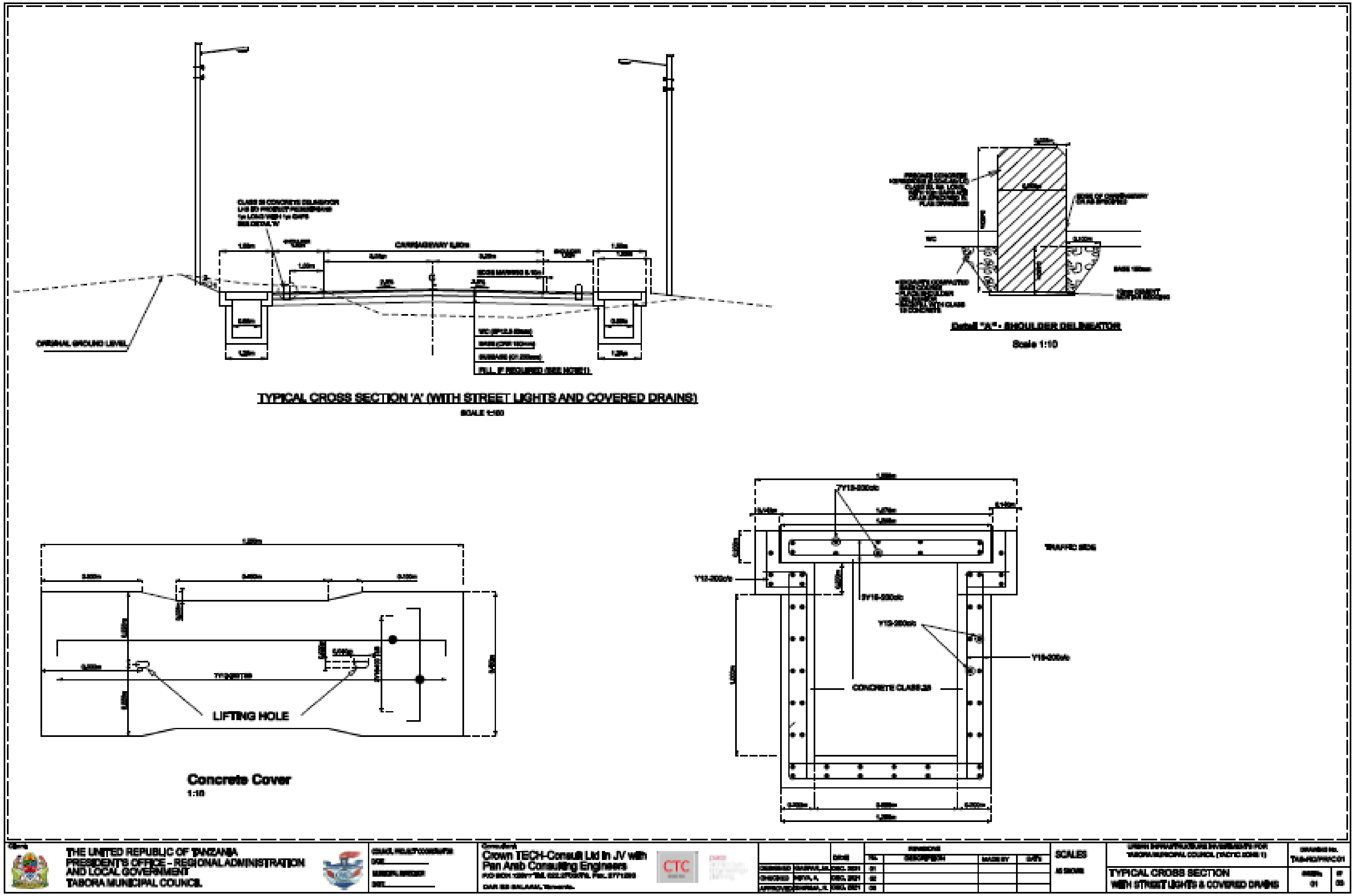
Photo 5: *Consultation with communities at Kanyenye Road*

Photo 6: *Consultation with communities at Swetu Road*

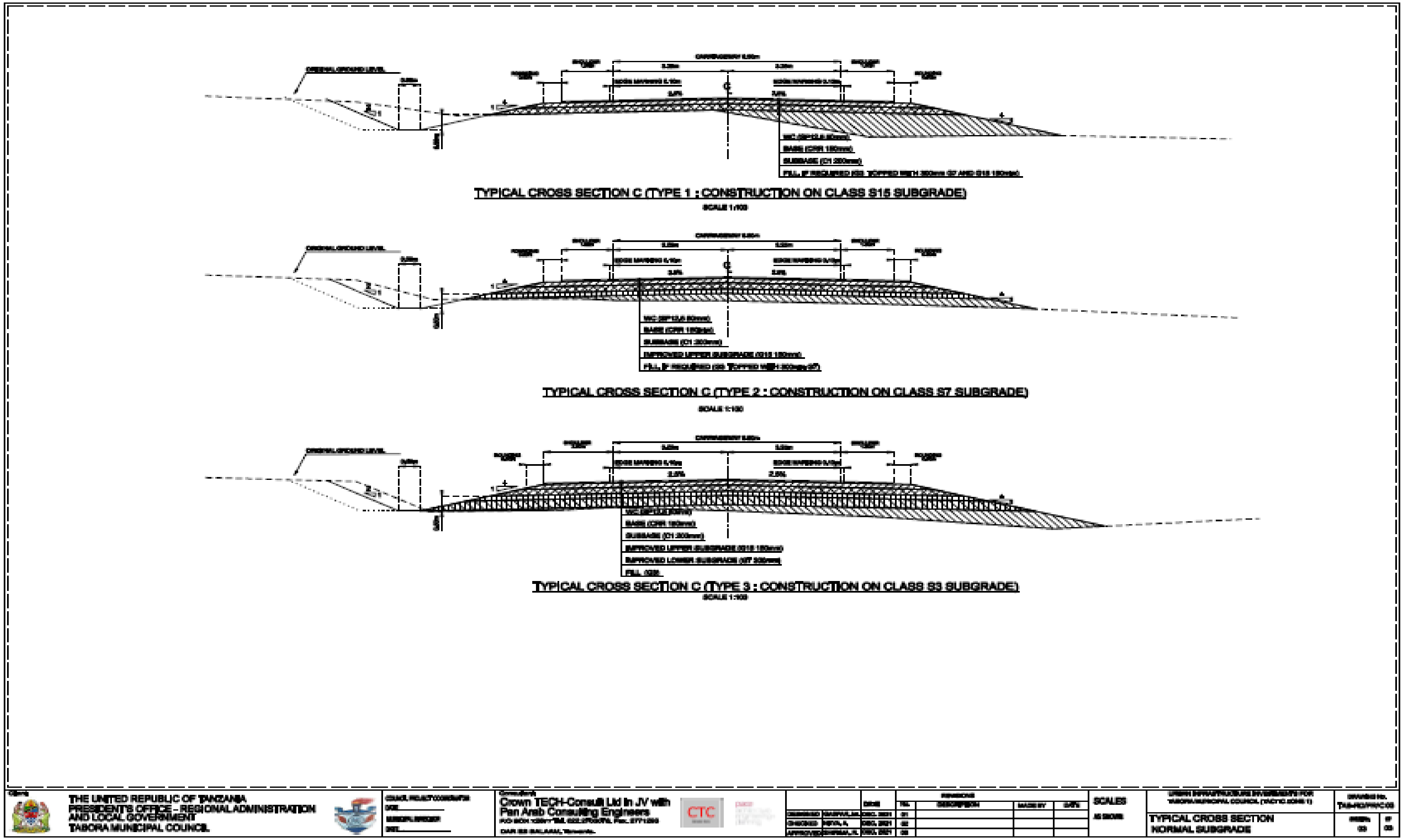
Photo 7: *Consultation with communities at MailiTano Road*

Photo 8: Consultation with communities at Kisarika road

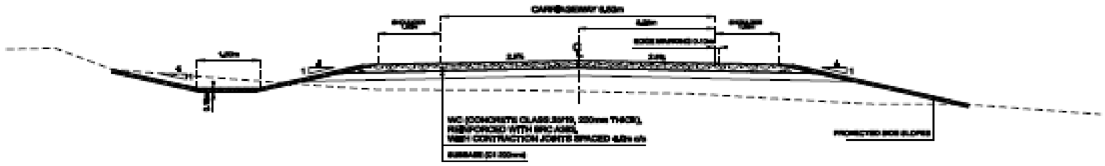
Appendix V: Architectural Drawings



Typical road cross-section with street lights and covered drain



Typical road cross-section of subgrades types to be constructed



TYPICAL RIGID PAVEMENT CROSS SECTION 'B'

SCALE 1:100

S/N	ROAD NAME	ROAD LENGTH			WIDTH REQUIREMENTS (m)					CROSS SECTION	STREET LIGHT	PAVEMENT		
		START	END	L (m)	CW	SH	DT	WW	TT			WC	BASE	SUBBASE
01	Kanyenye road I	0+000	0+146	146	6.50	1.50	3.10		11.10	A	YES	50 AC	150 CRR	200 C1
	Kanyenye road II	0+000	0+363	363	6.50	1.50	3.10		11.10	A	YES	50 AC	150 CRR	200 C1
02	Swetu road	0+000	3+391	3,391	6.50	1.50	3.10		11.10	A	YES	50 AC	150 CRR	200 C1
03	Mailitano road	0+000	1+129	1,129	6.50	1.50	3.10		11.10	A	YES	50 AC	150 CRR	200 C1
04	Kisarika I & II Road	0+000	2+359	2,359	6.50	1.50	3.10		11.10	B	YES	200 CONC.		200 C1
	Kisarika III Road	0+000	0+629	629	6.50	1.50	3.10		11.10	B	YES	200 CONC.		200 C1
06	Terminal Access	0+000	0+360	360	6.50	1.50	3.10		11.10	A	YES	53 AC	153 CRR	203 C1

NB:

CW = Carriageway; MD = Median; SH= Shoulder; DT= Ditch; BB = Busbay; WW = Walkay; GZ = Green zone; TT = Total

DSD = Double Surface Dressing, AC = Asphalt Concete, WC = Wearing Couse,

THE UNITED REPUBLIC OF TANZANIA
PRESIDENT'S OFFICE - REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT
TABORA MUNICIPAL COUNCIL

Crown TECH-Consult Ltd in JV with Pan Arab Consulting Engineers

DAR ES SALAAM, Tanzania.

TYPICAL CROSS SECTION

Typical rigid pavement cross-section 'B'

Appendix VI: Emergency Preparedness and Response Plan

EMERGENCY PREPAREDNESS AND RESPONSE PLAN

11.0 INTRODUCTION

Emergency Response Plan is to establish an organizational structure and procedures for response to major emergencies. Proper planning, preparation, and timely response to emergencies are the most effective ways to minimize adverse impacts to public health, property, and the environment. This Environmental Emergency Response Plan (EERP) contains the requirements and procedures for environmental emergency planning, preparedness, response, and reporting for operations at the grinding plant. The EERP will be designed to ensure timely identification of emergencies, clearly designate responsibilities, and promote effective response actions, with minimal confusion and disruption of operations. The main elements of the plan include:

- Specific emergency situations.
- An emergency monitoring and response management hierarchy and chain of Command with defined responsibilities for operations personnel.
- Emergency response plans for each type of emergency.
- Notification and reporting requirements for emergencies.

The plan will be comprehensive and is designed as an active reference for operations personnel during the life of the lead operation.

11.1 OBJECTIVE

To plan for, coordinate, implement and manage a program to protect the environment and the welfare of the public in the event of an emergency at project Area.

11.2 POTENTIAL EMERGENCIES

This EERP will cover environmental emergencies that are considered most potentially likely to affect the excavated area. Environmental emergencies involve the release, or threatened release, of pollutants such as oil to the soil, water, or air. Releases can be accidental, deliberate, or caused by natural disasters. Environmental emergencies are categorized as technological emergencies, human error emergencies and physical infrastructure emergencies.

These emergencies could arise because of:

- Fire.
- Equipment/infrastructure failure.
- Lightning and flooding; and

The specific emergencies that are possible during the operation of the plant are described below.

11.2.1 Technological Emergencies

Technological emergencies result from failure of equipment or facilities or could result from a process or system failure. Possibilities include:

- Hazardous materials handling incident.
- Safety system failure.
- Breaking system failure on vehicles.
- Power failure; and
- Emergency notification system failure.

11.2.2 Human Error Emergencies

A wide variety of emergencies can be caused by employee error or negligence. Overall, human error is the single largest cause of workplace emergencies and can result from:

- Inadequate training.
- Poor maintenance.
- Poor attitude
- Carelessness.
- Misconduct.
- Substance abuse; and
- Fatigue.

11.2.3 Physical Emergencies

Physical emergencies relate to the design and construction of the project infrastructure, whereby some condition or factor not accounted for in the design or some element of inadequate construction results in an emergency. Physical features to be considered are:

- The physical construction of the facility.
- Layout of equipment.
- Lighting.
- Evacuation routes and exits; and
- Proximity of shelter areas.

11.2.4 The Excavated Area Emergencies

Based on an integrated review of the future plant operations and the possible emergencies, a defined set of emergency situations has been developed. These are the specific emergencies that are anticipated in the implementation and operation of the excavate area operations. The defined emergencies are described below.

11.2.5 Pollution Control Failure

Failure of the pollution control facilities can occur around the operational area if the silt traps and cut off drains fail because of eroded material filling up in the traps or drains. The above scenario can have a significant impact on receiving environment. Regular inspections will be carried out.

11.2.6 Fire

Failure to observe safety guidelines at plant site can increase the risk of fire when the volatility and flammability of fuels is taken into consideration. Additionally, fire damage to any project infrastructure can cause release of hazardous materials to the air or ground. Methods and equipment used in fighting fires in the project area needs to take account of the presence of hazardous liquids. Firefighting equipment such as fire extinguishers will be installed in clearly marked places and within easy reach. Adequate training in firefighting coupled with regular fire drills will be conducted to ensure that employees are fully adept with handling emergencies resulting from fire. Lines of command will be established for employees to be aware of who to contact in the event of fire.

11.2.7 Risk of Lightning

Unbalanced electric charge in the atmosphere can cause lightning which is a massive electrostatic discharge. Humans can be hit by lightning directly especially when outdoors. Lightning strikes can cause hearing damage or trauma or can be fatal.

11.3 EMERGENCY MANAGEMENT ELEMENTS

This section of the plan describes the necessary response approach to the primary emergencies identified for the operation. There are two crucial elements to effective emergency response: the early identification of the emergency and a rapid and comprehensive response to address the emergency and minimize negative impacts. The response plans are based on:

- Monitoring and emergency identification.
- Environmental protection.
- Direction and control.
- Communications.
- Safety.
- Property protection.
- Community outreach.
- Recovery and restoration; and
- Administration and logistics.

These elements are the foundation for the emergency procedures that Starlink-Gulf Limited will follow to protect personnel, the environment, and equipment, and resume safe operations as quickly as possible.

11.3.1 Emergency Response Chain of Command

A specified chain of command for immediate response to emergencies as well as formal notification will be required to ensure effective response as well as compliance with appropriate regulations. Although each emergency will have different personnel involved in identifying and responding to emergencies on the first level, the specified chain of command is common to any emergency. The camp chain of command shall be addressed in the later stages:

An alternate for each position on the chain of command will be assigned. Should any person bin the chain of command takes leave or not be able to carry out his/her responsibilities, then the alternate should be immediately taking over the said responsibilities.

11.3.2 Safety Buffer Zone

The proposed project will establish the buffer zone to reduced or avoid dust emission during processing of dolomite power. The buffer zone will design with the height of 6 meters built by cement block for security purpose and dust controlled to the surrounding community.

Appendix VII: Non- Technical Executive Summary

UFUPISHO

TAARIFA YA ATHARI ZA MAZINGIRA KWA WANAOPENDEKEZWA KUBORESHA BARABARA YA KANYENYE (8.109KM), BARABARA YA SWETU (KM 8.371), BARABARA YA MAILITANO (KM 4.132) NA BARABARA YA KISARIKA (KM 2.829) HADI KIWANGO CHA LAMI MANISPAA YA TABORA, MKOANI TABORA

Mtetezi: Jamhuri ya Muungano wa Tanzania, Ofisi ya Rais – Tawala za Mikoa na Maendeleo ya Mitaa (PO-TAMISEMI)

Mawasiliano ya Mtetezi: PO-TAMISEMI,

Tawala za Mikoa na Serikali za Mitaa
Mradi wa Kusaidia Serikali za Mitaa
Jengo la COSTECH la Ghorofa ya 3, Kijitonyama
Ali Hassan Mwinyi Rd
Sanduku la Posta 34314
Dar es Salaam

Mtaalamu wa EIA: WESH Consulting Limited

Block No 3, Plot No. 105, Makongo Juu Street,
P. O BOX 35478, Dar es Salaam, Tanzania
Mob: +255 752 575 989/ +255 754 898 592
Barua pepe: weshconsultingltd@gmail.com

UTANGULIZI

Serikali ya Jamhuri ya Muungano wa Tanzania kupitia Ofisi ya Rais – Tawala za Mikoa na Maendeleo ya Mitaa inakusudia kufikisha miundombinu na huduma za msingi zilizoboreshwa katika kushirikisha mamlaka za serikali za mitaa za mijini na kutenga fedha kwa ajili ya kufanya Tathmini ya Athari kwa Mazingira na Kijamii (ESIA) ikiwa ni pamoja na maendeleo. Mpango wa Usimamizi wa Mazingira na Kijamii (ESMP) pamoja na kufanya Mpango Kazi wa Makazi mapya (RAP) kwa Manispaa ya Tabora miundombinu ya miradi midogo inayopendekezwa ambayo ni pamoja na; uboreshaji wa barabara ya Swetu yenye urefu wa Km 3.4, barabara ya Kisarika I&II 2.36Km na Kisarika III 0.63 Km, barabara ya Kisarika IV *(Nguzo Tanesco)* 3.6km, Mailitano barabara 3.1Km (Mailitano I 1.10km, Mailitano barabara

II 0.63Km, Mailitano barabara III0.69km, na Mailitano barabara IV 0.67km), Kanyeye I barabara 0.15Km Barabara ya Kanyenye II (*Madaraka st.*) 0.5km, Kanyenye III (Kanoni st.) barabara 1.08km, na Barabara ya Ufikiaji wa Kituo (*Mkunazini St.*) 0.36km . Uboreshaji wa miundombinu ya msingi ni sehemu ya mkakati wa Serikali wa kukuza maendeleo ya kijamii na kiuchumi ya miji na majiji ya Tanzania na kuimarisha maendeleo ya miji yenye tija, jumuishi na yenye kustahimili mabadiliko.

PO-TAMISEMI na Benki ya Dunia walianzisha majadiliano ya kuzingatia uboreshaji wa barabara ya Swetu, barabara ya Kisarika, barabara ya Mailitano na barabara ya Kanyeye . Utekelezaji wa mradi huu mdogo wa TACTIC unakusudiwa kuwezesha ukuaji wa uchumi ambao ni pamoja na; kuchochea ukuaji wa Mji kupitia ujenzi wa miradi midogo ya barabara ambayo itatoa mazingira bora ya kijamii na kiuchumi ambayo yatapunguza uhamaji wa trafiki pamoja na hatari za kijamii.

Tathmini ya Athari kwa Mazingira (EIA), katika muktadha huu ikirejelea utafiti wa Tathmini ya Athari kwa Mazingira na Kijamii (ESIA), ilifanyika kwa mujibu wa kanuni za Tathmini na Ukaguzi wa Athari kwa Mazingira (2005) na marekebisho yake ya 2018 inayotekeleza Sheria ya Usimamizi wa Mazingira Na. Na. Cheti cha EIA ni miongoni mwa idhini za sharti zinazohitajika kabla ya mradi kuanza. Bila ubaguzi, mradi huu utahitaji cheti cha EIA kabla ya ujenzi wa barabara kuanza. Utafiti huo pia ulifanya mapitio ya Viwango vya Benki ya Dunia vya Mazingira na Kijamii (ESS) vya 2018 na kujumuisha mahitaji yao ipasavyo. Utafiti huo ulifanywa kutoka Desemba 2021 hadi Januari 2022.

SERA, MFUMO WA SHERIA NA TAASISI

Tanzania imejitolea kufikia malengo ya maendeleo endelevu. Msukumo huu unazingatiwa katika Sera ya Taifa ya Mazingira na sera zingine za kisekta zikiwemo;

- Sera ya Taifa ya Mazingira (NEP) ya mwaka 1997
- Sera ya Taifa ya Usafiri (2003)
- Sera ya Taifa ya Madini (1998)
- Sera ya Sekta ya Ujenzi (2002)
- Sera ya Taifa ya Ardhi (1995)
- Sera ya Nishati (2003)

- Sera ya Taifa ya Maendeleo ya Makazi (2000)
- Sera ya Taifa ya Jinsia (1999)
- Sera ya Taifa ya Maji (2002)
- Sera ya Taifa ya Misitu (1998)
- Sera ya Taifa ya Uwekezaji (1997)
- Sera ya Kilimo na Mifugo (1997)
- Mkakati wa Kitaifa wa Kukuza Uchumi na Kupunguza Umaskini
- Sera ya Taifa ya VVU/UKIMWI (2001)
- Sera ya Hifadhi ya Taifa (1994)
- Sera ya Taifa ya Afya (2017)

Sheria na kanuni muhimu ambazo zina umuhimu kwa maendeleo ya barabara kuhusiana na usimamizi wa mazingira ni pamoja na;

- Sheria ya Usimamizi wa Mazingira Na. 20 ya (2004), Sura. 191
- Kanuni za Athari kwa Mazingira na Ukaguzi (2005)
- Sheria ya Ardhi ya Vijiji (1999), RE 2019
- na kipengele 3.4.10 Sheria ya Ardhi, 1999 RE 2019Sheria ya Matumizi ya Maji (Udhibiti na Udhibiti) (1974) kama ilivyorekebishwa mwaka 1981 (Sheria Na.10)
- Sheria ya Barabara, 2007
- Sheria ya Maeneo Yanayolindwa (1969)
- Sheria ya Mambo ya Kale ya 1964 (kama ilivyorekebishwa mwaka 1979) na Kanuni za Mambo ya Kale za 1991.
- Sheria ya Mipango Miji (2007)
- Sheria ya Mipango ya Matumizi ya Ardhi (2007)
- Usalama wa Afya Kazini (2003)

- Sheria za Serikali za Mitaa Na.7 & 8 za 1982
- Sheria ya Tume ya Kitaifa ya Mipango ya Matumizi ya Ardhi 3/84
- Kanuni za Ardhi (Tathmini ya Thamani ya Ardhi kwa ajili ya Fidia), 2001]
- Sheria ya Misitu, 1957 (Iliyorekebishwa mwaka 2002)
- Sheria ya Misitu, 1957 (Iliyorekebishwa mwaka 2002)
- Sheria ya Vilipuzi, 538
- Sheria ya Mkoa na Wilaya Na. 9, 1997
- Miongozo ya Tathmini na Usimamizi wa Mazingira kwa Sekta ya Barabara
- Sheria ya Madini (1998)
- Sheria ya Utwaaji Ardhi ya 1967

MAELEZO YA MRADI

Uboreshaji wa barabara ya Swetu 3.4Km, Kisarika road I&II 2.36Km na Kisarika III 0.63Km, Kisarika IV *(Nguzo Tanesco)* barabara 3.6km, Mailitano barabara 3.1Km (Mailitano I 1.10km, Mailitano road II, Mailitano barabara II 0.63Km IIIKm 0.63K , na barabara ya Mailitano IV0.67km), barabara ya Kanyeye I 0.15Km, Barabara ya Kanyenye II (*Madaraka st.*) 0.5km, barabara ya Kanyenye III (Kanoni st.) 1.08km, na barabara ya Terminal Access (*Mkunazini St.*) 0.36km ziko katika Halmashauri ya Manispaa ya Tabora, mkoani Tabora.

Mpangilio wa barabara za mradi uliopo unavuka kutoka mahali pa kuanzia hadi mwisho kupitia kata tofauti. Zaidi ya hayo, barabara zinapita katika maeneo nyeti kwa mazingira na maeneo yenye wakazi wengi na idadi ya huduma za umma ambazo mradi utaathiri. Maelezo ya usanifu wa miradi midogo ya barabara ni;

Vipengele muhimu vya muundo wa barabara ni pamoja na:

- Upana wa barabara ya lami ya lami itakuwa 6.5m
- Upana wa njia 3.25m
- Idadi ya Njia 2
- Upana wa mabega (ya lami) itakuwa 2x1.5m

- Upana wa barabara 9.5m
- Ukanda wa hifadhi ya barabara wa 30m
- Miundo ya mifereji ya maji, makutano, na kazi za barabara za ziada
- Barabara itakuwa na maisha ya muundo wa miaka 20

Shughuli kuu za ujenzi wa miradi midogo ni pamoja na;

- Uchimbaji na usafirishaji wa vifaa (changarawe, mchanga, mawe magumu, mkusanyiko, maji na lami)
- Kusafisha Njia ya Kulia (RoW) huku ukiacha miti ambayo haiingiliani na ujenzi.
- Ukarabati Kiasi Ujenzi au ujenzi kamili wa kalvati na miundo mingine ya mifereji ya maji.
- Uundaji wa tuta la barabara, uanzishwaji wa msingi na msingi, uso wa barabara
- Vivuko vya watembea kwa miguu, Vivukio vya Mwendo kasi, na Mikanda ya Rumble vitatolewa katika maeneo yote yaliyojengwa na vituo vya biashara vya vijiji vyote.
- Uwekaji mandhari wa maeneo yaliyofunikwa na barabara ya mradi na uanzishwaji wa mimea kwa madhumuni ya utendaji na uzuri kwenye miteremko ya kukata na kujaza itakuwa kufuata mahitaji ya Vipimo vya Kiwango cha MOW kwa Ujenzi wa Barabara.
- Ukamilishaji na usafishaji wa mwisho wa barabara na hifadhi ya barabara baada ya ujenzi, urekebishaji wa barabara za zamani, na ubadilishaji wa muda.
- Michezo itahitajika ili kudumisha njia inayoweza kutumika wakati wa ujenzi. Popote inapowezekana, njia mbadala za mitaa zitatumika. Ujenzi na matengenezo ya mikengeuko hii lazima iwe ya kiwango kinachohakikisha usalama wa wafanyakazi, watumiaji wa barabara, na umma kwa ujumla. Michezo nje ya hifadhi ya barabara itahitaji ruhusa ya ziada kutoka kwa wamiliki wa ardhi. Mwishoni mwa muda wa matumizi ya mchepuko, njia hiyo itasitishwa na ardhi ya asili kurejeshwa inavyokubalika.

MAZINGIRA YA MRADI

Manispaa ya Tabora

Manispaa ya Tabora ni Makao Makuu ya mkoa wa Tabora yenye ukubwa wa Kilomita za mraba 1092. Manispaa iko kati ya 4 ^{o} 52' na 5 ^{o} 9' latitudo Kusini na 33 ^{o} 00' Mashariki. Sehemu kubwa ya sehemu yake iko kati ya 1000m juu ya usawa wa bahari. Imezungukwa na Wilaya ya Uyui upande wa Magharibi, Kaskazini, na Mashariki na Wilaya ya Sikonge kwa upande wa Kusini.

Katika Manispaa, mvua hupungua kutoka magharibi hadi mashariki, magharibi, mvua ni zaidi ya milimita 1,000 wakati upande wa mashariki hupungua hadi milimita 700 au chini ya hapo. Kilele ni Desemba ikifuatiwa na kiangazi kidogo mnamo Januari.

Joto la wastani wakati wa mchana ni 22 ^{0}C - 26 ^{0}C. Joto la juu zaidi la 33.1 ^{0}C hutokea Oktoba kabla tu ya msimu wa mvua kuanza, huanguka hatua kwa hatua mwezi wa Desemba, na hubakia kwa kiasi kikubwa hadi Mei. Kati ya Mei na Agosti, Manispaa hupitia msimu wa baridi na wastani wa kiwango cha chini cha joto cha 15.7 ^{0}C ni cha chini ikilinganishwa na Oktoba.

Vyanzo vya maji

Hakuna vyanzo vya maji vinavyoaminika kwenye tovuti ya mradi mdogo. Hata hivyo, kuna mito miwili mikubwa ambayo ni Walla na Igombe ambayo ni mito ya muda inayopitia manispaa hiyo. Kwa hivyo, ujenzi wa mabwawa ya udongo na hifadhi inaweza kuanzishwa wakati wa misimu ya mvua ili kuhifadhi maji ambayo yanaweza kutumika kwa madhumuni ya ujenzi.

Flora

Kuna hifadhi kuu mbili za misitu zinazopatikana ndani ya Manispaa ya Tabora zinazomilikiwa na serikali kuu; hizi ni pamoja na: Hifadhi ya Msitu wa Igombe inayopatikana Kaskazini-Magharibi mwa manispaa katika kata za Misha na Ikomwa na Hifadhi ya Msitu wa Urumwa inayopatikana Kusini-Magharibi mwa manispaa hiyo katika kata za Itetemia na Ntalikwa. Asili ya hifadhi hizi za misitu kiasili inatawaliwa na misitu ya miombo.

Uoto wa asili wa Manispaa ya Tabora unaweza kuainishwa katika ardhi ya juu na chini au uoto wa ardhioevu. Katika nyanda za juu, kuna misitu, vichaka, na nyasi zenye vichaka. Misitu ya Miombo (*brachystegia boehmii*) ndiyo spishi inayotawala ndani ya manispaa, yenye miti ya mninga inayopatikana katika sehemu zilizotawanyika. Misitu ya Miombo yenye miti migumu maarufu ya mninga ni vyanzo vizuri vya mbao bora, kuni, mkaa na kwa ajili ya kutunza mizinga ya nyuki.

Wanyama

Fauna katika manispaa hiyo inajumuisha mifugo ya aina tofauti kama; ng'ombe, mbuzi, kondoo na kuku. Hata hivyo, baadhi ya viumbe kama ndege na nyuki, nk, wana makazi yao katika maeneo ya misitu. Mifugo wengi ni wa kienyeji, wachache wa kigeni na chotara hupatikana hasa katika eneo la mijini.

WADAU WA MRADI NA USHIRIKISHI

Mbinu rahisi ilipitishwa ili kubainisha washikadau wakuu na maswala makuu ya kimazingira na kijamii. Hii ilihusisha uchunguzi wa kimwili na mashauriano (mashauriano ya moja kwa moja). Taarifa nyingine kuhusu mradi huo zilipatikana kupitia utafiti wa dawati.

Mashauriano ya wadau yalifanyika wakati wa hatua ya ugawaji. Ngazi mbalimbali za wadau wakiwemo viongozi wa serikali za mitaa pamoja na wanajamii katika vijiji vilivyoko kando ya barabara ya mradi walitambuliwa na kushauriwa.

Wadau walijumuisha mashirika ya serikali, wanufaika, makampuni ya kibiashara, na makundi mengine yote rasmi au yasiyo rasmi yanayohusiana na mradi. Mahojiano yalitumika katika mchakato wa kuwatambua washikadau. Kutoka kwa mdau mmoja, timu iliunganishwa kwa mwingine na mdau mwingine, katika mchakato wa mnyororo au wa mtandao. Ifuatayo ni orodha fupi ya wadau wa taasisi na watu binafsi.

Wadau wakuu ni pamoja na:

- Wizara ya Ujenzi na Uchukuzi;
- Wizara ya Ardhi, Nyumba na Maendeleo ya Makazi;
- Wizara ya Maliasili;
- Wizara ya Maji;
- RAS-Ofisi – Tabora
- TANROADS-Tabora
- TARURA – Tabora

- TFS-Tabora
- Halmashauri ya Manispaa ya Tabora
- Jeshi la Zimamoto na Uokoaji-Tabora
- WEO & VEO kwenye tovuti ya mradi mdogo
- Makampuni ya Huduma, TANESCO, TTCL, na Mamlaka za Ugavi wa Maji (TUWASA)
- Jumuiya ya eneo la karibu la mradi mdogo
- LATRA-TABORA

MATOKEO YA MASHAURIANO YA UMMA

Upeo na kazi ya awali ya uwandani ilifichua masuala muhimu yafuatayo ambayo yamefafanuliwa katika utafiti huu wa EIA. Masuala makuu ni pamoja na;

Manufaa ya Kiuchumi: Barabara nzuri yenye lami italeta manufaa mbalimbali ya kiuchumi kwa jamii zinazoishi kando au karibu na barabara. Hizi ni pamoja na; kupunguza gharama za usafiri, ongezeko la usafiri unaopita katika mradi mdogo wa barabara, kupunguza mmomonyoko wa udongo wakati wa msimu wa mvua, kupunguza matatizo ya mafuriko, kupunguza muda wa kusafiri.

Usanifu Unaopendekezwa wa Barabara: Mpangilio wa barabara upanuliwe ili kuchukua watembea kwa miguu, jamii zenye baiskeli na pikipiki, usanifu wa barabara za mradi uzingatie urembo wa Mji ikiwa ni pamoja na kuweka taa za barabara za barabara za mradi na ikiwezekana kwa barabara ya Ulaya (kuanzia Barabara ya Madafu hadi Kilimatinde) ambayo inapita kati ya RAS na makazi ya viongozi wengine wa mkoa ili kupunguza matukio ya wizi. Vile vile, muundo unapaswa kuzingatia maeneo yenye mafuriko na mfumo wa mifereji ya maji.

Miundombinu ya Umma: Baadhi ya huduma zinazotolewa kwa jamii yaani maji, umeme, na mawasiliano ya simu zitaathiriwa/ au kutatizwa na ujenzi wa barabara. Huduma ya maji kutoka TUWASA ndio chanzo kikuu cha maji kwa wakazi wa manispaa ya Tabora; Kwa hiyo, awamu za mradi zinapaswa kuepuka uchafuzi wa maji. Kuna Machinjio, vituo vya afya, na shule ziko kando ya barabara ndogo ya mradi.

Makazi mapya na fidia : Unyakuzi wa mali za watu walioathirika na mradi, hasa nyumba. Suala hili ni muhimu na nyeti sana kwani ni ghali sana na hali ya kifedha iliyopo kwa mtu binafsi kuweka muundo wa nyumba. Ni mali ambazo zinathaminiwa sana na jamii.

Mahali pa Maeneo ya Kambi: Watu wa eneo hilo wanapaswa kushirikishwa katika uteuzi wa maeneo ya kambi. Maeneo ya kambi ya mkandarasi yanapaswa kujengwa kwa vifaa vya kudumu vya ujenzi. Wazo ni kutumia miundo hii kwa huduma za umma kwa mfano shule au ofisi za mitaani mwishoni mwa awamu ya ujenzi wa mradi.

Kuenea kwa VVU/UKIMWI na Maambukizi Mengine ya Kujamiana : Kudhoofisha usalama wa jamii na hatari ya kuongezeka kwa magonjwa, hasa VVU/UKIMWI. TARURA na mshauri (PO-TAMISEMI) kufanya rasmi mkataba rasmi na taasisi itakayokuwa inaendesha kampeni ya kuzuia maambukizi ya VVU/UKIMWI kupitia uenezaji wa semina zinazofaa na zinazofaa za kujenga uelewa wa kujikinga na VVU/UKIMWI, kampeni ziwe kwa wafanyakazi wote wawili. hasa na jamii, ushirikiano mzuri na CMACs na wadau wengine ni muhimu kwa kampeni za uhamasishaji wa VVU/UKIMWI zinazozingatia matokeo wakati wa ujenzi wa barabara.

Ndoa za utotoni na mimba: Imesisitizwa na wadau kuwa miradi mingi ya ujenzi imekuwa chanzo kikubwa cha mimba za utotoni kwa watoto wa kike wa shule. Wadau hao walipendekeza baadhi ya hatua za kukabiliana na hali hiyo yaani wazazi waweke utamaduni wa kuwaelimisha watoto wao juu ya jinsia na elimu ya afya ya uzazi, kuzingatia maadili na maadili, na pia wazazi wawe na tabia ya kuwajibika kama vielelezo ambavyo watoto wanaweza kuiga kwao.

Uhamasishaji juu ya usalama barabarani: Imekuwa ikizingatiwa kila wakati na kushuhudiwa kuongezeka kwa idadi ya ajali za barabarani ambazo ni mbaya na kuondoka kwa ulemavu baada ya barabara ya lami kujengwa; kama barabara za lami zinazopendekezwa, zitapoteza maisha ya watu kupitia ajali. Mkandarasi/TARURA kutoa mafunzo kwa viongozi wa jumuiya mbaya kuhusu Kampeni ya Usalama Barabarani na Afya na Usafi Mahali pa Kazi ili wawe waelimishaji wakuu wa jamii kwa watumiaji wa barabara kwa kusambaza taarifa, elimu na mawasiliano muhimu, sahihi na zinazofaa kwa wanajamii. Hii inaambatana na uwekaji au uwekaji wa alama za barabarani zinazoeleweka na zinazoeleweka (ikiwezekana kwa Kiswahili), utumiaji wa nundu za mwendo kasi barabarani, na ufuatiliaji wa jumla wa polisi wa trafiki pamoja na ugawaji wa alama za usalama mahali pa wafanyikazi.

Kuchochea ukuaji wa mji: Mradi utachochea ukuaji wa miji na mitaa iliyo kando ya barabara ndogo zinazopendekezwa. Miji hii inapaswa kusaidiwa na serikali katika kupanga (kwa mfano, matumizi ya ardhi na upimaji wa viwanja) ili kuzuia ukuaji usiopangwa wa makazi ambao unaathiri moja kwa moja upatikanaji wa huduma muhimu za umma kama vile usambazaji wa maji safi na kudhibiti taka zinazozalishwa na wakazi wa miji na mitaa husika. barabara. Walakini, mradi unapaswa kuzuia usumbufu wa huduma muhimu za umma haswa wakati wa ujenzi.

Fursa za ajira kwa wenyeji: Kila mtaa/kata inayopitika inapaswa kupewa kipaumbele katika utoaji wa vibarua wasio na ujuzi na wenye ujuzi mdogo katika mradi. Kwa hivyo mkandarasi anapaswa kuzingatia sera ya maudhui ya ndani katika kutekeleza mradi wakati wa kuajiri wafanyikazi na mnyororo wa usambazaji wa huduma.

Bima ya Wafanyakazi: Uzoefu uliopatikana kutoka kwa wakandarasi wengine wa kigeni ni kwamba hawatoi bima ya mahali pa kazi kwa vibarua wa kawaida. Kufuatia sheria za kazi zilizopo TARURA na mamlaka za halmashauri ya Manispaa ya Tabora zinapaswa kuwasimamia wakandarasi hao kuzingatia sheria zilizopo za nchi katika kulinda usalama wa nguvu kazi yote katika eneo la ujenzi ili kuwafanya wawe na sera stahili za bima.

Ufikivu Ulioboreshwa: Mradi mdogo unaopendekezwa utahakikisha upatikanaji rahisi wa usafirishaji wa bidhaa, bidhaa, na watu kwa hivyo, kuwezesha maendeleo zaidi ya kimwili.

Uchafuzi na Mtetemo Wakati wa Ujenzi: Uzalishaji wa vumbi, kelele kutoka kwa vifaa/mashine za ujenzi zinazosonga, na ulipuaji wa miamba ni asili ya kazi zote za ujenzi wa barabara. Mkandarasi lazima awe na njia ya kukandamiza vumbi, kupunguza kiwango cha kelele na kutoa taarifa ya mapema kwa jamii kuhusu muda mwafaka wa kulipua mawe ili kupata kokoto.

Kulinda Miundombinu iliyojengwa: Ilisisitizwa na wadau kuwa kuna haja ya kujenga utamaduni wa kulinda na kulinda miundombinu ya mradi miongoni mwa wanajamii hasa baada ya kukamilika kwa ujenzi wa mradi mdogo. Imebainika katika maeneo mengine wananchi wamekuwa wakiharibu miundombinu ya barabara yaani boliti, nati zilizofungwa kwenye madaraja kwa kuziuza kama vyuma chakavu.

Ulinzi wa Mazingira na Uendelevu : Njia za maji ya dhoruba zisielekezwe mashambani kwa kuwa tabia kama hiyo imeharibu mazao na ardhi ya kilimo kutokana na mmomonyoko wa udongo. Inapaswa kuelekezwa kwenye njia sahihi za maji ambazo hazichafui mazingira. Pia, uvujaji wa dizeli, mafuta, na vilainishi vingine kutoka kwa vifaa vya ujenzi na mashine hadi kwenye uso wa barabara na kwenye vyanzo vya maji unapaswa kuepukwa.

Urembo wa Mazingira: Kwa kuwa Manispaa ya Tabora imekuwa na kampeni ya upandaji miti, hivyo basi, mkandarasi ahakikishe miti hiyo inapandwa kwenye maeneo ya hifadhi ya barabara na kuhakikisha inakua kabla ya kushughulikia mradi kwa mteja.

Ukatili wa Kijinsia: Kutokana na uzoefu uliopatikana kutokana na kuongezeka kwa matukio ya UWAKI kutokana na miradi mingine ya ujenzi wa barabara, wanajamii walieleza wasiwasi wao kuwa wakati wa mchakato wa ujenzi wa mradi huo, watu wengi zaidi watakuja kufanya kazi katika eneo la mradi. kwa hivyo kunaweza kuchochea unyanyasaji wa kijinsia katika jamii zao kutokana na mwingiliano wa watu kutoka asili tofauti za kitamaduni. Wanatoa wito kwa mkandarasi kutilia mkazo wafanyakazi wa mradi kuheshimu utu kwa kufuata mila na desturi za jadi badala ya kuwa sababu ya kuchochea masuala ya UWAKI katika eneo la mradi.

ATHARI MUHIMU ZINAZOWEZEKANA KWA MAZINGIRA NA KIJAMII

Athari zimeainishwa katika athari za awamu ya Kabla ya Ujenzi, athari za awamu ya Ujenzi na athari za awamu ya Uendeshaji. Vipokezi vikuu vya athari zinazohusiana na uboreshaji unaotarajiwa wa barabara ya Swetu 3.4Km, barabara ya Kisarika I&II 2.36Km na Kisarika III 0.63Km, Kisarika IV *(Nguzo Tanesco)* barabara ya 3.6km, barabara ya Mailitano Km 3.1Km (barabara ya Mailitano I 1.1km II, Mailitano II 1.1km 0.63Km, Mailitano barabara III0.69km, na Mailitano barabara IV0.67km), barabara ya Kanyeye I 0.15Km, Barabara ya Kanyenye II (*Madaraka st.*) 0.5km, Kanyenye III (Kanoni st.) barabara 1.08km, na Barabara ya Ufikiaji wa Kituo (Mkunazini *St.)* 0.36km ni pamoja na rasilimali za kimwili (haidrolojia, ubora wa maji ya uso, udongo, ubora wa hewa, na kelele); rasilimali za kiikolojia (mimea); mali, afya ya umma, na usalama, aesthetics, na mazingira.

Athari zifuatazo zilitambuliwa kuwa zinaweza kutokea wakati wa awamu ya kabla ya ujenzi;

- Unyakuzi wa ardhi, upotevu wa mali, na makazi mapya
- Uundaji wa kazi na kuongeza mapato

Athari zifuatazo zilitambuliwa kuwa zinaweza kutokea wakati wa awamu ya ujenzi;

- Uundaji wa kazi na kuongeza mapato
- Uharibifu wa huduma za umma

- Mmomonyoko wa udongo na kutokuwa na utulivu wa mteremko
- Hatari ya Maji na Uchafuzi wa Ardhi
- Kuongezeka kwa kelele, vibration, na uchafuzi wa hewa
- Usalama Kazini na hatari za kiafya
- Kuongeza ajali za barabarani
- Kuongezeka kwa Taka
- Kuongezeka kwa Uondoaji wa Maji
- Upotevu wa Nyenzo za Dhahiri na Uharibifu wa Ardhi
- Kupotea kwa viumbe hai
- Kuongezeka kwa VVU/UKIMWI
- Ongezeko la Watu
- Kuingilia kwa Visual wakati wa Ujenzi
- Ongezeko la Ukatili wa Kijinsia

Athari zifuatazo zilitambuliwa kuwa zinaweza kutokea wakati wa awamu ya uendeshaji;

- Usafirishaji rahisi na usafirishaji wa bidhaa
- Ukuaji wa uchumi na biashara
- Uundaji wa nafasi za kazi wakati wa awamu ya ujenzi
- Ongezeko la bei za bidhaa
- Kupunguza muda wa kusafiri na gharama ya uendeshaji wa Gari
- Kupunguza gharama za uendeshaji na matengenezo
- Kupunguza ajali za barabarani
- Kuingilia kati kwa hidrolojia ya ndani
- Ongezeko la Viwango vya Unyonyaji wa Maliasili
- Hatari ya mashimo ya kukopa ambayo hayajarejeshwa

HATUA ZA KUPUNGUZA NA MPANGO WA USIMAMIZI WA MAZINGIRA NA KIJAMII (ESMP)

Chaguzi za kupunguza au kuzuia athari mbaya za kijamii na kimazingira zilizotambuliwa pamoja na mpango wa ufuatiliaji zimependekezwa katika ripoti hii na zimo katika ESMP. Wengi wao ni msingi wa mazoea mazuri ya uhandisi na mwitikio wa wakati wa taasisi inayowajibika. ESMP inaelezea ratiba ya utekelezaji wa mapendekezo ya hatua za kupunguza na pia kupanga shughuli za ufuatiliaji wa muda mrefu. Inafafanua majukumu na wajibu wa watendaji mbalimbali wa mpango. Gharama za Mbinu za kimazingira na kijamii ni TSH 174,500,000 (Bila gharama zitakazoonekana katika wakati huo (BOQ) na zoezi la makazi mapya.Makisio ya gharama za kila mwaka za kutekeleza pendekezo la mpango wa magari ya kimazingira na kijamii ni TSH 144,000,000.

TATHMINI YA RASILIMALI

huu wa kiuchumi ili kupima uwezekano wa miradi inayopendekezwa ya uboreshaji wa barabara wakati wa ushauri huu. Maelezo ya uchambuzi yatajumuishwa katika Ripoti ya Mwisho (ambayo itatayarishwa baada ya Usanifu wa Kina kukamilika na gharama zote kujulikana). Kawaida uchambuzi wa kiuchumi kwa ajili ya ujenzi wa barabara unafanywa kwa kutumia mfano wa HDM-4, ambao ni mfumo wa uchambuzi kulingana na dhana ya uchambuzi wa mzunguko wa maisha ya lami. Muundo huo huchanganua barabara ya mradi kwa kutumia chaguo tofauti za uwekezaji na matengenezo, kwa kuzingatia gharama na manufaa yanayohusiana yanayokadiriwa kila mwaka katika kipindi cha uchanganuzi, ili kubaini uwezekano wa kiuchumi na kiuhandisi wa mradi.

KUONDOA KAMISHENI

Uondoaji hautarajiwi katika siku zijazo zinazoonekana. Hata hivyo, kama hii itatokea, inaweza kuhusisha mabadiliko ya matumizi (mabadiliko ya kiutendaji) au uharibifu unaosababishwa na mabadiliko ya matumizi ya ardhi.

Mpango wa kina wa uondoaji unaozingatia maswala ya mazingira utatayarishwa na msanidi programu kabla ya uondoaji kazi. Iwapo itafanyika, uondoaji unaweza kuhusisha mabadiliko ya matumizi (mabadiliko ya kiutendaji) au ubomoaji unaochochewa na mabadiliko ya matumizi ya ardhi. Kwa hiyo kinachowasilishwa hapa ni Mpango wa Awali wa Uondoaji wa Tume ambao unatoa mwanga wa nini kifanyike iwapo kuna haja ya kufutwa kazi.

HITIMISHO LUSION

Hivyo basi, ilihitimishwa kuwa utekelezaji wa uboreshaji wa barabara ya Swetu 3.4Km, Kisarika road I&II 2.36Km na Kisarika III 0.63Km, Kisarika IV *(Nguzo Tanesco)* barabara 3.6km, Mailitano barabara 3.1Km (Mailitano I 1.1km, Mailitano) II 0.63Km, Mailitano road III 0.69km, na Mailitano road IV 0.67km), Kanyeye I road 0.15Km, Barabara ya Kanyenye II (*Madaraka st.*) 0.5km, Kanyenye III (Kanoni st.) barabara 1.08km, na Barabara ya Ufikiaji wa Kituo (*Mkunazini St.*) 0.36km haitahusisha madhara yoyote mradi hatua zilizopendekezwa za kupunguza zimewekwa vya kutosha na kwa wakati. Athari mbaya zilizotambuliwa zitadhibitiwa kupitia hatua zilizopendekezwa za kupunguza na mfumo wa utekelezaji uliowekwa katika EIS hii. PO-TAMISEMI imejitolea kutekeleza mapendekezo yote yaliyotolewa katika EIS na kutekeleza zaidi ratiba za ukaguzi na ufuatiliaji wa mazingira.

Appendix VIII: **Hydrology Report**

TABORA ROAD HYDROLOGY/ HYDRAULIC REPORT

1. INTRODUCTION

1.1 Background

The Government of Tanzania (GoT) is planning to engage a consultancy firm (or consortium) with international best practice experience in infrastructure engineering and urban planning to prepare feasibility studies, urban design, detailed engineering designs, environmental and social instruments, and bidding documents for a pipeline of investments in 4 municipalities. This assignment is one of three consultancies to design a first phase of investments under the proposed World Bank-financed Tanzania Cities Transforming Infrastructure and Competitiveness Project (TACTIC), implemented through the President's Office – Regional Administration and Local Development (PO-RALG). The assignment is intended to be an international good practice example of urban development that enhances economic productivity and job growth, inclusiveness, and builds resilience to hazards.

1.2 Scope of the study

This Report presents the hydrology/hydraulic investigations and analysis carried out to estimate the design peak flows at all sites where drainage structures are required to be provided across the proposed Tabora roads (Kanyenye I, Kanyenye II,Swetu ,Kisarika and Mailitano road) and consequently to proposed appropriate drainage structures with adequate size of opening to discharge safely the design discharge. The estimation of the peak flows is made based on available climatic data that were collected from the project area. The estimated peak flow values made at the identified drainage sites were used to propose the dimensions of the openings of the newly proposed drainage structures. The information that has been generated from the hydrology study include inventory checklist for road drainage structures, catchments draining across the project road, catchment characteristics, estimated design peak flow values and proposed new drainage structures.

1.3 Objectives of the assignment

Hydrology and hydraulic study has been carried out to estimate design peak flow values and to propose new drainage structures to be provided at the identified drainage sites along the Tabora roads

The specific objectives of the hydrology/hydraulic study were:

- To identify catchments draining across the road project and to determine the respective catchment characteristics, i.e., size of catchment, length of river channels, slope of river channel, land use, and soil type.

- To estimate design peak flow values corresponding to specified return periods.
- To propose sizes of openings of new drainage structures.

2. INFORMATION AND DATA REVIEW

In this section it is presented information that describes the climate of the project area and data that has been collected to enable carrying out the hydrology analysis to estimate design peak flow values.

2.1 Climate of the project area

Tabora has a tropical savanna climate with two seasons of approximately equal length. The wet season is from November to April and is followed by a dry season from May to October. The average annual rainfall is 959.7 mm.

TABORA LONGTERM MEAN MONTHLY RAINFALL (mm)

MONTH	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
RAINFALL	153.8	137.5	161.9	118.8	28.9	1.2	0.7	0.8	6.1	28.1	116.6	205.3

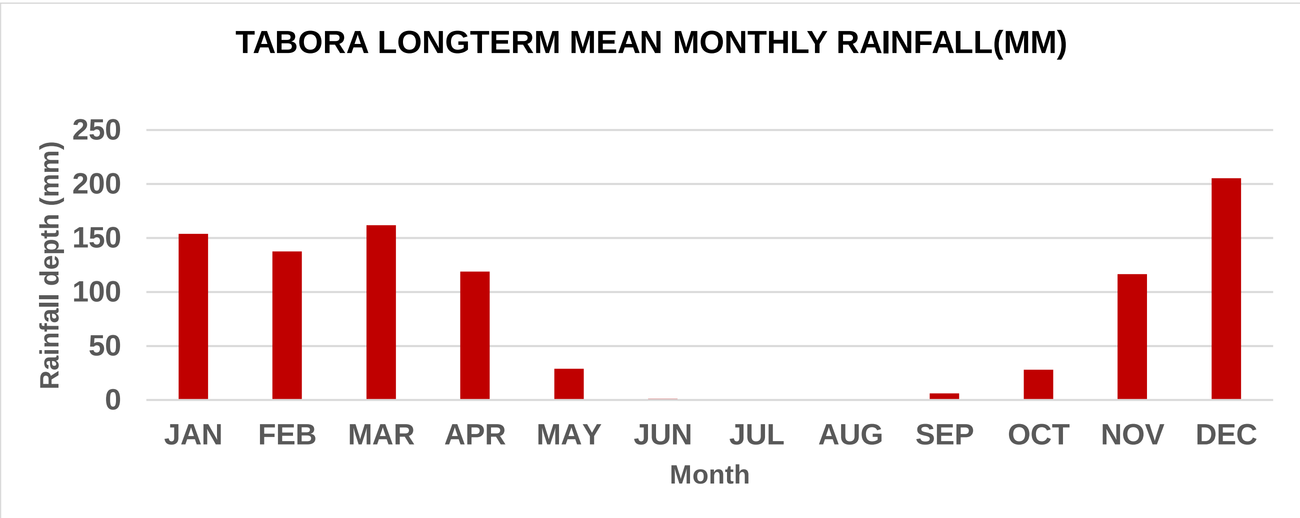


Figure 1 Seasonal Rainfall observed at Tabora

2.2 Available Data Records

2.2.1 Streamflow records

All the rivers/streams that drain across the road under study are not gauged and therefore historical streamflow records are not available.

2.2.2 Rainfall Records

Rainfall records observed at Tabora rainfall station was selected for analysis in the hydrology study. The data was collected from the Tanzania Meteorological Agency (TMA). The data collected comprised of the following:

- Monthly Rainfall totals
- 24-hr Annual Maximum rainfall values

Monthly rainfall data was used to characterize the seasonal rainfall of the project area. The 24-hr Annual Maximum rainfall values were used to carry out frequency analysis to determine rainfall design storms which are required to estimate the design peak flow values for catchments draining across the road. The rainfall records collected for the study is presented in **Annex 1.**

2.2.3 Maps

Topographical maps of scale 1:50,000 covering all the sub-catchments that drain across the road was acquired from the Mapping Division of the Ministry of Lands, Housing and Human Settlements. The topographical map was used to delineate the sub-catchment boundaries for the rivers/streams draining across the project road and to determine the catchment characteristics for the delineated catchments.

3. APPROACH TO HYDROLOGY/HYDRAULIC STUDY

The hydrology/Hydraulic study involved field investigation and desk study. The estimation of the design peak flow values was made on the basis of available rainfall records and information on catchment characteristics of the rivers/streams crossing the road. The estimated design peak flow values were used to determine new drainage structures required to be constructed along the project road. The approach to the study is highlighted in the sections below:

3.1 Field investigation

Field investigation involved carrying out a visual survey in the project area to identify existing hydraulic structures in order to establish an inventory of road drainage structures.

3.2 Identification and delineation of drainage catchments

The objective of adopting topographical maps and DEM (Digital Elevation Model) as primary source of data has been to delineate and characterize the catchments draining all rivers, streams and channels crossing the project road and to estimate associated catchment parameters, such as catchment area and channel lengths. Other parameters which were determined included stream elevation at start and at road crossing, the rivers/stream slope and catchment slopes. These parameters, together with other variables such as rainfall, land use, vegetation cover, basin soils and soil parameters were used as inputs data in the computerized flood estimation models for hydrological analysis and appropriate design of road hydraulic drainage structures.

One of the common parameters required by most hydrological models to predict catchment runoff is the catchment area. In most cases areas are measured from topographic sheets through delineation and measurement of the area on the map using planimeter or from the DEM by the use of suitable GIS software such as ArcGIS.

The Digital Elevation Model (DEM)/Digital Terrain Model (DTM) of the project was purchased and or retrieved from the Consultant's GIS database. The common available data set are in ARC ASCII format in decimal degrees and geographical Coordinate System datum WGS84, with a spatial resolution of 30mx30m and elevations given in meters. This data set was procured from the International Centre for Tropical Agriculture (CIAT), who have derived/ processed the data from the USGS/NASA SRTM (Shuttle Radar Topography Mission) data to provide seamless continuous topographical surfaces.

DEM processing in ArcGIS involved extracting tiles covering the project road (same extent as selected sheets of topographical maps) and re-projecting the data sets to UTM coordinate system Other processes included:

- Creating contours from the DEM map (Digital Elevation Model) of the Project road.
- Scanning and geo-referencing paper topographical maps.

- Overlaying contoured DEM (Digital Elevation Model) and the geo-referenced topographical maps to establish fit between the two data sets.
- Digitizing the road and superimposing to both topographical map and the DEM (Digital Elevation Model).
- Generating a drainage network of the project road. This process involved filling sinks in the DEM (Digital Elevation Model), creating raster of flow direction and flow accumulation and defining the minimum (threshold) drainage area.
- The channels contributing to the existing drainage were identified and their catchment delineated using the "watershed delineation tool" (i.e. based on the drainage network, flow direction and flow accumulation, slope and contour maps).
- Comparing the generated drainage network and the river network (available within the consultant GIS database) in order to confirm/verify reliability of the DEM (Digital Elevation Model).
- Identify all the drains crossing the road and delineate their catchments, considering the intersection between the channel of interest and the project road as the catchment outlet.
- Calculating the areas for delineated catchments and length of the longest channels and compared them with those calculated from paper topographical maps, prior to using the derived parameters into appropriate models for discharge estimation.
- Estimating other parameters such as catchment slope, length of the longest channel, maximum and minimum elevation within each catchment were derived all other required topographical parameters (slope, elevation at start/ exit of channels/rivers).

3.3 Estimation of design peak flow values

Both the Rational and TRRL methods were used to estimate design peak flow values required for the design of drainage structures proposed to be constructed along the project road.

3.3.1 The Rational Method

The rational method uses observed rainfall records and land use or land cover to estimate peak runoff from small drainage areas that are less than 1.0 km^2. The peak runoff is estimated from the following equation:

$Q = 0.278\ CiA$ ……………………………………………(1)

where

Q = peak flow (m^3/sec)

C = runoff coefficient (dimensionless)

i = average rainfall intensity (mm/hr)

A = drainage area basin (km^2)

The rainfall intensity (*i*) in millimeters per hour for duration corresponding to **the time of concentration** for the catchment area and having a recurrence period appropriate to the design the drainage structure under consideration, is read from Intensity-Duration-Frequency curve (IDF) applicable for use in a given catchment. **Time of concentration** is defined as the time taken by the storm runoff to travel from the most remote position of the catchment to the point of catchment outlet. The time of concentration was determined using the following empirical formula developed by Bransby-Williams.

$$Tc = 0.615 \times L / (A^{0.1} X\ S^{0.2}) \quad \text{.....................................(2)}$$

Where Tc = Time of concentration in hours

L = Length of main stream in km

S = Slope of main stream (%)

A = Catchment area in km^2

The rational method assumes uniform rainfall distribution over the entire catchment area, which is a reasonable assumption for small catchment areas.

The runoff coefficient, C, which is the proportion of rainfall that results into runoff was determined from **Table 1** on the basis of three factors namely topography, permeability of soil and vegetation cover of the catchment.

Table 1 Runoff coefficient values for different catchment types

Runoff Coufficient, C = Cs + Ck + Cv						
Cs - (Topography)			**Ck - (Soils)**		**Cv - (Vegetation)**	
Very flat	< 1%	0.03	Sand and Gravel	0.03	Forest	0.04
Undulating	1 - 10%	0.08	Sandy Clays	0.08	Farming	0.11
Hilly	10 - 20%	0.16	Clay and Loam	0.16	Grassland	0.21
Mountainous	> 20%	0.26	Sheet Rock	0.26	No Vegetation	0.28

Source: ***Road Rehabilitation Supervision Manual, 1989***

The estimation of the Rational Method thus involved the following steps:

i) Determine the drainage area (in km^2)
ii) Determine the time of concentration (in hours)
iii) Set the storm duration equal to the time of concentration and determine the average storm intensity from IDF Curve
iv) Determine the rational coefficient C
v) Select a frequency (return period) for the design
vi) Use rational method equation (Qp=CIA) to estimate peak flow.

3.3.2 The TRRL Method

3.3.2.1 Application of TRRL Model

The 'TRRL Model' developed by the UK Transport and Road Research Laboratory makes use of information on catchment characteristics such as area, land slope, channel slope, land use, soil type and climatic zone to generate runoff from rainfall design storms. The catchment characteristics derived from all the catchments that were identified to drain across the project road constituted inputs into the TRRL Model to generate peak runoff. Other information required as input in the model was obtained from tables provided in the published TRRL document. In addition, information on landuse characterizing the delineated catchments was gathered during field investigation to the study area.

The information required in the application of the TRRL method is described below:

(i) **Area of catchment** was determined from the topographical map by delineating the catchment boundary and then determining the area by planimeter.

(ii)**Catchment slope** designated as the value of slope for the entire catchment and it is measured between contours at approximately the 10% and 75% points on the longest drainage path in the catchment.

(iii) **Channel length** was measured from the topographical map. It is obtained by measuring a distance from the furthest point in the river/stream catchment to the point of flow outlet.

(iv) **Land slope** is categorized into average slope class, i.e., very flat(<1.0 %), moderate (1-4%), rolling (4-10%), hilly (10-20%) and mountainous >20%.

(v) **Land use** was determined from land use map.

(vi) **Catchment type, Rainfall zone and Rainfall time** were determined from the tables and maps provided in the document describing the TRRL model.

The information on land slope, soil type, land use, catchment type, rainfall zone and rainfall time were used to determine the other parameters described below.

vii) The contributing area coefficient (C_A)

It determines the portion of the catchment contributing runoff to the stream. It is determined from the expression

$$C_A = C_S \cdot C_W \cdot C_L \qquad \text{……………… (3)}$$

Where C_S = Standard contributing area coefficient determined from catchment slope and type information.

C_W = Catchment wetness factor determined from rainfall zone and type of stream (perennial or ephemeral)

C_L = Land use factor determined from land use information

viii) <u>The initial water retention (Y)</u>

This is the storage in the soil which must be filled before flood runoff occurs. It is determined from the defined rainfall zone.

ix) <u>The rainfall time (Tp)</u>

This is the time during which the rainfall intensity remains at a high level. It is determined from the defined rainfall time zone.

x) <u>The lag time (K)</u>

This is the time from the centre of mass of excess rainfall to the peak of a hydrograph. It is determined from catchment type.

Computation to determine peak flow Q_P for a given frequency of occurrence involve the following steps:

i) Calculate the design storm rainfall during time interval, P_{TB}

$$P_{T_B} = \frac{T_B}{24}\left(\frac{24.33}{T_B + 0.33}\right)^n . P_T \qquad \text{............... (4)}$$

T_B = Time Base of flow hydrograph (hr)

n = index value " n" applicable to a given rainfall time zone

P_T = Rainfall storm magnitude of return period T, (mm)

ii) Calculate volume of runoff, RO

RO =CA . (P_{TB} –Y) . A . 10^3 m^3 .... **(5)**

where

CA = Overall runoff coefficient

P_{TB} = Design storm rainfall during time interval (mm)

Y = Initial retention (mm)

A = Catchment Area (km^2)

iii) **Calculate average flow, Q_{bar}** (m^3/sec)

$$Q_{bar} = \left(\frac{0.93RO}{3600T_B}\right) \qquad \text{............... (6)}$$

where

T_B = Time Base of flow hydrograph (hr)

RO = volume of runoff (m^3)

iv) Compute design peak flow (Qp) ($m^{3/}sec$)

$Qp = F \times Q_{bar}$ **…………… (7)**

Where

F = Peak flood factor; F = 2.8 where lag time K is less than 0.5 or F = 2.3 where lag time K is more than 1.0 hour.

3.3.2.2 Estimation of Rainfall Storm Magnitudes

The estimation of design peak flow values using TRRL method is driven by inputting the rainfall design storms that were determined from observed rainfall records (24-hr Annual Maximum rainfall) from the rainfall station that was selected to represent the rainfall regime in the study area.

The rainfall station located at Tabora with 50 years of records from 1971 – 2020 was selected for rainfall analysis to determine rainfall design storms. The source of historical rainfall records was the Tanzania Meteorological Agency (TMA).

Frequency analysis was carried out on the 24-hr Annual Maximum rainfall data from Tabora rainfall station using the Extreme Value type I (EV1) distribution in order to determine the magnitudes of the design rainfall storms that were required to generate peak flows at the identified drainage sites along the project road. The magnitudes of the design rainfall storms were determined for the frequencies of occurrences of 25- and 50-year return periods (T).

The estimation of design rainfall storm magnitudes for specified return periods using the Gumbel Distribution is illustrated below

Prediction equation: $P_T = u + \alpha.K_T$ …………………………… (8)

P_T = Rainfall storm magnitude

K_T = Frequency factor

u & α. = Gumbel Parameters

Estimation of Gumbel Parameters (MoM)

Mean, $\mu = u + 0.5772\ \alpha$ …………………………………… (9)

St. deviation, $\sigma = 1.28\ \alpha$ …………………………………… (10)

The **Mean and St. Deviation values** were determined from the historical 24-hr Annual Maximum rainfall data collected from Tabora rainfall station.

3.4 Sizing and Determination of Hydraulic Capacity of Drainage Structures

The dimensions of the hydraulic structures have been determined depending on the estimated design peak flow values at each stream/river crossing. The discharge capacity of a culvert was determined basing on the ratio of headwater depth/height (or diameter) of structure. The hydraulic equations proposed in the report (South African Drainage Manual, 5th Edition, Published by the South African National Roads Agency Ltd, 2006) for the ratio equal to or greater than 1.2 for the inlet control situation have been used in sizing the culverts. The methods used to size the structures are described below:

3.4.1 Concrete Box Culverts (CBC)

$$Q=(2/3)*C*B*H*((2/3)*g*H)^{0.5} \qquad \text{......................................} (11)$$

where Q=discharge (m^3/s)

C=energy loss coefficient

B=culvert width(m)

H=upstream water head (m)

g=gravitational acceleration (m/s^2)

3.4.2 Concrete Pipe Culverts (CPC)

$$Q/D^2*SQRT(g*D) = 0.44*(S_0/0.4)^{0.05} * (H/D)^{1.5} \qquad \text{.........................} (12)$$

where Q=discharge (m^3/s)

C=energy loss coefficient

D=Culvert Diameter (m)

H=upstream water head (m)

S_0=Slope of culvert bed

g=gravitational acceleration (m/s^2)

The estimated peak flow values, i.e. flow of return period 25 and 50 years were used to proposed drainage structures to be constructed along the project road for the case of circular pipe and box culvert respectively. The flow of return period of 100 years was used to propose size of opening of a bridge.

The trial and error approach was used to determine the dimensions of a drainage structure to be proposed at a given identified drainage site. This implies that various dimensions, i.e, diameter for a circular pipe or width and height for a box culvert were tried for a proposed structure with the objective that the discharge capacity of the proposed structure matches or can discharge the estimated design peak flow at the given drainage site without overtopping.

4. RESULTS OF THE HYDROLOGICAL ANALYSIS

4.1 Information on catchment characteristics

Catchments that drain runoff across the road have been identified and these catchments have constituted the units where peak flow estimates have been determined. The delineated catchments are shown in **Annex 3**.

4.2 Frequency Analysis of AM Rainfall Data

4.2.1 Estimation of design rainfall storm magnitudes

As described in section 3.3.2.2, the Extreme Value type I (EV1) distribution was used to carry out frequency analysis in order to determine the magnitudes of the design rainfall storms which were required to generate peak flow values at the sites where rivers/streams cross the project road by using the TRRL Method. The result of the frequency analysis of the 24-hr Annual Maximum rainfall data carried out is a developed frequency curve of rainfall storm magnitudes that is presented in **Figure 2**. The estimated magnitudes of the design rainfall storms for the frequencies of occurrences of 25 and 50 years return period are presented in **Table 3.**

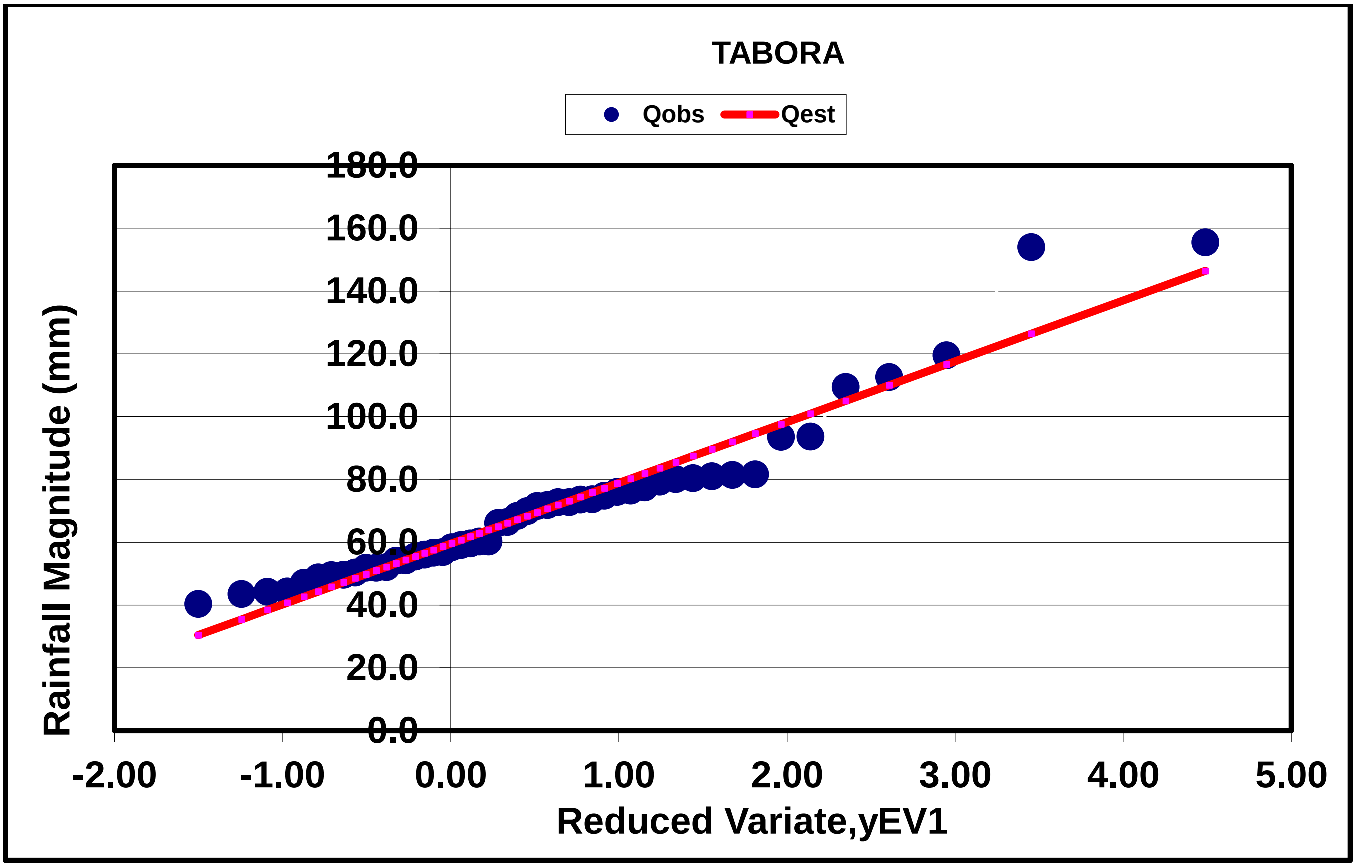


Figure 2 Frequency curve for AM rainfall for Tabora Rainfall Station

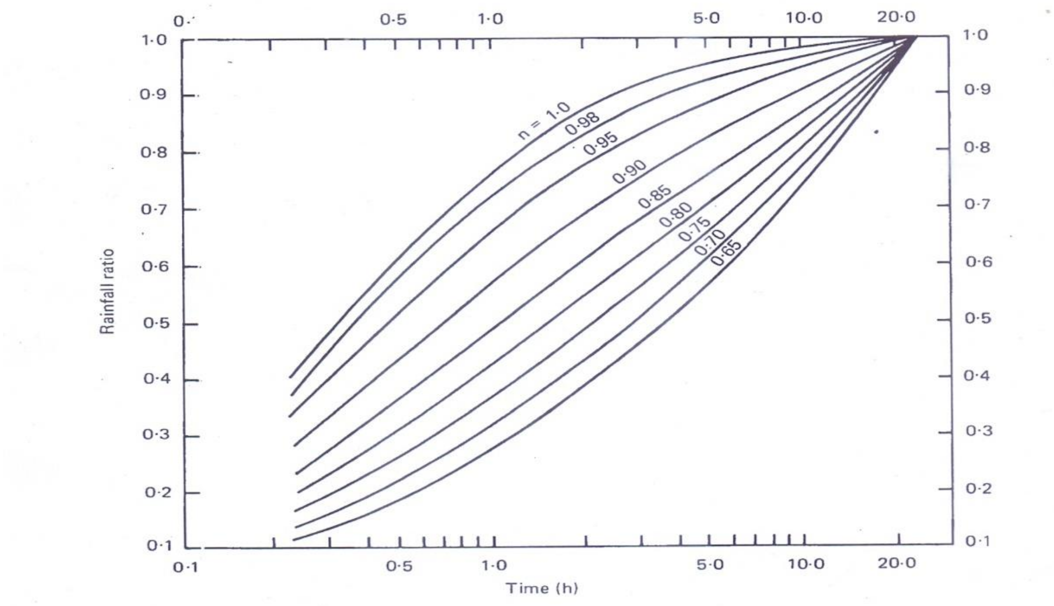
Table 2 Estimated rainfall design storm values (mm)

Rainfall Station	Tabora

No. years of record	50
AM Rainfall Statistics	
Mean AM Rainfall	70.70 mm
St. Dev. AM Rainfall	24.78 mm
Gumbel Parameters	
U	59.94
Alpha	19.32
Estimated Rainfall Design Storm Magnitudes	
Return Period, T, years	Rainfall Magnitude (mm)
10	103.42
25	121.74
50	135.33

4.2.2 Derivation of Intensity Duration Frequency (IDF) Curve

The use of the rational method to estimate peak runoff from catchments with catchment area less than 1.0 km^2 requires input of average storm intensity values into the rational method equation. In view of the fact that the information on IDF relationship from the project area is lacking, the approach reported in the document entitled "The prediction of storm rainfall in East Africa " by D. Fiddes, J.A. Forsgate and A.O. Grigg, 1974, was used to derive rainfall storms of short durations of 15 mins, 30 mins, 1 hour, 2 hours, 4 hours from estimated 24-hr rainfall design storms presented in **Table 2** above. The above-mentioned document provides guideline on how to convert the estimated 24-hr rainfall design storms to rainfall storms of short durations. The coefficients /ratios used to convert the 24-hr storm were determined from the curves presented in **Figure 3** obtained from the above referenced document by Fiddes and others. From the TRRL East Africa Flood Model document, the project area belongs to the rainfall time zone prescribed as ***inland zone*** and the corresponding ***index value*** "n" that is used to relate rainfall intensity and duration is given as ***0.96.*** With reference to the curves presented in **Figure 3,** the ratios used to convert the 24-hr rainfall storms estimated for Shirati rainfall station were determined from the curve developed for an ***index value*** "n = 0.95" which is close to a value **n = 0.96** applicable for inland zone. The conversion of 24-hr rainfall storm magnitudes estimated for Tabora to rainfall storm magnitudes of short durations is elaborated in **Table 3** below.



Source: *(D. Fiddes, J.A. Forsgate and A.O. Grigg, 1974)*

Figure 3 The coefficients /ratios used to convert the 24-hr rainfall storm to shorter durations

Table 3 Derived short duration rainfall storm depths from 24-hr rainfall storm depths determined for Tabora rainfall station

Duration (Minutes)	**Ratios to convert 24-hr to short duration design rainfall storms (Index value, n = 0.95)**	**Frequency for Design/ Return Period**		
		T=10 years	T=25 years	T=50 years
		24-Hr design rainfall storm depths (mm) for Tabora Station		
		103	122	135
		Short Duration design rainfall storm depths (mm)		
15	0.36	37	44	49
30	0.51	53	62	69
60	0.66	68	80	89
120	0.78	81	95	106
240	0.86	89	105	116

The rainfall storm magnitudes presented in **Table 3** above are expressed in terms of depth in mm. **Table 4** below presents the rainfall storm magnitudes as intensities rate expressed in terms of mm/hr.

Table 4 Derived rainfall storm magnitudes for short durations expressed in terms of rainfall intensity (mm/hr)

Duration (Minutes)	Duration (Hours)	Return Period		
		T=10 years	T=25 years	T=50 years
		Rainfall storm intensity (mm/Hr)		
15	0.25	149	175	195
30	0.5	105	124	138
60	1	68	80	89
120	2	40	47	53
240	4	22	26	29

The plot of rainfall intensities presented in **Table 4** above produced IDF curves which are presented in **Figure 4.** The derived IDF curves **(Figure 4)** were used to determine the storm intensities applicable for estimating peak runoff from small catchments. The storm duration for a given catchment was set equal to the computed time of concentrations for the given catchment.

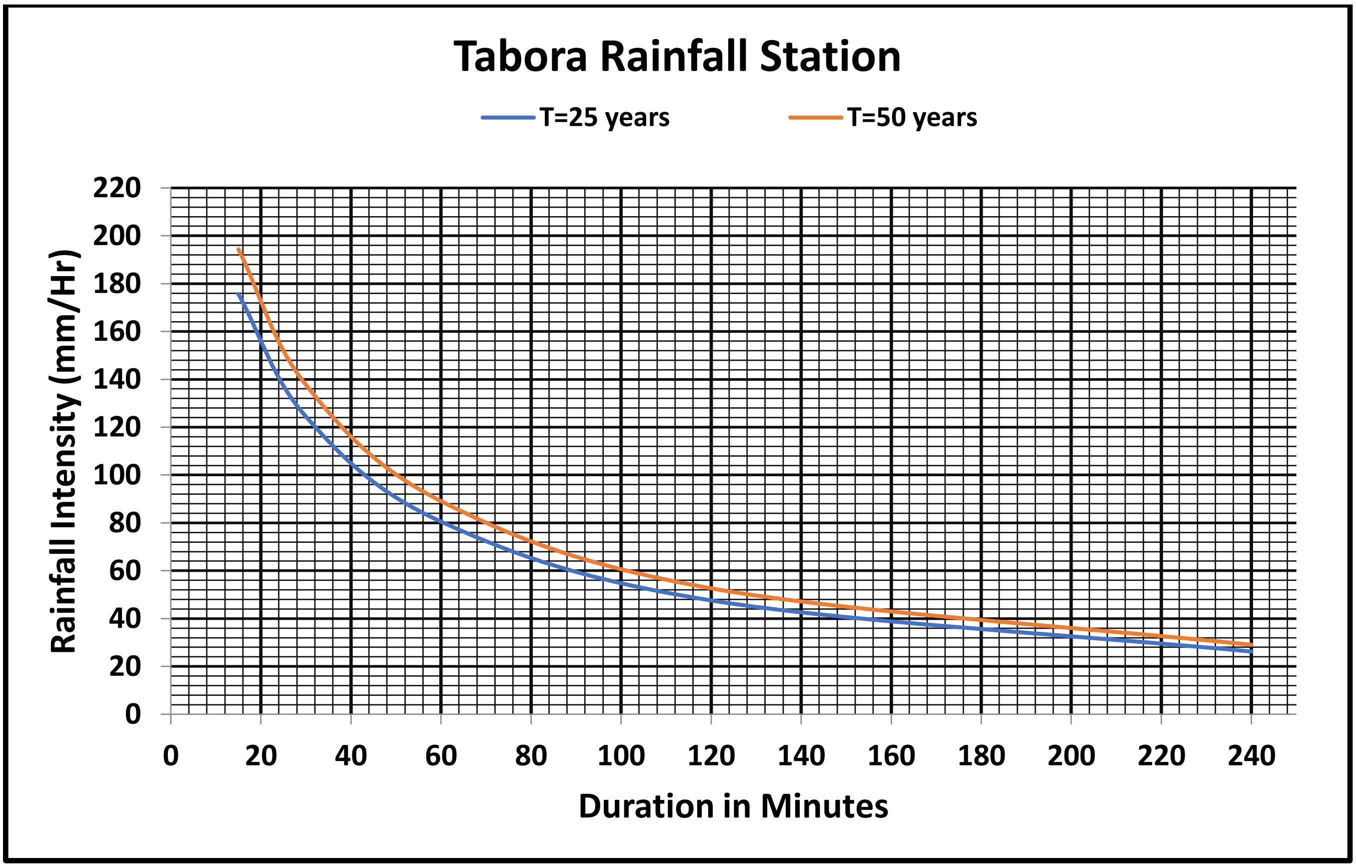


Figure 4 The IDF derived for use in the project area (Tabora)

4.3 Estimated Peak Flow Values

4.3.1 Rational Method Estimation of peak runoff values for Small Catchments

The rational Method was used to estimate peak runoff from a total of 5 small catchments with area equal or less than 1.0 km^2. As mentioned in section 3.3.1 the equation used to estimate the peak runoff is as follows:

$Q = 0.278 CiA$ ………………………………….. (13)

Where Q = peak flow (m^3/sec)

C = runoff coefficient (dimensionless)

i = average rainfall intensity (mm/hr)

A = drainage area basin (km^2)

The areas of the small catchments as delineated from topographical map of scale 1:50,000 as well as the computed time of concentrations for the small catchments are presented in **ANNEX 2** .The computed time of concentration for a given catchment was set equal to the rainfall storm duration applicable for that catchment. For a given storm duration the corresponding value of storm intensity (***i***) was read off from IDF curves presented in **Figure 4.** The runoff coefficient **(C)** for a given catchment was determine from **Table 2**. The runoff coefficient value C is determined from the relationship:

$C = Cs + Ck + Cv$ ………………………………….. (14)

Where Cs = Coefficient due to topography

Ck = Coefficient due to soil type

Cv = Coefficient due to vegetation

The topography of the project area is mainly undulating (Cs = 0.08). The soil is mainly silt clay (Ck = 0.0.16) while land surface is bare (Cv = 0.28). From the above selected values, the runoff coefficient value appropriate for use in the project area is 0.52 for undulating catchments. The computed runoff peak values from the small catchments using the Rational Method are presented in ANNEX 2.

4.3.2 TRRL Method Estimation for medium size Catchments

The TRRL model was used to estimate the design peak flow values for catchments of size greater than 1.0 km^2 but less than 200 km^2. TRRL parameters and rainfall design storms values (presented in **Table 2**) constituted inputs to the TRRL model to estimate the design peak flow values. All the analysis were summarized in ANNEX 2

5. PROPOSED DRAINAGE STRUCTURES

The discharge capacity of a proposed culvert was determined basing on the ratio of headwater depth/height (or diameter) of structure. The hydraulic equations proposed in the report (South African Drainage Manual, 5th Edition, Published by the South African National Roads Agency Ltd, 2006) for the ratio equal to or greater than 1.2 for the inlet control situation have been used in sizing the culverts.

5.1 Pipe Culverts

Pipe culverts have been proposed for small stream crossings. Their size and number depend on the estimated design peak flow value at each crossing. The minimum diameter for cross pipe culverts has been taken as 900mm. The schedule of the proposed **Pipe Culverts (CP)** is presented in **ANNEX 3.**

5.2 Box Culverts

Box culverts have been proposed at locations where major streams cross the road. The schedule of the proposed box culverts is presented in **ANNEX 3**.

6. CONCLUSIONS AND RECOMMENDATIONS

The proposed drainage structures in this study and those proposed in the previous study by are presented .The following observations are noted.

- Drainage structures have not been proposed at a number of low point locations observed during field visit where currently there are no drainage structures provided.
- the proposed drainage structures in ANNEX 3 in this report are recommended to be used in the detailed design of Tabora Roads (KanyenyeI, KanyenyeII,Swetu ,Kisarika and Mailitano_road)

6. ANNEXES

6.1. ANNEX 1

RAINFALL RECORDS FROM TABORA RAINFALL STATIONS

TABORA ANNUAL MAX 24 HOURS RAINFALL(MM)			
Year	**Rainfall(mm)**	**Year**	**Rainfall(mm)**
1971	49.6	1996	76
1972	43.4	1997	81.4
1973	54.1	1998	54
1974	74.7	1999	68.3
1975	58.3	2000	66.4
1976	81.6	2001	56
1977	80.9	2002	48.7

TABORA ANNUAL MAX 24 HOURS RAINFALL(MM)			
1978	66.1	2003	93.6
1979	72.7	2004	119.5
1980	40.3	2005	56.8
1981	72.7	2006	69.8
1982	79.2	2007	44.3
1983	73.6	2008	44.2
1984	56.6	2009	51.8
1985	73.5	2010	77.4
1986	59	2011	50.3
1987	49.5	2012	60.2
1988	71.8	2013	93.5
1989	51.8	2014	59.5
1990	76.4	2015	60.2
1991	109.4	2016	112.5
1992	80	2017	52
1993	80.3	2018	153.9
1994	47	2019	55.4
1995	155.5	2020	71.5

Appendix IX: Soil and Material Report

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LIST OF ABBREVIATIONS

AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway Transport Officials
ACV	Aggregate Crushing Value
AIV	Aggregate Impact Value
AMSL	Above Mean Sea Level
ASTM	American Society for Testing and Materials
CBR	California Bearing Ratio
CML	Central Materials Laboratory (TANLAB)
CRR	Crushed Rock (aggregate base course)
CRS	Crushed Stone (aggregate base course)
GDP	Gross Domestic Product
GM	Grading Modulus
HDM4	Highway Development and Management Vol. 4
Kg	Kilogram
Km	Kilometre
L	Litre
LGAS	Local Government Authorities
LHS	Left Hand Side
LL	Liquid Limit
m	Meter
M3	Meter Cubic
MDD	Maximum Dry Density
Mg	Milligram
MOW	Ministry of Works
MPa	Mega Pascal
No	Number
OMC	Optimum Moisture Content
PI	Plasticity Index
PL	Plastic Limit
PM	Plasticity Modulus
PMDM	Pavement and Materials Design Manual
PO - RALG	President's Office – Regional Administration and Local Development
PP	Plasticity Product
RHS	Right Hand Side
SG	Specific Gravity
SSS	Sodium Sulphate Soundness
TACTIC	Tanzania Cities Transforming Infrastructure and Competitiveness
TANROADS	Tanzania National Roads Agency
TOR	Terms of Reference
TPDC	Tanzania Petroleum Development Corporation
UTM	Universal Transverse Mercator Coordinates System
WDMI	Water Development and Management Institutes
WP	Plastic Limit
WS	Shrinkage Limit

1. INTRODUCTION

1.1 GENERAL

The Government of the United Republic of Tanzania in coordination with World Bank have allocated funds for carrying out Consultancy Services for Feasibility Study, Detailed Engineering Design and Preparation of Tender Documents in 4 regions.

This assignment is one of three consultancies to design a first phase of investments under the proposed World Bank-financed Tanzania Cities Transforming Infrastructure and Competitiveness Project (TACTIC), implemented through the President's Office – Regional Administration and Local Development (PO-RALG). The assignment is intended to be an international good practice example of urban development that enhances economic productivity and job growth, inclusiveness, and builds resilience to hazards.

The objective of the proposed TACTIC project is to strengthen urban management performance and deliver improved basic infrastructure and services in participating urban local government authorities. At its core, the project aims to promote economic development of Tanzania's cities and towns and its enabling infrastructure. Investments and technical assistance under the project are intended to promote urban development that is productive, inclusive and resilient. The project will support 45 urban Local Government Associations (LGAs) spread geographically across all regions of Tanzania, ranging in population from 26,402 to 416,442 (2012), divided into three tiers based on population and growth rate.

1.2 PLAN AND SCOPE OF INVESTIGATIONS

The soil alignment samples were taken after the establishment of the road centre line by our survey team. During preliminary soil alignment, soil samples were planned to be taken at every
1000m intervals along the project road; while at details design soil alignment samples are to be taken at 250m intervals. Grading, Atterberg limit tests, Moisture/density relationship and CBR tests had been conducted. Classification of soils and CBR design had been determined. Furthermore, the investigation was done to obtain sources of materials for construction works such as sand sources, borrow areas, quarry sources and water sources; the respective test was also conducted to determine the suitability for the use in construction works. The results and recommendations for various sources of materials are discussed in the report.

2. GENERAL INFORMATION

2.1 Topography

The topography through the project roads traverses from flat to rolling with hilly spots. The elevation ranges from 1180m above mean sea level (AMSL) to 1246m AMSL.

2.2 Climate

2.2.1 Vegetation

Tabora urban is primarily a residential area and vegetation is normally short grass and planted trees. The planted trees are widely spread within the municipal and are mainly highland species. The older trees are normally along the traffic isles and alongside the major streets in the Municipal.

2.2.2 Dry season

June, July, and August are the driest months in the year

2.2.3 Wet Season

December is the month with highest humidity in the year

Rainfall data for Tabora Station has been collected from Tanzania Meteorological Agency (TMA) and has been considered to be representative of the study area. The data collected and used include monthly total rainfall depths and annual maximum 24-hr rainfalls.

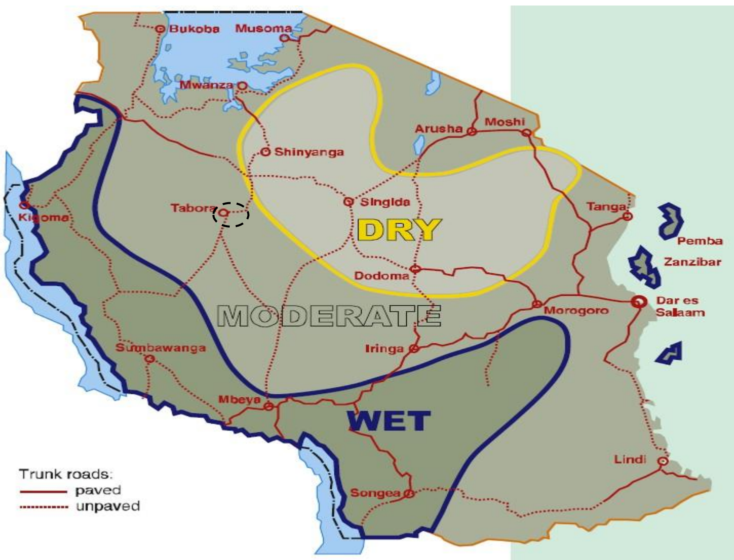

Figure 1: Moisture regime in the vicinity of the Tabora town (Black dotted line) from PMDM 1999

Table 1; Average Monthly Total Rainfall (mm) as per TMA

No.	Month	Avg. Rainfall (mm)
1	January	142
2	February	147
3	March	179
4	April	129
5	May	27
6	June	00
7	July	00
8	August	02
9	September	13
10	October	28
11	November	137
12	December	206

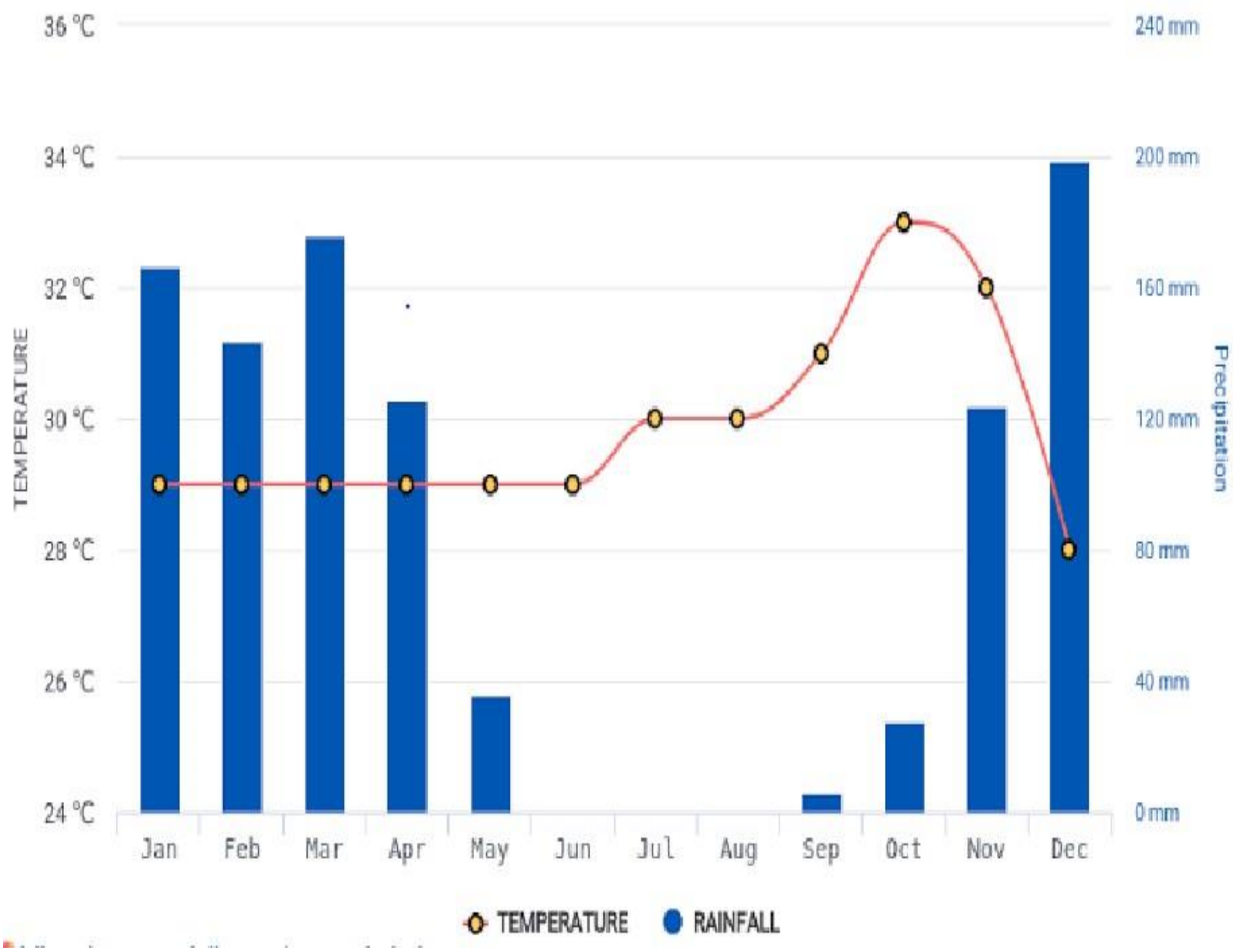

Figure 2: Weather/ climate graph for Tabora region as per TMA

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2.2.4 Temperature

The driest months are June and July with 00 mm of rainfall. The greatest amount of precipitation occurs in December, average of 206mm. The temperature ranges are generally as shown in Table 2

Table 2; Temperature range in the study area (Tabora)

Temperature Level	Range
Maximum Air Temperature	29.00C – 32.00C
Minimum Air Temperature	15.00C - 19.00C
Mean Air Temperature	22.00C – 25.20C

2.3 Vegetation and Land Use

The land is covered mostly by short grass and planted trees. The main land use is farming and the conservation of natural vegetation. Some of the economic activities carried out around Tabora are agriculture, livestock keeping, beekeeping and tourism.

2.4 Accessibility

All of the roads are accessible during the dry season, but Kisarika road is difficult to pass during the rainy season.

Figure 3: View of Kisarika road

Figure 4: View of swetu road

Figure 5: View of Maili tano road

3. PAVEMENT AND SUBGRADE INVESTIGATIONS

3.1 Introduction

Investigation of subgrade quality and pavement materials on the proposed route included the trial pits logging and sampling of materials, determination of particle size distribution, determination of Atterberg's limits and CBR values for the Subgrade materials. The CBR values were established based on the laboratory test results on representative soil samples tested at OMC using the three-point method. The base course materials were tested using Ten Percent Fines Value

The ultimate goals of the investigations were: -

- To determine the quality of existing Subgrade materials
- To outline the potential, borrow areas for the project
- Provide a basis for pavement thickness design

3.2 Test Pits Excavation

Test Pits were dug at an average interval of 250m throughout the project road as specified in TOR. The locations of Test Pits were selected in the way that they cover both areas in which existing alignment has to be maintained along the project road.

Test Pits were dug by alternating Left-hand side (LHS), Right-hand side (RHS) and centre.

Some photograph captions show various types of soil encountered along the alignment for excavated test pits as shown in figure 7, 8, 9 and 10 respectively

Figure 7; Test Pit excavated at km 1+750(Swetu road)

Figure 8:Test pit excavated at km 0+750(Kisarika road)

Figure 9:Test pits excavated at km 0+500(Maili tano road)

Figure 10: Test pits excavated at km 0+150 (Kanyenye road)

For each test pit, the following investigations were carried out: -

- A sampling of in-situ materials for laboratory tests.
- Soil profile showing layer thickness and type of material

Appendix 3-1 illustrates Trial Pits records

The field investigations were carried out in **December 2021.**

3.3 Laboratory Testing of Alignment Soils

Laboratory testing of alignment soil samples was carried out at **Central Technologies Limited (Construction Material Testing Laboratory in Dar Es Salaam)** after the completion of field investigations.

The Laboratory testing program was designed to include the following: -

- Soil Classification Test
- Atterberg's Limits (CML 1.2)
- Linear Shrinkage (CML 1.3)
- Moisture/Density Relationship
- CBR Test (3 Point Method) in soaked Condition
- Shrinkage Limit (ASTM D 4943-02)

The following tests were carried out on the subgrade materials: -

Table 3; Laboratory Tests on Subgrade Materials

Test Description	Test Method
Sieve Analysis	CML 1.7
Atterberg's Limits and Linear Shrinkage	CML 1.2, 1.3
Shrinkage Limit	ASTM D 4943-02
Moisture/ Density Relationship *note 1	CML 1.9
CBR *note 2	CML 1.11

Note 1: Moisture/Density Relationship was established using Modified Compaction

Note 2: The CBR tests were carried out at different moisture/density conditions to establish Dry Density – Moisture Content – CBR relationships for each of the representative soil types. Compaction

was undertaken according to CML 1.11 using 62blows/5layer/4.5kg rammer, 30blows/5layers/4.5kg rammer and
62blows/3layers/2.5kg rammer. Test in soaked condition was carried out.

3.4 Summary of Results

3.4.1 Condition of the proposed road

The roads are mainly passing on the existing route gravel road at some locations. Based on a field investigation and soil classifications, the laboratory test results for Grading and

Atterberg's limits shows most of the road has subgrade soils with characteristic ranging from Silty or Clayey and Sand, Silty Soils and Clayey soils. Tests are presented in **Appendix 3-2**

3.4.2 Subgrade Soils

Homogeneous Sections

Identification of sections having homogeneous subgrade conditions has been carried out according to PMDM chapter five (5). The alignment soils were grouped into two homogeneous sections.

The subgrade materials in the homogeneous sections for Swetu road (0+000 – 3+400km) were found to mainly comprise Silty, Clayey Gravel and Sand by 100% (whereby 35% or less of the particles pass through the No. 0.075mm sieve) falling into A-2 group according to AASHTO classification with varied degree of parking.

The subgrade materials in the first homogeneous sections for Kisarika road (0+000 – 2+600km) were found to mainly comprise Silty, Clayey Gravel and Sand by 66.7%, (whereby 35% or less of the particles pass through the No. 0.075mm sieve) falling into A-2 group according to AASHTO classification with varied degree of parking.

The subgrade materials in the Second homogeneous sections for Kisarika road (0+000 – 2+600km) were found to mainly comprise Silty, Clayey Gravel and Sand by 33.3%, (whereby 35% or more of the particles pass through the No. 0.075mm sieve) falling into A-4 and A-6 groups according to AASHTO classification with varied degree of parking.

The subgrade materials in the first homogeneous sections for MailiTano road (0+000 –

1+000km) were found to mainly comprise Silty, Clayey Gravel and Sand by 40%, (whereby 35% or less of the particles pass through the No. 0.075mm sieve) falling into A-2 group according to AASHTO classification with varied degree of parking.

The subgrade materials in the Second homogeneous sections for Maili Tano road(0+000 – 1+000km) were found to mainly comprise Silty, Clayey Gravel and Sand by 60%, (whereby 35% or more of the particles pass through the No. 0.075mm sieve) falling into A-6 and A-4 groups according to AASHTO classification with varied degree of parking.

The subgrade materials in the homogeneous sections for **Kanyenye road 1** (0+000 – 0+350km) were found to mainly comprise Silty, Clayey Gravel and Sand by 100% (whereby 35% or less of the particles pass through the No. 0.075mm sieve) falling into A-2 group according to AASHTO classification with varied degree of parking.

The subgrade materials in the homogeneous sections for **Kanyenye road II** (0+000 – 0+100km) were found to mainly comprise Silty, Clayey Gravel and Sand by 100% (whereby 35% or more of the particles pass through the No. 0.075mm sieve) falling into A-6 group according to AASHTO classification with varied degree of parking.

The figure below shows the plotting of the cumulative sum of the difference from the average values of the CBR Subgrade results against chainage. A change in slope indicates a change in the condition of the existing subgrade materials.

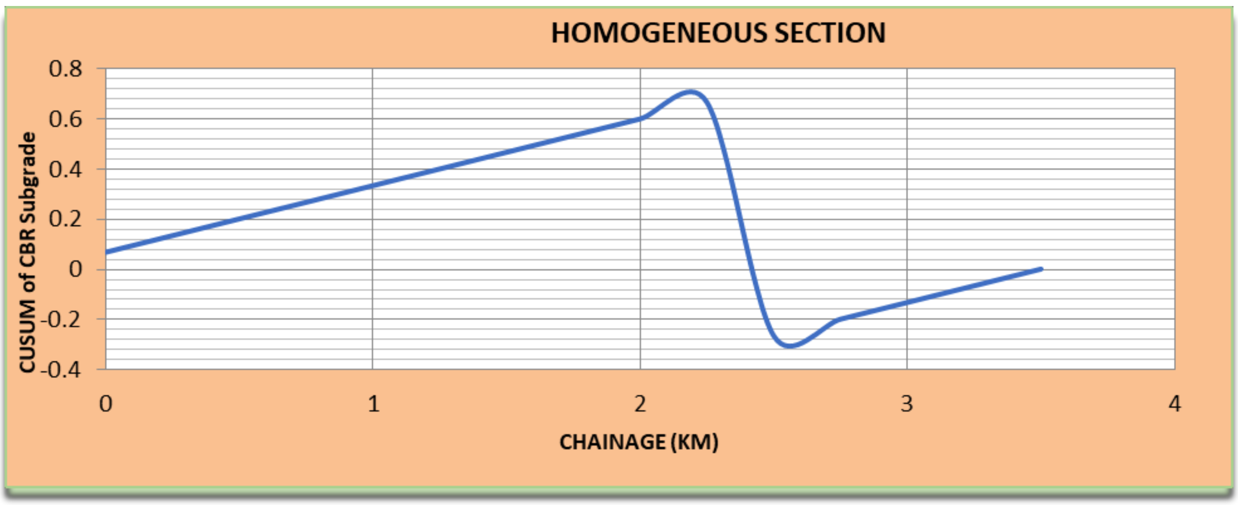


Figure 11:The CUSUM Method to Establish Homogeneous Sections of Swetu road from 0+000km to 3+400km

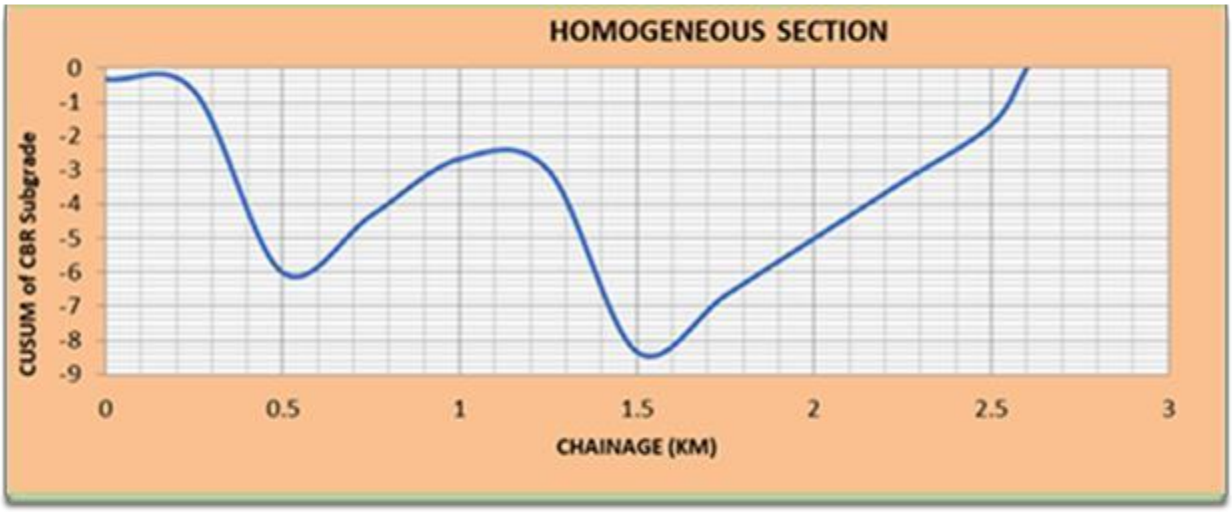


Figure 12:The CUSUM Method to Establish Homogeneous Sections of Kisarika road from 0+000km to 2+600km

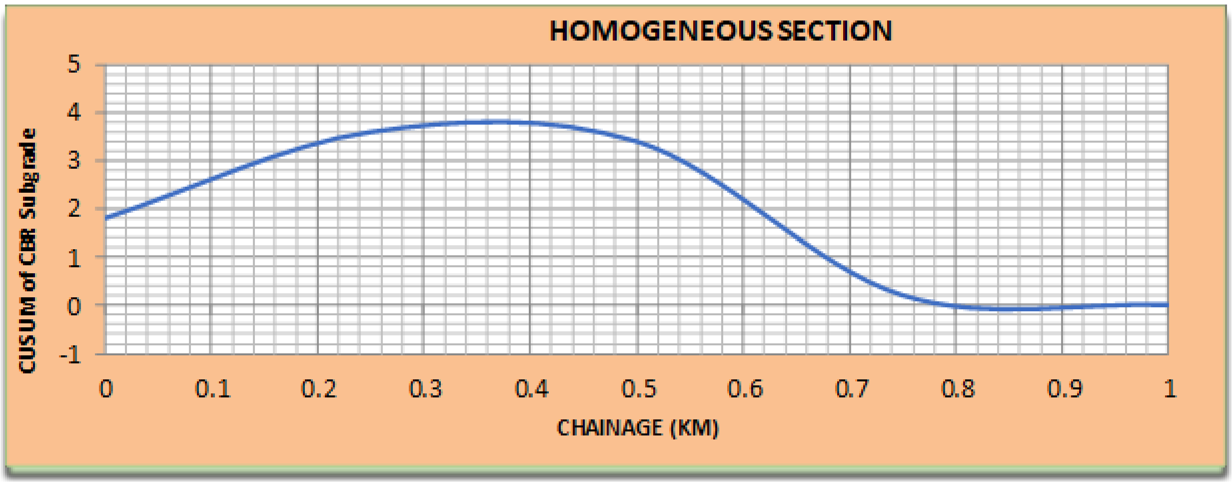


Figure 13:The CUSUM Method to Establish Homogeneous Sections of Maili Tano road from 0+000km to 1+000km

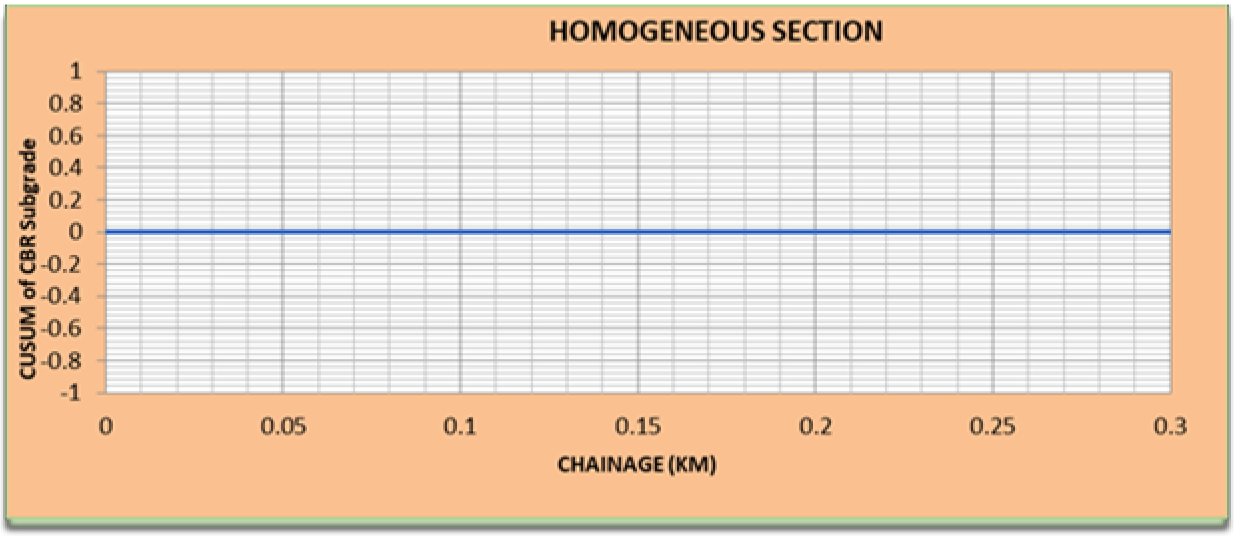


Figure 14:The CUSUM Method to Establish Homogeneous Sections of Kanyenye road 1 from 0+000km to 0+300km

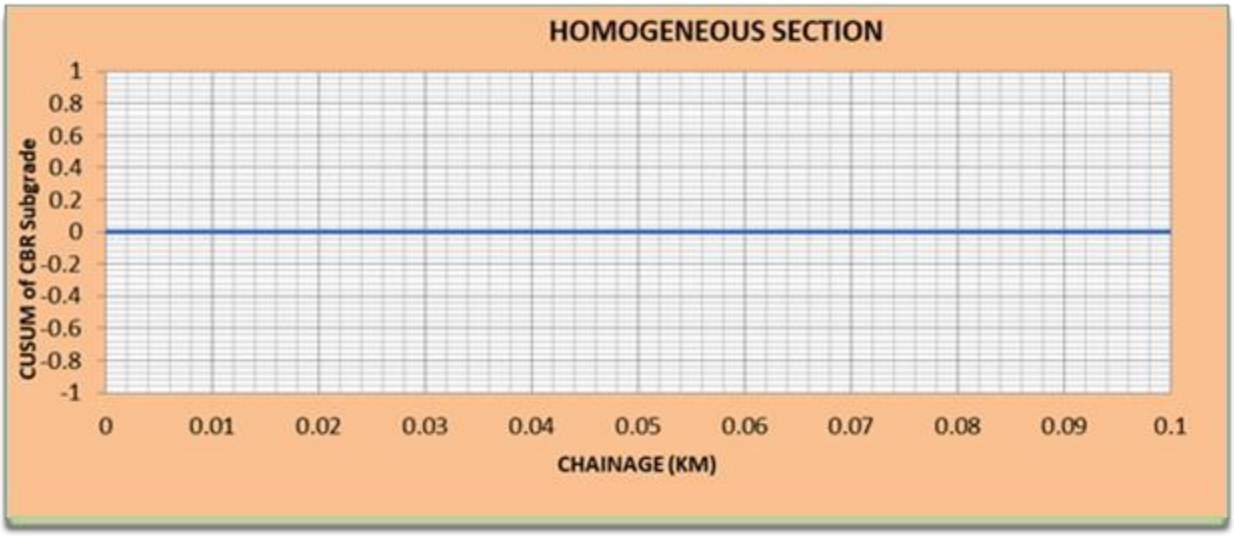


Figure 15:The CUSUM Method to Establish Homogeneous Sections of Kanyenye road II from 0+000km to 0+100km

3.4.3 Sub Grade Classes

The strength of the subgrade is classified according to the Pavement and Materials Design Manual (PMDM - Table 4): -

Table 4; Subgrade CBR Design

Subgrade Class	CBRdesign [%]			Density for Determination of CBRdesign [%] of MDD)
	Wet or moderate climatic zones 4 days-soaked value	Dry climatic Zones (Both requirements shall be met)		
		Tested at OMC	4 days-soaked value	
S15	Min15	Min 15	Min 7	95 BS-Heavy
S7	7-14	7-14	3-14	93 BS-Heavy
S3	3-6	3-6	2-6	100 BS-Light

Source: PMDM 1999

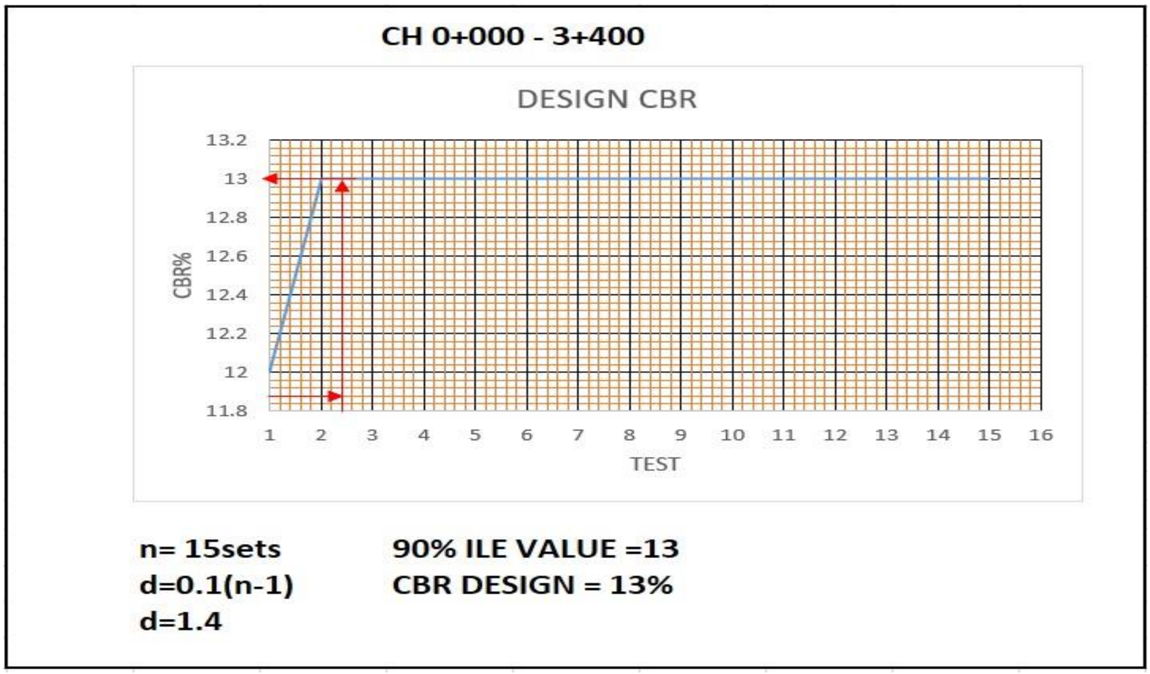


Figure 17:Design Sub grade CBR of Swetu Road

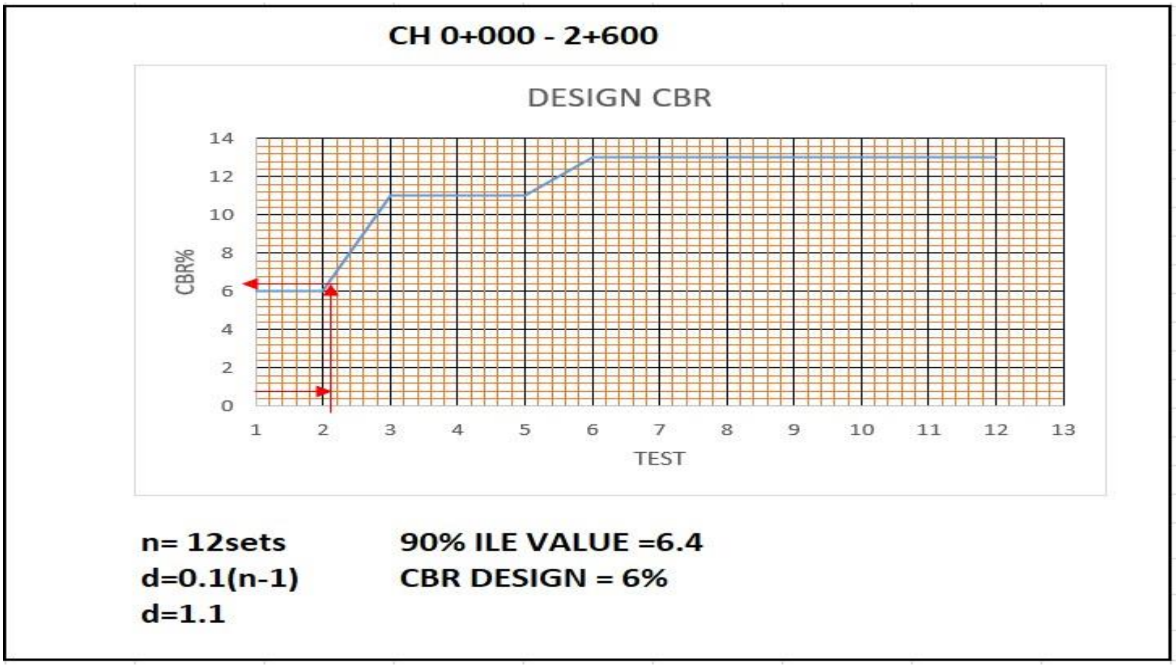
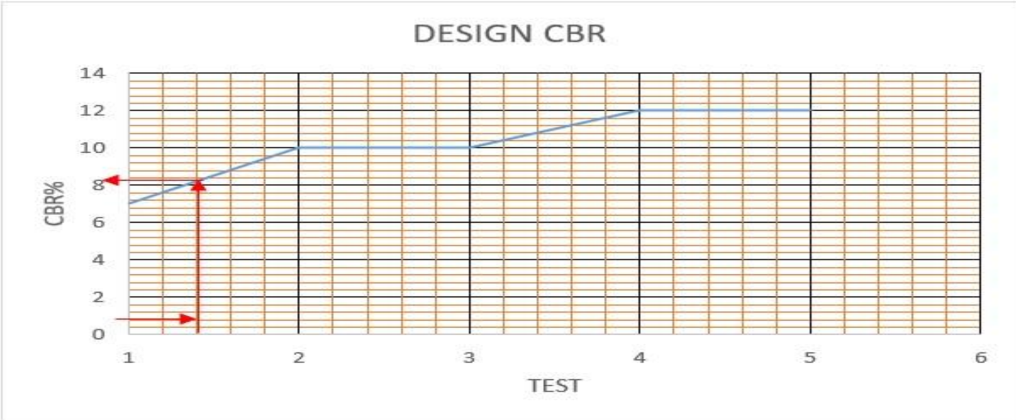


Figure 18:Design Sub grade CBR of Kisarika Road

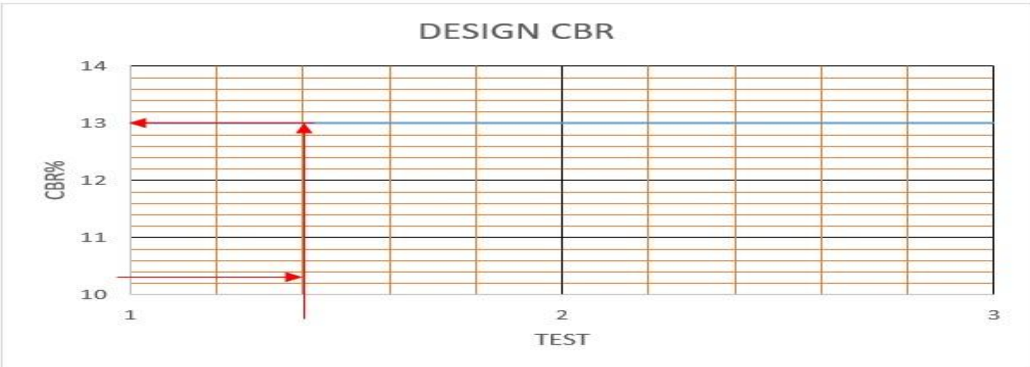
CH 0+000 - 1+000



n= 5sets **90% ILE VALUE =8.38**
d=0.1(n-1) **CBR DESIGN = 8%**
d=0.4

Figure 19:Design Sub grade CBR of Maili Tano Road

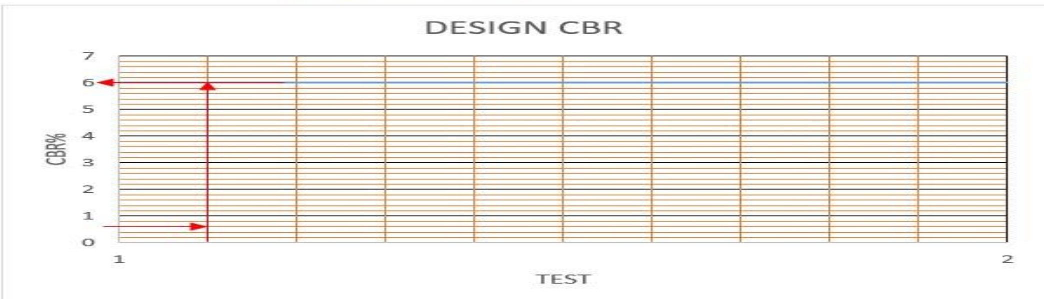
CH 0+000 - 0+350



n= 5sets **90% ILE VALUE =13**
d=0.1(n-1) **CBR DESIGN = 13%**
d=0.4

Figure 20:Design Sub grade CBR of Kanyenye 1 Road

CH 0+000 - 0+100



n= 2sets **90% ILE VALUE =6**
d=0.1(n-1) **CBR DESIGN = 6%**
d=0.1

Figure 21: Design Sub grade CBR of Kanyenye II Road

The subgrade soils were grouped according to their strength properties after laboratory tests and the general characteristics of these soils as shown in Tables 5,6,7,8,9 and 10

Table 5: Design Subgrade CBR Swetu road (0+000 – 3+400)

From (Km)	To (Km)	Design Subgrade CBR
0+000	3+400	S7

Table 6: Design Subgrade CBR Kisarika road (0+000 – 2+600)

From (Km)	To (Km)	Design Subgrade CBR
0+000	2+600	S3

Table 7: Design Subgrade CBR Maili Tano road (0+000 – 1+000)

From (Km)	To (Km)	Design Subgrade CBR
0+000	1+000	S7

Table 8: Design Subgrade CBR Kanyeye road 1 (0+000 – 0+350)

From (Km)	To (Km)	Design Subgrade CBR
0+000	0+350	S7

Table 9: Design Subgrade CBR Kanyeye road II (0+000 – 0+100)

From (Km)	To (Km)	Design Subgrade CBR
0+000	0+100	S3

The statistical occurrence of different subgrade soil types is summarized in Table 11

Table 11: Statistical occurrence of soil types: - Subgrade CBR Swetu approach road

TZ Class	Number of test pits	Frequency
S15	0	0
S7	15	100
S3	0	0
CBR<3%	0	0
Total	**15**	**100**

Table 12: Statistical occurrence of soil types: - Subgrade CBR Kisarika approach road

TZ Class	**Number of test pits**	**Frequency**
S15	0	0
S7	10	83.3
S3	2	16.7
CBR<3%	0	0
Total	**12**	**100**

Table 13: Statistical occurrence of soil types: - Subgrade CBR Maili Tano approach road

TZ Class	**Number of test pits**	**Frequency**
S15	0	0
S7	5	100
S3	0	0
CBR<3%	0	0
Total	**5**	**100**

Table 14: Statistical occurrence of soil types: - Subgrade CBR Kanyenye 1 approach road

TZ Class	**Number of test pits**	**Frequency**
S15	0	0
S7	3	100
S3	0	0
CBR<3%	0	0
Total	**3**	**100**

Table 15: Statistical occurrence of soil types: - Subgrade CBR Kanyenye II approach road

TZ Class	**Number of test pits**	**Frequency**
S15	0	0
S7	0	0
S3	2	100
CBR<3%	0	0
Total	**2**	**100**

It appears that the predominant soil classes encountered along the project roads are S7, and lastly S3.

The major general characteristics of soils from table classes are shown in Table 16

Table 16: Soil Classes

Subgrade Class	Major Characteristics	General rating as Subgrade
S15	Silty or Clayey gravel and sand	Upper Subgrade or Fill
S7	Silty soils	Lower Subgrade or Fill
S3	Clayey Silty	Fill
CBR<3%	Clayey or Cotton soils	Unsuitable

3.5 Problematic Soils

3.5.1 Low-Strength Soils (CBR<3% or PIW >20%)

A problematic soil is defined as soil with low strength and/or exhibits unfavourable characteristics such as expansiveness. According to the Tanzanian Pavement and Materials Design Manual Chapter 6, the soil will be potentially expansive and requires extended investigations if exhibiting both of the following properties: -

- The result of the field reconnaissance indicates expansive soils, and
- PIW is greater than 20%

Where: PIw = PI x (% passing 425µm)/ 100.

$\varepsilon ex = 2.4xWp - 3.9xWs + 32.5$

εex = Expansiveness

Wp= Plastic Limit tested on fraction <0.425mm according to CML test 1.3

Ws = Shrinkage Limit tested on fraction <0.425mm according to ASTM D4943 – 891

3.5.2 Classification of Expansive soils

The expansiveness of the soils is a convenient expression to classify predicted heave as the result of swelling in expansive soils, although heave depends on a number of the other factor such as the conditions under which the soils perform in the road including initial moisture content, density and suction, plus lateral support, vertical stress and stress history. The expansiveness of the soil is however a practically measurable parameter that makes it possible to classify the expected severity of the problem. The system for the relative classification of expansive soils is given in Table 17

Table 17: Expansive soils – Classification

Expansiveness εex	Classification
<20	Low
20 – 50	Medium
>50	High

According to the carried-out investigations, there is no problematic soil along the project roads most of the subgrade soils were observed to be silty sand soils with PIw less than 20.

4. INVESTIGATION OF CONSTRUCTION MATERIALS

4.1 Introduction

Investigations of construction Materials have been conducted to identify sources and quality of materials including Borrow Areas, Sand Pits, Construction Water sources and hard stone (Quarry) sources.

4.2 Borrow Areas

4.2.1 Site Investigation

During soil and materials investigation, two borrow areas were identified along or near the projects and samples were taken for laboratory testing to check the quality of the available materials for pavement construction.

Table 18, gives a summary of the locations of the potential borrow area and their estimated quantities.

Table 18:Borrow Areas and Estimated Quantities

		Coordinates in		Estimated	Remarks/ Existing or New
1	TULI	E:0488426	14Km LHS from Tabora municipal, along Tabora- Manyoni road	160,000m3	
2	TUMBI	E:0471341	14.6Km from Muriet Tabora municipal along Tabora- Urambo	337500m3	Existing

A sketch of the location of borrow areas is shown in **appendix 4-1**, and a summary of laboratory test results indicating properties and potential usage of materials is shown in **appendix 4-2.**

Figure 23:View of Tuli Borrow Area

Figure 24:View of Tumbi Borrow Area

4.2.2 Laboratory test of borrow pits materials

Laboratory testing of borrow pits materials was carried out at **Central Technologies Limited (Construction Material Testing Laboratory)**.

Testing has been carried out on the samples extracted from each borrow pit according to the following test methods.

Laboratory testing program for construction materials

- Atterberg's Limits (Test methods - CML 1.2 & 1.3)
- Linear Shrinkage (Test method - CML 1.4)
- Particle Size Distribution (Test method - CML 1.7)
- Moisture /Density Relationship (Test method - CML 1.9)
- CBR - Three-Point Method in soaked condition (Test method - CML 1.11)

All tests were carried out following the Central Materials Laboratory Testing Manual 2000.

Note 1: CBR Specimen were compacted according to CML 1.11 in soaked condition, using 62 blows/ 5 layers/ 4.5kg rammer, 30 blows/ 5 layers/ 4.5kg rammer and 62 blows/ 3 layers/ 2.5kg rammer respectively.

4.2.3 Summary of Results

The analysis of laboratory test results for the materials from the borrow area has shown to have meet G15 and G25 materials and scarcity of higher-class materials G45, G60 and G80. However, sub-base materials classes having a minimum CBR of 20 are available that suit for stabilization of C1.

Available materials from the investigated borrow area comprise Silty, Clayey, Gravel and Sand of which 35% or less of the particles pass through the 0.075mm sieve, which can be classified as G15 for Tuli borrow pit and G25 for Tumbi borrow pit.

4.3 Quarry Site

4.3.1 Site Investigation

One proposed hard stone source for aggregates was investigated. The source namely TUMBI quarry was found at TUMBI village 16.8km from Tabora town, along the Tabora- Urambo road.

Rock outcrops and boulders are expected to be used in masonry works and the pitching of drainage structures.

The sample was taken for laboratory tests to determine the properties of construction works.

Table 19:Hard stone sources and their Estimated Quantities

S/n	**Chainage (Km)**	**Name of Hardstone**	**Coordinates (UTM) in Arc**	**Offset dist. (Km)**	**Estimated Quantities**	**Remarks**
1	16+800 Tabora- Urambo	TUMBI QUARRY	E:0468434 N:9439247	530m, RHS	4,900,000	Existing

Figure 25; View of Tumbi hard stone Source

4.3.2 Laboratory testing of hard stone samples

The hard-stone Sample from only one source was tested at **Central Technologies Limited** (**Construction Material Testing Laboratory)** & **the University of Dar Es Salaam** and subjected to the following test methods:

- Loss Angeles Abrasion - LAA (Test method – CML 2.9)
- Aggregate Crushing Value - ACV (Test method – CML 2.6)
- Ten Percent Fine Value - TFV (Test method – CML 2.7)
- Sodium Sulphate Soundness - SSS (Test method – CML 2.10)
- Bitumen Affinity
- Specific Gravity - SG and Water Absorption (Test method - CML 2.2)
- Soluble Salts Content
- Aggregate Impact Value - AIV (Test method – CML 2.8)

Materials from only one source investigated were sampled for laboratory testing. The rock source contains massive rocks occupying big areas if crushed possibly will produce various sizes of aggregates for construction works.

Based on the laboratory test results, hard stone source meets the general requirements for Concrete, Surface Treatment/Bituminous works and other construction works. A summary of laboratory test results from hard stone sources is shown in Table 20

Table 20: Hard Stone Source summary of Laboratory test results

Source Name	Location (Ch km:)	TFVDry (KN)	TFVWet (KN)	LAA %	ACV (%)	SG	Water Absorption	Bitumen affinity (%)	Soluble salts content		SSS (%)	AIV	Remarks
									Chloride (%) Cl-	Sulphate content S03 (%)			
TUMBI QUARRY	16+800 Tabora-Urambo road	240	185	22	16.3	2.713	0.85	97	0.017	0.098	2.38	15	Recommended for Asphalt concrete, surface dressing and concrete works

Full laboratory test results indicating the properties of these hard-stone sources are presented in Appendix 4-3

Recommendations were done using the following References

1. PMDM 1999

2. Interim Guideline for hotmixed asphalt 2018

Table 21:Aggregate requirement for Superpave Surfacing (***Source: Guideline for HMA, 2018***)

Property	Test	Standard test method	CML Test method	Requirement
Hardness / Toughness	Aggregate Crushing Value (ACV)	BS EN1097-4.	LTM 2000 (2.6)	Fine graded, max 25% Coarse graded: max 21%
	10% Fines Value (TFV)	BS EN1097-4	LTM 2000 (2.7)	Asphalt surfacings and base: min 160 kN Open-graded surfacings and SMA: min 210 kN Wet/dry ratio ≥ 0.75 for all asphalt mixes
	Aggregate Impact Value (AIV) – ***Optional***	BS EN1097-4	LTM 2000 (2.8)	Max 30%
	Loss Angeles Abrasion (LAA)	ASTM C535/ C131	LTM 2000 (2.9)	Max 35%
Soundness / durability	Magnesium sulphate or Sodium sulphate	ASTM C88	LTM 2000 (2.10)	12 to 20% is normally acceptable. Some specifications require ≤ 12% loss after 5 cycles
Particle shape and surface texture	Flat and elongated particles²	ASTM D4791	-	Max 10%
	Coarse aggregate angularity³	ASTM D5821	-	95/90 (at least 95% of coarse fractions should have one fractured face and 90% has two or more fractured faces
	Fine aggregate angularity	ASTM C1252	-	Min 45%
Cleanliness	Sand equivalent	ASTM D2419	-	Min 50% total fines fraction
	Clay lumps and friable particles	ASTM C142/ AASTHO T330	-	Max 10%
Specific gravity and water absorption	Coarse aggregate (> 4.75 mm)	ASTM C127	LTM 2000 (2.2)	Maximum absorption of 1% by mass
	Fine aggregate (< 4.75 mm)	ASTM C128	LTM 2000 (2.2)	Maximum absorption of 1.5% by mass

Table 22: Requirement for CRR (***Source: PMDM-1999***)

Material properties *CML Tests*	**Material class: CRR**	
Atterberg limits: *1)*		
Max Liquid limit *CML1.2*	30	
Max Linear Shrinkage *CML1.4*	3	
Grading: *CML1.7*		
Sieve size (mm)	Grading limits - CRR (% passing sieve)	
	Coarse type	Fine type
37.5	100	
28	87-97	100
20	75-90	87-97
10	52-68	62-77
5	38-55	44-62
2	23-40	27-45
1.18	18-33	22-38
0.425	11-24	13-27
0.075	4-12	5-12
Particle strength and shape		
Minimum TFV dry *CML2.7*	110kN	
Ratio dry to soaked value of TFV *CML2.7*	TFV_{soaked} shall be minimum 75% of the corresponding TFV_{dry} value	
Maximum flakiness index *CML2.4*	35%	
Minimum field density *CML2.2*	Nominal value minimum 88% the aggregate's apparent density *2)*	

1) It is emphasised that the Atterberg limits shall be measured according to the CML test methods 1.2 1.3 and 1.4. These methods follow British Standard (BS) procedures and utilise BS equipment. Other laboratory test procedures and equipment do not give comparable results and shall not be used unless proper correlation to CML/BS has been carried out to the satisfaction of the Engineer.

2) The Engineer may allow that the BS-Heavy compaction is used as reference value with a minimum nominal field density requirement of 104% MDD of BS-Heavy.

4.3.3 Sand Investigation

One source (sand deposit) was found and the sample was taken for laboratory testing. Found at Inala Cheyo village offset of 8km RHS from Tabora-Manyoni road.

The sand sample was subjected to the following test: -

- Particles size distribution
- Organic impurities
- Atterberg's limits

Table 23, gives a summary of the locations of sand pits and their estimated quantities

Table 23; Location of Sand deposit and their Estimated Quantities

S/n	Name	Offset distance	Coordinates (UTM) in Arc	Estimated Quantities (m3)	Remarks Existing/New
1	Inala cheyo sand quarry	8km RHS from Tabora-Manyoni road	E:0483103 N:9440928	120,000	Existing

Table 24 summarizes the recommendation for the use of a sand sample from the source identified during the investigation.

Table 24; Summary of Laboratory test results of Sand samples

Name and Location	**Clay lumps and friable particles**	**Organic Content**	**Sand Equivalent**	**Characteristic**
	SPEC Max 3%	SPEC Max 5%	SPEC Min 40%	
Inala cheyo sand quarry	1.47	0.58	60	Recommended for concrete and other construction works

References:

1) Sand equivalent, AASHTO T-176

2) Clay lump and Friable Particles, AASHTO T-112

3) Organic Impurities in Sand/Organic content, AASHTO T-21 & AASHTO T267-86 :1996

Figure 26: View of Inala cheyo Sand Source

A full summary of laboratory test results of sand sample is presented in **appendix 4-4**

4.4 Water Sources

4.4.1 Site Investigation

There is no credible source of water which can be used for construction Projects. Therefore, boreholes and shallow ponds should be initiated to have enough storage of water in Tabora. But there is only one source of water located more than 20 km from Tabora town known as Igombe dam which also is used to feed Tabora town and another area as a source of water for home use.

The construction of boreholes will give benefit the surrounding people during and after the construction of the roads.

5. SOURCE OF MANUFACTURED MATERIALS FOR ROAD AND BRIDGE CONSTRUCTION

As part of quality assurance, the Construction materials to be used will be tested for compliance. The major manufactured materials for road construction and their sources have been described hereunder: -

5.1 Cement

Cement for construction is easily available on the mainland commonly parked in 50kg bags and sourced from the factories in Dar es Salaam, Tanga and Mbeya.

5.2 Reinforcement Steel

Reinforcement steel for structural works is also available on the mainland from various factories in Dar-Es-Salaam, Tanga and abroad. The strength and other properties of reinforcing steel must be confirmed by testing samples in approved testing laboratories.

5.3 Bitumen

Bitumen for road works is generally available from TPDC or external supplies. The properties must be checked by testing representative samples in approved testing laboratories.

6. DESIGN TRAFFIC LOADING

6.1 Axle Load Survey

The purpose of the traffic survey is to capture information on directional traffic loading and determine Vehicle Equivalent Factors (VEF) for various categories of vehicles for the estimation of traffic loading on the project road in terms of E80s.

The damaging effect of an axle passing over the pavement is expressed by the equivalency factor related to an equivalent standard axle (E80) of 8160 kg load:

Equivalency factor = [Axle Load (kg) / 8160]4.5.

The equivalent standard axle load concept is further defined in 'The Highway Development and Management (HDM4) series' as follows: ***"The equivalent standard axle load factor is the number of applications of a standard 80kN dual-wheel single axle load that would cause the same amount of damage to a road as one application of the axle load being considered"*.1**

6.2 Vehicle Equivalent Factors (VEF)

Vehicle Equivalency Factor (VEF) is a summation of equivalent standard axle loads of individual axles of a vehicle.

The equivalent standard axle loads of individual axles of a vehicle were summed up to obtain a Vehicle Equivalency Factor (VEF). The VEF for every vehicle in the axle load survey was determined and an average value was subsequently calculated separately for each vehicle category for each direction.

6.3 (a) Normal Traffic Growth

Normal traffic is traffic that is currently using the existing Kisarika, Swetu, Maili tano, Kanyenye I, Kanyenye II roads in the Without Project Case (WoP) and which will continue to use the road in the With Project Case (WP).

This traffic is similar to base year or survey year traffic, which has been adjusted for daily, weekly and monthly variations.

(b) Generated Traffic

The concept of generated traffic is governed by the general demand theory, i.e., demand is a function of price thus transport demand will increase if transport cost decreases. With this functional relationship, any improvement option in the transport infrastructure, e.g., improved road or bridge construction will reduce the vehicle operating costs considerably, and in turn, lead to an overall reduction in transport cost, and accordingly, increase in traffic
demand.

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1 The Highway Development and Management (HDM4) Series; Volume 4

The lowering of transport costs normally influences generated traffic. Demand for transport being a derived demand is a function of processes, which include costs such as vehicle operating costs and travel time costs. A lowering of these costs as a result of an improved road network makes it attractive to road users, which results in additional trips also referred to as generated traffic.

(c) Diverted Traffic

This is traffic that in the WoP situation is using other roads or routes and that with the construction of the kisarika, Swetu, maili tano, Kanyenye I, Kanyenye II roads, will divert from its existing route to the project route because of some perceived advantages brought about by the improvement's due shorter length or faster travel times or fewer administrative or border delays, absence of non-tariff barriers and so on. For diverted traffic to materialize there have to be existing alternative routes to the proposed new or improved road/bridge and there must be traffic that wishes to travel beyond the start and endpoints.

Diverted traffic is also known as 're-assigned' traffic. It occurs on improved roads from alternative routes and modes, which may get shifted on account of time, distance and comfort advantages.

Estimating the volume of traffic that will divert requires knowledge of road user-perceived costs for each of the alternative routes. These are based on the route characteristics such as length and design speed etc. Thus, for example, if we have Route A @ 5.5 hours travel time and Route B @ 4.5 hours travel time some traffic will prefer Route B. The volume of traffic that could potentially divert will be ascertained from origin-destination surveys. Once the potential traffic diversion is known, a sub-set of that can be expected to divert. The sub-set will range from

100% to 50%.

6.4 Traffic Load Class (TLC)

The average VEF for each heavy vehicle category, for each direction, was then applied to traffic AADTs for each road section of the project road to obtain cumulative E80s traffic loading over the design life of 20 years using appropriate traffic growth factors.

The VEFs were assumed to remain constant over the design period. Growth in the number of heavy vehicles was considered to be the same as for normal, diverted and generated traffic growths. Table 23; gives a summary of yearly E80s for a design life of 20 years.

6.5 Axles loaded to above 13 tonnes

Axle loading on the new road project will be needed to be controlled by placing warning signs which restrict the passage.

6.6 Traffic Load Classification (TLC)

The following table data will be used for the design of pavement: -

Table 25:Traffic Load Classes for Road sections

Section No.	Road Section Name	Climatic zone	TLC
1	Kisarika road	wet	TLC 10
2	Swetu Road	wet	TLC 10
3	Mail Tano road	wet	TLC 10
4	Kanyenye Road-I	wet	TLC 10
5	Kanyenye road - II	wet	TLC 10

From the summary table above the project, road pavement is recommended to be designed for **TLC 10** for the whole Sections with waste scenario climatic zone wet but during binder selection, the high and low-temperature zones shall be adopted.

7. PAVEMENT DESIGN

7.1 Design Standards

The pavement designs were done following Tanzania Standards (Pavement and Material Design Manual, **MOW 1999).** The general standard for the completed road shall correspond to that of double surface dressing/asphalt concrete (Tanzania Standard Manual).

A design life (design period) of 20 years has been adopted.

The climatic conditions, the topography and the actual observations all indicate that subsoil proportions should be assessed at the soaked condition as a basis for the design. Also, the Pavement and Materials design Manual-1999 chapter 2.2 classify the Tabora region as a moderate climatic zone; but most of the area in the Tabora water table is very near we can assume the **worst scenario** which is a wet area. Assuming the **worst scenario** for the design of pavement as a **Wet zone** to be adopted, but during binder selection, the maximum and minimum temperature along the road section shall be taken care of.

The pavement design for this road section is based on a minimum subgrade CBR of 15%. This is achieved by the provision of improved subgrade layers.

7.2 Design traffic

The design traffic load class for the project road adopted from the analysis will be **TLC 10** for all roads, to take into consideration all factors that may arise in any change or increase in traffic using the road. The details of the design traffic for the pavement design are summarized in table 26.

Table 26; Traffic loading summary

Road sections	Length km	Traffic load Class	Design Period (Yrs)	Climatic Zone
Kisarika road	2.6	TLC 10	**20YRS**	**WET**
Swetu Road	3.4			
Mail Tano road	1.1			
Kanyenye Road-I	0.3			
Kanyenye road - II	0.1			

7.3 Subgrade treatment

7.3.1 Non-Problematic Soil (normal Soil)

The required minimum CBR value for the pavement design is 15% (Pavement and Materials Design Manual-1999) this can be achieved in some sections by constructing improved subgrade layers.

Improved subgrade layers G7 and G15 for the lower and upper layers. For sections with the superior existing surface course and subgrade material that meet G15 requirements, the construction approach shall be scarification 200mm thick, mix and compact to 95% heavy compaction. For G7 sections, the construction approach shall be replacement of G7 with superior material, which meets G15 requirement, dump, spread and compact to 95% heavy compaction. For the G3 section, the construction approach shall be the replacement of G3 with G7 and G15 materials quality layer-by-layer and compact to a specified standard.

The subgrade CBR values shall be determined from laboratory test results.

The required subgrade strength is of a CBR minimum of 15% and this can be achieved in some sections by constructing improved subgrade layers. Below is the description of subgrade treatments for different subgrade materials quality.

Treatment of Sections with Subgrade characteristics of PIW >20%)

The sections that will be examined exhibit expansive soils characteristics with PIw greater than 20% and CBR less than 3.

It is recommended that on these sections the pavement subgrade be strengthened by removing 600mm below the bottom of the subbase layer and replacing it with better quality fill materials. However, during construction, the contractor will have to verify the full extent of the distance for the provision of fill materials and the contractor should take into consideration the new levels of vertical alignment before cut and after the cut for purpose of verification of quantities executed

Table 27; Design of improved subgrade layers summarized from the subgrade CBR design determined in soil surveys.

	Subgrade classes

		G15	G7	G3
Improved subgrade layers to be constructed	Upper layer	None	150mm G15	150mm G15
	Lower layer	None	None	300mm G7

Note: Material requirements for improved subgrade layers, refer to PMDM chapter 5, *Table 5.4*

7.3.2 Treatment of expansive soil subgrade

The pavement and Materials Design Manual recommend the following treatment to be applied on expansive soil: -

a) Full removal of expansive soil

Where the finished road level is designed to be less than 2 metres above ground level, remove the expansive soil to a minimum depth of 600 mm over the full width of the road, or

b) Removal of expansive soil under the unsurfaced area

Where the finished road level is designed to be greater than 2 metres above ground level, remove the expansive soil to a depth of 600 mm below the ground level under the unsurfaced area of the road structure.

Note:

i. Stockpile the excavated material on either side of the excavation for subsequent spreading on the fill slopes to produce as flat a slope as possible.

ii. The excavation formed as directed in 'a' and 'b' above should be backfilled with plastic non-expansive soil materials of G3 quality and minimum plasticity index 15% in 150mm lifts and compact to a specified standard.

iii. After the excavated material has been replaced with non-expansive material in 150 mm lifts, bring the road to finished level in approved materials, with a side slope of 1:2, and ensure that pavement criteria are complied with; the previously stockpiled expansive soil excavated as directed should then be spread over the slope.

7.4 Pavement Material

7.4.1 Construction Design

There are 5 sections of roads under study; The Consultant has adopted the use of **TLC 10 for the design of all roads section (worst-case scenario).** The following alternatives design have been evaluated as per PMDM 1999: **Design for TLC 10**

a) Alternative one (TLC 10)

Pavement Structure with Granular Base Course for Wet climatic zones

The proposed route consists of an inferior material, which will require replacement with superior material as per Chapter 6 of the PMDM. Some sections contain superior properties, which meet the design requirements of the subgrade layer.

Construction of new pavement layers of subbase, base course and surfacing based on the Traffic Load Classification (TLC 10) will be done as indicated below.

i. Asphalt concrete wearing course with aggregate from crushed rock of a suitable hardness from an approved quarry

ii. A base course consisting of Crushed rock from an approved Quarry.

iii. Subbase consisting of Cement Stabilized natural gravel material from an approved borrow area.

Refer to PMDM chapter 8

Traffic Class : TLC 10

Surfacing layer : 50mm AC Base course : 150mm CRR Subbase : 200mm C1

b) Alternative two (TLC 10)

Pavement Structure with Cemented Base for All climatic zones.

Construction of new pavement layers of the subbase, base and surfacing layer shall be done as indicated below.

i. Double surface dressing (ST) wearing course with aggregate from crushed rock of a suitable hardness from an approved quarry

ii. A base course consisting of cement-stabilized natural gravel material from approved borrow areas.

iii. Subbase consisting of cement-stabilized natural gravel materials from approved borrow areas.

Refer to PMDM chapter 8

Traffic Class : TLC 10

Surfacing layer : ST(DSD) Base course : 150mm C2

Subbase : 125mm C1 + 125mm CM

c) Alternative three (TLC 10)

Pavement Structure with Bituminous mix in the Base course for all climatic zones.

Construction of new pavement layers of subbase, base and surfacing layer shall be done as indicated below

i. Double surface dressing (ST) wearing course with aggregate from crushed rock of a suitable hardness from the approved quarry.

ii. Dense Bitumen Macadam (DBM30&40), mean large aggregate mix for the base course (LAMBS), Mean foamed bitumen mix (FBMIX)

iii. Subbase consisting of natural gravel materials from approved borrow areas.

Refer to PMDM chapter 8

Traffic Class : TLC 10

Surfacing layer : ST(DSD)

Base course : 150mm DBM40

Subbase : 200mm G45

d) Alternative Four (TLC 10)

Pavement Structure with Base course type of Penetration Macadam for All climatic zones.

Construction of new pavement layers of the subbase, base and surfacing layer shall be done as indicated below.

i. Asphalt Concrete Wearing Course with aggregate from crushed rock of a suitable hardness from the approved quarry.

ii. A base course consisting of Penetration Macadam.

iii. Subbase consisting of cement-modified materials from approved borrow areas.

Refer to PMDM 1999 chapter 8

Traffic Class : TLC 10

Surfacing layer : 50mm AC

Base course : 125mm PM80

Subbase : 200mm CM

NB: Due to the nature of the swamp along **Kisarika road**, this road is designed as rigid pavement

RIGID PAVEMENT DESIGN(TLC 10)

- **Jointed Unreinforced Concrete Pavement (JUCP) with a tied shoulder.**

JUCP pavements have no reinforcement. However, the longitudinal and transverse joints are provided with dowels or tie bars depending upon the type of joint.

The thickness of a JUCP concrete slab is determined from Figure 6.2a and 6.2b of **PMDM – RP - ERA 2013** depending on the strength of the concrete. The Figure shows the thicknesses required for concrete slabs that have effective support to the edge of the most heavily- trafficked lane (i.e. the right lane) by means of tied shoulders,in absence of tied shoulder an additional of slab thickness is required .

- **Jointed Reinforced Concrete Pavement (JRCP) with tied shoulder.**

The thickness of JRCP slabs is shown in Figure 6.3 of **PMDM – RP - ERA 2013** for pavements with tied shoulders. The thickness depends on the amount of reinforcement that is used, as shown in the Figures. Thus, there are several alternative combinations of the thickness of concrete slab and the amount of reinforcement.

In addition to the longitudinal reinforcement, JRCP pavements should be provided with transverse reinforcement consisting of 12 mm diameter steel bars at 600 mm spacing. The minimum thickness for JUCP and JRCP is 150 mm

- **Continuously Reinforced Concrete Pavement (CRCP) with tied shoulder.**

CRCP pavement can better withstand severe stresses induced by differential movements. For a given traffic volume in terms of ESAs, the required thickness of CRCP concrete slab is shown in Figure 6.5 of **PMDM – RP - ERA 2013**

Longitudinal reinforcement in CRCP pavements should be 0.6% of the concrete slab cross- sectional area, and consist of 16 mm diameter deformed steel bars. Transverse reinforcement should be provided at 600 mm spacing and consist of 12 mm diameter deformed steel bars to prevent the opening of any longitudinal cracks which may form.

Transverse reinforcement is also required for ease of construction. In the absence of effective shoulder support adjacent to the most heavily trafficked lane, an additional slab thickness is required and can be determined from Figure 6.6 of **PMDM – RP - ERA 2013**. The minimum thickness of concrete for CRCP is 200mm

Construction of the new Concrete surface layer will be done according to Pavement Design Manual Volume II-Rigid Pavement – Ethiopian Road Authority as listed below taking into account the traffic load class of TLC10. (Design life of 40years).

a) Alternative one; Jointed Unreinforced Concrete Pavement (JUCP) with the tied shoulder.

- Concrete surface Class 30.
- Subbase consisting of cement stabilized natural gravel material from approved borrow areas.

Refer to Traffic analysis results Table 7.1

Traffic Class	**:**	**TLC 10**
Surfacing layer	:	230mm Concrete Class 30
Subbase	:	200mm C1

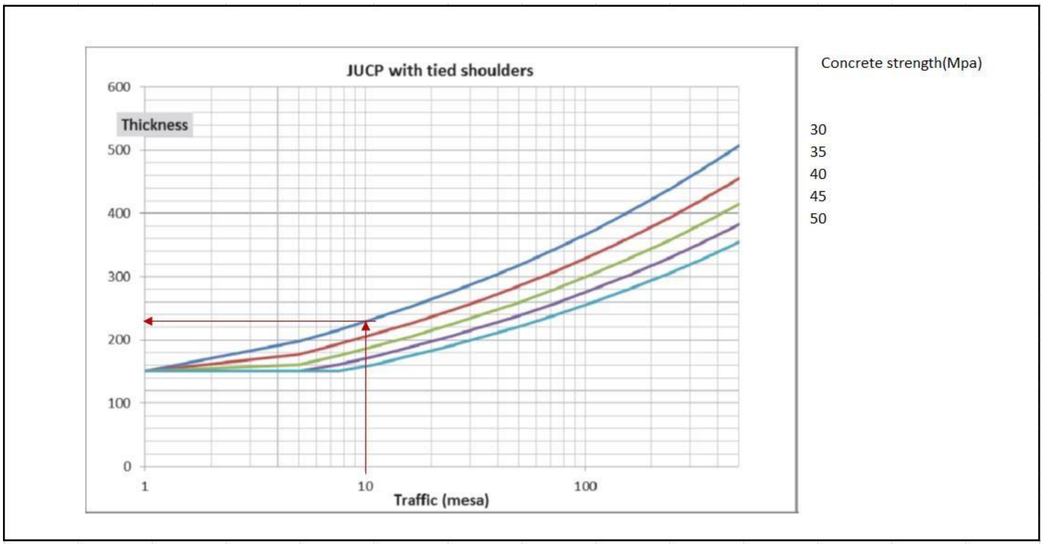


Figure 27:Determination of concrete slab thickness on Jointed unreinforced concrete pavement(JUCP)

b) Alternative two; Jointed reinforced Concrete Pavement (JRCP) with a tied shoulder.

- Concrete surface Class 30.
- Subbase consisting of cement stabilized natural gravel material from approved borrow areas.

Refer to Traffic analysis results Table 7.1

Traffic Class : TLC 10

Surfacing layer : 170mm Concrete Class 30 + 700mm2/m Reinforcement bars

Subbase : 200mm C1

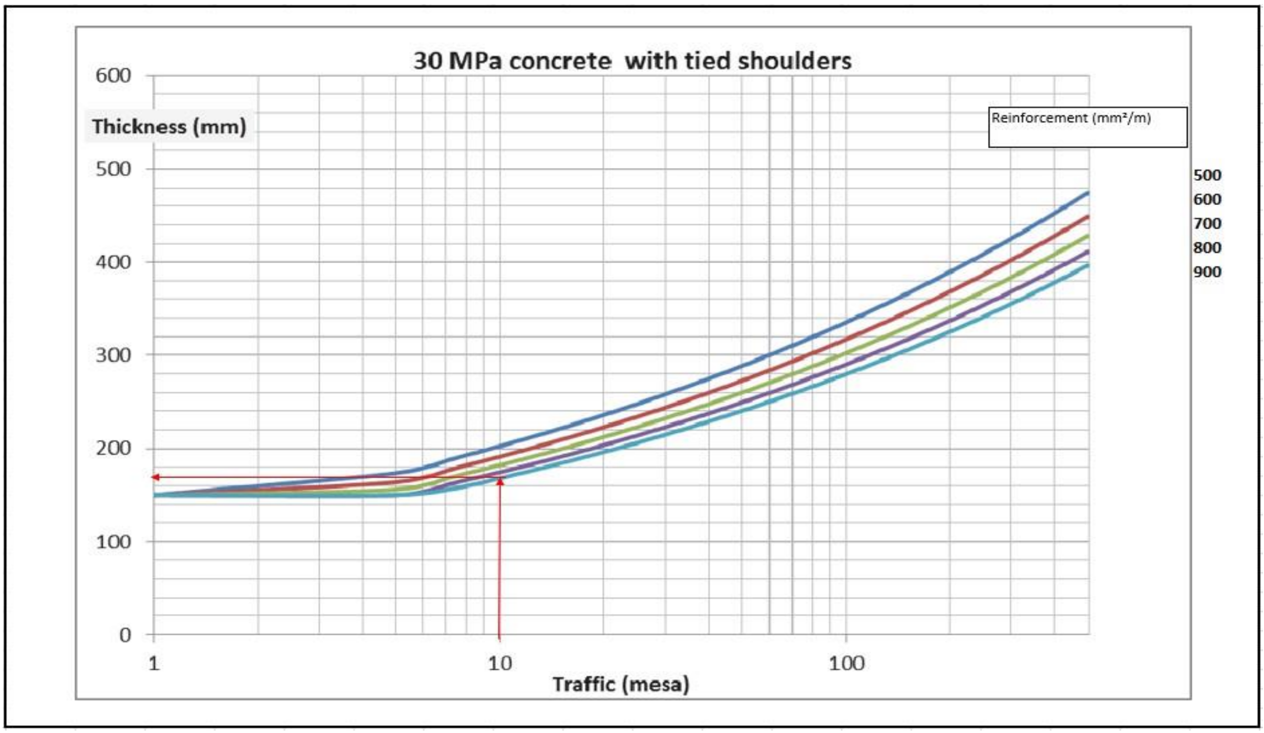


Figure 28:Determination of concrete slab thickness on Jointed reinforced concrete pavement(JRCP)

7.5 Summary of Pavement Design

From available construction materials and moisture regime, the recommended alternatives pavement construction is listed in Table 28

Table 28; Pavement Construction

Road section	Traffic load Class	Alternative Construction	Subbase	Base course	Surfacing
		JUCP with tied shoulder (PDM-RP-ERA)	200mm C1	-	230mm Concrete Class 30
		JRCP with tied shoulder (PDM-RP-ERA)	200mm C1		170mm Concrete Class 30 + 700mm2/m Reinforcement Longitudinal bars, Transverse reinforcement of 12mm diameter @

TABORA ROADS	**TLC 10**	Alternative one	200mm C1	150mm CRR	50mmAC
		Alternative two	125mm C1 + 125mm CM	150mm C2	ST(DSD)
		Alternative three	200mm G45	150mm DBM 40	ST(DSD)
		Alternative Four	200mm CM	125mm PM 80	50mm AC

* NB:DBM – Mean dense bitumen macadam

PM – Mean Penetration macadam

8. CONCLUSION AND RECOMMENDATION

The proposed pavement design will provide sufficient bearing capacity to withstand the estimated traffic loading during the required pavement life of twenty years. However, alternative one for **flexible pavement** of the Pavement Structures for TLC 10 and **Jointed reinforced concerete pavement(Kisarika road)** are the most recommended options as we have sufficient rock to crush the aggregates, also adequate material for stabilization of the subbase layer. **The rest three alternatives for flexible pavement are not favoured due to the following reasons:**

a) Alternative two

Pavement structures with three stabilized layers of subbase and base course are not most recommended, this is because of the following: -

▪ Rock outcrops are abundant along the project road and they comply with the requirements of the standard specifications

▪ Many layers of cement CM, C1 and C2 are likely to have cracks on the pavement due to the creation of rigidity.

b) Alternative three

▪ The use of a bituminous base course is very expensive

▪ Materials for the G45 layer are scarcely available in any of the investigated borrow areas.

c) Alternative four

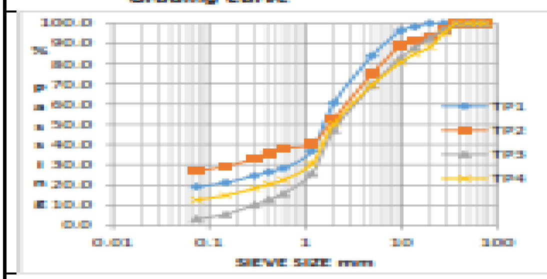
▪ This alternative is the same as alternative three as it requires the usage of the bituminous base course which is very expensive

Table 29: Recommended Pavement Structure

Road sections	Length (Km)	Traffic load Class	Subbase	Base course	Surfacing
SWETU,MAILI TANO,KANYENYE ROADS	5.02			150mm CRR	50mm AC 14

KISARIKA ROAD	3.0	TLC 10	200mm C1	-	170mm Concrete Class 30 + 700mm2/m Reinforcement Longitudinal bars, Transverse reinforcement of 12mm diameter @ 600mm spacing - Contraction Joints (Dowel bar) 20mm diameter @300mm spacing, 400mm long - Expansion Joints (Dowel bar) 25mm diameter @300mm spacing, 600mm long - Longitudinal Joints (Tier bar) 12mm diameter @600mm spacing, 1000mm long - Construction Joints 20mm diameter @300mm spacing, additional 700mm long

We also recommend using 60/70 penetration grade bitumen since it is dense enough to resist the traffic loads. **NB;** Amount of active filler(cement/lime) should not exceed 2%. An excessive amount of filler may reduce voids in the mineral aggregate to the point that sufficient binder content for a durable mix cannot be added. Furthermore, too much filler may stiffen the mix and the mix will be difficult to compact. On the other hand, too little filler could result in low cohesion, and the mix may fall apart.



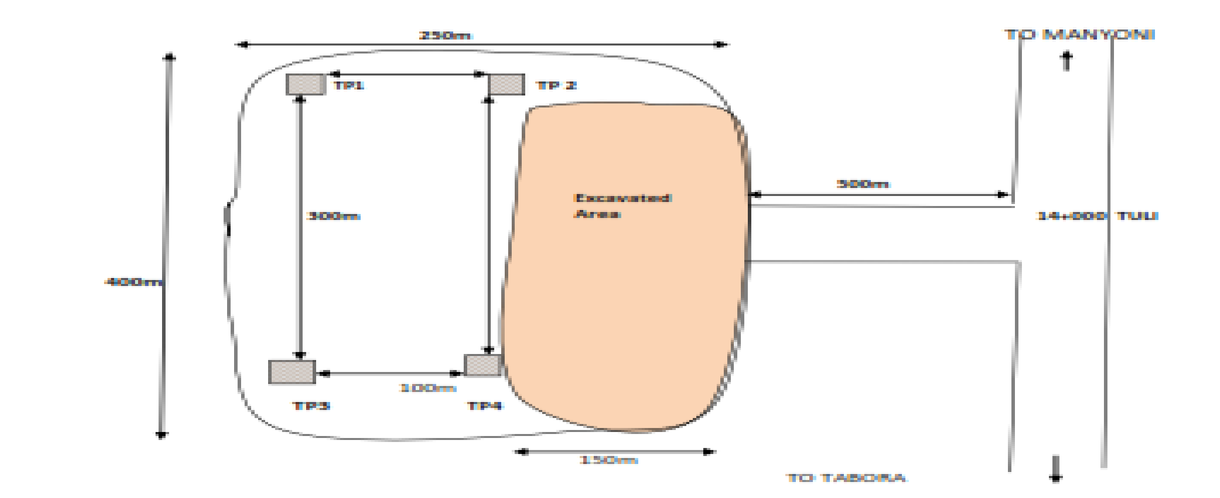
Density & CBR

Test Pit	OMC	MDD	Soaked CBR 4 days	
No	(%)	Kg/m³	CBR AT 95% MDD	SWELL AT 100% MDD
TP 1	7.3	1993	19	0.85
TP 2	7.3	1993	19	0.87
TP 3	7.3	1988	19	0.87
TP 4	7.3	1986	19	0.87

E 0488426
N9440791

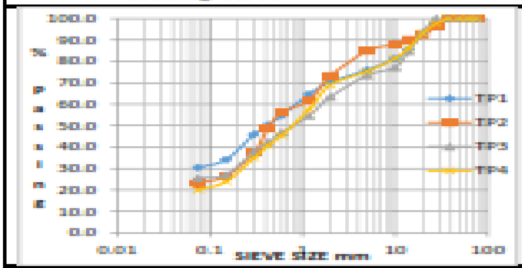
Remarks

Typical Thickness of overburden: 0.5m
Typical Thickness of Gravel Seam: 4m
Estimated Exploitable Quantity: 160,000m³



EXISTING TULI Borrow Area Site Description	Borrow Area No: 01	**Location:** CH 14+000,offset 500m LHS from TABORA TO MANYONI

Grading Curve



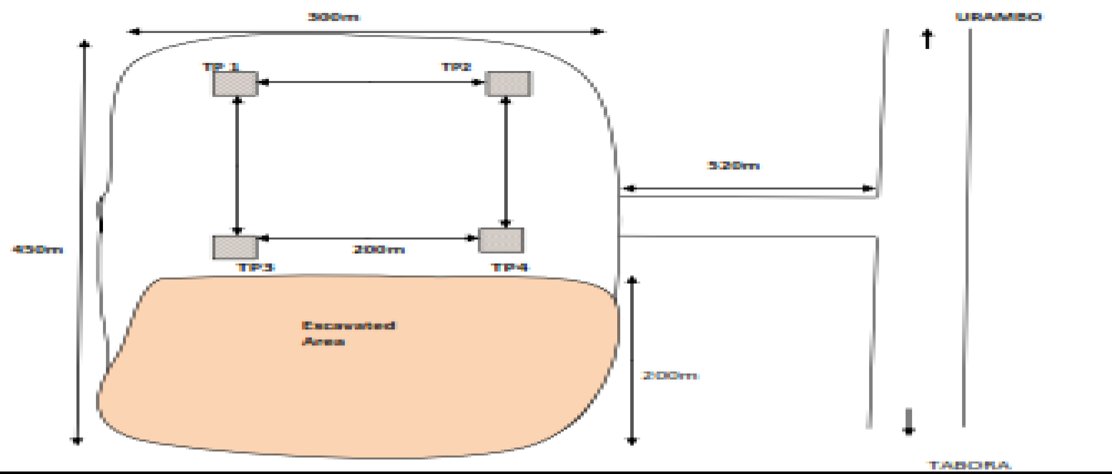
Density & CBR

Test Pit No	OMC (%)	MDD Kg/m³	Soaked CBR 4 days: CBR AT 95% MDD	Soaked CBR 4 days: SWELL AT 100% MDD
TP 1	8.0	2003	27	0.87
TP 2	9.7	1998	25	0.31
TP 3	9.7	1995	27	0.69
TP 4	8.0	2001	25	0.69

E:0471341
N:9441693

Remarks

Typical Thickness of overburden: 0.5m
Typical Thickness of Gravel Seam: 4.5 m
Estimated Exploitable Quantity: 337,500m^3



TUMBI Borrow Area Site Description	Borrow Area No: 02	**Location:** Km 14+600, offset 520m LHS from TABORA to URAMBO AT tumbi Village