CONSULTANCY SERVICES FOR UNDERTAKING THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED SECOND TANZANIA INTERMODAL AND RAIL DEVELOPMENT PROJECT (TIRP 2)

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EXECUTIVE SUMMARY

Title: CONSULTANCY SERVICES FOR UNDERTAKING THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED SECOND TANZANIA INTERMODAL AND RAIL DEVELOPMENT PROJECT (TIRP 2)

1. Overview

The Report has been prepared as one of the deliverables of Environmental and Social Impact Assessment (ESIA) for the upgrading of the existing Dar es Salaam – Isaka (970 km) central corridor meter gauge railway infrastructure. The proponent of the project is the Tanzania Railways Corporation (TRC), an implementing institution on behalf of the Government of Tanzania under the Ministry of Works and Transport. This report provides the roadmap onto undertaking the ESIA for Tanzania Intermodal and Rail Project II (TIRP II) as per deliverables of the ToR including methodology, timelines, and deliverables.

2. Background

The TRC prepared TIRP aimed at improving the performance of TRC (management and operational) in carrying out intermodal transport services along the Central Corridor and hence increase its market share within the transport sector as well as improve its financial self-sustainability. The planned improvements will result in the timely delivery of goods and improve passenger traffic to acceptable levels. Among other things, the proposed project involves rehabilitation and upgrading of the central railway line (CRL), in particular the section between Dar es Salaam port and Isaka town in Shinyanga Region, so as to facilitate revival of freight transportation to hinterland Tanzania and neighboring countries of Rwanda, Burundi, Uganda and eastern Democratic Republic of Congo.

The upgrading includes bridges and culverts, formations, ballasting, track renewal, stations and facilities and associated activities within the Central Railway Network in stages and will enable introduction of a dedicated "BLOCK TRAINS" to transport 20 ft and 40 ft containers between Dar es Salaam and Isaka operating with 18.5t axle loads and speeds up to 75 kph.

Under TIRP 1, a total of 570 km out of 970 km of the railway track and 374 bridges were rehabilitated along Dar as Salaam – Isaka railway infrastructure through TIRP in year 2020. The rehabilitation track included completed track renewal and refurbishment works. The rehabilitation and maintenance work for selected structures (Bridges & Culverts) along Tabora to Isaka section was completed in 2020.

The challenge is that, only 540 km out of 840 km of the railway track (Dsm-Tabora) excluding the 130 km railway track section of Tabora-Isaka and only 374 bridges were rehabilitated along Dar as Salaam – Isaka railway infrastructure, as a result unattended railway track and bridges continued to deteriorate. Furthermore, the Tabora-Isaka section and intermodal yards for freight handling as well as Kilosa-Gulwe section were not completed under TIRP. This situation may delay delivery of a reliable open access infrastructure from Dar es Salaam to Isaka as the main objective of the Project. In this regard, it worth noting that TIRP II will be implemented in the existing operating railway infrastructure within a stretch of 970 km network but only in sections that were not covered during TIRP I.

Preliminary Social Impact Assessment and Environmental screening conducted in January 2012 provided baseline data/information and determined the likely potential environmental, social, and economic impacts associated with the project and assessed key issues prior to implementation of the proposed project. Detailed ESIA study for TIRP I was conducted in 2018 and certified in 2019, complying with National Standards as per the Environmental Management Act of 2004 and Regulations of 2008, WBG Environmental Health and Safety Guidelines and social safeguards and other applicable Operational Policies.

Thus, following the updates and changes in the national and international laws and regulations specifically WB E&S standards, the proponent is required to review all available relevant documents including preliminary design, maps, previous studies, and any other work associated with this project so as to adhere compliance with the requirements of the Environmental Management Act (2004) and other applicable national laws and the World Bank ESF for undertaking the Environmental and Social Impact Assessment.

3. Project Activities

The construction activities of the project will be done in following phases.

- **Mobilization Phase:** Mobilization activities including work in support of acquisition of all regulatory requirements including approval from the National Environment Management Council and licenses from other regulatory authorities. The planning stage involved in a reconnaissance site visit to the project location while considering issues of staging of operations, location of stations, camp site, material sources and investigation, selection of routes, etc.

- **Construction/Rehabilitation Phase:** The construction phase will take place subsequent to the issuing of the licenses from relevant authorities. The construction phase for the entire project site is expected to be approximately 36 months at maximum. This will involve the following: establishment of related works and all support infrastructures that are significant for the construction work, site clearance, acquisition and transportation of construction materials, constructions, excavation and land filling works, solid and liquid waste management.
- **Demobilization Phase:** This includes demobilization of the machineries, management of wastes generated during the project activity and site restoration. The estimated time for demobilization is 6 months.
- **Operation/Maintenance Phase:** This phase will include the maintenance of the Truck whenever necessary as far as this project is considered the design life of the project shall be about 20 years.

4. Waste Generation and Disposal

The major solid waste generated from the activities are the municipal solid and liquid waste from domestic, construction and demolition wastes including hazardous wastes such as waste oil from machineries etc. At this time of the study there is no specific area demarcated for the disposal of the generated waste, therefore the project generated waste will be disposed to the authorized designated disposal sites following the Tanzania waste disposal regulations as per Environmental Management Act, 2004. It is expected that, the Project implementation will lead to generation of solid wastes as well as hazardous wastes. These might be potentially harmful to the surrounding environmental components if not mitigated and monitored diligently.

5. Existing Regulatory and Institutional Framework

For the proposed project to achieve its intended objectives, it shall operate under various National policies, legal and administrative frameworks. These include laws and policies of

Tanzania and World Bank Environmental and Social Framework. The ESIA and EMSP report shall be prepared in line with Tanzania's national legislative requirements and applicable international standards. Also, the conventions and protocols ratified by Tanzania and directives of International Organizations (World Bank) shall also be considered.

6. Public Participation and Stakeholder Engagement:

The Consultant during the ESIA process met with the public, relevant public agencies, project affected people and households, local NGOs, media and special interest groups where applicable including;

- National Environment Management Council (NEMC)
- National Bureau of Statistics, Dar es Salaam
- Ministry of Water (MoW)
- Ministry of Lands
- Ministry of Health
- Tanzania Forest Services Agency (TFS)
- Tanzania Rural Road Authority (TARURA)
- Tanzania Roads Agency (TANROADs)
- Tanzania Electricity Supply Company Limited (TANESCO)
- Occupational Safety and Health Authority (OSHA)
- District and City Councils
- Ward Mtaa and Village Councils
- Market sellers,
- Students,
- Police, etc.

<u>Involvement of Stakeholders</u>

Consultation with statutory bodies and institutions were made through direct personal interviews, while the public was consulted through public meetings which were conducted at selected villages. The main objectives of community consultations were to:

- Present the project,

- Provide clear and accurate information about the project to the communities along the proposed project area,
- Obtain main concerns and perceptions of the population and their representatives regarding the Railway track,
- To obtain opinions and suggestions directly from the affected communities on their preferred mitigation measures.

Results of Public Consultation

Overall, the consulted stakeholders are in favor of the proposed project. Nonetheless, they made a number of observations and raised concerns the most outstanding of which are listed below:

- Some parts of the areas traversed by the railway track are prone to flooding and as such this should be taken into consideration when designing drainage infrastructure.
- There is a need for making level crossing to some areas to allow easy and safe passage of people.
- Safety signage should be provided.
- There will be spread of HIV/AIDS and other sexually transmitted infections. The increase of construction workers may increase interactions rate with resultant increase in transmission of communicable diseases.
- Gang houses should be rehabilitated so that to eliminate hideout areas for thieves.
- The contractor should give priority of employment to the people hailing from the villages along the project site during the construction. The villagers may be involved in some activities as laborers during the construction phase.
- Education on Gender Based Violence (GBV) as well as Sexual Harassment (SH) and Sexual Exploitation and Abuse (SEA) on prevention and response is required to make women, youth and all special/vulnerable groups enjoy their labor opportunities in the Project.
- TRC must ensure the entire workforce at the construction site is well covered by appropriate insurance policies and safety gears. Also, first aid should be provided at work as per requirements of CRB.

- Graves, places of worships, and shrines may be affected. Therefore, appropriate measures should be taken to take care of them in good time.

7. Alternatives

The alternative analysis was done based on different options as described for the proposed project. The proposed alternative included an analysis of the location, construction materials and technology, timing, input and design alternatives as well as the do-nothing option.

The following are the summarized alternatives for this project

- The proponent is planned to use power distribution from TANESCO, however the analysis of available alternative technologies conducted shows that the most prominent alternative source of energy is diesel generator and photovoltaic (PV) system as the backup energy in case of emergency.
- Alternative to Kilosa –Gulwe-Igandu section

  Among other permanent solutions and alternatives provided to encounter the disturbing and flood related problems to this location are;

  Raising rail track embankment relying on the obtained highest flood level from hydrological analysis. This will enhance adequate headroom and freeboard and minimize flooding and related risks on embankment and installed structures.

  Design and Installation of drainage structures and water ways associated by adequate erosion control measures.

  Construction of sedimentation ponds which will increase the hydraulic efficiency of installed structures which are negatively affected by sedimentation process. However, the ongoing study on flood analysis and possibilities of strengthening of sedimentation ponds by the Government's multi-sectoral technical committee will recommend the short term and long-term practical measures to ensure the railway track is protected from frequent flooding events.

- Alternatives Sources for Construction Materials:

  For the case of sand and aggregates the existing licensed borrow pits and quarry sites will be utilized while water for various construction activities will be obtained from rivers along the project corridor with issued permits. Alternatively, water for construction works may be extracted from boreholes depending on the aquifer situation as may be determined by relevant Basin Water Board. Cement, reinforcement bars, paints, etc., will be sourced locally from hardware shops in along the project. See the detailed result on section 6.4 of this report.

- Do-Nothing Alternative / Option:

  Under the No-Action Alternative, the railway will not be constructed or operated, and socio-economic impacts and benefits described in this report will not occur. The do-nothing alternative assumes that even the existing railway road will not be repaired or rehabilitated, since this is exactly what the proposed project is intended to do. Assessment of the project indicates that there might be some localized impacts but is not of sufficient importance to stop the proposed project. Accordingly, the consideration of do-nothing option can be justifiably dismissed as an alternative for the following reasons:

  - Need and desirability of the project to encourage the economic activities
  - The environmental impacts expected from the proposed project can be reasonably mitigated to acceptable and satisfactory standards
  - The potential environmental impacts will be much localized

8. Description of Major Significant Impacts and Mitigation Measures

✓ Positive impacts

Creation of Employment: Construction activities will create direct and indirect employment for the local people as well as for people from neighboring towns. Direct employment will benefit both skilled laborers as well as non-skilled laborers, while indirect employment will include employment of food vendors (especially women) and other small businesses such as soft drinks vending.

Improved Hydrology and Drainage: Upgrading of the Railway Track, will facilitate construction of new side and cross drainage structures. This will improve the drainage of the existing railway track. Sedimentation of culverts and railway track side drains will be reduced due to provision of control devices and cover vegetation. In addition, flooding to the Railway track will be reduced and water stagnation within and on railway track sides will be eliminated.

Diversification of the Local Economy: Upgrading of the project will attract more investors to use reliable railway network for transportation. The scenario will bring in more employment opportunities as well as other income generation opportunities to the local people. One of the consequences of this is diversification of economic activities reduces the risk of depending on agriculture only.

Increased interaction of people as a driver for social change: The project activities in all phases will encourage people from other parts of the country to move in and live in the area. In-migrants will likely come with new ideas and lifestyle if not standards into the project area. Such opportunities will create room for both negative and positive social transformation for both groups to share values and adopt new cultures and diffusion of cultural values suitable for development.

Increasing infrastructural performance and sustainability: The project will help the updating of the MGR structures that are highly affected due to the implementation of the SGR especially in the brides and culvert areas.

Increased household income: The project will increase trading activities along and in the vicinity of the project line, thereby increasing the income of households along the railway track as vendors are likely to increase prices for goods, and services are likely to increase from increased demand.

- ✓ **Negative impacts**

Loss of vegetation and farmlands: clearance of land needed for the temporary use during establishment of camps, borrowing of materials, construction of detours or access roads, etc. To mitigate the impact, the contractor shall avoid unnecessary clearing of vegetation, including limiting clearing of vegetation to the corridor of impact. The contractor shall not borrow materials from forest lands, water courses and wildlife protected areas without permit from authorities entrusted to manage the protected areas. Moreover, specific assessment on environment, biodiversity and social should be conducted with specific management plan when need arises to identify these areas for Project's use. The owners of farmlands affected by construction works shall be compensated accordingly.

Deterioration of Ambient Air Quality: During the phases of the project, ambient gases, Noise level and dust that will impair air quality will be high. However, during operation dust generation will be very low as there will be no movement of construction trucks on site rather than train movement along the Railway truck.

Soil erosion: Clearing of vegetation during establishment of camps, construction of diversions, and access roads and earthworks will remove and disturb topsoil, leaving behind loose, but infertile soil, which is too poor to sustain good plant growth for being susceptible to wind and water erosion, especially in hilly road sections. In addition, cuts and fills will be prone to formation of gullies. The impact shall be mitigated by proper design (providing for erosion prevention measures (including grassing and planting trees) and maintenance during the operation phase of the railway track.

Risk of Road and Railway track traffic accidents: During construction, increased traffic movements and speeds, especially across settlements will increase the risk of traffic accidents. Similarly, during operation of the railway track there is likely to increase road traffic accidents, including road kills along level-crossings. The impact shall be mitigated by installing speed humps to the roads going to the level crossings and posting warning signs across rail way and roads i.e at approaches to accident black spots.

Deterioration of visual and scenic quality: Earthworks, excavation of borrow pits, clearing of vegetation, and improper disposal of wastes generated by construction activities will deteriorate visual and scenic quality. In addition, cuts of hills and borrow pits, especially if located near settlements will also disturb visual and scenic quality.

Generation of noise and vibrations: During construction, generation of noise and vibrations will result from borrowing/ processing of materials (e.g. excavation, drilling and blasting of rocks, crushing of stones), increased traffic volume and movement of equipment during transport of materials, earthworks (including excavation and compaction).

During the operation of the railway track, there will be an increase in the level of noise and vibrations from movement of the train.

The impact due to increased level of noise and vibrations during construction shall be mitigated by ensuring adequate maintenance of the vehicles, including proper fine tuning of engines, equipping equipment with exhaust mufflers, and avoiding construction works in settlement areas during the night. In addition, construction workers working under severe noise environment shall be equipped with ear plugs. The following measure might be implemented to minimize Noise and vibration from the project

- Ensuring Locomotive Engines are regularly maintained,
- Avoiding unnecessary horns in the urban areas and sensitive receptor areas i.e. employing the use of flag man to all crossing areas,
- Maintaining law speed of the trucks in urban areas and sensitive receptor areas.

Risks of accidents to animals and humans: Increased traffic volume and speeds during construction are likely to cause accidents to workers and the local people as well as wildlife (kill of animal along their corridor). However, fauna crossings are placed in SGR which is parallel to the existing MGR project railway track and hence highly reducing the risk of wildlife kill especially on the identified passing corridors. Furthermore, designated borrow pits are likely to cause serious accidents to animals (especially if they are located around wildlife crossing areas and pastoral communities) when are not well slope levelled and entry restriction with proper fence and signage. To avoid the impact, the Contractors shall not open borrow pits in the mentioned areas unless provision of safety measures is ensured. In addition, the maximum depth of borrow pits shall be 3m, all borrow pits shall be kept self-draining and protected to prevent rainwater water ponding and from community access. Also, borrow pits shall be reinstated/rehabilitated immediately after completion of their use.

Generation of wastes: Construction activities at the sites and the camps will generate substantial amounts and types of wastes: solid wastes such as plastic containers, used tyres, metal parts, plastics and cables, batteries, and liquid wastes such as used motor oil, sanitary wastes, and medical wastes as well as e-wastes. These wastes if not treated or disposed of properly are likely to cause occupational and community health problems, cause contamination of water resources, and impair scenic quality. To mitigate the impacts, the Contractor shall comply with the waste treatment and disposal mitigation measures provided in the environmental and social management plan of this report including developing a Waste Management Plan.

Damage to graves: Any graveyard located close to the railway track is likely to be damaged by construction activities. To mitigate the impact, the Contractor shall work carefully in order to avoid damage to graves. In case damages cannot be avoided, the affected graves shall be relocated by excavation to a place selected by grave owner(s). Comply with national and international legal requirements (e.g. Chance Find Procedures).

Soil and water pollution by concrete slurry, concrete, and sedimentation: Potential sources of soil pollution are concrete and concrete slurry, fuel, and oil. Soil pollution will impair soil fertility and regeneration of vegetation. Sources of water pollution will consist of wet cement and concrete products, fuel, oil, sediments etc. If wet concrete products, fuel, and oil find their way into rivers they may cause serious contamination and damage. Cement contains lime which is very detrimental to fauna and flora (aquatic dwellers). In addition, deposition of concrete and fine sediments into rivers will also affect the ecosystem. Fuel and oil can reduce dissolved oxygen led to decrease in Biological Oxygen Demand in water course.

Water pollution shall be mitigated by preventing entrance of wet cement and concrete products, oil, and fuel into storm water, putting in place a designated concrete washout facility where all remaining and concrete washout will be conducted/ dumped and contained.

Surface Water Flow Modification: This will be caused by construction of fill embankments during construction of bridges and culverts as well as across flood plains, which will impede or interfere with natural surface water flow patterns, whereby concentrating flows in the upstream, resulting into flooding, soil erosion, channel modification, and sedimentation of rivers in the vicinity of the railway track. To mitigate the impact culverts shall be designed such that their hydraulic capacities are capable of sustaining possible peak water flows.

Disruption of community access: Construction of railway track side drains will create barriers to community access to their residence and business areas. The impact shall be mitigated by providing temporary pedestrian crossing across line drains during construction and permanent ones when the railway track is completed.

Occupational health and safety hazards: Construction activities will expose workers to different chemical health hazards, physical health hazards, and biological health hazards. Physical hazards will include fall from heights or being hit by falling objects. Chemical health hazards will result from exposure of workers to hazardous construction materials, while physical health hazards will result from general work environment (noise, vibrations, manual handling, fall from height, stepping on or striking against objects, and manual handling injury, and workers being hit by an excavator or crane). Biological health hazard will result from drinking unsafe water and food poisoning, and unsafe disposal of sanitary wastes. To mitigate the impacts, the Contractor shall develop a proper Occupational Health and Safety Plan with guiding details onmeasures to prevent physical, chemical, and biological health hazards during construction of the project, which include work practice, personal protection, and hygiene.

Increased Vulnerability: Displacement, migration, and changes in community dynamics due to the railway project can lead to increased vulnerability of women and marginalized groups to various forms of violence, including sexual harassment and exploitation,

Isolation and Fear: The construction process can alter the physical and social environment, leading to increased isolation and fear among women and girls due to poorly lit or unsafe areas, reducing their access to public spaces and transportation,,

Increased transmission of HIV/AIDS: During construction, interaction between the immigrant, workers and the locals may exacerbate the spread of HIV/AIDS and other sexually transmitted infections. To mitigate the impact, the Contractors shall subcontract NGOs to prepare and implement a community awareness campaign on the same.

Increased and unwanted pregnancies: Increased and unwanted pregnancies especially among schoolgirls is likely to happen as project workers could easily entice schoolgirls with money in return for sexual favors. The impact be mitigated at the project level by employing the following interventions like community/public awareness campaign and toolbox sessions and employing of strictly by laws to the workers who will be found to have sexual relationships with schoolgirls.

Poaching of wild animals by construction workers: Construction workers are likely to be tempted to poach wild animals for meat or for selling. To mitigate the impact, the supervising consultant in collaboration with respective organs/entities shall create awareness on Wildlife laws and regulations in conservation among project workers and surrounding communities.

Contribution to climate change: Increased traffic volume from diverted, generated traffic as well as operation of heavy machinery and equipment during construction phase, there expected to be an increase the generation of greenhouse gases, the result of which will be increased contribution to the greenhouse effect.

Mitigation measures for increased traffic volume and greenhouse gas emissions during the construction phase, as referred by the World Bank Environmental and Social Framework (ESF), may include:

- Traffic management plans: Develop and implement effective traffic management plans to minimize congestion and optimize traffic flow, thereby reducing overall vehicle emissions.
- Construction equipment emissions standards: Enforce the use of construction equipment that meets or exceeds recognized emissions standards to minimize air pollution and greenhouse gas emissions.
- Fuel efficiency: Encourage the use of fuel-efficient vehicles and machinery during the construction phase to reduce greenhouse gas emissions per unit of work performed.
- Adequate and timely maintenance of Project's operating vehicles, equipment and machinery

On top of that the use of hydrocarbons as a source of energy will also contributing emission of greenhouse gasses and thus the impact can be mitigated by ensuring the project is using equipment and tools that may use other alternative source of energy that should not be source of greenhouse gases emission to the environment.

Reduced lifespan of the railway tracks due to climate change: Variations of temperatures resulting from global warming are likely to cause expansion and contraction of the railway structures and premature failures of hydraulic structures due to cracking. In addition, flooding resulting from severe and heavy rainfall may cause serious damage or overtopping of structures. To mitigate the impact, appropriate designing and type of railway track construction materials that sustains higher temperatures of the project area have been proposed. Also, this has been taken into account in the selection of the return period in respect of design of hydraulic structures for the railway track.

Furthermore, the ongoing study on flood analysis and possibilities of strengthening of sedimentation ponds by the Government's multi-sectoral technical committee will recommend the short term and long-term practical measures to ensure the railway track is protected from frequent flooding events. Furthermore, a Climate and Risk Assessment Study from Dar es Salaam to Isaka (supported by Quality Infrastructure Investment Partnership Bank) is currently undertaken in order to identify the vulnerable areas with the objective of protecting them as well as coming with an effective practical emergency response preparedness system on place. Upon completion of these studies, the recommended measures will be incorporated in the updated ESMP for implementation accordingly.

9. Environmental and Social Management Plan (ESMP)

Environmental and Social Management Plan (ESMP) intends to set forth "environmental and social conditions" that the project proponent shall adhere to. It aims at ensuring effective implementation of the proposed mitigation measures. The following will be responsible for implementing the ESMP.

- TRC

TRC will be responsible for the overall implementation, administration, and enforcement of the recommendations of the ESIA, including:

- ✓ Ensuring that the ESMP provisions are included in all tender documents issued for construction work and activities on site and shall monitor/enforce the requirement for the Contractors to abide by the specifications thereof.
- ✓ Coordinating the implementation of the ESMP by the contractor.
- ✓ Provide NEMC with reports on environmental and social compliance as part of their annual progress reports and annual environmental monitoring reports.

- Supervising Engineers

The Supervising Engineer will be responsible for the overall project management and also will be responsible for ensuring day to day implementation and compliance with all provisions and requirements of the ESMP. The Engineer will ensure that the Contractors provide appropriate training for their staff on ESMP.

- Contractors

The obligation of the contractors will be to ensure the control and limitations of disturbance to the project site, routes, and its surrounding environment and communities during the construction cycle of the project.

Within 30 days upon notification of contract award, the contractors shall prepare and submit a Contractor-Environmental and social Management Plan (C-ESMP) and a Site-Specific Health and Safety Management Plan (SSHSMP) to client through project consultant for implementation and this shall be done in collaboration with NEMC and LGAs. The two plans shall describe measures to be followed to protect the environment, the public, local communities, workers, and ecological habitats within and in the neighborhood of the project working areas.

- National Environment Management Council

NEMC is the main responsible agency for ensuring that development projects carried out in the United Republic of Tanzania adequately address environmental and social issues during the lifetime of each of the projects. NEMC shall therefore:

- ✓ Periodically carry out or assign an independent evaluator to carry out compliance monitoring in circumstances where a claim has been raised by any member of the community, Community Based Organization, or Non-Governmental Organization on negative aspects of the project. During monitoring, the District Environmental Officer shall accompany NEMC or an independent evaluator.
- ✓ Have the power to request for ESMP compliance report and take necessary measures including instituting fines to enforce compliance of the ESMP.

10. Environmental and social monitoring plan

Environmental and Social Monitoring Plan is an objective, periodical, reliable, and continuing process of observation and assessment of environmental changes. It is intended to ensure implementation of mitigation measures is done the way they have been proposed and in accordance with the regulations and standards. It is therefore based on monitoring indicators, which will have to be compared with targets to gauge the effectiveness of the mitigation's plans.

There will be two basic forms of monitoring as follows:

Effect's Monitoring: This will record the consequences of activities on one or more environmental components. This will involve physical measurement of selected parameters or the execution of surveys to establish the nature and extent of induced changes.

Measurement Based Inspection: This will involve evaluation of trends in the values of environmental and social parameters systematically measured and collected, to ensure that they are within acceptable legal and technical standards. This will involve collection of samples for analysis. In this respect, water and air samples will be collected and analyzed.

The main tools that will be used for monitoring are checklists, visual examinations, and quantitative measurements of environmental effects monitoring parameters. Written records will be kept detailing the dates that monitoring took place and the findings of the monitoring.

To ensure effective implementation of the mitigation's measures, the Supervising Engineer shall deploy an Environmental and Social Specialist for regular monitoring and reporting of day-to-day implementation of the ESMP by the Contractor. The Environmental and Social Specialists will also advise the Resident Engineer on measures to take against the Contractor in the event that the Contractor fails to comply with the SSHSMP and the SSEMP as well as other environmental, social, and health and safety requirements of the contract.

11. Cost Benefit Analysis of the Project

The estimated costs for mitigation measures (in table 7.1) may vary during project implementation, since they could not be accurately calculated (are indicative). This is due to the fact that some of the impacts will only be realized during construction phase, the costs for these will also be short term, especially if mitigation measures are fully implemented.

Generally, the project is envisaged to be beneficial. However, most of the value of these benefits cannot be easily quantified in financial terms. Nevertheless, in the long-term the project benefits are expected to be higher than project costs. Actually, the cost incurred will be short-term only during design and construction. After construction the project proponent will be able to recover the costs due to increased revenue collection as a result of increased collection of railway toll, investment activities, tourism activities, transportation of agricultural products, etc.

12. CONCLUSION AND RECOMMENDATIONS

The planned upgrade for the existing Dar es Salaam – Isaka (540 km) railway infrastructure is socially and -economically desirable and viable because it will enhance transportation and social – economic development in East, Central and West Regions as well as adjacent regions.

Expectedly, the project will have both positive and negative impacts on the natural and human environment; it will affect both the environment and human communities that are found along and in the neighborhoods of it as well as all that interact with it.

Measures have been proposed to enhance impacts which are positive to the environment and the local people. For those impacts that are negative, mitigation measures have been proposed to avoid or abate them to the extent possible for the purpose of maximizing benefits of the railway track and minimizing detrimental effects of the project.

ACKNOWLEDGEMENT

All the efforts entailed in the preparation of this report benefited from inputs of a great number of individual people and institutions including contributors of professional inputs. The contribution of each one of them is appreciated by all of us.

More specifically, thanks are due to all the stakeholders of proposed second Tanzania intermodal and rail development project (TIRP 2) in Dar es Salaam, Kibaha, Morogoro, Dodoma, Singida, Tabora and Shinyanga Regions who participated in various institutional and public consultation undertakings during the gathering of the data for this report. Special thanks are due to the Project Affected Persons (PAPs) who took time off their busy schedules to provide information and data during the fieldwork for this report.

Thanks, are additionally due to TRC staff in Dar es Salaam as well as in upcountry offices for facilitating all the work pertinent to the acquisition of data for this report. In a special way, we also acknowledge the cooperation and assistance extended to us by various staff of Ministries and other government Institutions to mention few are OSHA, TANESCO, Fire and Rescue Force, etc. To all the others who wittingly or unwittingly contributed to the ESIA background work who are not mentioned here by name, we also give a very big thank you.

DECLARATION

This Environmental Impact Assessment report has been prepared by:

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

AI	Area of Influence
AIDS	Acquired Immune Deficiency Syndrome
AQRB	Architects and Quantity Surveyors Registration Board
BS	British Standard
CBOs	Community Based Organizations
CH	Critical Habitat
CHAA	Critical Habitat Area of Analysis
CoI:	Corridor of Impact
CRB	Contractor's Registration Board
CRL	Central Railway Line
DC	District Council
DED	District Executive Director
DIZ	Direct Impact Zone
DWE	District Water Engineer
ECC	Environmental Clearance Certificate
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
ERB	Engineering Registration Board
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan

EMP	Environmental and Social Monitoring Plan
ESS	Environmental and Social Specialist
FGD	Focus Group Discussion
FY	Financial Year
GHGs:	Green House Gases
GIS	Geographic Information System
GoT	Government of Tanzania
GPS	Global Positioning System
HIV	Human Immunodeficiency Virus
ICD	Irritant Contact Dermatites
IDA	International Development Association
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KII	Key Informant Interview
km	Kilometer
MOW	Ministry of Works
NACP	National HIV/AIDS Control Programme
NEMC	National Environmental Management council
PAPs:	Project Affected Parties (Persons)
PIC	Project Implementation Consultant
PM	Particulate Matter
QS	Quantity Surveyor

RAP	Resettlement Action Plan
RAS	Regional Administrative Secretary
REA	Rural Energy Agency
RoW	Right of Way
RUBADA	Rufiji Basin Development Authority
SADC	Southern Africa Development Community
SATCC	Southern Africa Transport and Communications Commission
SEA	Strategic Environmental Assessment
SGR	Standard Gauge Railway line
SPM	Suspended Particulate Matter
SSEMP	Site Specific Environmental Management Plan
SSEP	Site-Specific Environmental Management Plan
SSHSMP	Site-Specific Health and Safety Management Plan
SWAT	Soil and Water Assessment Tool
TANESCO	Tanzania Electric Supply Company
TANROADS	Tanzania National Roads Agency
TARURA	Tanzania Rural Roads Agency
TC	Town Council
TDS	Total Dissolved Solid
TIRP	Tanzania Intermodal and Rail Project
ToC	Table of Contents
TOC:	Take Over Certificate

ToR	Terms of Reference
TRC	Tanzania Railways Corporation
TTCL	Tanzania Telecommunication Company Ltd.
UNEP	United Nations Environment Program
URT	United Republic of Tanzania
VECs	Valued Environmental Components
VPO –	DOE Vice President Office – Department of Environment
WB	World Bank
WHO-GPA	World Health Organization Global Programme on AIDS
WMA	Wildlife Management Area

CHAPTER ONE
1. INTRODUCTION

1.1 General

Tanzania Railways Corporation (TRC) here in after referred to as a proponent is a state corporation established under The Railway Act No. 10 of 2017 with the core mandate of providing an efficient and effective rail transport service, manage and develop rail infrastructure and ensuring rail infrastructure safety and security in Tanzania Mainland. To strengthen TRC operations, the Government of United Republic of Tanzania has applied for a credit from the International Development Association (IDA) in an amount equivalent to US$ 201 million, towards the cost of the Second Tanzania Intermodal and Rail Development Project (TIRP-2), and intends to apply part of the proceeds for contract for provision of Consultancy Services for undertaking the Environmental and Social Impact Assessment of the proposed Second Tanzania Intermodal and Railway Development Project (TIRP2).

TRC has started upgrading the existing Dar es Salaam – Isaka (540 km) railway infrastructure in order to enhance efficiency and safety of railway operations. The upgrades included bridges and culverts, formations, ballasting, track renewal and associated activities within the Central Railway network in stages and will enable introduction of a dedicated "BLOCK TRAINS" to transport 20ft and 40 ft containers between Dar es Salaam and Isaka operating with 18.5 t axle loads and speeds up to 75 kph.

Under TIRP 1 a total of 540 km out of 970 km of the railway track (Dsm-Tabora) and 374 bridges were rehabilitated along Dar as Salaam – Isaka railway infrastructure. As a result, unattended railway track and bridges continued to deteriorate. Furthermore, the Tabora-Isaka section and intermodal yards for freight handling as well as Kilosa-Gulwe section were not completed under TIRP. This situation may delay delivery of a reliable open access infrastructure from Dar es Salaam to Isaka as the main objective of the Project.

The challenge is that, only 540 km out of 840 km of the railway track (Dsm-Tabora) excluding the 130km railway track section of Tabora-Isaka and only 374 bridges were rehabilitated along Dar as Salaam – Isaka railway infrastructure, as a result unattended railway track and bridges continued to deteriorate. Furthermore, the Tabora-Isaka section and intermodal yards for freight handling as well as Kilosa-Gulwe section were not completed under TIRP. This situation may delay delivery of a reliable open access infrastructure from Dar es Salaam to

Isaka as the main objective of the Project. In this regard, it worth noting that TIRP II will be implemented in the existing operationg railway infrastructure within a stretch of 970km network but only in sections that were not covered during TIRP I.

Preliminary social impact assessment and environmental screening that was conducted in January 2012 provided baseline data/information and determined the likely potential environmental, social and economic impacts associated with the project and assessed key issues prior to implementation of the proposed project. Detailed ESIA for TIRP I was conducted in 2018 and certified in 2019 complying with National Standards as per the Environmental Management Act of 2004 and Regulations of 2005 as amended in 2018, WBG Environmental Health and Safety Guidelines and social safeguards and other applicable Operational Policies. Thus, in order to comply with National Standards and Regulations of 2005 as amended in 2018, WBG Environmental Health and Safety Guidelines and Social safeguards and other applicable Operational Policies TRC was decided to update the ESIA for TIRP1 for TIRP 2. Also considering the updating and changes in the national and international laws and regulations, the proponent reviewed all available relevant documents—preliminary design, maps, previous studies and any other work associated with this project—so that they can be updated in accordance with the requirements of the Environmental Management Act (2004), other applicable national laws and the World Bank ESF for undertaking the Environmental and Social Impact Assessment including International Conventions/Treaties.

1.2 Regulatory requirements for the project

Environmental and Social Impact Assessment studies were carried out as per the provisions of Environmental (Impact Assessment and Audit) Regulations, 2005 as well as its amendment regulation of 2018 as well as WB Environmental Health and Safety Guidelines (WB-EHS).

The Environmental and Social Impact Statement is the main output of the ESIA process providing the environmental authority with sufficient information on the proposed project to warrant the issuance or refusal of an environmental certificate.

1.3 Justification for the Project

The main objective of TRC is to provide rail transport services and to develop, promote and manage rail infrastructure. With a vision of being an efficient and reliable rail transport service provider in Africa and to manage the rail transport in a cost-effective manner through development, and maintenance of rail systems to provide safe service to local and international customers for sustainable socio-economic development. To attain the mentioned goals, TRC saw that the strengthening of infrastructure will enable the railway track to be able to carry 18.5-ton axle load between Dar es Salaam port and Isaka so as to meet its objectives and thus the TIRP 2 project has seen to be important to be implemented.

1.4 Objective of the study and Environmental and Social Impact Assessment

1.4.1 Objective of the Project

The proposed Project Development Objective is to to strengthen logistic capacity and develop the inter-modal and rail containers operations in TRC central railway corridor on Dar es Salaam – Tabora – Isaka. The main elements that have been identified as being critical to improve trains operations are (a) capacity and reliability of railway infrastructure, (b) availability and reliability of rolling stock, (c) strengthening of logistic chains at rail-port interface and terminals of the project line section (d) well defined organizational structure and institutional responsibilities.

The project will finance the following four components:

Component 1: Strengthening of Railway Infrastructure and support of design studies

Component 2: Strengthening climate resilience of Kilosa-Gulwe-Igandu section

Component 3: Institutional Safety and Operational Support.

Component 4: Contingent Emergency Rapid Response Component (CERC).

1.4.2 Objective of the ESIA

The main objective of undertaking Environmental and Social Impact Assessment for rehabilitation of the railway line from Dar es Salaam to Isaka is to update baseline data/information and to determine the likely potential environmental impacts associated with the project and provide mitigation measures prior to implementation of the proposed project in compliance with the national environmental requirements and World Bank Environmental and Social Framework (ESF).

The study will focus on Dar-Isaka segment and review all available relevant documents, namely preliminary design, maps, previous studies, and any other work associated with this project. The study has been carried out in accordance with the requirements of the Environmental

Management Act (2004), other applicable national laws and the World Bank ESF for undertaking the Environmental and Social Impact Assessment. including International Conventions/Treaties.

The study reviewed relevant laws, regulations and functions of TRC in order to clearly reveal the institutional setting or administrative frameworks of the proposed project in Tanzania as far as environmental and social issues are concerned.

The specific objectives are:

i. To prepare a detailed environmental and social baseline situation;

ii. To predict and evaluate possible environmental and socio-economic impacts;

iii. To delineate Environmental Management Plan and Monitoring Plan;

iv. To develop Emergency Response Plan.

1.5 Parties involved

The following sections provide details of parties involved up to this time in the preparation of the Environmental and Social Impact Assessment (ESIA) of the project.

1.5.1 Project Proponent

Tanzania Railways Corporation (TRC) is responsible for the overall management of the project. It is accountable for setting planning priorities, mobilization of funds and taking corrective actions based on monitoring and evaluation framework table 1.1 represent details of the proponent.

Table 1.1: Details of the proponent

Name of the proponent	Tanzania Railway Corporation
Contact Person(s)	Miss Magdalena Kitila
Official Address	dg@trc.co.tz
Physical Address	P.O. Box 76959, Sokoine Drive, Dar es Salaam. Fax: 022 21334028 Phone: 0800 11 00 42

1.5.2 Details of the Environmental Assessment Practitioner

Khatib & Alami Consulting Engineers were appointed by TRC as consultants for carrying out Consultancy Services for Environmental and Social Impact Assessment for the project. The team has then included multidisciplinary experts in the pursuant of the project as shown in the Table 1.2

Table 1.2: *Study Team – Key Professional Staff*

S/No.	Name of Professional	Position Assigned
7.	P.Eng. Franella Halla	Environmental Engineer - Team Leader and Environmental Expert
8.	P.Eng. Wazia Mtiga	Environmental Engineer -Assistant Team Leader
9.	P.Eng. Ferdinand B. Mesela	Hydrologist
10.	P.Eng. Godfrey Katimba	Civil/Railway Engineer
11.	Dr. Benaiah Lusato Benno	Ecologist
12.	Mr. Robert Kishiki	Sociologist

In addition to the above-mentioned Key Professionals, additional Staff included in the study so that to ensure all intended objectives of the study are attained on specified time, the supporting staff are as listed in table 1.3.

Table 1.3: *Study Team – Supporting Staff*

S/No.	Name of Support Staff	Position Assigned
1.	P.Eng. Dadi Shahame	Civil/Railway Engineer
2.	P.Eng. Geoffrey K. Mwanjoka	Assistant Hydrologist
3.	Linda Nyenzi	Assistant Railway Engineer - 01
4.	Moses Singibala	Assistant Hydrologist - 01
5.	Grace Mhina	Assistant Railway Engineer - 02
6.	Hassan Samadu	Assistant Hydrologist - 02
7.	Norbert Cosmas Mrema	Assistant Environmentalist
8.	Daniel Jonathan	Assistant Environmentalist

S/No.	Name of Support Staff	Position Assigned
9.	Mr. Menance Jonathan	Assistant Environmentalist
10.	Mr. Dotto Jonas	Assistant Sociologist
11.	Mr. Edward Gama	Assistant Sociologist

Source: Consultant 2022;

1.6 Scope of Services for ESIA Study

The ESIA study focused on Dar-Isaka segment and reviewed all available relevant documents, namely preliminary design, maps, previous studies and any other work associated with the project. The study carried out in accordance with the requirements of the Environmental Management Act (2004), other applicable national laws and the World Bank ESF for undertaking the Environmental and Social Impact Assessment including International Conventions/Treaties.

The study reviewed relevant laws and functions of TRC in order to clearly reveal the institutional setting or administrative frameworks of the proposed project in Tanzania as far as environmental and social issues are concerned. The entire study focused on the following tasks as mentioned in the ToR:

- Task 1. Description of the Proposed Project:
- Task 2. Description of the Baseline Environmental and Social Components:
- Task 3. Legislative and Regulatory Considerations:
- Task 4. Determination of the Potential Impacts of the Proposed Project:
- Task 5: Analysis of Alternatives to the Proposed Project:
- Task 6: Development of an Environmental and Social Management Plan (ESMP):
- Task 7. Public Participation and Stakeholder Engagement:
- Task 8. Assist in Inter-Agency Coordination and Public/NGO Participation:
- Task 9. Key Measures and Actions for the Environmental and Social Commitment Plan (ESCP)
- Task 10. Non-Technical Summary:

1.7 Methodology and Approach of the Study

1.7.1 Methodology

For the preparation of detailed ESIA, the team collected the necessary information through field assessments, government authorities, Non-Governmental Organizations (NGOs)/ Community Based Organizations (CBOs) etc. and carried out public consultations including Focus-Group Discussions (FGDs) as per requirements. Apart from this, environmental monitoring was done to know air quality, noise level, water quality, and ecological monitoring to know the baseline conditions of the area.

For the preparation of detailed ESIA, necessary information was collected through field assessments, government authorities, Non-Governmental Organizations (NGOs)/ Community Based Organizations (CBOs), etc., and carried out public consultations including Focus-Group Discussions (FGDs) as per requirements. Apart from this, environmental measurements were done for air quality, noise level, water quality, know the baseline condition of the area.

The team has also developed communication links with appropriate personnel of TRC and other relevant key entities with the objective of progress of proposed assignment in a timely manner. The scope of the study is to describe the project and evaluate all the possible positive and negative impacts on environment and socio-economic condition of the project area. The figure 1.1 depicts the schematic diagram for detailed ESIA tasks and approach.

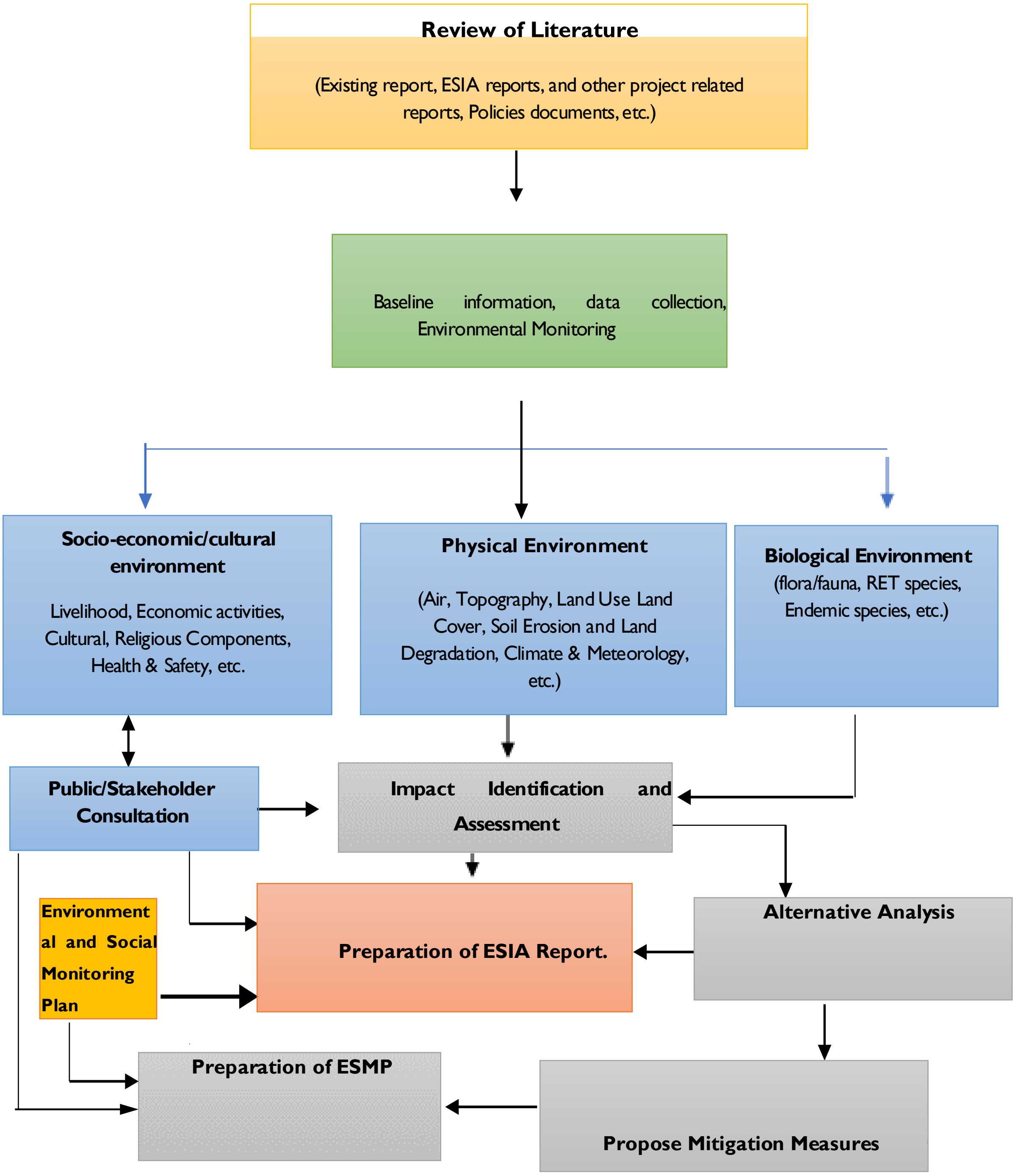


Figure 1.1: Approach for Preparation of ESIA

1.7.2 Data Collection

Literature review has been used for the ESIA study. The prime objective is to review of existing studies, environmental legislation, environmental and social surveys, and technical documents relevant to the project. The team collected required information from different government departments, academic institutions (*universities*), public agencies, research institution, authorized websites, etc. The collected information (*policy documents, published books, journals, and census data*) has been reviewed by the team for better understanding of project area, environment, sensitiveness, and socio-economic structures see figure 1.2.

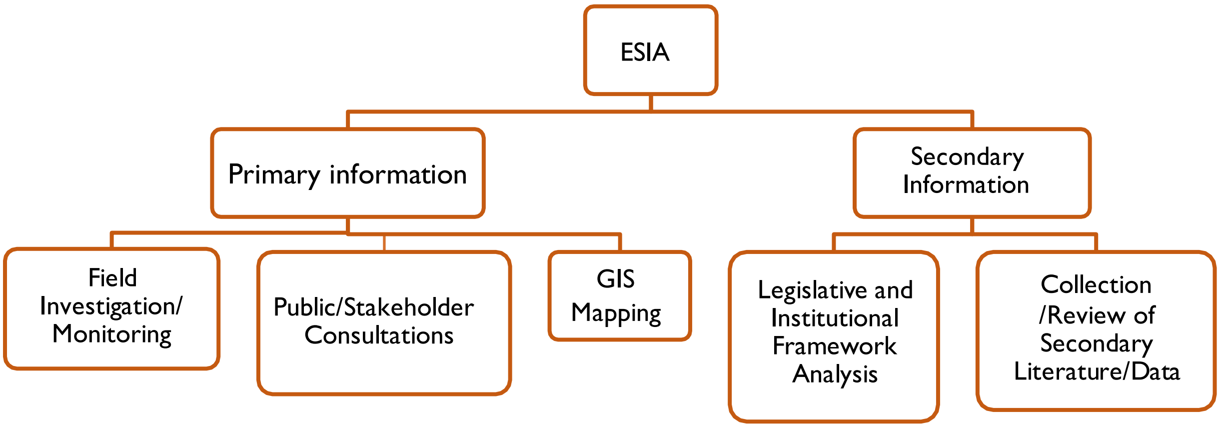


Figure 1.2: Procedure for Data Collection

1.7.3 Mapping

GIS maps were prepared to illustrate the climatic conditions, land use & land cover patterns and topographic information, and other related parameters. The mapping was based on geographical coordinates collected during field surveys, consultations, and information from government departments and while some are based on data available from satellite images and authorized websites.

1.7.4 Inception Phase

The consultant team visited the project sites several times (Reconnaissance Survey from July to August 2022) and interacted with various stakeholders such as Ward offices, City council, Municipal District Offices, regulatory authorities, Community groups, Non- Government Organizations (NGOs/CBOs) during for conducting the preliminary investigations to define the scope of the ESIA study. The stakeholders had been identified through a detailed stakeholder identification and mind- mapping process in discussion with TRC. The findings of the preliminary assessment had been recorded, documented, and presented in this report.

1.7.5 Preparation of ESIA

During the preparation of ESIA following tasks were followed:

I. Review of Legislative and Regulatory Framework

The team studied the relevant legislations and policies of Tanzania related with the projects. The WB Environmental and Social Framework (ESF) are also studied and analyzed to streamline the policies that are triggered by the project.

II. Environmental and Socio-Economic Baseline Study

The team collected and assessed information on key environmental and social parameters present within the project areas (direct influence zone). The approach for the environmental and socio- economic baseline study is as follows:

A. Environmental Baseline Study

Literature Review

Other than primary data collection through survey, environmental monitoring, stakeholder consultations, information were also collected from secondary sources through literature review. The documents, which were reviewed for collecting secondary information include feasibility study report, design reports, relevant research papers, journals etc. These documents were obtained from the Government Departments, TRC, government as well as other authorized websites and academic institutions. The received literatures were reviewed, relevant information was extracted and referred in this ESIA report. The documents, which were referred for this ESIA are listed below:

Government Departments and TRC:

- Provision of Consultancy Services for Field Assessment and Preparation of Tender Documents for the Track Works and Maintenance Contracts of Dar- Isaka along Railway Central Corridor 2016, Detailed Design Report.

- ESIA for TIRP1
- Standard Gauge Railway Line (SGR) Project Dar es Salaam – Makutopora, Tanzania Environmental and Social Impact Assessment, TZ, 2019).
- The United Republic of Tanzania National Environmental Policy (Govt Document (Tz), 1997) as amended in 2021.
- Dar Es Salaam city 2016-2036 master plan volume i- main report.
- Proposed Tanzania Intermodal and Rail Project (TIRP) Rehabilitation of Railway Line Including Track Renewal and Bridges Upgrading Between Dar Es Salaam And Isaka Along The Core Corridor To Mwanza, 2013,
- Proposed Tanzania Intermodal and Rail Project (TIRP) Rehabilitation of Railway Line Including Track Renewal and Bridges Upgrading Between Dar Es Salaam and Isaka Along The Core Corridor To Mwanza, 2019,

Authorized websites:

International Union for Conservation of Nature (RET species categorizations, research papers, Key biodiversity areas, etc.), Bird International (important birds' area, Endemic Birds Area), World Bank (Project related documents-Project appraisal documents, Project information documents), ADB (Study reports), etc.

Academic Institutions:

Research papers/journals from Dar es Salam University.

- Sustainability of the Standard Gauge Railway Construction Project in Tanzania. Jianmin Wang and Victor Sifamen Sekei Mar, 2021.
- Simionescu, V.; Silvius, G. Assessing sustainability of railway modernization projects: A case study from Romania. Procedia Comput. Sci. 2016, 100, 458–465.
- Donaldson, D. Railroads of the Raj: Estimating the impact of transportation infrastructure. Am. Econ. Rev. 2018, 108, 899–934.

Field visits

Field visits had been initiated from the inception phase and continued throughout the period of ESIA study **(figure 1.3** to **figure 1.4**). The major objective of the visit is to gather site related information including social economic data. And, also to understand the existing conditions of the site and, to obtain reports of earlier study carried out for the review and analysis purposes. After every site visit of the expert, there was a brief discussion about the project upgrading with the TRC technical team.

Figure 1.3: Consultant Team during Reconnaissance Survey (July 2022).

Figure 1.4: **Expert team during air quality measurement**

Field Monitoring:

The team conducted monitoring for physical, and biological components of the environment. The detail monitoring process is given below: -

i. ***Air Quality***

Air Quality Monitoring refers to systematic measuring of the quantity and types of certain pollutants in the surrounding area. Air quality monitoring was done to know air quality in the project influenced area. Parameters PM2.5, PM10, NOx, SO2, CO and H2S were selected for monitoring. The concentrations level of each parameter was measured by using Air Quality Monitoring Devices, i.e., Aeroqual series 500. Portable fixed sensor was used for PM10 & PM2.5, while Multi RAE Lite wireless portable multi gas monitor was used for monitoring NOx, SO2, CO and H2S. Ambient Air Quality Monitoring was carried out for three point (considering the sensitivity and type of the receptor) at each region along the project corridor. Samples were collected on maximum 8-hour basis for carbon monoxide (CO), hydrogen sulphide (H2S) & nitrogen oxide (NOx) and 24 hours for the particulate matters & sulphur oxide (SOx) as per the requirement of Tanzanian Guidelines. The sampling locations were selected based on:

- Topography of the project influence area.
- Densely populated areas within the project area.
- Wind Direction and wind speed.
- Avoidance of construction activity or any other activity, which may be temporary in nature.

The monitoring locations are as per table 1.4 results are presented in Chapter 5 for monitoring location see in the appendix 2.

Table 1.4: The monitoring locations

Sl. No.	Region	Sampling Location	Category of the area	Co ordinate	
				Latitude	Longitude
1.	Dar es Salaam	AQMS-1	Industrial, Commercial and Residential	39.2552	-6.8357201
2.		AQMS -2		39.2454	-6.8409901
3.		AQMS -3		39.2313	-6.8482199
4.	Pwani	AQMS -4	Rural, Commercial and Residential	38.8647	-6.83776
5.		AQMS -5		38.8482	-6.8288298
6.		AQMS -6		38.8228	-6.83042
7.	Morogoro	AQMS -7	Industrial, Commercial and Residential	37.658	-6.8172598
8.		AQMS -8		37.6517	-6.80937
9.		AQMS -9		37.645	-6.8001399
10.	Dodoma	AQMS -10	Industrial, Commercial and Residential	35.7586	-6.1854
11.		AQMS -11		35.7425	-6.1829901
12.		AQMS -12		35.7316	-6.1726198
13.	Singida	AQMS -13	Rural, Commercial and Residential	35.0274	-5.7256098
14.		AQMS -14		35.0146	-5.7034898
15.		AQMS -15		35.0046	-5.7102799
16.	Tabora	AQMS -16		32.8375	-5.0363302
17.		AQMS -17		32.8252	-5.02461

Sl. No.	Region	Sampling Location	Category of the area	Co ordinate	
				Latitude	Longitude
18.		AQMS -18	Industrial, Commercial and Residential	32.816	-5.01366
19.	Shinyanga	AQMS -19	Rural, Commercial and Residential	32.9246	-3.91764
20.		AQMS -20		39.2552	-6.8357201
21.		AQMS -21		39.2454	-6.8409901

ii. Noise quality

Noise monitoring was conducted to assess the background air and noise levels in the project site and its surrounding area. Noise Quality Monitoring was based on 'The Environmental Management Quality Standards (Control of Noise and Vibration Pollution) Regulation, 2010 (Final Draft). The site selected for noise monitoring is given below **Table 1.5 and as appended in the appendix 2.**

Table 1.5: Noise Quality Monitoring Stations

Sl. No.	Region	Location Code	Category of Area	Co ordinate	
				Latitude	Longitude
1.	Dar es Salaam	NM-1	Industrial, Commercial and Residential	39.2552	-6.8357201
2.		NM-2		39.2454	-6.8409901
3.		NM-3		39.2313	-6.8482199

Sl. No.	Region	Location Code	Category of Area	Co ordinate	
				Latitude	Longitude
4.	Pwani	NM-4	Rural, Commercial and Residential	38.8647	-6.83776
5.		NM-5		38.8482	-6.8288298
6.		NM-6		38.8228	-6.83042
7.	Morogoro	NM-7	Industrial, Commercial and Residential	37.658	-6.8172598
8.		NM-8		37.6517	-6.80937
9.		NM-9		37.645	-6.8001399
10.	Dodoma	NM-10	Industrial, Commercial and Residential	35.7586	-6.1854
11.		NM-11		35.7425	-6.1829901
12.		NM-12		35.7316	-6.1726198
13.	Singida	NM-13	Rural, Commercial and Residential	35.0274	-5.7256098
14.		NM-14		35.0146	-5.7034898
15.		NM-15		35.0046	-5.7102799
16.	Tabora	NM-16	Industrial, Commercial and Residential	32.8375	-5.0363302
17.		NM-17		32.8252	-5.02461
18.		NM-18		32.816	-5.01366
19.	Shinyanga	NM-19	Rural, Commercial and Residential	32.9246	-3.91764
20.		NM-20		39.2552	-6.8357201
21.		NM-21		39.2454	-6.8409901

Monitoring Method: Ambient noise level or sound pressure levels (SPL) were measured by a portable sound level meter having built in facilities to read noise level directly in dB. A-weighted equivalent continuous sound pressure level (Leq) values were computed from the values of A- weighted SPL measured with the help of noise meter. Noise monitoring equipment was calibrated before starting the monitoring. The equipment (with attached microphone) was placed at approximately 1.5 m above ground level and away from buildings/structures to prevent reflection. A windscreen was placed on the microphone to prevent measuring errors by wind blowing across the microphone. Equipment was checked periodically to ensure device is working properly. Climatic conditions and ambient sounds observed during the measurement period was documented. At each location, noise monitoring was conducted continuously over a period of twenty-four hours to obtain Leq values at uniform time intervals of 1 hour.

Daytime Leq has been computed from the hourly Leq values between 6.00 a.m. and 10.00 p.m. and nighttime Leq from the hourly Leq values between 10.00 p.m. and 6.00 a.m. using the following formula.

$$L_{eq_{night}} = 10\log\frac{1}{9}\sum_{i=1}^{9}10^{\frac{L_i}{10}} \qquad L_{eq_{day}} = 10\log\frac{1}{15}\sum_{i=1}^{15}10^{\frac{L_i}{10}}$$

Where, Li = Leq value of the i^{th} hourly time interval.

Area category: A-Any building used as hospital, convalescence home, home for the aged, sanatorium and institute of higher learning, etc.; B-Residential building; C-Mixed Residential (with some commercial and entertainment); D- Residential and industrial small-scale production and commerce and E- Industrial area.

Daytime: 6.00 a.m. to 10.00 p.m.; Nighttime: 10.00 p.m. to 6.00 a.m.

iii. Water quality

- **Monitoring location and frequency**

Three stations were monitored by the consultant during in July, 2022. Exact locations and chainage along the project area are presented in Table 1.6, one sample was collected and analyzed per location.

Table 1.6: Number of Stations

Source Name	Source ID	Easting	Northing
Ruvu River	RR	460804	9247433
Mkata River	MR	274474.70	9247581.51
Kidete River	KR	249962.89	9263181.02

- **Sampling techniques**

In an effort to standardize the sampling techniques, it was agreed that the water sampling, sample preservation, sample transportation and storage, would be carried out in accordance with methods outlined in the 20th edition of the Standard Methods for the Examination of Water and Wastewater (*Clesceri et al., 1998*) or in accordance with TBS standards. Specifically, the procedure designed to:

- Collect water samples using the simple surface grab technique at the middle of the stream where free flowing water is observable
- Collect water samples at about 30 to 50 cm under the surface of the stream. If in-situ measurement was not possible, immediately preserve samples collected with proper preservative agents (i.e., sulphuric acid for nutrients measurement) and store in a cooler to prevent further breakdown of chemicals and biological contents.
- Analyze all water samples within the recommended holding time

- **Laboratory analytical methods**

Following with the requirement of the sampling plan water quality sample were preserved and transported for the measurement at Ardhi University Laboratory in Dar es Salaam. Water quality samples were measured by following the established analytical method elaborated in the Table 1.7.

Table 1.7: **Water quality parameters and their corresponding analytical methods**

Analytical parameter	Recommended analytical methods
Ph	TZS 861(Part 2):2006 – Electrometric Method
Color	ISO 7887: 1994, Water quality –Examination and determination of colour– Section 3: Determination of true colour using optical instruments
Turbidity	APHA Standard Methods:2130 B. Nephelometric Method
Salinity	Potentiometric
Electric Conductivity	Potentiometric
Total Dissolved Solid	Potentiometric (TDS meter)
Ammonia Nitrogen	Nessler method
Phosphate	Ascorbic Acid Method/ Spectrophotometer HACH DR/4000
Calcium	TZS 861(Part 7):2006 – Flame Atomic Absorption Spectrometry
Magnesium	TZS 861(Part 7):2006 – Flame Atomic Absorption Spectrometry
Sodium	TZS 861(Part 7):2006 – Flame Atomic Absorption Spectrometry
Iron	TZS 861(Part 7):2006 – Flame Atomic Absorption Spectrometry
Lead	TZS 861(Part 7):2006 – Flame Atomic Absorption Spectrometry
Zinc	TZS 861(Part 7):2006 – Flame Atomic Absorption Spectrometry
Chromium	TZS 861(Part 9):2006 – Colorimetric Method

- **Data assessment**

Status and trends

The maximum, average and minimum values of each water quality parameter were analyzed for each monitoring station to show the status of water quality and the average value were taken as a result in this report. These values were compared to TBS water quality Standards to identify any exceeded values that need special attention as presented in the Chapter 5.

B. Biodiversity and Ecological Baseline Study

Biological and ecological investigations were conducted with emphasis on terrestrial and aquatic flora and fauna biodiversity. Fauna biodiversity focused on large mammals, small and medium sized mammals, birds and herptiles (reptiles and amphibians). Flora biodiversity emphasized on vegetation physiognomies, types and plant life forms in particular the identification of trees, shrubs, herbs, sedges, lianas, climbers and grasses. As part of the biodiversity baseline surveys; aquatic surveys were conducted with emphasis on fish, macro-invertebrates, and riparian vegetation.

The target fauna groups within project areas were surveyed using a combination of dung and other animal signs, key informant interview, literature review and opportunistic collection and observation on a casual basis. Birds were surveyed by using a combination of calls, observations and scanning the habitats with the aid of field binoculars.

A rapid qualitative assessment of selected vegetation covering Acacia-commiphora bushlands, miombo woodlands, thickets, scrubland and croplands was conducted to check and assess the floristic composition, conservation status and degree of human disturbance/interference, and hence help to detect, reveal and predict changes as a result of the impact of proposed transmission line on the environment, particularly on vegetation characteristics. Qualitative assessment was based on opportunistic observations of trees, shrubs, herbs, and grasses and ground floras throughout the fieldwork.

For literature review, the intention was to obtain information on flora and fauna biodiversity occurring in or around the proposed project areas. In the literature synthesis, particular attention was paid to species which could trigger World Bank Environmental and Social Standard 6 - ESS6. To attain this ESS6 were reviewed. In order to understand the biodiversity species associated with project footprint areas the following databases were also queried:

i. Tanzania Biodiversity Information Facility (TanBIF) database to understand flora and fauna species in the Area of Interest (AOI) of the Railway line.

ii. Naturalist project database to understand flora and fauna species associated with the proposed project area.

iii. Convention on Migratory Species (CMS) database to understand migratory fauna species.

Biodiversity Assessment

Biodiversity assessment was undertaken as part of the Biological and Ecological Impact Assessment associated with the proposed project. This assessment was undertaken in accordance with the requirements of the ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. Relevant to this baseline ecological survey the ESS6 were considered. These guidelines were explored to come up with opportunities for protecting and conserving important terrestrial biodiversity habitats within proposed project areas.

C. Socio-economic Baseline Study

(i) Primary and Secondary Data

This assessment is based on primary exercises like field investigations, consultations/meetings with relevant stakeholders and secondary sources for instance, socio-economic data were obtained from books, reports, journals and other sources such as National Bureau of Statistics (NBS), Municipal councils, TRC, NGOs, CBOs, Universities and other sources. These documents are listed below:

1. The United Republic of Tanzania, 2012, Population and Housing Census, National Bureau of Statistics Ministry of Finance Dar es Salaam and Office of Chief Government Statistician President's Office, Finance, Economy and Development Planning Zanzibar.
2. Dar Es Salaam city 2016-2036 master plan volume i- main report.
3. National Bureau of Statistics (NBS), 2016 and the Ministry of Industry, Trade and Investment (MITI), 2016.
4. Municipals' social economic Profiles.

(ii) Public and Stakeholder Consultations

Public and Stakeholder Consultations is a stakeholder engagement process that involves the local population and project stakeholders in collecting the baseline information on socio-economic profile and providing their views and feedback to consider in the project design and management. It also helps the project authority to establish the communication links with communities and stakeholder relevant to the project and in identifying and managing the risks and threats that may come across during project implementation. Thus, an effective public consultation approach was adopted to achieve these objectives, which includes the following steps (Figure 4.5).

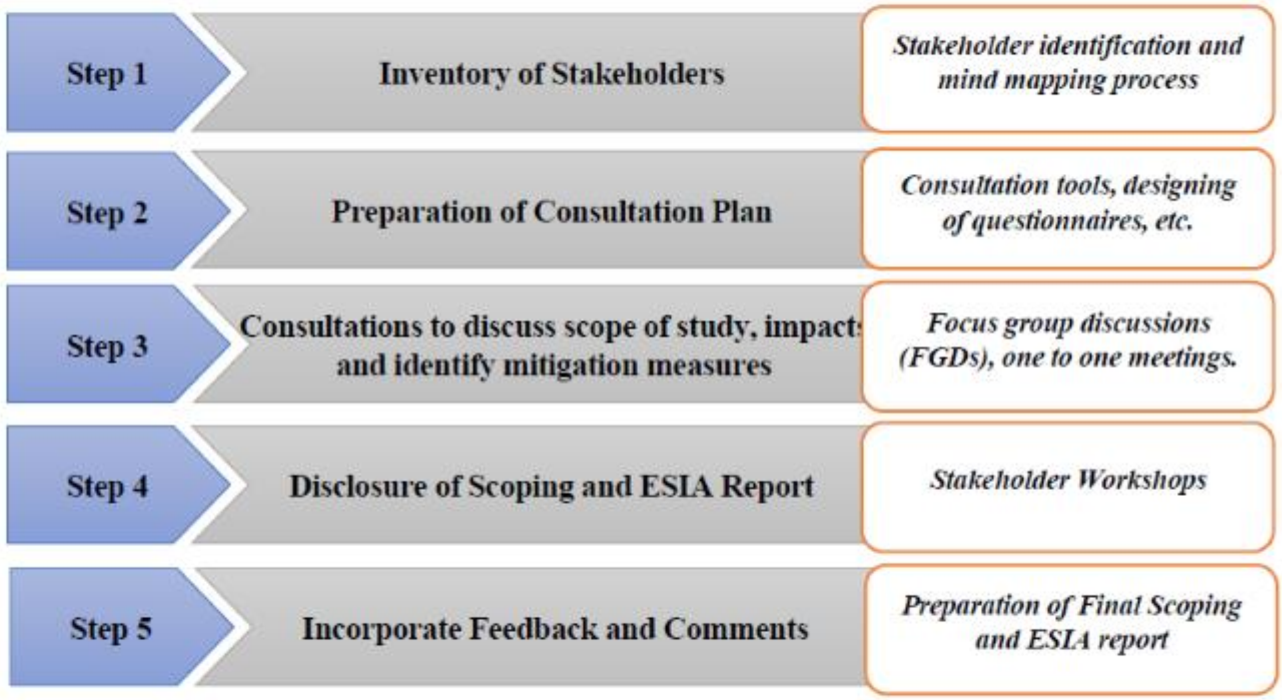


Figure 1.5: **Steps to Public and Stakeholder Consultations**

The stakeholder's engagement through consultations includes identification of stakeholders, analysis of their objectives and interests, and consultations. Figure 1.6 shows the simplified diagram of stakeholder engagement.

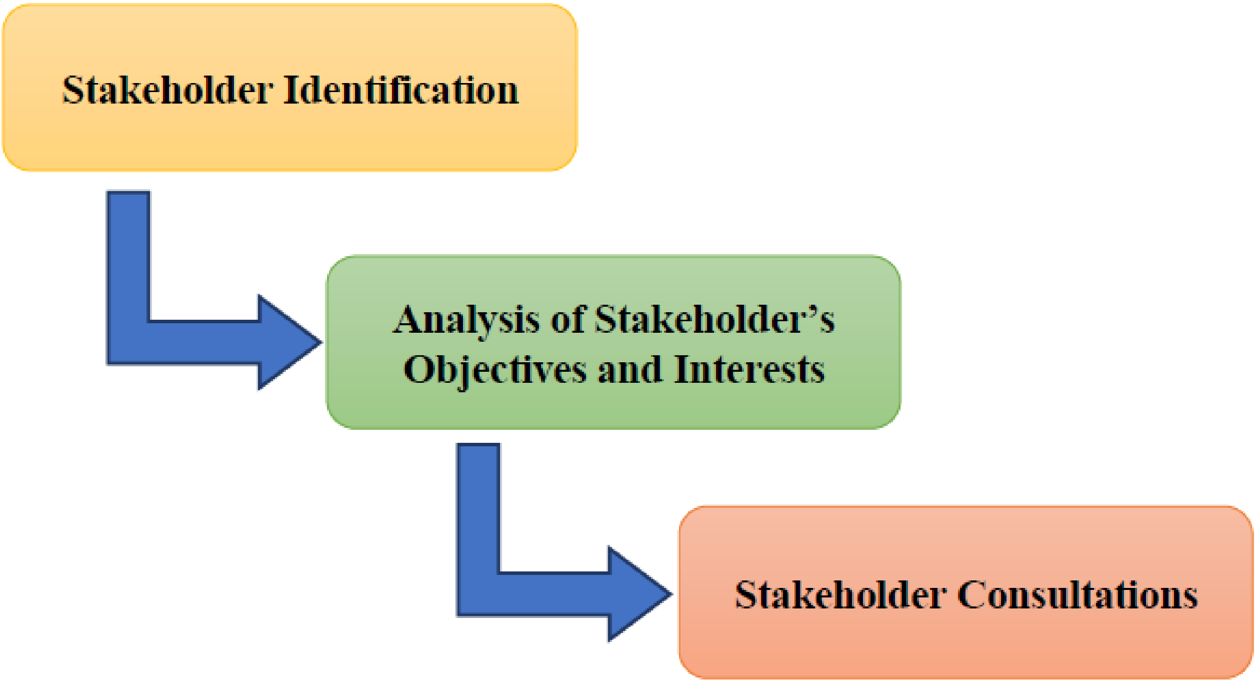


Figure 1.6: **Stakeholder Engagement Process**

Stakeholder Identification

Stakeholder's identification was done though following process (a generalized stakeholder identification process in illustrated in **Figure 1.7**):

- Literature review.
- Brainstorming and information collected through initial discussions with project entities and other relevant stakeholders.
- Obtaining ideas through review of previous similar projects and others.
- Identification through surveys, questionnaire, and profile analysis.
- Expert judgement.

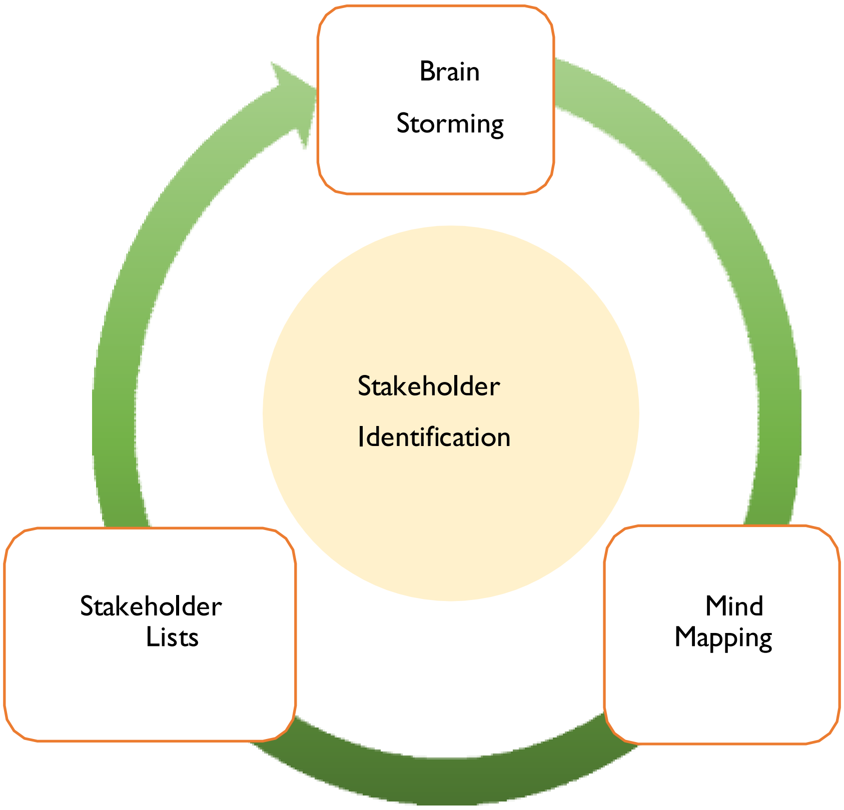


Figure 1.7: Stakeholder Identification Process

Analysis of Stakeholder's Objectives and Interests

Once the stakeholders have been identified, their impacts on and interests in the project assessed considering the following objectives:

i. Who adversely affected by potential environmental and social impacts in the project's area of influence?

ii. Who are the most vulnerable among the potentially impacted stakeholders?

iii. At which stage of project development will stakeholders be most affected (e.g. procurement, construction, operations, decommissioning)?

iv. What are the various interests of project stakeholders and what influence might this have on the project?

v. Which stakeholders can best assist with the early scoping of issues and impacts?

vi. Who strongly supports or opposes the changes that the project will bring and why?

This analysis can be done through mind mapping activities (a form of diagrammatic or visual interpretation of relationships between subjects), which help in clarify project objectives and dependencies and categorization and prioritization of the stakeholders.

- National Environment Management Council (NEMC),
- Dar es Salaam City Council Health Department (DSCCHD),
- National Bureau of Statistics, Dar es Salaam,
- National Environment Management Council,
- Ministry of Water (MoW)
- Ministry of Lands,
- Ministry of Health,
- Tanzania Forest Service,
- Tanzania Electricity Supply Company Limited (TANESCO),
- Occupational Safety and Health Authority (OSHA),
- Regional Offices,
- Municipals and Districts Offices,
- Ward Councils,
- Village Councils, etc.

Consultations

Following consultation-based methodologies was adopted for the ESIA study:

- One to one meeting.
- Focus groups discussions.

- Stakeholder workshops.

The information on each consultation and meetings along with the photographs were included in the report and raw forms in the Appendixes with attendance sheets.

One to One Meeting:

One to one meeting was carried out with key Stakeholders based on pre-set questionnaires to focus on the project objectives.

Focused Group Discussions (FGDs)

FGDs were carried out with local communities, local and regional authorities, cultural and religious groups, NGOs, and other project stakeholders. In FGDs, discussions were held on the issues set out by the key expert of the team. The issues be related to environment and social components.

In order to carry out the discussion more effectively and efficiently, the team involved around 10 to 15 participants at a time during the discussion. During the FGDs, precautions were taken so that the discussion remains focused but open, not get influenced or structured by the interviewer/conductor.

The one-to-one consultation and FGDs carried out throughout the project as per requirement to know the issues, concerns, suggestion of the local communities, local and regional authorities, and other key stakeholders.

(iii) Analysis of Alternatives

Different options based on project design, technology, rehabilitation techniques, etc. were compared in the report based on feasibility study. Apart from that there is a comparison in terms of disposal options and disposal locations for different materials. Similarly, the comparative analysis of With Project and without project Scenario is also presented.

(iv) Identification of Impacts and Mitigation Measures

Based on the findings of the field investigations and consultations, team of experts identified the potential impacts of all the project/sub-project specific activities related to construction, operation and decommissioning phase and the cumulative impact assessment (CIA). Interaction matrix has been used to identify the interaction between project activities and the environmental and social sensitivities. This records the rationale for the impacts and their potential significance, mitigation measures, linked to relevant legislation, the construction contract requirements, and the provisions of the ESMP.

Impacts are identified from environmental and socio-economic baseline as affecting the receptors air, water, land, biodiversity, resources, and community. These were further categorized into pre-construction, construction, operational and decommissioning impacts. After the identification of impacts, suitable and viable mitigation measures are proposed for each potential negative impact for all construction, operation, and decommissioning phases of the project.

(v) Environmental and Social Management and Monitoring Plans

Environmental and Social Management Plan (ESMP) is the key to ensure a sustainable development. It comprises of all the mitigation measures, which have been proposed for the identified potential impacts. The budget required for the implementation of the proposed ESMP is also provided.

1.7.6 Impact Assessment

- ***Impact Assessment Process***

The purpose of impact assessment is to identify and evaluate the significance of potential impacts on identified receptors and resources according to defined assessment criteria and to develop and describe mitigation measures that will be taken to avoid or minimize any potential adverse effects and to enhance potential benefits of the project.

The impacts of the proposed Project were identified based on the findings of stakeholder consultation, the existing baseline conditions, the proposed Project activities, and professional knowledge of the consultants. Impacts are first distinguished as either positive or negative. The cross-sectoral issues and aspects are: health; safety; air quality, especially dust; waste management; social aspects particularly labor recruitment and management; infrastructure, and utilities.

- ***Impact Types and Definitions***

An impact is any change to a resource or receptor brought about by the presence of a Project component or by the execution of a Project related activity. The evaluation of baseline data provides crucial information for the process of evaluating and describing how the Project could affect the biophysical and socio-economic environment.

Impacts are described according to their nature or type, as summarized in table 1.8

Table 1.8: Impact Nature and Type

Nature or Type	Definition
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative	An impact that is considered to represent an adverse change from the baseline or introduces a new undesirable factor.
Direct impact	An impact that results from a direct interaction between a planned project activity and the receiving environment/receptors (e.g. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality) in detail see section 6.1.1.
Indirect impact	An impact that results from other activities that are encouraged to happen as a consequence of the Project (e.g. in-migration for employment placing a demand on resources) in detail see section 6.1.2.
Induced impact	An impact that results from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g., influx of camp followers resulting from the importation of a large Project workforce).
Cumulative impact	An impact that acts together with other impacts (including those from concurrent or planned future third-party activities) to affect the same resources and/or receptors as the Project in detail see section 6.1.3.

- ***Assessing Significance***

Impacts are described in terms of 'significance'. Significance is a function of the **magnitude** of the impact and the **sensitivity/vulnerability/importance of resource/receptor**.

- ***Determining Impact Magnitude***

Impact magnitude (sometimes termed severity) is a function of the **type, extent, duration, scale,** and **frequency** of the impact. These characteristics apply to both planned and unplanned events/ impacts and are briefly described in *Table 1.9*.

An additional characteristic that pertains **only to unplanned events** is **likelihood**. The likelihood of an unplanned event occurring is designated using a qualitative scale, as described in *Table 1.9*.

Table 1.9: Impact Characteristics Terminology

Characteristic	Definition	Designations
Type	A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect)	Direct Indirect Induced
Extent	The "reach" of the impact (e.g., confined to a small area around the Project Footprint, projected for several kilometers, etc.).	**Local** - impacts that affect an area in a radius of 20km around the development site. **Regional** - impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem. **International** - impacts that cross national borders, affect nationally important environmental resources or affect an area that is nationally important/or have macro-economic consequences.
Duration	The time period over which a resource / receptor is affected.	**Temporary** - impacts are predicted to be of short duration and intermittent/occasional. **Short-term** - impacts that are predicted to last only for the duration of the construction period. **Long-term** - impacts that will continue for the life of the Project but ceases when the Project stops operating. **Permanent** - impacts that cause a permanent change in the affected receptor or resource (e.g. removal or

Characteristic	Definition	Designations
		destruction of ecological habitat) that endures substantially beyond the Project lifetime.
Scale	The size of the impact (e.g., the size of the area damaged or impacted, the fraction of a resource that is lost or affected, etc.)	[no fixed designations; intended to be a numerical value or a qualitative description of "intensity"]
Frequency	A measure of the constancy or periodicity of the impact.	[no fixed designations; intended to be a numerical value or a qualitative description]

- ***Identification of Mitigation and Enhancement Measures***

For activities with significant impacts, the ESIA process is required to identify, in collaboration with the Project proponent, suitable and practical mitigation measures that can be implemented. Mitigation that can be incorporated into the project design, in order to avoid or reduce the negative impacts or enhance the positive impacts, have been defined and require final agreement with the client as these are likely to form the basis for any conditions of approval by NEMC. The implementation of the mitigation is ensured through compliance with the Environmental and Social Management Plan (ESMP) and Environmental and Social Monitoring Plan (ESMoP).

(ESMMP)

- ***Residual Impact Evaluation***

After first assigning significance in the absence of mitigation, each impact is re-evaluated assuming the appropriate mitigation measure(s) is/are effectively applied, and this results in a significance rating for the residual impact.

1.8 General Approach

A multi-disciplinary team of experienced sociologist, scientists and environmental professionals was assembled to carry out the required resource assessment, generation of baseline data, determination of potential impacts and recommendation of mitigation measures. An iterative approach among the environmental team members and other project professionals was adopted.

The team utilized the checklist for data gathering, analysis, and presentation whereby team members conducted the reconnaissance investigations together to determine the critical elements for analysis and the issues to be highlighted for the design and planning process. Team meetings were held to discuss the progress of investigations and analyses and facilitate integration of data toward an understanding of the systems at work in both the natural and built environment. The study approach was done extensively in the following aspect of the environment:

1.8.1 Air Environment

Collection of surface meteorological data like wind speed, wind direction, relative humidity, rainfall, ambient temperature etc. Design of ambient air quality monitoring network Measurement of 24-hourly average background concentrations of PM, RPM (size <10 µm), SO_2, O_3, NO_2 and CO.

1.8.2 Noise Environment

Establishing existing status of noise levels in residential, commercial, industrial areas and silence zones within the block area for proposed project.

1.8.3 Land Environment

Collection and assessment of secondary data for the soil done in the study area. Soil characteristics data were taken from FAO soil global map and Geological Survey of Tanzania website and the result is as described in sub section 5.4.1.4.

1.8.4 Water Environment

Collection of surface water resources for determining quality of water in the study area.

1.8.5 Biological Environment

Collection of data on flora and fauna with respect to project area; Collection of information on wildlife sanctuaries / reserve forest if any in the vicinity of the project area; Assessment of species diversity, density, and abundance etc., within the study region.

1.8.6 Socio-economic Environment

Rapid field appraisal techniques in conjunction with desk research were employed to investigate;

The socio-economic considerations within the project area,

- Population and settlement characteristics
- Land uses and livelihoods
- Developments underway
- Infrastructures in place
- Water supply and other utilities
- Waste management practices
- Recreational activities
- Communication and Welfare facilities i.e. hospital, educational institutions and project awareness amongst the public

1.8.7 Anticipated Environmental Impacts

Identification of Environmental Impacts associated with project activities

Assessment of Environmental Impacts due to the proposed activity on air, land, water, biological and on human interests; Prediction of adverse impacts due to activities related to proposed project activities.

1.8.8 Mitigation Measures

It is recommended that all equipment is operated within specified design parameters during construction, operation and decommissioning phases. Use of ear muffs/plugs and other protective devices should be provided to the workforce in noise prone areas. According to WB-ESF requirement the project will use the mitigation measures hierarchy below so as to minimize the project impact to the environment, which includes avoidance, minimization, restoration and compensation.

Avoidance: During the rehabilitation of railway line, the contractor shall identify and avoid potential impacts to the extent possible. This shall involve careful planning and design to minimize disturbance to sensitive habitats, water bodies, or cultural sites. It may include route selection that avoids environmentally or socially sensitive areas, such as protected habitats or communities.

Minimization: If avoidance is not entirely possible, efforts should be made to minimize the impacts. This includes employing construction techniques and technologies that reduce noise, vibration, dust, and other disturbances. Minimization measures may also involve optimizing construction schedules to minimize disruption to local communities and ecosystems.

Restoration: After construction, the contractor shall restore any areas that were disturbed or impacted. This may involve re-vegetation of embankments, restoration of water bodies, or rehabilitation of affected ecosystems. Restoration efforts should aim to enhance biodiversity, ecological connectivity, and the overall ecological function of the area.

Compensation: In cases where avoidance and restoration are not sufficient, compensation measures can be considered. This will involve creating new habitats, establishing wildlife corridors, or implementing conservation initiatives in nearby areas to offset the ecological impacts. Compensation measures should be designed to provide equivalent or greater ecological value compared to the areas affected.

1.8.9 Environmental and Social Management Plan

Environmental and Social Management Plan (ESMP) will be drawn after identifying, predicting, and evaluating the significant impacts on each component of the environment with a view of maximizing the benefits from proposed project. The following measures will also be included in the ESMP.

Recommended mitigation measures required to address environmental concerns such as wildlife and habitat protection, cultural and archaeological sites protection, terrain stabilization, maintaining freshwater horizons, debris disposal and conservation of natural drainage and water flow. Provide a comprehensive and detailed plan covering environmental variables to be monitored, the location and timing of sampling and the use to be made of monitoring data to ensure compliance with the applicable environmental rules/regulations throughout the life of the project. Delineate post-closure plan coexisting with natural surroundings for abandonment of project components.

1.9 Limitations of the study

This report is based on the data collected from primary and secondary sources, visual inspection, discussions with government officials and local people. Ideally, the ESIA study should be carried out considering seasonal aspects of a complete data set. However, the time allocated for this assignment was not adequate to gather primary data with seasonality (dry and wet seasons) therefore other data was supplemented from secondary sources. Contents of the ESIA

1.10 Report Structure

According to the ToR, the ESIA report will be divided into the following Chapters as listed below:

1. INTRODUCTION
2. PROJECT DESCRIPTION
3. EXISTING REGULATORY AND INSTITUTIONAL FRAMEWORK
4. APPROACH & METHODOLOGY
5. BASELINE ENVIRONMENTAL & SOCIO- ECONOMIC CONDITIONS
6. ALTERNATIVE ANALYSIS
7. INTER-AGENCY AND PUBLIC/NGO CONSULTATION
8. IDENTIFICATION AND ANALYSIS OF POTENTIAL IMPACTS
9. IMPACT MITIGATION MEASURES

10. ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

11. ENVIRONMENT AND SOCIAL MONITORING PLAN

12. GRIEVANCE REDRESS MECHANISM

13. CONCLUSION AND RECOMMENDATIONS

14. LIST OF REFERRENCES

15. LIST OF APPENDICES

CHAPTER TWO
2. PROJECT DESCRIPTION

2.1 Project Overview

The Tanzania Railways Corporation (TRC) Tanzania Intermodal and Rail Project (TIRP) aimed at improving the performance of Tanzania Railways Corporation (TRC) (management and operational) in carrying out intermodal transport services along the Central Corridor and hence increase its market share within the transport sector as well as improve its financial self-sustainability.

The improvement in the corridor includes bridges and culverts, stations, formations, ballasting, track renewal and associated activities. The activities which will be done in stages and will enable the introduction of a dedicated “BLOCK TRAINS” to transport 20 ft and 40 ft containers between Dar es Salaam and Isaka operating with 18.5 t axle loads and speeds up to 75 kmph.

The Project basically acts as Type A transport infrastructure project as defined in the first schedule of the Environmental Management (Environmental Impact Assessment and Audit) (Amendment) Regulations, 2018 which read as one with the Environment Impact Assessment and Audit Regulations, 2005.

2.2 Project Location and Accessibility

The study area is between Dar es Salaam and Isaka on the central line railway corridor. It is an existing operating railway line which was partly rehabilitated through TIRP 1. The TIRP 2 project covers a stretch of 430 km, with a corridor of 7.5 m each side from Dar es Salaam to Isaka falling under the jurisdiction of seven Regions, namely Dar Es Salaam, Pwani, Morogoro, Dodoma, Singida, Tabora and Shinyanga see figure 2.1 and other in Appendix 2.

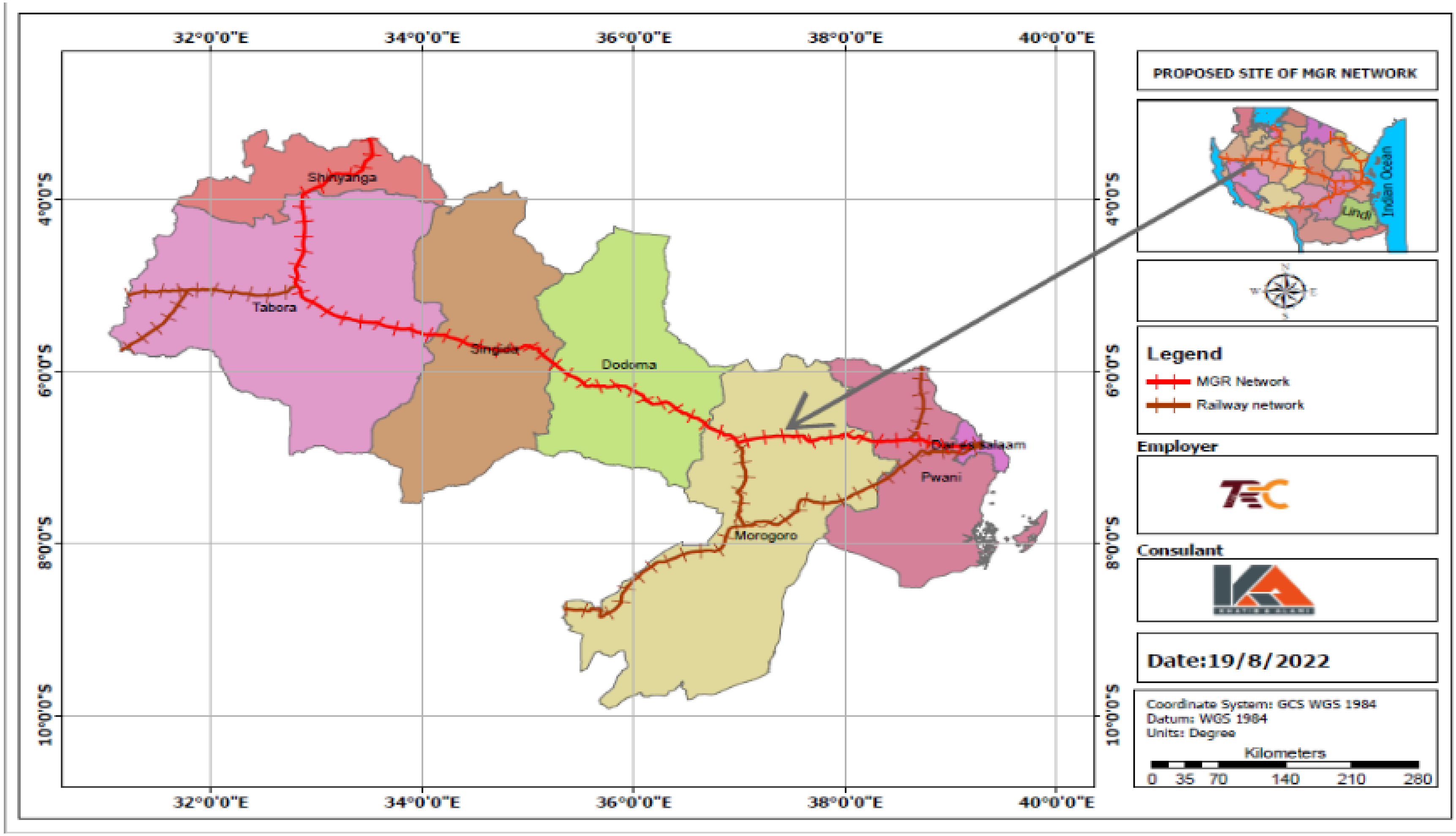


Figure 2.1: Project Location map

2.3 Adjacent features

The project is a linear transport infrastructure project which passes through seven regions of Tanzania and different Districts/ Municipalities (i.e. Dar es Salaam City Council, Kibaha Town Council, Morogoro District Council, Morogoro Municipality, Kilosa District Council, Mpwapwa District Council, Dodoma Municipality, Bahi District Council, Manyoni District Council, Itigi District Council, Nzega District Council, Uyui District Council, Sikonge District Council, Tabora Municipality, Kahama District council and Msalala District council) having different characteristics and designations (urban, Semi urban or rural). The project is passing through or is adjacent to several features that can either be natural or manmade including telecommunication lines, graves, schools, residential houses, industries, farms, rivers, streams, water utilities, borrow pits, warehouses, small markets, etc. The details of the facilities per chainage is given in Appendix 6. Therefore, these features will be either positively or negatively affected by the project implementation. Thus, in this ESIA descriptions and impacts of all features are made in accordance with EMA, 2004 and World Bank ESF standards that will be triggered.

2.4 The Right of Way (RoW)/ Railway Reserve

According to the Second Schedule of the Railways Act No. 4 of 2017, The Right of Way/way leave of the railway line is 30 m from the center line of the railway line on both sides (left and right sides). ,In this project, 15 m (7.5m at each side from the track) project corridor is considered from Dar es Salaam to Isaka. Within this designated project's corridor there was no encroachment observed. Most of the permanent structures along the corridor are located out of the RoW as per Railway Act, 2017. However, at chainage 17/4 in Pugu area where there is a graveyard close to the corridor, in a section that was part of TIRP I that was provided with proper addressing in RAP and therefore will not be of concern during TIRP II.

2.5 Sensitive Receptors

As described in section 2.3 the project site is passing through several biotic and abiotic entities which may be constituted of different ecosystems along the railway corridor. However, during the field visit, both terrestrial and aquatic ecosystems were observed to be near or crossed by the 7.5m project corridor of implementation. No critical habitats were identified since it is an existing operating railway with adapted environment already. Moreover, the ESMP provided mitigation measures to be taken when passing in these identified areas during construction stage. These are ponds, rivers, streams, wetlands, forest reserves, desert ecosystem, etc. As per Article 52 (1) of the EMA, 2004 Swamp areas were declared as sensitive areas and since the project also passes through several swampy areas, seasonal and perineal rivers, it may be declared that in some areas the project site passes through or is very close to sensitive areas/ ecosystems which might trigger the requirement of EMA, 2004 as well as WB-ESF especially ESS6 (see figure 2.2).

Figure 2.2: Wetland at Mkadage Area

2.6 Existing Situation

The proposed project site is already existing and operational consisting various existing infrastructure and facilities. Their state and operational condition as assessed during the study shall be described in this section. However, based on the reference made from the engineering report done by CPC consultant for the project in 2017, the description of the project divided in to four Sections:

I. Section -A- Dar - Ngerengere (KM 0.0 - KM 145.0)

II. Section -B- Ngerengere – Kilosa (KM 145.0 - KM 283.3)
III. Section -C- Kilosa – Itigi (KM 283.3 - KM 626.0)
IV. Section -D- Itigi – Isaka (KM 626 - KM 970)

This ESIA shall also use the same chronology.

2.6.1 The railway tracks

The railway track consists of the terrace onto which the rail is fixed on sleepers. Ballast is appropriately placed on the terrace for stabilization purposes. The existing rail track covers 2,724 km of Single-Track Meter gauge railway network in 12 Regions. The rail is constructed of 2 parallel steel rails attached to perpendicular crossties (sleepers) made of steel and/or wood/timber at/near crossings and stations.

The crossties are mounted on a terrace of ballast with underlying sub-ballast and fine-grained sub-grade foundation. While crossties made of timber/wood are resilient and tend to give smooth ride, they often require initial chemical treatment to reduce rot and attack by insects and are also not structurally suitable for modern high-speed tracks. In addition, they have negative environmental impact since they are derived from forests. The current status of the railway line is composed of 141 km of light rails of 56.12 Lb./yd, 662 km of 60 Lb./yd and 431 km of 80 Lb./yd. In this case, TIRP II aims to upgrade the track line to 80 Lb./yd in those sections that were not rehabilitated during TIRP I.

Ballasts for the CRL are obtained from Tura quarry in Tabora and generally consist of 150-225 mm deep layer of stone crushed to a size of 40-65 mm for providing support to the crossties, promoting drainage and minimizing organism growth on the tracks.

2.6.2 Level Crossings

The level crossings are provided on railway line in all strategic areas especially in the area where the railway track crosses with the road to mention few are Kamata, Buguruni, Kipawa, Gongolamboto, Soga, Ngerengere, Morogoro, and Dodoma Tambuka Reli. These are provided to allow road traffic to pass across the Railway track. However, it was noted that in some places the design allowed road traffic to pass over or under the railway track where in some areas all are in the same level as seen in the list of photos/ figure provided in the appendix 5.

According to TRC general rules of 1997 level crossings may be manned or unmanned. Therefore, only a few sections along the corridor have provided with gatemen at manned level crossings to regulate the traffic and in an unmanned level crossing. The team noted that the railway corridor crossing different class of the road, with different visibility conditions and volume of road traffic. Based on consultations done the team does not get the exact number of accidents that occurred at the level crossing however, there are some circumstances of accidents that were reported to occur at the level crossing in urban areas (railway crossing areas in major towns) as well as rural areas. The accidents occurred due to different reasons to mention few are failure to follow railway track /road signs to all road users, absence of railway track makers or indicator to some areas for example at Igandu primary school where safety signage was placed in a wrong area where students are not crossing, with poor visibility at some crossings. This triggers the requirement of the World Bank ESS4 (Community Health and Safety) to be considered so as to minimize health and safety risks to the communities and Road users.

Team noted that some of the areas along the project need to have the following as remedial measures to reduce the risk of accidents.

- Manning of level crossings,
- Providing lift barriers,
- Level crossing indicators,
- Stop signs for level crossings,
- Speed breaker at level crossings,
- Rumble strips at level crossings.

Figure 2.3: Railway crossing at line Police in Dodoma Region

NOTE

As the level of the passing road traffic is the same as that of the railway track, the crossing is referred to as a level crossing.

2.6.3 Drainage structures

The inventory and visual assessment of existing drainage structures was conducted along the railway track in order to assess their present condition on functional level for both hydraulic and structural requirements. The information required for assessing the capacities of the existing structures, structure type, siltation and erosion, opening sizes and description of terrain were recorded for each structure.

Local bystanders were also queried regarding yearly flood levels experienced at all major structures and/or structures of special interest to assist in the initial assessment of the adequacy of the hydraulic capacity of the existing facilities. The in-depth details of the surveyed structures are as documented in the Inventory of Existing Drainage Structures Schedule, appended to this report as Appendix 7.

2.6.3.1 Cross-drainage structures

From the railway condition assessment and inventory of existing drainage structures, the railway track has a total of ***1,597 existing cross-drainage structures*** with the following classification:

I. **369 Bridges**
II. **612 Pipe Culverts** (Cross and Access):
III. **616 Box Culverts**:

Generally, most of the existing structures have clogged openings due to siltation and, as such, were observed to be non-performing to their full capacity. However, the actual number of the structures to be rehabilitated in TIRP II will be determined as the a result of the ongoing assessment studies of Dsm-Tabora and Tabora-Isaka for scope and budget allocated for the Project.Project. One major notable impairment on the drainage facilities within the railway line (and area in its vicinity) was the erodibility of the soils within their vicinity. Gulleys and scour holes were observed mostly on the outlets. significant number of the major structures crossing major rivers are overtopped and flooded with storm water during heavy storm events and rainy seasons. Evidence and details of these are as documented in the Inventory of Existing Drainage Structures Schedule, appended to this report as Appendix 7. This situation has informed the Consultant of the impacts that these events have exerted on the physical environment especially if the high hydraulic requirements of the railway line are not met, and the need for higher railway embankments and crossing structure heights is not incorporated in the Design stage of the railway line. Some of the structures have broken end structures such as headwalls and wing-walls and therefore subjecting the embankment to deterioration and creating hazardous environment for the railway users as indicated in the list of figures below.

2.6.3.2 Linear drainage structures

Apart from the major cross-drainage structures, linear drainage facilities of the railway line were also observed and measured. Lined drain ditches of Grouted Stone Pitching and/or Reinforced Concrete, were observed at several locations, while unlined Earth Drains/Channels were also observed. Some drains appear to be performing well (by accommodating the flow without spilling/overflowing into the railway) while at other locations, the channels were overtopping as well as eroded due to lack of lining.

Below is a collection of site photos showing key areas with challenges associated to the existing drainage facilities. The photos are meant to offer a clear picture of the existing drainage situation as discussed in the previous sub-sections, in supplementing the detailed information as provided in the Inventory of Existing Drainage Structures Schedule, appended to this report as Appendix 7.

	
Soil Deposition inside opening of a Small Box Culvert at Mzaganza (Kilosa) at Chainage 305 + 509.6	*Nearly 70% of anticipated Opening Size is clogged with Sand/Siltation at Mzaganza (Kilosa) at Chainage 305 + 146*

Inadequate/insufficient opening sizes led to severe overtopping of the railway track at the Munisagara plain (Kilosa). It was noted that, 3 years ago, the Mkondoa River spread greatly, resulting in flooding. at Chainage 300 + 883

New CBC Structure constructed in the recent TIRP 1 Improvements at Munisagara (Kilosa) at Chainage 295 + 845

Ponding/Stagnation of Water at Outlet of a Small Slab Bridge at Chainage 296 + 210

Upstream of the great Mkondoa River Bridge at Munisagara (Kilosa). Water is known to reach the Steel Girder Level at Chainage 294 + 371

Over 50% Clogging of 5 cells of CPCs at Mkadage (Kilosa) at Chainage 284 + 050

Small Open Rectangular Concrete Drain approaching Kilosa Centre at Chainage 281 + 870

Kilosa TRC Station Marker Post at Chainage 282+ 000

Proximity between MGR and SGR Tracks and Drainage Structure dominant at Chanzulu (Kilosa). at Chainage 274 +634

Well-packed Gabion Matresses at Chainage 274 +634

Ponding/Stagnation of Water at Chanzulu Bridge at Chainage 273 +390

Downstream of the Main Mkata River Bridge at Mkata (between Kilosa and Mvomero).

Downstream of a Minor Mkata River Bridge at Mkata (between Kilosa and Mvomero). at Chainage 293 + 707

SGR Overpass Bridge at Lukobe (Morogoro Urban). at Chainage 230 + 201

 *Damaged End-Structures of CPC 900 mm at Ch. 1+490*	 *Gabion Boxes and Mattress Protections on Outlet of Culvert at Ch. 32+375*
 *Outlet End of Box Culvert at Ch. 44+625. Eroded behind Wing walls*	 *Scour Hole at Outlet End of Pipe Culvert at Ch. 50+786*
 *Severe Siltation of Box Culvert at Ch. 64+081*	 *Debris of Damaged Old Structure at Outlet End of Box Culvert at Ch. 78+470*

Rocky Bed of the Khoronaida River

Figure 2.4: List of drainage structures along the project site

2.6.3.3 Remarks and conclusion on existing structures

Based on the site observations and preliminary assessments of the existing drainage structures, the following remarks and conclusions were drawn:

i. A large portion of the railway track has faced the impacts of poor drainage facilities leading up to scenarios of wash ways, flooding, storm water overflowing/overtopping the track as well as ponding. Details are as documented in the Inventory of Existing Drainage Structures Schedule, appended to this report as Appendix 7.

   A key point to note on this aspect is that, all the mentioned impacts have occurred and/or are occurring in the past and present environment; whereas the future scenarios are considered to be more crucial and severe due to the ongoing impacts of climate change on the regimes and patterns of rivers and all other modes of surface runoff.

   In this regard, the track, as well as neighboring establishments, do not stand a chance unless proper improvement of the facilities is carried out.

ii. Replacement of the Existing Structures with new structures is necessary to cater for:

- Inadequacy of the Hydraulic Opening Capacity of the existing structures as compared to the Design Discharge to be conveyed at the same location and current Flooding scenarios.
- Incorrect Positioning of the existing structures. This applies to those whose main channel evades the opening of the facility and crosses the railway elsewhere, resulting in further deterioration of the railway.
- Severe Siltation and Clogging of the existing structures, indicative of the need for a larger opening to facilitate transportation of sand and other debris
- Structural Failure of the existing structures whose end-structures and/or main culvert units/cells have been fractured, cracked, broken, dislocated, honeycombed, exposed of rebar, rusted or worn-out.

iii. Addition of Cross-Drainage Structures at areas where none previously existed is a necessity. This is due to the fact that climatic changes and urbanizations (constructions activities) have resulted in changes of the flow regimes, resulting in the additional streams/channels crossing the railway at points which originally were not being crossed. Apart from the above factors, some crossing locations may simply have been mistakenly overlooked in the previous railway investment. Thus, the new structures are meant to cater for the same.

iv. A few existing structures appeared to be structurally intact and in good condition while hydrological analyses revealed that the existing hydraulic opening capacity is sufficient for the Design Discharge to be conveyed.

2.6.3.4 Flood plain areas

Lowland areas and flood plains were observed; with most serving as agriculture and cattle grazing near the railway line. The challenges observed at the areas (as reported by witnesses and local residents) include:

i. Collection/ponding of surface runoff from storm water for long durations of time due to either the area having extremely low gradient or not having a definite flow path/direction.
ii. Deterioration of the existing gravel railway as a result of the ponding.
iii. Encroachment of water in the nearby residents and local establishments.

iv. Total blockage of the existing railway path, a situation that forces the railway users to opt for other longer routes and/or cross the water with bare feet (for pedestrians)

The proposed proper treatment of the areas is proposed and includes:

i. Raising of the Railway Embankment.
ii. Provision of a series of Relief Structures (either box or pipe culverts) along the plain area stretch to lower the water depth that would otherwise be too high due to damming that would result from the raised embankment to be constructed.

2.6.4 Bank Conditions

Most of the railway alignment between Dar es Salaam and Isaka is on embankment. In general, the condition of the banks observed to have the following conditions

- Worn out 'shoulders',
- Damage to side slopes,
- Damage to banks has also occurred due to landslides caused by intense runoff, unlawful vehicular crossing, human and animal trespassing see in figure 2.5 and table 2.1

Table 2.1: Bank condition

Section	Bank Condition	Photo Evidence	Remedial Measure
A	Bank condition in this section observed to be poor especially from startup of the project to Pugu area where there is a lot of human activities done across the project, i.e., all forms of trespassing including unauthorized crossings for humans, animals and vehicles as well as lack of drainage	See appendix 5	- Ensure there is a proper crossing for animals, trucks and other things along the stretch, - The upgrading should consider the design recommendations provided from SGR which runs parallel - Side drainage should be constructed to protect the

Section	Bank Condition	Photo Evidence	Remedial Measure
	structures along MGR line also improper dumping of solid waste in the banks. The other area from Pugu to Ngerengere bank observed to be fairly good however it has some areas affected by the existence of SGR, animal trace pacing, lack of side drains and unauthorized crossings for humans and animals		bank where storm runoff are directed in the Rail way line, - Regular cleanness and monitoring along the truck - Rebuilding the eroded embankments with suitable fill materials to the standard cross sections. - Improving the drainage conditions of the formation at surface and sub-surface - levels
B	The section has stable banks but with low embankments heights at few locations. Within the Morogoro urban area where there is rampant human, animal and vehicular trespass. The section between Mkata - Kimamba is a low flood area with a lot of grazing. The cases are very low with scattered ballast. The section between Kimamba and Kilosa has an embankment with very low cases at many locations.	See appendix 5	- Ensure there is a proper crossing for animals, trucks and other things along the stretch, - The upgrading should consider the design recommendations provided form SGR, - Side drainage should be constructed to protect the bank where storm runoff is directed in the Rail way line, - Regular cleanness and monitoring along the truck - Rebuilding the eroded embankments with suitable fill materials to the standard cross sections.

Section	Bank Condition	Photo Evidence	Remedial Measure
	There are some areas where the project crosses in the area with Black cotton Soil		- Treating the top layer of the soil with quick lime so as to reduce the harmful effects of the soil, - Consolidating the soil at optimum moisture content - Improving the drainage conditions of the formation at surface and sub-surface - levels
C	In this section there are some places has poor banks which result in the poor operation of the railway. The poor condition in the banks caused by Flooding, unauthorized human, animal trespassing, lack of side drains, damping of solid waste in the banks, etc. The section between Kilosa and Gulwe faces severe problems due to overtopping of banks and washouts. The noted areas were those just after Kilosa station up to Gulwe station where the Mkondoa River runs close to the railway, affecting the railway line in many parts. For	See appendix 5	- Ensure there is a proper crossing for animals, trucks and other things along the stretch, - The upgrading should consider the design recommendations provided from SGR, - Side drainage should be constructed to protect the bank where storm runoff is directed in the Rail way line, - Regular cleanness and monitoring along the truck - Rebuilding the eroded embankments with suitable fill materials to the standard cross sections. - Treating the top layer of the soil with quick lime so as to

Section	Bank Condition	Photo Evidence	Remedial Measure
	example, at 287/8km the railway line had shifted due to serious river bank erosion, and at 293/2km at the bridge where the Mkondoa River crosses the railway line floods that occurred in December 2009 destroyed the Railway line Other sections where railway embankment is in bad shape lie within the urban areas of Dodoma, Manyoni and Itigi.		reduce the harmful effects of the soil, - Consolidating the soil at optimum moisture content
D	The section is at a fairly level with shallow cuttings and banks. The bank between Malongwe and Nyahua, from km 758 – 764, lies in Nyahua swamps, and as a result it has unstable formation and bad track parameters. The track between Tabora and Isaka traverses through several flood plains and rice fields. The banks are generally low.	See appendix 5	- Ensure there is a proper crossing for animals, trucks and other things along the stretch, - Side drainage should be constructed to protect the bank where storm runoff is directed in the Rail way line, - Regular cleanness and monitoring along the truck - Rebuilding the eroded embankments with suitable fill materials to the standard cross sections.

Section	Bank Condition	Photo Evidence	Remedial Measure
			- Improving the drainage conditions of the formation at surface and sub-surface levels

Figure 2.5: Solid waste dump site along the railway bank at Kizota Dodoma

2.6.5 Cuttings

The project site from Dar es Salaam to Isaka passes though different landform having different topographical features and characteristics. Thus, leaded the construction of the Railway line to have cuttings in some areas. The cuttings conditions observed by the team per section are as described below.

- **Section - A**

This section started from Port area in Dar es Salaam where it crosses in the city center with no side cuttings due to the landform of Dar es Salaam. However, the exit between Pugu and Mpiji there is mountainous areas where the Railway traverses through it and thus cuttings were made. Example of the chainage of the stretch of railway alignment within which earth cuttings is made is from km 24.4 to 28.7. The Masonry and stone pitching have been done in those areas where threat of landslides exists. Further, field inspection revealed that the existing catch water drains are silted up with overgrown vegetation. The only rock cutting in this stretch is located near Kidugalo station at km 134, which appears to be stable.

- **Section - B**

There are no deep 'earth' cuttings in this section. However, there are a few rock cuttings between Ngerengere and Mikese. 'Boulder falling' caution signs have been installed near some cuttings, indicating danger. Information given from station masters in this section revealed that, in recent years, no incident of boulder falling, and infringement of the line has been reported. The cuts are vertical or at very sharp gradient. Some protective measures such as cement lining have been applied on a few stretches.

- **Section - C**

The section between Kilosa and Godogode has long stretches of rock cuttings and the line meanders along the Mkondoa and Kinyasungwe rivers. Information obtained from TRC, 2017 design report indicated that there was a study done by JICA which recommended a comprehensive engineering solutions for the section between Kilosa and Gulwe. The measures included re-routing of the line on nine stretches. However, these recommended measures were not actualized yet, the area still has problem with some temporary measures taken.

- **Itigi – Isaka (Package D)**

The terrain from Itigi to Isaka is fairly level and there are no high cuttings in need of special attention. Observation done at the site revealed that the Railway line in this area passing through low land areas with swamps and black cotton soil.

2.6.6 Track materials

During the site visit the team observed the track along Dar es Salaam - Isaka have the following materials Rails, Sleepers and fittings/ Fastenings of different type depending on the section where it is installed or located.

- Rail

A *flat-footed rail*, also called a *vignole rail* (Figure 2.6), with an inverted T-type cross section of inverted T- type was observed along all section of the project. The rail was directly fixed to the sleepers with the help of spikes.

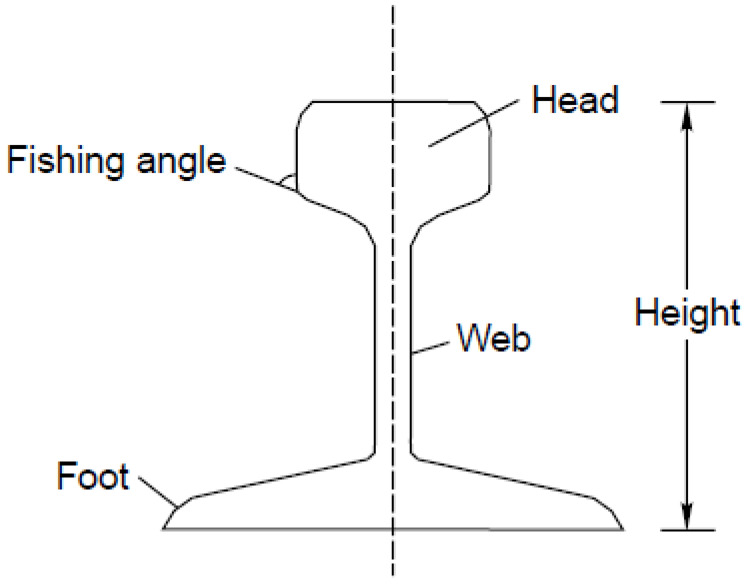


Figure 2.6: Flat footed Rail

Observations made revealed that in some section the rail had wearing effect which caused due to the passage of moving loads and friction between the rail and the wheel of the trucks. And sometimes the rail head gets worn out in the course of service. However, the team noted that the effects of weather conditions such as changes in temperature and rains, the presence of materials such as sand or gravels cause considerable wear and tear of the vertical and lateral planes of the rail head.

Within the project Wear was observed to be more prominent at some special locations of the track. The locations are the following:

b. On sharp curves, possibly due to centrifugal forces,
c. On steep gradients, possibly due to the extra force applied by the engine,
d. On approaches to railway stations, possibly due to acceleration and deceleration,

- Sleepers

Reference made from design report provided the steel sleepers was recommended in all sections of the project. However, during the field visit the team observed the Railway truck have been installed with two types of sleeper wooden sleepers and steel sleepers.

Wooden sleepers: *these were observed mostly in bridges they have a thicker section of about 25 cm × 15 cm or 25 cm × 18 cm (see figure 2.7)*. The mentioned normal service life of wooden sleepers installed estimated to be about 15 years.

Figure 2.7: Wooden sleepers at Magadu

Steel sleepers: *About 98% of the central railway track on is laid on steel sleepers.*

It has been noticed by the team that in some area of the sections steel sleepers tend to become loose due to the bending of the pressed-up lugs or due to wear at the rail seat. The holes also get elongated during service. Special types of shims and liners are provided in these circumstances to hold the gauge well. Another problem observed is that they tend to become centre bound.

Fittings/ Fastenings: *The purpose of providing fittings and fastenings in railway tracks is to hold the rails in their proper position in order to ensure the smooth running of trains. These fittings and fastenings are used for joining rails together as well as fixing them to the sleepers, and they serve their purpose so well that the level, alignment, and gauge of the railway track are maintained within permissible limits even during the passage of trains.* The design done for this project recommended the existing railway line to be converted into Continuous Welded Rail (CWR) track. However, not all parts of the railway were converted to CWR as recommended up to now. Survey done from Dar es Salaam to Isaka revealed that Fish Plates, Fang Bolts, Pandrol clip or elastic rail clip and Spring steel clip were installed in the track.

2.6.7 Railway signage

Two types of the railway sign were observed along Dar es Salaam – Isaka Railway line: these are warning signs and indication signs. As per referred TRC general rules of 1997 the signage are placed in the strategic areas however it was noted that they are not adequate and sufficient enough to cover its intended purposes in all sections example at TAZARA where is one of the major level crossings to the project corridor it does not have visible rail way sign on both sides of the Road. The signage observed in the project site were:

I. The Permanent Warning Boards

- Maximum Speed Boards;
- Speed Restriction Boards;
- Facing Point Boards;
- Stop Boards;
- Stop/Change Lever Boards;
- Whistle Boards,
- Boulder Boards;

- Derailer Boards;
- Infringement of Structure Gauge Signs;
- Marking of Gauge Infringements and Other Dangerous Line Sides Objects;
- Limit of Shunt Boards; and
- Signal Warning Boards;
- Momentum Grade Boards

II. Indication Signs

- Kilometre Posts

These are made of stone, concrete, unserviceable steel sleepers. These are placed at every kilometre, half kilometre and 100m. Markings on Kilometre posts are black numerals on a white background see figure 2.8.

Figure 2.8: Kilometer post

- Gradient Posts

Gradient posts along the project line are erected at all point where the gradient in the line changes.

The rehabilitation of this project has to make sure that signage is well placed to the appropriate areas to minimize risk to the road users and nearby communities as per requirement of ESS4.

III. Station Name Boards

The Station names are written on the station building and/or placed at both ends of the station where can be seen when entering or leaving the station. Not all stations have station name boards.

2.6.8 Stations

The crossing stations between DSM and Isaka are: Pugu, Mpiji, Soga, Ruvu, Magindu, Ngerengere, Mikese, Morogoro, Mkata, Kilosa, Kidete, Gulwe, Igandu, Kikomo, Dodoma, Kigwe, Bahi, Makutupora, Manyoni, Agondi, Itigi, Kazikazi, Kitalaka, Karangasi, Tura, Malongwe, Nyahua, Goweko, Igalula, Itulu, Tabora, Kakola, Nzubuka, Ipala, Bukene, Mahene, Isaka (see figure 2.9). At each station there is a station master (except Mahene) where the driver must obtain an authority to proceed also known as a 'line clear' in order to enter the next block section. This system ensures that a suitable 'space interval' is provided between running trains so that there are no collisions and accidents.

The layout of stations varies in size and importance according to the type and volume of traffic handled and according to their locations with respect to cities or industrial areas. It was observed that not all stations have the same size and facilities in place. However, most of the facilities in all stations observed to be dysfunctional or in poor condition due to maintenance status. Some stations, especially intermediate stations, have toilets. Others don't have toilets including Nyahua, Igalula, Mahene and Ipala.

Solid waste and wastewater management at all stations were also observed to be poor since no places were designated to manage all types of wastewaters produced in that station. The problem may highly be observed during rehabilitation period since the toilets in the station may also be shared with the construction crews.

Dar es Salaam, Morogoro, Dodoma and Tabora found to be big compared to the rest of the stations due to their designated task/ purposes to be done. The team identified the following environmental concerns associated with major stations:

- Littering from scattered obsolete and work out scrapers, parts including coach batteries, worn-out forklifts, leaking roofs (which exposes staff and threatens equipment and machines to corrosion attack), old and unusable materials etc.
- Sawmill and carpentry dust;
- Lubricating oil spills and oil washings resulting from lack of oil interceptors;
- Unsorted wastes;
- Oil leaks from locomotives;
- Air pollution from open burning of saw dust loaded with lubricants;
- Blocked drainages; and
- Oil polluted soil.

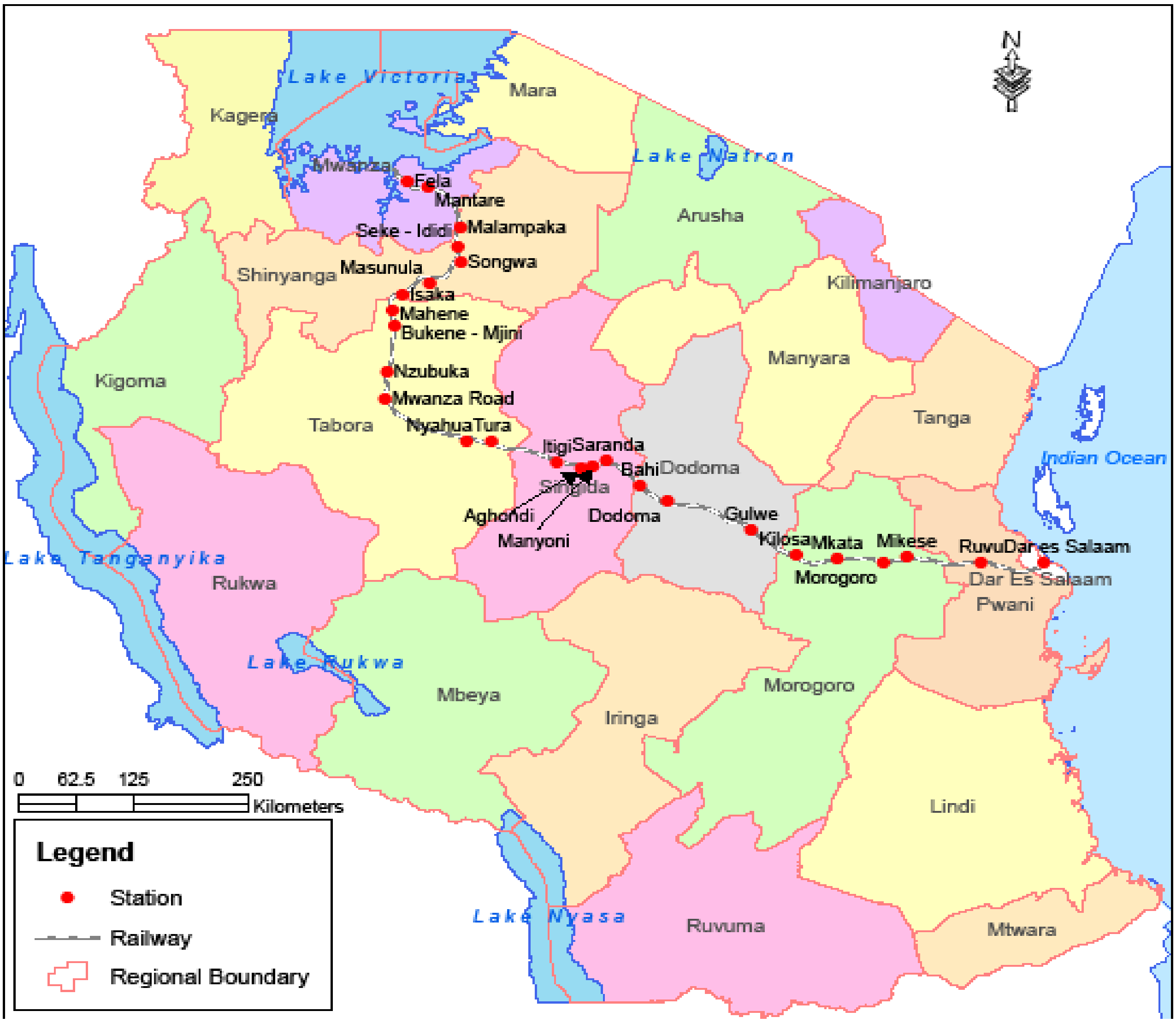


Figure 2.9: ***Railway Stations***

2.6.9 Track Maintenance

For track maintenance, the TRC organized gangs (camps) of 8-10 people (provided with all social facilities where possible. One gang is responsible for a track length of up to 8 km. Each gang reports to a keyman and is responsible for the following:

- Ensuring proper ballast and cushion on the tracks to prevent/minimize possible lateral movements of the tracks;
- Clean and remove grass and related growth and dirty and cut tall grass and tree branches obstructing close to the RoW leaving a minimum of 1.5 m clean and clear view on each side of the railway track;

- Clean all side drainages/furrows to avoid water logging and grow grass where necessary to minimize erosion; and
- Screen and replace ballast and ensure their adequacy, proper tamping and lining.

However, observations done at site revealed that few gangs reside in the houses provided by TRC while others come from villages which are nearby the project site. The main reason for them to stay in the villages is due to poor conditions and maintenance of the houses provided by TRC. The team observed some of the houses do not have roof and are left to deteriorate due to the weather conditions and others have roof, but no one is living and thus wild animals and thieves are living there as seen in figure 2.10.

Figure 2.10: Gang Houses at Isanenge

Environmental and Social Issues Associated with Track Operation and Maintenance

According to the Environmental Assessment and Management Guidelines for the Railways Sub -Sector (URT, 2013), environmental threats resulting from the operation and maintenance of the track includes:

- Population increases and the impact of it has led to increased releases and change in behaviors of catchment areas;

- Land use changes with increased paved areas as well as increased water loads;
- Accident involving killing of animals (both wild and domestic animals especially cows);
- Serious littering and waste dumping on the tracks close to towns and between towns (Pugu -Dar es Salaam, Morogoro, Dodoma, etc.);
- Invasion of TRC owned areas and assets including car parking on diamond-space which is accompanied by environmental and safety problems;
- Forest destruction for wooden/timber sleepers (Mishu, Mtundu and Mkora from Tabora Misitu);
- Serious damages from flash floods (Mkondoa river in Gulwe/Kilosa and increased water flows from the mountains as a result of deforestation and climate change;
- Sanitary wastes which drop directly over the tracks threatening the environment and human (including gang workers) life;
- Pollution in gang camps due to inadequate provision of required amenities;
- Noise during blasting; and
- Theft of sleepers and other railway assets.

2.6.10 Utilities

2.6.10.1 Water sources and usage

Referring to the nature of the project site and locations of the stations, number of water sources from subsurface to surface sources are used in the project corridor. Some stations use underground water sources i.e. dug well or borehole available nearby their locations while others use surface water through pipe supplied from respective water supply Authorities. The absence of reliable sources of water to some stations may cause the possibility of sanitation diseases to the users which may trigger the requirement of the WB- ESS3 and ESS4. Therefore, the proponent/ contractor (during rehabilitation) will be required to undertake specific piping installation within the project site to suit the intended operations. The following operations such as ablution, toilets, kitchen and firefighting require water thus the project must have well above ground and ground water storage tanks with appropriate sizes to cater all needs of the project. The estimated total water demand per day during project phases are summarized in table 2.2

Table 2.2: Water demand

Phase of the project	Activities	Water Demand Litres per day
Installation phase	Construction	8000
	Domestic	300
	Air pollution suppressing	20000
Total water Demand		28300
Operation Phase per station	Cleaning	5000
	Domestic	3000
	Ablution	2000
Total water Demand		10000
Fire fighting		100,000

Note: *The estimation of the water demand based on expert knowledge and that given in the water and wastewater design manual.*

2.6.10.2 Electricity

Major use of electricity power for the project would be for lightning and operations of buildings in camps/sub camps and offices and running of electrical equipment in workshops. Main source of electricity will be supplied by TANESCO via an installed transformers available nearby the stations. Moreover, standby generators will be installed in case the default in the electric supply grid. ESS3 provides for energy efficiency requirements aim to promote the efficient use of energy resources and reduce environmental impacts. In short, the technical requirement is to ensure that projects or activities implement measures to enhance energy efficiency. Corrective measures needed would involve implementing energy-saving technologies, adopting energy-efficient practices, and optimizing energy use. This may include upgrading equipment, improving insulation, utilizing renewable energy sources, implementing energy management systems, and promoting energy conservation awareness among project stakeholder

2.6.10.3 Wastewater management

Liquid waste generated at the stations of the project site are mainly domestic wastewater which consists of black water (excreta, urine, and faecal sludge) and grey water (kitchen and bathing). Assumption made on the average number of the people per stations which is 64 person per day, thus, it is estimated that 3072 Liters of wastewater shall be generated per day, this taken from 60l per capita per day as referred in the Water and Wastewater Design

Construction Manual, 2020. The management of the wastewater generated is still a problem to most of the nearby stations and along the truck therefore the Project shall ensure a proper Waste Management Plan is developed and implemented to accommodate all scenarios of working in linear project sites as well is the camps/subcamps depending on the size of workers stationed. Moreover, waste water management and treatment should adhere to the Environmental Management Act, 2004 provisions in collaboration with the respective authorities at District and Regional levels.

In line to that oils spills traces were also found to some stations especially the stations at Dar es Salaam, Morogoro and Tabora, thus during rainy season the storm runoff to the areas might have small quantities of oil that going to the streams and resulting to the water pollution and thus triggering WB – ESS3 (Resource Efficiency and Pollution Prevention and Management).

2.6.10.4 Sanitary facilities

Sanitary services available in some of the stations of project site; includes toilets and bathrooms. Not all toilets and bathrooms in the stations designated for Male and Female and are in adequate for those stations having toilets. Also, observation made revealed that all toilets available in the site no one has the provision for disabled people. The following measures has to be in place to ensure that the systems operate optimally during all phases of the project see toilet at Zuzu station in figure 2.11, whereby will eliminate the risk of water and land pollution which triggers ESS3 as well as social risks such as social conflicts as per ESS1 of the WB-ESF

- Inspection for scum and sludge depth once each year so that scum or sludge cannot escape from the tank into the drain field,
- Each station should be provided with proper designed toilets having provision to all users as proposed in Appendix 4,
- The tank emptied once every three years,
- Water entering the tank be minimised by using water wastage reduction means such as press only taps for taps and washbasins,
- Toilets to be redesigned to ensure they have male and female sections as well as disabled sections are available as per attached drawing in the appendix 4.

Figure 2.11: Toilet at Zuzu station

2.6.10.5 Firefighting system

During the study period Dar es Salaam, Morogoro, Dodoma and Tabora stations has installed with portable fire extinguishers to fight for fire in case of fire emergences while the rest has no any system or provision of firefighting equipment installed to fight for fire emergences. The objective of the Fire and Gas Detection System is to:

- Provide early detection of fire
- Provide alarm to alert personnel
- Provide specific automatic response in selected high priority alarm situations

Thus, the team suggested that all stations have to be installed with firefighting equipment do that to be used in case of any fire emergency either in stations or in the train. All Fire protection systems are to be designed in accordance with the Codes and Standards. At the building, a Fire Alarm Control panel (FACP) must be provided with addressable heat, manual call points and external audible alarms.

Manual, portable handheld or wheeled fire extinguishers has also to be fixed in place at the facility as per the methodology used in the determination of the required amount of fire extinguishers detailed in NFPA 10. On top of that, the following measures to prevent generation of fire shall be taken on board:

- Smoking and the use of matches or any other source of fire in the terminals/ stations and operational area is strictly not allowed,
- Elimination of combustible materials in the storage area will be done by the housekeeping team.

2.6.10.6 Solid waste management system

The observed solid waste generated from the site consists of packaging materials, food waste, scrap metals, oil drums, papers, pieces of worn-out clothes, plastic bottles, yard sweepings and maintenance wastes. Scrap metals generated from the maintenance of the track they are stored near by the track throughout the corridor, oil drums generated to the stations with maintenances shades, while the rest observed to all stations and along the track. No sorting of waste is done at the site thus hazardous and nonhazardous are all mixed together. Information given at site no any record has been taken if there is a special registered hazardous waste collector has been given a contract to collect hazardous waste generated. Instead of that all waste are collected to some stations buried in the pit while others are burning in an open environment which result to the environmental pollution see figure 2.12. The waste produced by the Project should adhere to the developed waste management plan whereby separation at source, collection points established as per type of waste but also handling hazardous waste using NEMCs certified contractors for transport and disposal at the authorized disposal sites. Non-hazardous waste shall be collected and disposed to the authorized dumpsites as instructed in EMA, 2004. This is to be done so that to protect environment as per requirement of EMA, 2004 and WB - ESS3.

Figure 2.12: Solid waste burning pit at Mahene

2.7 Project Phases

2.7.1 Design Phase

Based on the information given from TRC, the design of the project has been done by CPCS consultants where they had been engaged to prepare works contract documentation by undertaking surveys of the network and designing the required interventions, including producing drawings, specifications, bidding documents and cost estimates. The Consultancy services covered Dar es Salaam – Tabora and Tabora – Isaka**.** The studies were done from 2014 to 2016.

However, as per ToR for this project, TRC has started upgrading the existing Dar es Salaam – Isaka (970 km) railway infrastructure to enhance efficiency and safety of railway operations since 2019 and completed in 2020. A total of 540 km of the railway track and 374 bridges were rehabilitated along Dar as Salaam – Isaka railway infrastructure. Therefor there is still remaining 430 km railway part of the project which has not yet rehabilitated and that was due to financial constraint. It is believed that the finding and recommendations of this study might form a basis of design of the remaining part or should recast some oversee to the design that have already been done.

2.7.2 *Mobilisation Phase*

In view of the nature of the project, the mobilization of the project consists of obtaining all required insurance, bonds and permits, preparatory work and operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project sites, preparation of stores and other facilities necessary for work on the project sites clearance and disposal of all wastes and all other work which must be performed or cost incurred prior to the beginning of work at the project site. During mobilization, different types of waste are anticipated to be produced. The waste is constituted of both hazardous and nonhazardous - to mention few are swept wastes, steel bars, oils and the food remains for people who will be preparing the site for construction/ maintenance activities.

2.7.2.1 *Sourcing of materials*

During mobilization phase, different materials shall be procured so that to ensure construction or rehabilitation of the rails is done in a timely manner and efficiently as it will be prepared. Reference made from the Design report done by CPCS consultant, the following were the materials that were proposed to be procured during the mobilization phase of the project:

- Rails,
- Sleepers,
- Fastenings,
- Ballast,
- Railway signage.

The source of these materials is indicated in the table 2.3.

Table 2.3: Construction Materials for the proposed warehouse building

No	Name	Origin	Quantity
1.	Rail	to be imported	To be determined during design period
2.	Sleepers	to be imported	To be determined during design period
3.	Fastenings	to be imported	To be determined during design period

No	Name	Origin	Quantity
4.	Ballast	Quarry Sites Within Tanzania source will be contractors' choice	To be determined during design period
5.	Railway signage	Within country	To be determined during design period
6.	Cement	Within country	To be determined during design period
7.	Sand	Within country	To be determined during design period
8.	Steel Bar	Within country	To be determined during design period
9.	Water	DAWASA/boreholes	To be determined during design period

Source: K and A 2022

Information obtained from design report done by CPCS consultant indicated borrow pits per section were as follows,

- Section A: Dar – Ngerengere

The borrow pit materials at Mpiji and Ngerengere are shown to have CBR strength of 12% and 13% respectively. They are therefore found to be suitable for improved subgrade. However, the section utilizes high strength materials from Vigawa Kisarawe, with CBR strength greater than 25%. This section requires about 104,997m^3 of ballast for both track refurbishment and complete track renewal of the railway line

The borrow pits at Vigawa Kisarawe, Ngerengere and Mpiji found to have more than enough material to cover earthworks requirements for this section of the railway line. The Vigawa Kisarawe borrow pits have been used for previous road works by TANROADS and have vast amounts of high-quality material that can be used for works in this section of the railway line and beyond

- Section B: Ngerengere - Kilosa

The borrow pits that fall under this package include Mikese and Kimambila. The quality of the materials at these pits is such that the CBR strength ranges from 12 to 18% respectively and are therefore suitable for subgrade improvements. The materials for pavement construction will require being hauled from Vigawa-Kisarawe and beyond the railway line, as this section does not have adequate construction materials. The borrow pits at Mikese, Kimambila and Vigawa-Kisarawe have enough material to cater for the earthworks needs of this section of the line. This section requires about 121,383m^3 of ballast for both track refurbishment and complete track renewal of the railway line

- Section C: Kilosa – Itigi

The borrow pits along this section have large quantities of high strength materials with CBR strength ranging from 13% to 20%. There is a total of 9 borrow pits in this section, including two pits in Itigi, and one each in Aghondi, Manyoni, Saranda, Kigwe, Kikombo, Igandu, and Msagali. The materials found at Saranda have good strength with a CBR higher than 30% in some areas, which is required for embankment construction. These borrow pit locations have more than enough material to supply the earthworks needs of this section of the track. . This section requires about 108,828m^3 of ballast for both track refurbishment and complete track renewal of the railway line

- Package D: Itigi – Isaka

The borrow pits along this section have been shown to consist of good quality materials, especially along the cutting section of the railway line. The total number of 11 borrow pits are investigated in this section including Isaka, Malolo, Isagehe, Ipala, Mlima wa rada, Tabora, Malongwe, Ipulanilo, Kitaraka, Kazikazi, and Itigi. The quality of materials along this section varies in CBR strength, i.e. from 12% to 20% at 95% compaction. In addition, the existing borrow pits for road construction that were opened along Itigi - Tabora road between Kazikazi and Tura stations could be used for embankment construction in this section. It was observed that the material present at these sites is more than sufficient to cover the earthworks needs of this section of the railway line. This section requires about 95,137m^3 of ballast for both track refurbishment and complete track renewal of the railway line

On top of that, the team reviewed available documents for the project and noted that the following were identified as Quarry rock and stone sources:

a) Lugoba Quarry

The review of existing literature indicates that Lugoba Quarry located along Chalinze-Tanga road consists of high-quality rock suitable for railway ballast

b) Msolwa Quarry

The review done at this area showed that there is no uniformity in the quality of material, and it changes from hard to soft in different sections of the pit. It is also noted that the government has already closed the quarry due to the growing population and residential settlement surrounding the area.

c) Tura Quarry

We have also reviewed the existing information about Tura Quarry along Itigi-Tabora road. Tura quarry is the only quarry owned by TRC, which has been used since started in 1985 by then TRC to produce ballast for the Central railway line. The quarry is located at km 697 near Tura station along the Central Line. The igneous rock (granite stone) has shown to consist of good quality producing ballast with Los Angeles Abrasion Value between 20 – 25% (Source: TRC). The crushing equipment has aged but if repaired /maintained to operating condition, the quarry would have the capacity to produce up to 1,000 tons per day.

2.7.2.2 *Transportation of materials*

The contractor will be required to select quarry site or borrow pit on his own desire where will also be responsible for the transportation of all construction materials and equipment from point of sourcing to the site mainly by using Roads or Railway line. Most of the construction material such as steel, timber, Iron bars, etc. may be brought from places far away from the project site but efforts shall be made to source materials as close to the site as possible to minimize transportation impacts and cost for transportation. The transportation of materials should be done to ensure the protection of the environment as per requirement of the EMA, 2004 and WB – ESF (as per ESS 1, 2, 3 and 4).

2.7.2.3 *Duration*

The duration of this phase is estimated to be Four (4) months per each section of the project.

2.7.2.4 *Manpower*

During this phase, about 200 people will be recruited to perform all required activities. However, in many cases, the labor force (total or partial) needs to be brought in from outside the project area. In several cases, this influx is compounded by an influx of other people ("followers") who follow the incoming workforce with the aim of selling them goods and services, or in pursuit of job or business opportunities. The influx of the people under certain conditions, it can affect project areas negatively in terms of public infrastructure, utilities, housing, sustainable resource management and social dynamics. Thus, TRC through its consultant of the project shall ensure ESS2 is adhered accordingly and the recruitment for the labors to the project shall ensure gender balance. ESS2 recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth.

*2.7.2.5 **Storage***

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

*2.7.2.6 **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 during the pre-construction Bphase

Waste	Types	Amount	Treatment/ Disposal
Solid Waste (Degradable)	Vegetation (Trees, Shrubs and Grasses) and remnants of timber.	(Based on Clearance for campsites)	Mulching, composting and Natural barriers and erosion control
	Food remains, cardboards and papers	(Based on generation rate of 20 g/day/ person)	Collected in a large skip bucket at the campsite then to be composted and used as manure for the gardens at the camp site or transported to damp site.
	Topsoils	I (Based on removal of 10 cm topsoil from the (area for Contractor’s	Backfilling material in the borrow pits, fill the diversions.

Waste	Types	Amount	Treatment/ Disposal
Solid Waste (Non-Degradable)		and Engineer's camps erection	
	Scrap metals and plastics	3- 4 kg per day	contracting registered dealers to collect and transport the hazardous waste to authoraised disposal sites as directed by EMA,2004 and ESSF3
	Tins, glasses	2- 3 kg per day	Taken to the authorized dumpsite at the City
Liquid waste	Sewage	(Based on 40 l/capita/day water consumption and 80% becomes wastewater)	Septic tank –Soak away system at the campsites then collected and transported by registered companies to authorized disposal sites when full.
	Oils and greases	None	Car maintenance will be done at proper garages and maintenance workshops established in camp sites. The oils and greases will be temporary stored and then collected by authorized hazardous waste contractors to disposal sites.

Note: Figures provided are based on consultant experience from similar projects therefore are indicative i.e. they might change during actual implementation of the project.

2.7.3 Construction Phase

Up to the time of site visit, a total of 326 km of the railway track and 374 bridges were rehabilitated along Dar as Salaam – Isaka railway infrastructure through TIRP in year 2020. The Rehabilitation track included completed track renewal and refurbishment works. The rehabilitation and maintenance work for the selected structures (Bridges & Culverts) along Tabora to Isaka section was completed in 2020. Therefore, the remaining components are expected to be done after the government secures the funding from the WB and shall be executed as TIRP2.

The major construction activities shall include;

- Extraction and transportation of materials (gravel, sand, hard stones, aggregates, water and cement)

- Clearing the right of Right of Way (RoW) while leaving intact the trees which do not interfere with the construction.
- Rehabilitation Partially Construction or full construction of bridges and other drainage structures.
- Level Crossings, and other Rail way signage shall be provided in all built up areas and trading centers of all villages.
- The landscaping of areas covered by the railway track and establishment of vegetation for functional and aesthetic purposes on cut and fill slopes shall be in accordance with the requirements of the Standard Specification for railway track Works.
- The final finishing and cleaning up of the railway 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 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 in an acceptable manner.

2.7.3.1 ***Duration***

The duration of this phase expected to be two (2) years per each section of the project.

2.7.3.2 ***Manpower***

During this phase, about 500 people will be recruited to perform all required activities. TRC through its consultant of the project shall ensure ESS2 is adhered to accordingly and the recruitment for the labors to the project shall ensure gender balance. ESS2 recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth.

2.7.3.3 ***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 which do not allow moisture). Timber will directly be used at the required areas and consequently there will be no stockpiling of timber at the camp sites.

2.7.3.4 Types, Amounts and treatment/disposal of Wastes

Types, amounts and treatment/disposal of wastes during the construction phase are shown in Table 2.5.

Table 2.5: Types and treatment/disposal of wastes during the construction phase

Waste	Types	Amount	Treatment/ Disposal
Solid Waste (Degradable)	Vegetation (Trees, Grasses) and remnants of timber.	Approximately about 1,000m^3 of biomass	Composting, Mulching and soil erosion control
	Food remains, cardboards and papers	(Based on generation rate of 0.2/day/ person)	Collected in a large skip bucket at the campsite then to be composted and used as manure for the gardens at the camp site
Solid Waste (Non-Degradable)	Topsoils	(Based on removal of 10cm topsoil)	Backfilling material in the borrow pits, fill the diversions.
	Scrap metals, drums and plastics	3-5kg per day	contractingregistered dealers to collect the hazardous waste by national legislation.
	Tins, glasses	2-5 kg per day	Taken to the authorized dumpsite at
Liquid waste	Sewage	To be determined (Based on, 40l/capita/day water consumption and 80% becomes wastewater)	Septic tank –Soak away system at the camp site
	Oils and greases	Non	Car maintenance will be done at proper garages

Note: All figures provided in the table are indicative and thus they might change during project actual execution and the requirement of the contractor at that particular section.

2.7.4 Demobilization phase

- Demobilization of temporary structures will be done for proper restoration of the site e.g. removing/spreading top-soils piled along the rail way road, restoration of borrow pits to required grades if required, 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.

Note

An Occupational Health and Safety Plan will de developed and implemented to guide the demolition and demobilization at site to ensure safety of the workers involved with a proper management procedure of incidents. Moreover, the rehabilitation/restoration will be done by considering ecology of the area at that particular time, however, the consultation to the responsible authorities shall also be done for guidance. Considering nature and the cost for the restoration the contractor might be guided to either refill the ponds and quarry pits or ensure they are safely maintained to support the existing ecological system at that particular time this will also be done as per national and WB standards as well as to the Environmental Code of Practice for Road works (2009).

2.7.4.1 ***Duration***

Demobilization stage will last for a period of three (3) months for each lot of the project.

2.7.4.2 ***Types and Sources of Project requirements***

Types and sources of project requirements during the demobilization phase are shown in Table 2.6.

Table 2.6: Types and sources of project requirements during the demobilization phase

Requirements	Type	Source
Manpower	Skilled	Contractor
	Unskilled	Local People along the railway track
Equipment	Bull dozer	Contractor
	Motor grader	Contractor
	Tippers	Contractor

2.7.4.3 *Types, treatment/disposal of Wastes*

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

2.7.4.4 *Manpower*

During this phase, about 500 people will be recruited to perform all required activities. TRC through its consultant of the project shall ensure ESS2 is adhered accordingly and the recruitment for the labors to the project shall ensure gender balance. ESS2 recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth.

2.7.5 *Operation phase*

The project is under "Central Railway Line" and therefore will be directly managed by TRC through all station masters and maintenances crews. The design period is 20 years, after which maintenance will be needed. During this time, TRC will carry out routine maintenance by attending to problematic areas, clearance of vegetation within the ROW (railway track reserve area) and monitoring.

Other activities include installation of railway track signs, and replacement of railway track furniture, control of litter accumulation on railway track sides, awareness rising on proper railway track/ road use and railway track/ road management to the communities, monitoring and evaluation, management to reduce pollutant concentrations in runoff, disposal of wastes from railway track maintenance activities, storage and management of maintenance materials and equipment.

2.7.5.1 Duration

The duration of this phase will be twenty years (20) years for each particular section of the project.

2.7.5.2 Types, and Sources of Project requirements

Types and sources of project requirements during the operational phase are shown in Table 2.7.

Table 2.7: *Types and sources of project requirements during the operational phase (Maintenance)*

Requirements	Type	Source
Raw Materials	Aggregates	To be identified
	Sand	To be identified
	Water	To be identified
	Cement	Local vendors
	Sleepers	Outside the country
	Rail	Outside the country
	Fastening	Outside the country
Manpower per section	Skilled	TRC
	Unskilled	Local People along the railway track
Equipment	Excavator	TRC
	Wheel loader	
	Water Boozer	
	Bull dozer	
	Motor grader	
	Plate compactor	

Requirements	Type	Source
	Tippers	

Note: All figures provided in the table are indicative and thus they might change during project actual execution and the requirement of the contractor at that particular Lot.

2.7.5.3 Transportation

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

2.7.5.4 Storage

Most of the 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.

2.7.5.5 Types, Amounts and treatment/disposal of Wastes

Types, amounts and treatment/disposal of wastes during the operational phase are shown in Table 2.8.

Table 2.8: Types and treatment/disposal of wastes during the operational phase

Waste	Types	Treatment/ Disposal
Solid Waste (Degradable)	Vegetation (Trees and Grasses)	Composting and used as mulching agent to the nearby farms
Solid Waste (Non-Degradable)	Scrap metals, drums	Sold to Recyclers registered to collect the hazardous waste by national legislation as per ESS3
	concrete, Tins, glasses and plastics	Taken to the Authorized municipal landfill.
Liquid waste	Oils and greases	Car maintenance will be done at proper garages where the spillage occurs, the oil and grease will be taken by the registered hazardous waste management company as

Waste	Types	Treatment/ Disposal
		required by the ESS3 of the ESF of the WB and the national guidelines

2.8 Safety and Health

Safety and Health issues will be followed accordingly in all phases by following the OHS Act, 2003 as well as the requirement of the World Bank Environmental and Social Framework (ESF), ESS4 which 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 an acceleration or intensification of impacts due to project activities. Thus, during the construction the communities shall be protected with the impact from project activities and workers must be provided with appropriate protective gears. During the operation there must be safety officers and representatives committee to overlook all the safety issues with other supporting regulations such as OHS construction rules of 2015. There must be forklifts with alarms and speed limit. The Emergency Assembly Point shall be provided at the front areas of the sites and shall be installed with appropriate safety sign to it.

2.8.1 Emergency Response Plan

Emergencies are undesired event or incidences that require immediate response and attention. In most likely situations, require evacuation to prevent or reduce injuries to personnel, damage to property and environment. Possible emergencies that will be considered include; train accident, Fire emergencies, accidents emergencies which may occur due to trips and falls. The TRC shall develop an emergency response plan to deal with all occurrences as and when it occurs during the project construction to decommissioning phases.

2.8.2 Incident Reporting

Procedure for reporting all emergencies and implementation of corrective actions will be developed by the contractors during construction phase and operator during operation phase. All incidences recorded shall be reported to the client and Leaders in charge.

2.9 Project Boundaries

Determination of project boundaries refers to an identification of impact zones institutionally, temporal and spatially, within which the project impacts will reach. This process involves determination of the extent impacts that would spread away from the core project site. The following project boundaries have been identified.

2.9.1 Institutional boundaries

Institutional boundaries refer to those institutions and sectors which interact with the proposed project in terms of utilities or concern either directly or indirectly. These can be determined from political boundaries, Acts and Regulations, Institutional mandates and administrative organizations.

This proposed project touches the interest of many institutions and administrative units in relation to several policies, laws and plans in Tanzania and several sector ministries. These institutions include NEMC, WB, TASSAC, FIRE, TANESCO, City Councils, OSHA and others.

2.9.2 Temporal boundaries

Temporal boundaries refer to the period and reversibility of impacts. Most of impacts are short term but others may extend to long-term impacts. For example, the impacts such as noises and dusts may be short-lived, but the presence of the railway corridor in the selected ward may have implications that stretch far into the future until when decommissioning is undertaken. For instance, the issues of waste management, emission and dusts pollution may continue to be a problem unless measures are taken to ensure that acceptable limits are adhered to.

Also, consideration needs to be given to what happens when the project ends, where there is a need for decommissioning of the project and site restoration. Some of the impacts that will occur during decommissioning are such as noise, dusts as well as an increase in noise levels especially in the ward which will be caused by demolition activities and will disappear as soon as decommissioning is accomplished. However, some impacts will remain in the environment even after the closure of the project.

2.9.3 Spatial boundaries

Spatial boundaries refer to the dispersion effect of the project impacts. The scale of dispersion can be locally, regionally, either nationally or internationally. The proposed warehouse building in the area will have a wide range of implications that could be felt locally, regionally, nationally, or even internationally thus causing impacts as far as to those areas. Therefore, in determining the spatial dimension of the project it is important to consider impacts in a form like a contour layout.

Starting with the core impact area (the area where the project is located and, which would bear the most impact than the rest). In this case, the core impact area for the project will be all Areas where project will be located.

The second area is the immediate impact area. This is the area surrounding the core area and bears relatively some of the impacts. In case of the proposed building the immediate impact area will be the neighboring villages, towns, and others in general which will benefit from revenues paid by the investor and from different social economic activities. Other immediate impact area includes adjacent communities where most of the labor force, food and goods are likely to come from.

The third area is an area known as the area of influence. In terms of spatial dimension this is the outer most area that consists of centers of decision making that can influence the development of the proposed project. These centers of decision-making include Dodoma, the capital city of Tanzania and Dar es Salaam city which is the biggest city and where most ministries head-offices are located.

CHAPTER THREE

3. EXISTING REGULATORY AND INSTITUTIONAL FRAMEWORK

3.1 Introduction

In this chapter, the national and international laws, policies and regulations relevant to the project are identified and discussed. The objective of this chapter is to understand the key provisions and regulations concerning the proposed project activities related to environmental and social aspects.

The ESIA report with consolidated ESMP was prepared in line with Tanzania's national legislative requirements and applicable international standards. Also, the conventions and protocols ratified by Tanzania and the directives of International Organizations (World Bank) are considered. The Applicable Acts, Regulations, Policies and Guidelines for the construction/ railway sector that are followed in the area are taken into consideration while preparing the ESIA report (listed in Table 3.1). The applicability of each legislation with respect to the proposed project is explained in this section.

Table 3.1: Policies, Acts and Regulations Applicable to the Project

S/No.	Legislation
	Policies
1.	Construction Industry Policy, 2003.
2.	National Employment Policy, 1997.
3.	National Energy Policy, 2003.
4.	National Environmental Policy, 1997. , As amended 2021
5.	National Health Policy, 2003.
6.	National Human Settlements Development Policy, 2000.
7.	National Land Policy, 1995 (revised in 1997).
8.	National Policy on HIV/AIDS, 2001.
9.	National Strategy for Growth and Reduction of Poverty (NSGRP/MKUKUTA) - II, 2010.

S/No.	Legislation
10.	National Tourism Policy, 1998.
11.	National Transport Policy, 2003.
12.	National Water Policy, 2002.
13.	National Women and Gender Development Policy, 2000
14.	Road Safety Policy, 2009.
15.	Sustainable Industries Development Policy, 1996.
16.	Tanzania Wildlife Policy, 1998.
17.	The Mineral policy of Tanzania, 2009.
18.	The National Investment Promotion Policy, 1996.
Acts	
19.	Land Use Planning Act No.10, 2007.
20.	The Employment and Labour Relations Act, 2004.
21.	The Energy and Water Utilities Regulatory Authority Act, 2002.
22.	The Environmental Management Act, 2004.
23.	The Forest Act, 2002.
23.	The HIV and AIDS (Prevention and Control) Act, 2008.
24.	The Land (Amendment) Act, 2004.
25.	The Local Government (Urban Authorities) Acts, 2002.
26.	The Merchant Shipping Act, 2003.
27.	The Occupational Health and Safety Act, 2003.

S/No.	Legislation
28.	The Ports Act, 2004.
29.	The Railways Act, 2002.
30.	The Road Act, 2007.
31.	The Solid Waste Management Act, 2009.
32.	The Surface and Marine Transport Authority Regulatory Act, 2001.
33.	The Urban Planning Act, 2007.
34.	The Village Land Act, 1999.
35.	The Water Resources Management Act, 2009.
36.	The Water Supply and Sanitation Act, 2009.
37.	The Wildlife Conservation Act, 2009.
38.	Water Laws Act, 1999.
39.	Workers Compensation Act, 2008.
Regulations	
40.	Tanzanian harbors regulations, 1991
41.	The Environmental (Registration of Environmental Experts) Regulations, 2005
42.	The Environmental Impact Assessment and Audit Regulations, 2005
43.	The Environmental Management (Air Quality Standards) Regulations, 2007
44.	The Environmental Management (Hazardous Waste Control and Management) Regulations, 2009
45.	The Environmental Management (Soil Quality Standards) Regulations, 2007

S/No.	Legislation
46.	The Environmental Management (Standards for the Control of Noise and Vibration Pollution) Regulations, 2011
47.	The Environmental Management (Water Quality Standards) Regulations, 2007
48.	The Fisheries Regulations, 2009
International Obligations and Treaties	
49.	1996 Convention on Biological Diversity.
50.	ILO Minimum Age Convention (C138), 1973
51.	The 1989 Basel Convention
52.	The 1991 Bamako Convention
53.	Working Environment (Air Pollution, Noise and Vibration) Convention (No. 148)
World Bank Environmental and Social Framework	
54.	Environmental and Social Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
55.	Environmental and Social Standard 2: Labor and Working Conditions
56.	Environmental and Social Standard 3: Resource Efficiency and Pollution Prevention and Management
57.	Environmental and Social Standard 4: Community Health and Safety;
58.	Environmental and Social Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement
59.	Environmental and Social Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

S/No.	Legislation
60.	Environmental and Social Standard 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities
61.	Environmental and Social Standard 8: Cultural Heritage
62.	Environmental and Social Standard 10: Stakeholder Engagement and Information Disclosure

3.2 Applicable policies, acts and regulations

The applicable policies, acts and regulations of Tanzania relevant to the project are given below in **Table 3.2**.

Table 3.2: Applicable Policies, Acts and Regulations

S. No.	National Policies	Description	Relevance to the Proposed Project
Policy			
1.	The National Environmental Policy, 2021	The National Environmental Policy contains policy guidelines, plans and guidance for the determination of priority actions. It provides information for monitoring and regular review of policies, plans and programs. Objectives: • To prevent and control degradation of land, water, vegetation, and air, • To ensure sustainability, security and equitable use of resources, • To conserve and enhance the natural and man-made heritages including the biological diversity of the ecosystems of Tanzania, • To improve the condition and productivity of degraded areas including rural and urban settlements, • To raise public awareness and understanding of the essential linkages between environment and development, • To promote individual and community participation in environmental action, to promote international cooperation on the environment agenda including implementation of Treaties,	In the context the policy aims at prevention, reduction and control of pollution of the inland, water bodies including that from land-based sources of pollution: There should be control of indiscriminate urban development, particularly in vulnerable sites such as river and lakes. Fragile ecosystems and endangered species should be protected by mitigation and prevention of coastal and waterways degradation by controlling pollution of marine water.

S. No.	National Policies	Description	Relevance to the Proposed Project
2.	National Water Policy, 2002	The government launched the water policy in 1991 for overall development and management of water resources. The major aspects, which is addressed in the policy include: • community participation, • community-based management, • institutional aspects, • cost sharing for rural population, • full cost recovery for urban population, • full ownership of the projects, • involvement of the private sector, • water resources and environmental awareness, • improved integration of water and sanitation activities, • external support agency assistance	Identifying and preserving water sources and catchment areas.
3.	**The National Investment Promotion Policy, 1996**	This policy stresses on the need for modernization of equipment and technology upgradation to enable the optimal use of available resources.	It improves the efficiency of operations and the quality of products and co-products etc.
4.	**Construction Industry Policy, 2003**	The Construction Industry Policy is a process for improving the capacity and effectiveness of the construction industry to meet the national economic demand for buildings and other physical infrastructure facilities.	To ensure efficient, transparent and effective implementation and management of construction projects and application of practices, technologies and products which are not harmful to both the environment and human health.
5.	**National Transport Policy, 2003**	The National Transport Policy (2003) aims at providing efficient and cost-effective domestic and international transport services for the population and goods relating to different sectors of the national economy. The policy also aims	The policy recognizes the need for restructuring of rail way for increased infrastructure, safety, security and efficiency in operations.

S. No.	National Policies	Description	Relevance to the Proposed Project
		at ensuring safety and causing minimum environmental degradation.	It promotes Rail way transport for mass movement of passengers and goods. It also reforms and privatizes transport operations and institutions to make the services more efficient.
6.	**National Women and Gender Development Policy, 2000**	The objective of the policy is to provide guidelines that will ensure that gender sensitive plans and strategies are developed in all sectors and institutions.	To eradicate poverty and emphasizes on gender equality and equal opportunity for both men and women to participate in development.
7.	**Road Safety Policy, 2009**	The policy provides for safe environment for road traffic system in accordance with internationally accepted standards. The policy involves the stakeholders and puts emphasis on cooperation and sharing of knowledge, experience, expertise and resources.	It aims at reducing the occurrence and severity of road crashes and consequently the level of fatalities and injuries in an efficient and professional manner and reducing road deaths.
8.	**Tanzania Wildlife Policy (1998)**	The policy administers, regulates and promotes the management of the wildlife resource through continuous establishment of Protected Areas (PA) based on systems planning.	To promotes the conservation of wildlife and its habitats and prevent illegal use of wildlife throughout the country.
9.	**National Energy Policy, 2003**	The National Energy Policy ensures the availability of reliable and affordable energy supplies and their use in a rational and sustainable manner in order to support national development goals.	To establish an efficient energy production, procurement, transportation, distribution and end-use system in an environmentally sound and sustainable manner.

S. No.	National Policies	Description	Relevance to the Proposed Project
10.	**Sustainable Industries Development Policy, 1996**	The policy ensures that the industrial sector is focused on human development. The employment and equitable development by undergoing a structural orientation and enhancing sustainable technological progress.	To create employment opportunities, external balance of payments and economic transformation for achieving sustainable economic growth.
11.	**National Human Settlements Development Policy, 2000**	The policy promotes development of sustainable human settlements and facilitates the provision of adequate and affordable shelters to all income groups in Tanzania.	To improve the level of infrastructure and social services for sustainable human settlements and development. To create employment opportunities and eradicate poverty.
12.	**National Health Policy, 2003**	The policy aims at reducing the burden of disease, maternal and infant mortality and hence increase life expectancy through the provision of adequate and equitable maternal and child health services. It facilitates and ensures the availability of drugs, medicine, other medical supplies and infrastructure.	To promote environmental health and sanitation, adequate nutrition, control of communicable diseases and treatment of common conditions.
13.	**National Employment Policy, 1997**	The policy aims at increasing national productivity by: • Helping people attain gainful and freely chosen productive employment, • Reduce unemployment and underemployment rates. It ensures income security and social inclusion by safeguarding the basic rights and interests of workers in accordance with National and International Labor laws and Standards.	To promotes equal access to employment opportunities and resources for vulnerable groups of women, youth and people with disabilities.

S. No.	National Policies	Description	Relevance to the Proposed Project
14.	**National Strategy for Growth and Reduction of Poverty (NSGRP/MKUKUTA) - II, 2010**	The National Strategy for Growth and Reduction of Poverty is a framework that focuses on poverty reduction: The NSGRP is guided and encouraged by the aspirations of Tanzania's Development Vision (Vision 2025) for high and shared growth, high quality livelihood, peace, stability and unity, good governance, high quality education and international competitiveness. The Strategy promotes the effective participation of civil society, private sector development and local and external partnerships in development and commitment to regional and other international initiatives for social and economic development.	It is committed to the Millennium Development Goals (MDGs) that are internationally agreed targets for reducing poverty, hunger, diseases, illiteracy, environmental degradation and discrimination against women.
ACTs			
15.	**The Environmental Management Act, 2004**	It provides legal and institutional framework for sustainable management of environment. It outlines principles for management, impact and risk assessments, prevention and control of pollution, waste management, environmental quality standards, public participation, compliance and enforcement.	It provides the basis for implementation of international instruments on environment. It also empowers the NEMC to formulate strategies for inland and marine management along with local government authorities.
16.	**Water Laws Act, 1999**	The Act facilitates the private sector participation in water supply and sewerage in Tanzania. It provides guidelines on the tariffs chargeable for provision of water supply and sewerage services and examines and approves them.	It exercises licensing and regulatory functions in water supply and sewer services including the establishment of standards relating to equipment attached to water and sewerage system.
17.	**The Water Supply and Sanitation Act, 2009**	It regulates the establishment of water supply and sanitation authorities and the community owned water supply organizations. It also provides for the appointment of service providers and repeals the Waterworks Act.	To help in sustainable management, adequate operations and transparent regulation of water supply and sanitation services.

S. No.	National Policies	Description	Relevance to the Proposed Project
18.	**The Water Resources Management Act, 2009**	The Act provides institutional and legal framework for sustainable management and development of water resources, prevents and controls water pollution and works on the participation of stakeholders and the general public in implementation of the National Water Policy and repeals the Water Utilization (Control and Regulation) Act. The Act ensures that the nation's water resources are protected, used, developed, conserved, Managed and controlled considering the fundamental principles of meeting the basic human needs and promoting sustainable and beneficial use of water.	Prevents and controls water pollution and works on the participation of stakeholders.
19.	**The Forest Act, 2002**	The Forest Act provides for the management of forests and repeals certain laws relating to forests and other related matters. It promotes and enhances the contribution of the forest sector to the sustainable development of Tanzania and the conservation and management of natural resources for the benefit of present and future generations.	To ensure ecosystem stability through conservation of forest biodiversity, water catchments and soil fertility, sustainable supply of forest products and services.
20.	**The Wildlife Conservation Act, 2009**	The Wildlife Conservation Act makes provisions for the conservation, management, protection and sustainable utilization of wildlife and wildlife products. It is meant to protect and conserve wildlife resources and its habitats in game reserves, wetland reserves, game-controlled areas, wildlife management areas, dispersal areas, migratory route corridors, buffer zone and all animals found in areas adjacent to these areas by putting in place appropriate infrastructure, sufficient personnel and equipment.	To protect, conserve and put in to force existing regulations in areas with great biological diversity, including wetlands and giving special conservation status to endemic, rare or endangered wildlife species.

S. No.	National Policies	Description	Relevance to the Proposed Project
21.	**The Road Act, 2007**	The Road Act makes provisions for road financing, development, maintenance, management and other related matters. The responsibilities of the ministry include formulating road policy, preparing and coordinating the implementation of roads investment and development programmes, preparing guidelines, standards and specifications for road works and monitoring the performance of the road network, to oversee and monitor road safety and environmental issues. The road authority is responsible for the development, maintenance and management of public roads and related facilities.	Monitoring the performance of the road network, to oversee and monitor road safety and environmental issues; and responsible for the development, maintenance and management of public roads and related facilities.
22.	**The Railways Act, 2002 as amended in 2017**	The Railway Act states that it is the railway operator's duty to ensure people's safety during the operation of the railway and that he can internally manage and control a railway with the Land Regulatory Authority (LATRA) consent.	To ensure safety of people during the operation of the railway and that he can internally manage and control a railway with the Land Regulatory Authority (LATRA) consent.
23.	**The Solid Waste Management Act, 2009**	The Act provides the management of solid wastes in conformity with the best environmental practices, that includes: • The methods for handling various types of wastes including their disposal for which reuse, recycling or composting alternatives are available and implements standards and requirements for waste handling, separation and processing, • It also establishes the licensing and permitting system for the regulation of waste management facilities, equipment and waste haulage and prescribes fees for the issue of licenses, permits, inspections and other services related to waste management.	To handle various types of wastes including their disposal for which reuse, recycling or composting alternatives are available and implements standards and requirements for waste handling, separation and processing.

S. No.	National Policies	Description	Relevance to the Proposed Project
24.	**The Employment and Labor Relations Act, 2004**	The Employment and Labour Relations Act makes provisions for core labour rights, establishes basic employment standards, provides a framework for collective bargaining, works to prevent and settle disputes and related matters.	To promote economic development through economic efficiency, productivity and social justice and providing the legal framework for effective and fair employment relations and minimum standards regarding conditions of work.
25.	**The Occupational Health and Safety Act, 2003**	The Act repeals the Factories Ordinance. It makes provisions for the safety, health and welfare of workers at work in factories and other places of work.	To protect workers against hazards to health and safety arising due to activities of the workers. This act is applicable to or covers other employees also and any kind of occupational hazard is covered.
26.	**The HIV and AIDS (Prevention and Control) Act, 2008**	The Act provides for the prevention, treatment, care, support and control of HIV and AIDS. It promotes public health in relation to AIDS and provides for appropriate treatment, care and support using available resources to people living with or at risk of HIV and AIDS. The ministry is responsible for establishing a comprehensive system of monitoring and evaluation mechanisms to determine the magnitude and progression of HIV infections and other matters relating to HIV and AIDS.	To promote public health in relation to HIV and AIDS. Provide for appropriate treatment, care and support to people living with or at risk of HIV and AIDS using available resources.
27.	**The Ports Act, 2004**	The Ports Act established the Tanzania Ports Authority and stipulated its functioning and powers. It also repealed the Tanzania Harbors Authority Act, 1977.	The functions of the Authority include managing the operations of the sea and inland waterways and ports by enhancing the geographical position of Tanzania as maritime nation by securing the provision of services in loading and unloading of cargo and passenger services. It develops, promotes and manages the port's infrastructure and maintains port safety and

S. No.	National Policies	Description	Relevance to the Proposed Project
			security. Since the project started from the Port area thus proponent has to abide with this Act
28.	**The Surface and Marine Transport Regulatory Authority Act, 2001 Now TASAC**	The Surface and Marine Transport Regulatory Authority (SUMATRA) Act establishes a regulatory authority in relation to surface and marine transport sectors and provides information for its operation in place of former authorities. The functions of the Authority include protecting the interests of consumers, protecting the financial viability of efficient suppliers, promoting the availability of regulated services to all consumers including low income, rural and disadvantaged consumers.	The authority can: Issue, renew and cancel licenses, Establish standards for regulated goods and services, Establish standards for the terms and conditions of supply of the regulated goods and sources, Regulate rates, charges and makes rules.
29.	**The Energy and Water Utilities Regulatory Authority Act, 2002**	The Act establishes a regulatory authority in relation to energy and water utilities. It establishes standards for goods and services, regarding the terms and conditions of supply of goods and services and regulate rates and charges.	Monitors the performance of the regulated sectors in relation to levels of investment, availability, quantity and standard of services.
30.	**Workers Compensation Act, 2008**	The Act contains regulations for compensation to employees in case of disablement or death, injuries or diseases sustained in the course of employment and identifies the source of the funds for administration and regulation of workers compensation.	To provide rehabilitation and adequate compensation to employees who suffer occupational casualties.
Regulations			

S. No.	National Policies	Description	Relevance to the Proposed Project
31.	**The Environmental Impact Assessment and Audit Regulations, 2005 as amended 2018**	The main objectives of environmental audit are to determine how far activities and processes of a project or undertaking conform to the approved environmental and social management plan of that specific project, environmental management practices and environmental quality standards and provide regulatory bodies with a framework for checking compliance with, and the performance of an Environmental and Social Management Plan.	It ensures that environmental considerations are properly addressed and incorporated in the decision-making process meant for development
32.	**The Environmental (Registration of Environmental Experts) Regulations, 2005 as amended 2021**	These Regulations establish a system for registration of environmental experts. They provide a system of professional conduct for carrying out environmental impact studies and environmental audits ensuring that the environmental impact assessments and audits are carried out in independent, professional and impartial manner.	It provides for a code of conduct for environmental experts. These rules are needed to maintain discipline and exercise some degree of control over the environmental experts.
33.	**The Environmental Management (Air Quality Standards) Regulations, 2007**	These Regulations set baseline parameters on air quality and emissions based on acceptable limits and enforces minimum air quality standards prescribed by the National Environmental Standards Committee.	To set baseline parameters on air quality and emissions based on acceptable limits and enforces minimum air quality standards prescribed by the National Environmental Standards Committee.
34.	**The Environmental Management Hazardous Waste Control and Management Regulations, 2009**	These Regulations ensure the safe storage and disposal of hazardous wastes of all categories and their movement into and out of Mainland Tanzania.	To ensure that the standards prescribed for the hazardous waste management are followed and remain operational all the time and the waste effluents are treated or modified to comply with the prescribed standards before final disposal.

S. No.	National Policies	Description	Relevance to the Proposed Project
			The hazardous liquid wastes generated from campsite and on-site works are supposed to be treated to meet the environmental standards before their discharge into public sewers, municipal oxidation ponds, open land or into receiving water bodies.
35.	**The Environmental Management Water Quality Standards) Regulations, 2007**	The objective of these regulations is to enforce minimum water quality standards prescribed by the National Environmental Standards Committee. To enable the National Environmental Standards Committee to determine water usages for purposes of establishing environmental quality standards and values for each usage. To ensure all discharges of pollutants considering the ability of the receiving waters to accommodate contaminants. The National Environmental Standards Committee of Tanzania Bureau of Standards is responsible for establishing the minimum standards for the treatment of effluents before their final discharge into public sewer systems.	To enforce minimum water quality standards prescribed by the National Environmental Standards Committee.
36.	**The Environmental Management Standards for the Control of Noise and Vibration Pollution) Regulations, 2011**	These Regulations prescribe the maximum permissible noise and vibration levels from a facility or activity to which a person can be exposed.	To take controlling and mitigating measures for the reduction of noise and vibration

S. No.	National Policies	Description	Relevance to the Proposed Project
37.	**The Environmental Management (Soil Quality Standards) Regulations, 2007**	The objectives of these Regulations include: Setting limits for soil contaminants in agriculture and other habitats, Enforcing and prescribing minimum soil quality standards prescribed by the National Environmental Standards Committee (NESC), Ensuring implementation of criteria and procedures prescribed by the NESC for the measurement and determination of soil quality, To prescribe measures and guidelines for soil management and ensure their compliance.	To enforce and prescribe minimum soil quality standards prescribed by the National Environmental Standards Committee (NESC)
38.	**The Environmental Management (Control o f Ozone Depleting Substances)**	The objectives of these Regulation included: To eliminate the production and consumption of ozone depleting substances in accordance with the phase out schedule of the Montreal Protocol; To control and monitor the amount of ozone depleting substances entering or leaving the United Republic of Tanzania; To promote measures, strategies, programmers, incentives, equipment and technologies in favor of the use of ozone friendly substances, products and equipment in line with national obligation specified by the Montreal Protocol;	To enforce and prescribe the use of ozone friendly substances, products and equipment.

S. No.	National Policies	Description	Relevance to the Proposed Project
39.	**The Fisheries Regulations, 2009**	The objectives of these Regulations include: The control and management of fisheries on a sustainable basis, Taking care of other matters prescribed under the Fisheries Act 1995, Making consequential amendments to the Fisheries (Fees, Royalties and Levies) Regulations, 2008.	Control and management of fisheries on a sustainable basis.
National Plans			
40.	**National Plan Of Action To End Violence Against Women And Children In Tanzania 2017/18 – 2021/22**	The main objective of this plan is to Eliminate violence against women and children in Tanzania and improve their welfare.	The project is passing to number of the area having different social, cultural and economic values that triggering the project proponent, contractor and supervising consultant to ensure the need of the plan are adhered.

3.3 International obligations and treaties

The international obligations and treaties in which Tanzania is a part are explained below in **(Table 3.3)**

Table 3.3: International Obligations and Treaties

S. No.	International Obligations and Treaties	Description
1.	Working Environment (Air Pollution, Noise and Vibration) Convention (No. 148).	The convention establishes and states the criteria for determining the hazards of exposure to air pollution, noise and vibration in the working environment and specifies exposure limits based on these criteria.
2.	The Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (also known as the 1972 London Convention).	The convention promotes the effective control of all sources of marine pollution and takes practicable steps to prevent pollution of the sea by dumping of wastes and other matters.
3.	The 1991 Bamako Convention.	It is a convention of African nations which prohibits the dumping of hazardous and radioactive wastes into Africa. This convention controls the transboundary movement of hazardous wastes within the continent. Hence, prohibiting all ocean and inland water dumping.
4.	The 1989 Basel Convention.	The convention aims at reducing hazardous waste generation by ranging them based on their origin, composition and characteristics.
5.	1996 Convention on Biological Diversity.	This convention develops national strategies for the conservation and sustainable use of biological diversity, ensuring fair and equitable sharing of the benefits arising from genetic resources.
6.	ILO Minimum Age Convention (C138), 1973.	The convention talks about the minimum age for employment, to ensure the abolition of child labour. In Tanzania, according to the Employment and Labour Relations Act, 2004; the minimum age for employment is 14 years, who shall only be employed to do light work which won't harm the child's health and development.

3.4 World Bank's Environmental and Social Framework

The World Bank Environmental and Social Framework sets out the World Bank's commitment to sustainable development, through a Bank Policy and a set of Environmental and Social Standards that are designed to support Government of Tanzania's projects, with the aim of ending extreme poverty and promoting shared prosperity.

This Framework comprises:

- A Vision for Sustainable Development, which sets out the Bank's aspirations regarding environmental and social sustainability;
- The World Bank Environmental and Social Policy for Investment Project Financing, which sets out the mandatory requirements that apply to the Bank; and
- The Environmental and Social Standards, together with their Appendixes, which set out the mandatory requirements that apply to the Government of Tanzania,

This ESIA has reviewed the above framework's components' relevance to the Project as shown in the below sub sections;

3.4.1 Vision for Sustainable Development

World Bank Group is globally committed to environmental sustainability, including stronger collective action to support climate change mitigation and adaptation, recognizing this as essential in a world of finite natural resources. It recognizes that climate change is affecting the nature and location of projects, and that World Bank-financed projects should reduce their impact on the climate by choosing alternatives with lower carbon emissions.

Equally, social development and inclusion are critical for all of the World Bank's development interventions and for achieving sustainable development.

At the project level, these global aspirations translate into enhancing development opportunities for all, particularly the poor and vulnerable, and promoting the sustainable management of natural and living resources. Therefore, within the parameters of a project, the Bank seeks to

- Address project-level impacts on climate change and consider the impacts of climate change on the selection, siting, planning, design and implementation and decommissioning of projects;
- Maximize stakeholder engagement through enhanced consultation, participation and accountability.
- The designs of urban roads and drainage channels have observed the vision of sustainable development by ensuring climate change adaptation strategies have been taken into considerations.

3.4.2 World Bank Environmental and Social Policy for Investment Project Financing

This Environmental and Social Policy for Investment Project Financing sets out the mandatory requirements of the Bank in relation to the projects it supports through Investment Project Financing. The Bank is committed to supporting Tanzania government in the development and implementation of projects that are environmentally and socially sustain-able, and to enhance the capacity of Borrowers 'environmental and social frameworks to assess and manage the environmental and social risks and impacts of projects.

The Bank will assist Tanzania government in their application of the ESSs to projects supported through Investment Project Financing in accordance with this Environmental and Social Policy for Investment Project Financing (Policy).

To carry out this Policy, the Bank will:

- Undertake its own due diligence of proposed projects, proportionate to the nature and potential significance of the environmental and social risks and impacts related to the project;
- As and where required, support the Tanzania government to carry out early and continuing engagement and meaningful consultation with stakeholders, in particular affected communities, and in providing project-based grievance mechanisms;

The Bank shall evaluate the environmental and social risks management plan including the extent of stakeholders' engagement on the project throughout.

3.5 World Bank Environmental and Social Standards (ESSs)

3.5.1 Environmental and Social Standard 1: Assessment and Management of Environmental and Social Risks and Impacts

ESS1 sets out the Borrower's (GoT) 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, in order to achieve environmental and social out-comes consistent with the Environmental and Social Standards (ESSs).

The Government of Tanzania through TRC is required to conduct environmental and social assessment of TIRP 2 project for Bank financing to help ensure that projects is environmentally and socially sound and sustainable. The environmental and social assessment should be proportionate to the risks and impacts of the subproject. It will inform the design of the project, and be used to identify mitigation measures and actions and to improve decision-making.

TRC will manage environmental and social risks and impacts of the project throughout the project life cycle in a systematic manner, proportionate to the nature and scale of the project and the potential risks and impacts.

ESS1 includes the following Appendixes, which form part of ESS1, and set out certain requirements in more detail:

- Appendix 1: Environmental and Social Assessment;
- Appendix 2: Environmental and Social Commitment Plan; and
- Appendix 3: Management of Contractors

Among the requirements under ESS1 relevant to the Upgrading of the Rail way line project include: Conduct an environmental and social assessment of the proposed project, including stake holder engagement; Undertake stakeholder engagement and disclose appropriate information; Develop an ESCP, and implement all measures and actions set out in the legal agreement including the ESCP; and Conduct monitoring and reporting on the environmental and social performance of the project against the ESSs.

In addition, the proposed project should apply the relevant requirements of the Environmental Health and Safety Guidelines (EHSGs) once Tanzanian requirements differ from the levels and measures presented in the EHSGs, the GoT will be required to achieve or implement the more stringent.

The proposed projects have been conducted with ESIA study and adequately undertaken stakeholders' engagement as required by ESS1 in order to create the sense of ownership by the community and sustainability. TRC shall prepare ESCP and sign legal agreement on its implementation.

3.5.2 Environmental and Social Standard 2: Labor and Working Conditions

ESS2 recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. The government of Tanzania is required to promote sound worker-management relationships and enhance the development benefits of rail way transport sector under TIRP 2 project by treating workers in the project fairly and providing safe and healthy working conditions.

Among ESS2, objectives include:

- To promote safety and health at work
- To promote the 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, in accordance with this ESS) and migrant workers, contracted workers, community workers and primary supply workers, as appropriate.
- To prevent the use of all forms of forced labor

The project contractor shall adhere to the objectives under regular audits to be conducted by TRC, OSHA and the project Supervising Engineer. However, specific project's Labour Management Procedures (LMP) have been prepared to guide labour issues during construction and operation of the proposed roads and drainage channels.

3.5.3 Environmental and Social Standard 3: Resource Efficiency and Pollution Prevention and Management

ESS3 recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, eco- system services and the environment at the local, regional, and global levels The current and projected atmospheric concentration of greenhouse gases (GHG) threatens the welfare of current and future generations At the same time, more efficient and effective resource use, pollution prevention and GHG emission avoidance, and mitigation technologies and practices have become more accessible and achievable.

Among ESS3, objectives include:

- 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 generation of hazardous and non-hazardous waste
- To minimize and manage the risks and impacts associated with pesticide use

On pollution prevention and management, the Government of Tanzania through TRC will avoid the release of pollutants or, when avoidance is not feasible, minimize and control the concentration and mass flow of their release using the performance levels and measures specified in national law or the EHSGs, whichever is most stringent.

During construction, operation of machineries, equipment and plant shall contribute on GHG emissions. Contractor shall adhere to all recommended actions to reduce GHG emissions from operating vehicles and plant. In addition, installation of diesel generators to the stations or camp site as an emergency power supply shall be taken into account as GHG contributor. Low emissions generator has been proposed in chapter 2 of this ESIA.

3.5.4 Environmental and Social Standard 4: Community Health and Safety

ESS4 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 an acceleration or intensification of impacts due to project activities.

ESS4 addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of GoT through TRC to avoid or minimize such risks and impacts, with particular attention to people who, because of their particular circumstances, may be vulnerable.

Objectives of the ESS4 include:

- 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 consider actions relating to climate change, in the design and construction of infrastructure, including dams.
- To avoid or minimize community exposure to project-related traffic and road safety risks, diseases and hazardous materials
- 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

ESS4 requires:

The GoT will design, construct, operate, and decommission the structural elements of the project in accordance with national legal requirements, the EHSGs and other GIIP, taking into consideration safety risks to third parties and affected communities.

Where the project involves provision of services to communities, the GoT will establish and implement appropriate quality management systems to anticipate and minimize risks and impacts that such services may have on community health and safety. In such circumstances, the GoT will also apply the concept of universal access, where technically and financially feasible.

The proposed project has identified, evaluated and shall monitor the potential health and safety risks to workers, affected communities and other users throughout the project life cycle. The ESMP has incorporated technically and financially feasible safety measures into the project's designs to prevent and mitigate potential safety risks to all users and affected communities.

3.5.5 Environmental and Social Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement

ESS5 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. The term "involuntary resettlement" refers to these impacts Resettlement is considered involuntary when affected per sons or communities do not have the right to refuse land acquisition or restrictions on land use that result in displacement.

Objectives of ESS5 include:

- 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 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 prior to the beginning of project implementation, whichever is higher

- To improve living conditions of poor or vulnerable persons who are physically displaced, through provision of adequate housing, access to services and facilities, and security of tenure
- 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 dis closure of information, meaningful consultation, and the informed participation of those affected

Among the requirements of ESS5 include the following:

- The GoT will demonstrate that involuntary land acquisition or restrictions on land use are limited to direct project requirements for clearly specified project purposes within a clearly specified period. Will consider feasible alternative project designs to avoid or minimize land acquisition or restrictions on land use, especially where this would result in physical or economic displacement, while balancing environmental, social, and financial costs and benefits, and paying particular attention to gender impacts and impacts on the poor and vulnerable.
- When land acquisition or restrictions on land use (whether permanent or temporary) cannot be avoided, the GoT will offer affected persons compensation at replacement cost, and other assistance as may be necessary to help them improve or at least restore their standards of living or live-livelihood, subject to the provisions of paragraph 26 through 36 of this ESS.
- Compensation standards for categories of land and fixed assets will be disclosed and applied consistently Compensation rates may be subject to upward adjustment where negotiation strategies are employed. In all circumstances, a clear basis for calculation of compensation will be documented, and compensation distributed in accordance with transparent procedures.
- Where livelihoods of displaced persons are land-based, or where land is collectively owned, the GoT will offer the displaced persons an option for replacement land in

accordance with paragraph 35(a), unless it can be demonstrated to the Bank's satisfaction that equivalent replacement land is unavailable.

- The GoT will take possession of acquired land and related assets only after compensation in accordance with this ESS has been made available and, where applicable. In addition, livelihood restoration and improvement programs will commence in a timely fashion in order to ensure that affected persons are sufficiently prepared to take advantage of alternative livelihood opportunities as the need to do so arises.
- The GoT will ensure that a grievance mechanism for the project is in place, in accordance with ESS10 as early as possible in project development to address specific concerns about compensation, relocation or livelihood restoration measures raised by displaced persons (or others) in a timely

3.5.6 Environmental and Social Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

ESS6 recognizes the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they support. This ESS also addresses sustainable management of primary production and harvesting of living natural resources. ESS6 recognizes the need to consider the livelihood of project-affected parties, including Indigenous Peoples, who's access to, or use of, biodiversity or living natural resources may be affected by a project. The potential, positive role of project-affected parties, including Indigenous Peoples, in biodiversity conservation and sustainable management of living natural resources is also considered

Objective of ESS6 include but not limited to,

- 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.

ESS6 requirements include among others:

- The environmental and social assessment as set out in ESS1 will consider direct, indirect and cumulative project-related impacts on habitats and the biodiversity they support. This assessment will consider threats to biodiversity, for example habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading, pollution and incidental take, as well as projected climate change impacts.
- Through the environmental and social assessment, the GoT will identify the potential project related risks to and affects habitats and the biodiversity that they support.
- The GoT's assessment will include characterization of baseline conditions to a degree that is proportional and specific to the anticipated risk and significance of impacts.

The proposed site has no sensitive biodiversity however along its chain age it was observed to cross in the area where there is wildlife animal corridor and in some other there are protected forest reserve.

3.5.7 Environmental and Social Standard 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities

ESS7 contributes to poverty reduction and sustainable development by ensuring that projects supported by the Bank enhance opportunities for Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities to participate in, and benefit from, the development process in ways that do not threaten their unique cultural identities and well-being.

Among the ESS7 objectives include:

- To ensure that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/ Sub-Saharan African Historically Underserved Traditional Local Communities.

- To improve project design and promote local support by establishing and maintaining an ongoing relationship based on meaningful consultation with the Indigenous

Peoples/Sub- Saharan African Historically Underserved Traditional Local Communities affected by a project throughout the project's life cycle.

Among the general requirements of ESS7, include: 11. A key purpose of this ESS is to ensure that Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities present in, or with collective attachment to, the project area are fully consulted about, and have opportunities to actively participate in, project design and the determination of project implementation arrangements. The scope and scale of consultation, as well as subsequent project planning and documentation processes, will be proportionate to the scope and scale of potential project risks and impacts as they may affect Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities.

During ESIA study, no Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities were identified within or near the proposed sites.

3.5.8 Environmental and Social Standard 8: Cultural Heritage

This ESS sets out general provisions on risks and impacts to cultural heritage from project activities ESS7 sets out additional requirements for cultural heritage in the context of Indigenous Peoples. ESS6 recognizes the social and cultural values of biodiversity. Provisions on Stakeholder Engagement and Information Disclosure are set out in ESS10.

Objectives of the ESS8 include:

- 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,
- To promote meaningful consultation with stakeholders regarding cultural heritage,
- To promote the equitable sharing of benefits from the use of cultural heritage

ESS8 requires:

- The environmental and social assessment, as set out in ESS1, will consider direct, indirect and cumulative project-specific risks and impacts on cultural heritage. Through the environmental and social assessment, the GoT will determine the potential risks and impacts of the proposed activities of the project on cultural heritage.

- The GoT will avoid impacts on cultural heritage. When avoidance of impacts is not possible, the GoT will identify and implement measures to address impacts on cultural heritage in accordance with the mitigation hierarchy.

During impacts' assessment study and through communities and stakeholders' consultations, there is heritage site was identified to be within or near the project

3.5.9 Environmental and Social Standard 10: Stakeholder Engagement and Information Disclosure

This ESS 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.

Objectives of ESS10 are:

- 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 their 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,

- 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.

ESS10 requirements among others include:

- The GoT will engage with stakeholders through- out the project life cycle, commencing such engagement as early as possible in the project development process and in a timeframe that enables meaningful consultations with stakeholders on project design. The nature, scope and frequency of stakeholder engagement will be proportionate to the nature and scale of the project and its potential risks and impacts.
- The GoT will engage in meaningful consultations with all stakeholders. Will provide stakeholders with timely, relevant, understandable and accessible information, and consult with them in a culturally appropriate manner, which is free of manipulation, interference, coercion, discrimination and intimidation.
- The process of stakeholder engagement will involve the following, as set out in further detail in this ESS:
  (i) Stakeholder identification and analysis;
  (ii) Planning how the engagement with stakeholders will take place;
  (iii) Disclosure of information;
  (iv) Consultation with stakeholders;
  (v) Addressing and responding to grievances; and
  (vi) Reporting to stakeholders.

The TIRP 2 project has prepared a specific Stakeholder Engagement Plan (SEP) for the proposed projects which guided consultations during the ESIA stage.

3.6 The World Bank ESH Guidelines

Once a member of the World Bank Group is involved in a project, adherence to the EHS Guidelines is mandatory as a matter of policy. The General EHS Guidelines are a set of technical reference documents which addresses "Good International Industry Practices" in four focus areas:

1) Environmental
2) Occupational Health and Safety

3) Community Health and Safety and
4) Construction and Decommissioning

The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project based on the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are considered.

Under TIRP project, these guidelines shall be implemented during construction and operation of the project.

CHAPTER FOUR

4. BASELINE ENVIRONMENTAL & SOCIO- ECONOMIC CONDITIONS

4.1 Introduction

This chapter provides baseline information on the existing physical, biological and socio-economic conditions in the area studied under this project.This baseline information is used as a benchmark to identify and determine the level of potential impact due to the project. This data has to be taken into account in planning of the monitoring and mitigation requirements.

The baseline information was collected from primary and secondary data sources. Primary information was collected through field study, consultations, and satellite images. The secondary information was collected from published journals, books, authorized websites, government reports and previous studies.

4.2 Area of Influence

The Area of Influence includes the Project site (the land to be used for the proposed corridor (each side) see figure 5.1, the area surrounding the proposed project to be potentially affected and nearby communities, laydown area and materials sites' locations (i.e. borrow pits and quarry sites). The area of influence for this project are defined as:

- The area likely to be affected include:
  - (i) The project's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project;
  - (ii) Impacts from unplanned but predictable developments caused by the project that may occur later or at different location/s; or
  - (iii) Indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.
- Supporting infrastructures which are facilities that are not part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.
- Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably

defined developments at the time the risks and impacts identification process is conducted.

4.2.1 Direct Area of Influence

In the context of this report, the Direct Area of Influence includes the proposed railway road footprint as well as the receiving environment surrounding the railway track likely to be affected by the Project activities during construction, operation, and decommissioning phases within a radius of 0.5km.

This also includes areas that will be impacted by the construction of the railway track, health and safety impacts (including disturbance from noise and dust during construction), and construction camps and immigration of job opportunists into the local area.

4.2.2 Indirect Area of Influence

The Indirect Area of Influence includes areas beyond the proximity of the project's buffer zone radius (0.5km) of the Project site, which may be affected by the Project although to a lesser extent see figure 4.1 for Dar es Salaam and in Appendix 2 for other regions.

The area was selected so as to counter check the effects of other human activities that may contribute impacts to the project or causing superimposition impacts as that of the project especially in the town areas.

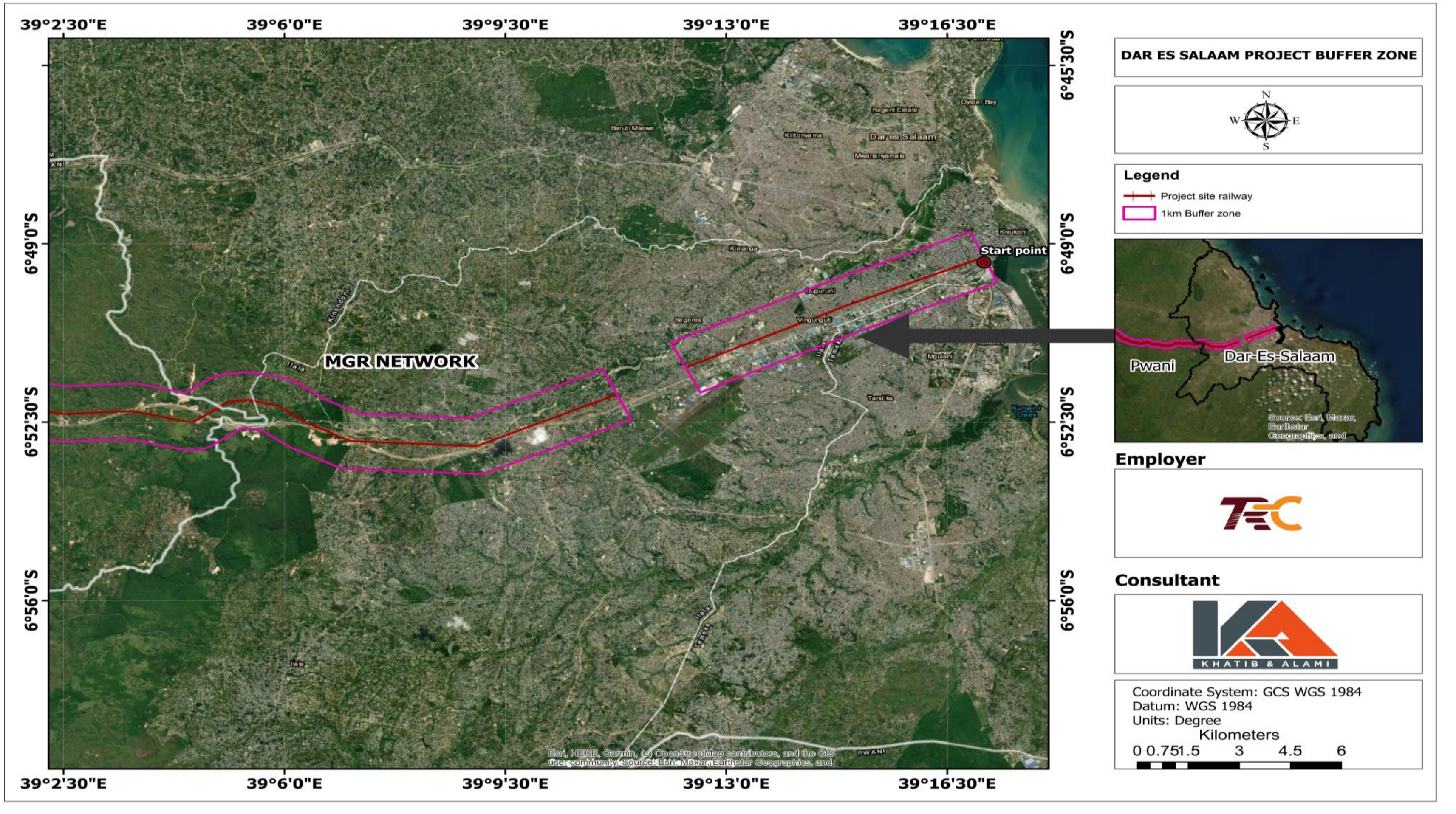


Figure 4.1: Project Area of Influenc

4.3 Sensitivity Screening

Based on the sensitivity screening (reviewing of the WB –ESF- especially ESS6) undertaken for the areas along proposed project, the proposed project route passing through or nearby some most valuable ecosystem, i.e., swamps and rivers, (see Figure 4.2) and refer to section 2.5. There are no conservation plans along the railway road for the municipalities and districts connected by the proposed project; however, the project crosses and goes parallel with a number of rivers (Ruvu, Wami and Kondoa River) and tributaries that direct its water to the Indian Ocean, hence Biodiversity Areas are present or defined.

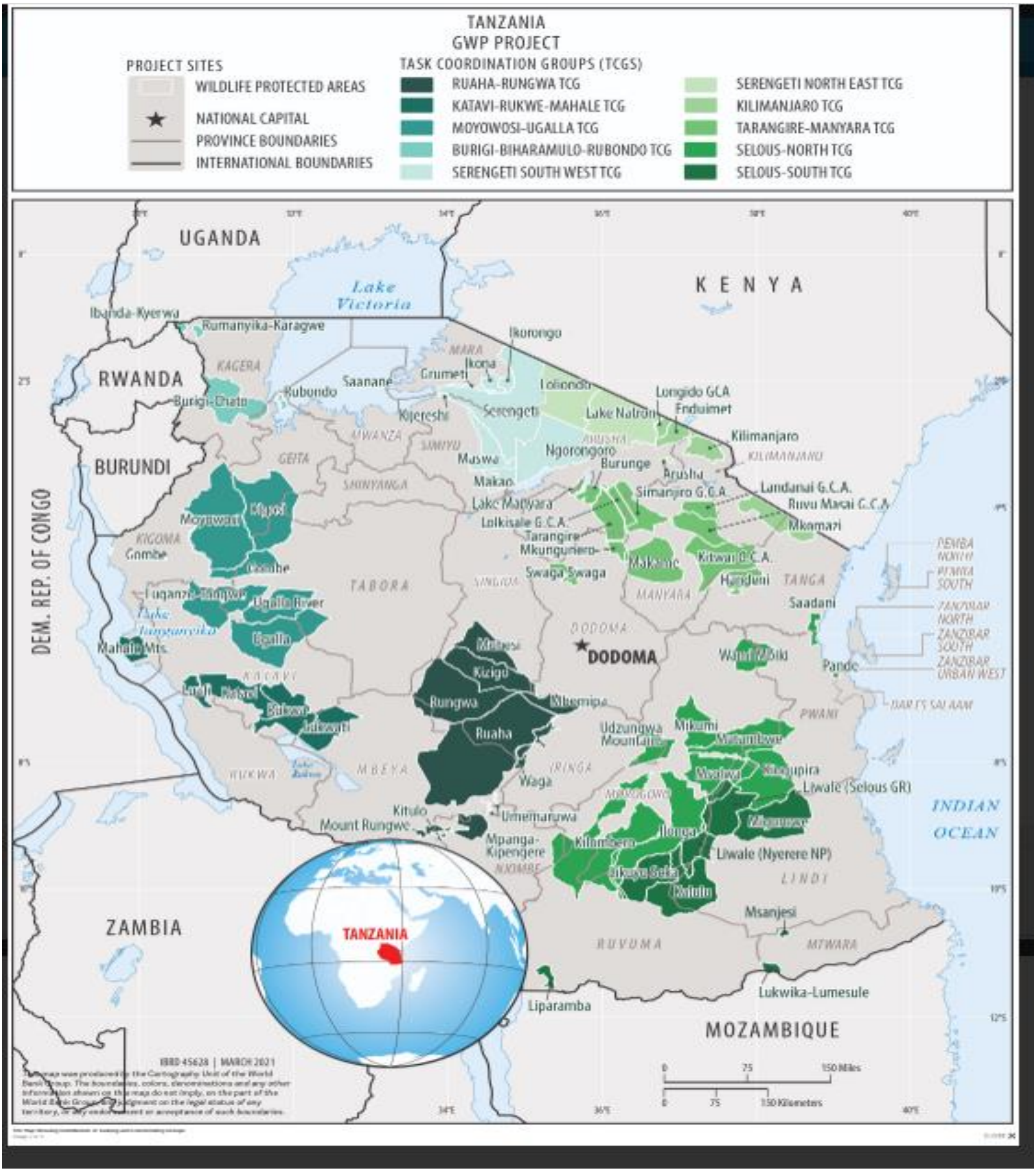


Figure 4.2: Conserver Area

4.4 Land use and land cover of the area

Referring section 2.3 the project site crossing seven Regions and 17 Districts of Tanzania having different land uses varying from agricultural, industries, forest reserves, residential, bare lands, water reserving areas, etc. (see figure 4.3) and in the appended summary of social economic in the appendix 8. As far as the buffer zone of this project is concerned, land use has undergone great changes over time. The area of cropland has been decreased; the area of construction land has been increased significantly. The area of forest/grassland and water area fluctuated slightly around the average line. The introduction of New SGR line has contributed to about 70% of this in the project corridor.

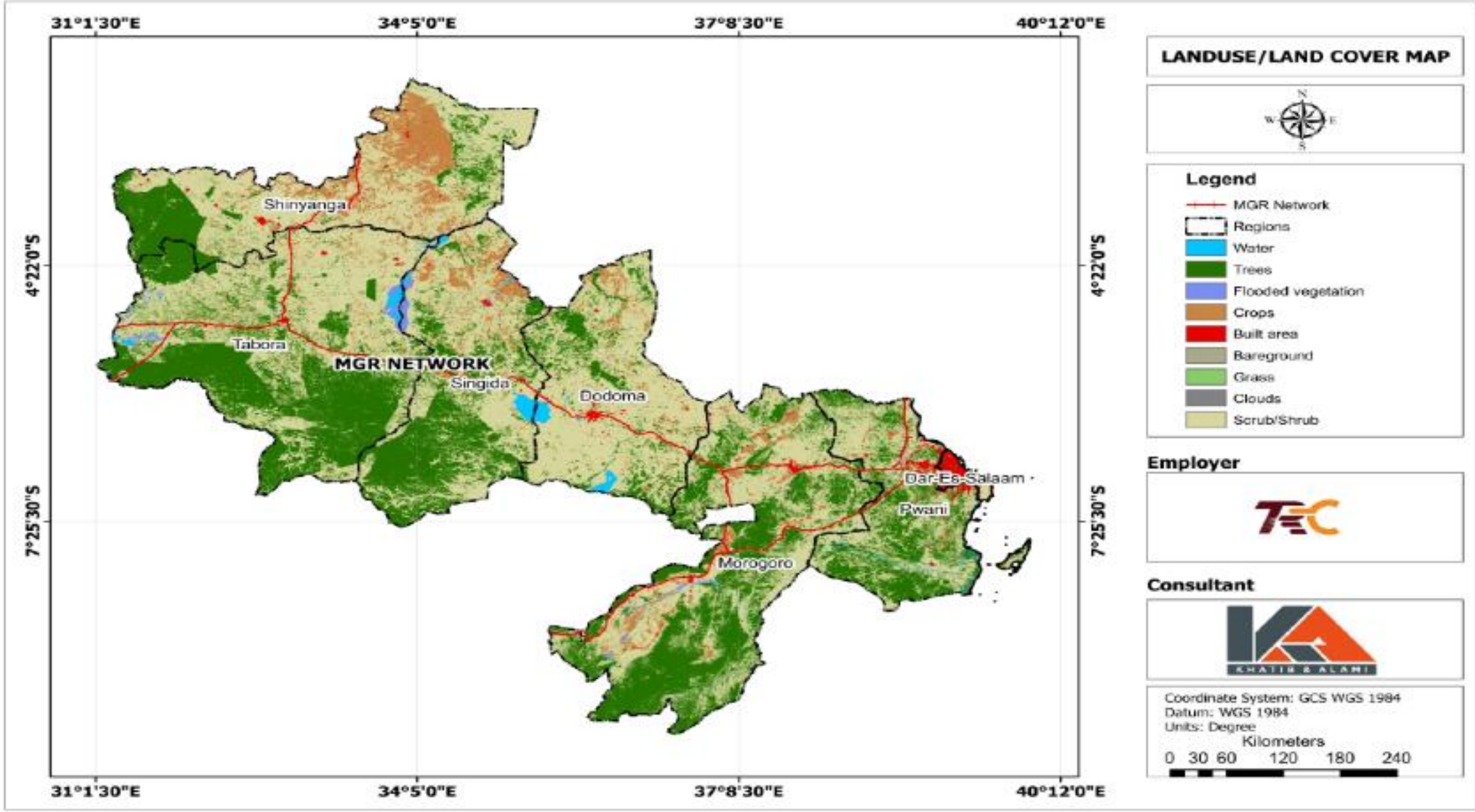


Figure 4.3: Land use in the project corridor

4.5 Environment and social status of the project study area

The environment and social status of the project area to be described in this section is divided in the following sub sections

(i) Physical characteristics
(ii) Biological Characteristics
(iii) Social Economic Characteristics. This will be presided by lesson learnt from TIRPI

4.5.1 Physical Environment

4.5.1.1 Climate

This section shall be based on the finding given by Tanzania Metrological Agency (TMA) from its recently official published statement bears the name as "Statement on the Status of Tanzania Climate In 2021". The paper stated that Tanzania as one of the developing countries, also suffers to the impact of the climatic change such as Increasing temperatures, sea level rise, changing precipitation patterns and frequent extreme weather events that might threaten human life and safety, water and pasture availability, food security, and socio-economic development. It also identifies that the extreme temperatures, heavy rainfall, floods, prolonged dry spells, and droughts have significantly caused damage to infrastructures, disruptions of agricultural activities, and even increased habitat suitability for biting insects, pests, and transmission of vector-borne diseases.

Climate of Tanzania

- Temperature range

Temperatures across the country are normally characterized by relatively less fluctuation throughout the year. The annual long-term average temperature over different stations in the country ranges from 14.4 °C to 26.4 °C. Regions with the highest temperatures are along the coast and western parts of the country. The season with high temperatures starts from October through February or March of the following year, while the cold season is from May to August. The annual minimum air temperature (Tmin) and maximum air temperature (Tmax) across the stations in the country ranges from 9.6 °C to 22 °C and 19.1 °C to 30.7 °C respectively.

On average, November and December were the warmest months of the year 2021, November being a record break in historical perspective while December being the third warmest on record since 1970. In those months the country average air temperature anomaly was 1.3 °C and 1 °C above long term average (1981-2010). In addition, higher maximum temperature anomaly between 1°C and 2 °C above long term average were observed over large part of the country in November, except northern coast, north-eastern highlands, and southern regions whose temperature anomaly exceeded 2 °C. Likewise, maximum temperature anomaly exceeding 2 °C was observed in southern region extending to southwestern highlands during December. On the other hand, September recorded relatively warmer nights, whereby many parts of the country recorded temperature anomalies between 1°C and 2 °C above long term average.

- Rainfall distribution

The rainfall distribution and variability are driven by multiple factors including East African Monsoon, El-Niño Southern Oscillation (ENSO), and westerlies from Congo, tropical cyclones, and Inter-Tropical Convergence Zone (ITCZ). The migration of ITCZ north and south across the equator is among the main factors affecting the distribution and variability of rainfall in Tanzania and the entire East African region. The migration of ITCZ lags the overhead sun by 3-4 weeks over the region. The ITCZ migrates to southern regions of Tanzania in October to December, reaching southern part of the country in February and reverses northwards in March, April, and May. Due to this movement, some areas experience single and double passages of the ITCZ. The areas that coincide with single passage are known as unimodal areas. These include the southern, southwestern, central, and western parts of the country, which receive rainfall from November to April or May (NDJFMA, also known as Msimu). Areas that experience double passage are known as bimodal, and include northern coast, northeastern highlands, Lake Victoria areas, and the Islands of Zanzibar (Unguja and Pemba). These regions receive two distinct rainfall seasons. The long rainy season (also known as Masika), which starts mainly in March and continues through May (MAM) and the short rainfall season (also called Vuli) which starts in October and continues through December (OND). January and February are the transition period (relatively dry) for bimodal areas while June, July, August, and September are dry months for the entire country.

The country total rainfall for 2021 was 847.2 mm, which is 177.5 mm below the long-term average and equivalent to 82.7% of average. This observation makes 2021 to be the fourth driest year on record since 1970, where 2003, 2012, and 2005 were the first, second, and third driest years respectively. Most parts of the country received normal rainfall ranging between 75% and 100% of average, except for the northern coastline including Zanzibar Islands, which received below normal rainfall ranging between 50% and 75% of average. However, the year 2021 was particularly wet over southeastern Tanzania, specifically, the eastern part of Mtwara region which recorded above normal rainfall ranging between 125% and 150%.

Local and Site-Specific Climate

The information is based on the published statement by TMA of 2021 compared with other previously statements. Rainfall across the entire stretch of the proposed MGR from Dar es Salaam to Isaka is variable. The southern, southwestern, central, and western parts of the country receiving single passage of rainfall (unimodal) from November to April or May (also known as Msimu). While other Areas experiences double passage of rain fall which known as bimodal. Those regions include northern coast, northeastern highlands, Lake Victoria areas, and the Islands of Zanzibar (Unguja and Pemba). The long rainy season (also known as Masika), which starts mainly in March and continues through May and the short rainfall season (also called Vuli) which starts in October and continues through December. January and February are the transition period (relatively dry) for bimodal areas while June, July, August, and September are dry months for the entire country.

Weather and climate related impacts

The extreme weather events had major and adverse impacts on population displacement, destruction of infrastructures (i.e., rail way line, Kilosa Gulwe area, roads, telephone lines) and loss of lives and properties. In addition, due to less rainfall especially towards the end of the year many areas in the country are normally affected by prolonged dry spells which might impaired agricultural activities, pasture, and water availability. Prolonged dry spells coupled with high temperatures during September to December may also cause severe shortage of water and pastures. This condition may result into starvation and deaths of thousands of livestock in different parts of the country. According to TMA, 2021 a total of 306,358 livestock died, which includes 157,695 cattle, 94,230 sheep, 48,290 goats, and 6,135 donkeys and 8 camels, especially in Manyara, Morogoro, Coast, Arusha, and Kilimanjaro regions due to high temperatures during September to December 2021 caused severe shortage of water and pastures.

Climatic change scenarios

Tanzania being member of the UN has signed number of multilateral agreements to protect the environment and one of it is The Paris Agreement of 2015 which sets out a global framework to limit global warming to well below 2°C, preferably to 1.5°C, compared to pre-industrial levels. To achieve this global temperature goal, countries aim to reduce growth of greenhouse gas emissions as soon as possible and rapid reductions, thereafter, based on the best available science, economic and social feasibility.

The effects of climate change are already well visible by increasing air temperatures, melting glaciers and decreasing polar ice caps, rising sea levels, increasing desertification, as well as by more frequent extreme weather events such as heat waves, droughts, floods and storms. Climate change is not globally uniform and affects some regions more than others. On the table 5.1 and Figure 4.4 to 4.17, you can see how climate change has already affected the regions passed by the project starting from Dar es Salaam to Shinyanga during the past 40 years.

The data source used is ERA5, the fifth generation ECMWF atmospheric reanalysis of the global climate, covering the time range from 1979 to 2021, with a spatial resolution of 30 km.

Table 4.1: climate change scenarios

Region	Climatic change scenario
Dar es Salaam	Figure 4.4 graph shows an estimate of the mean annual temperature for the larger region of Dar es Salaam. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the temperature trend is positive, and it is getting warmer in Dar es Salaam due to climate change. If it is horizontal, no clear trend is seen, and if it is going down, conditions in Dar es Salaam are becoming colder over time. In the lower part the graph shows the so-called warming stripes. Each colored stripe represents the average temperature for a year - blue for colder and red for warmer years.

Region	Climatic change scenario
	Figure 4.5 shows an estimate of mean total precipitation for the larger region of Dar es Salaam. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the precipitation trend is positive, and it is getting wetter in Dar es Salaam due to climate change. If it is horizontal, no clear trend is seen and if it is going down conditions are becoming drier in Dar es Salaam over time. In the lower part the graph shows the so-called precipitation stripes. Each colored stripe represents the total precipitation of a year - green for wetter and brown for drier years. *From the figures 4.4 and 4.5 it is clear that alternate change in climatic conditions i.e. rainfall and temperature may cause the deterioration of the strictures.*
Kibaha	Figure 4.6 shows an estimate of the mean annual temperature for the larger region of Kibaha. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the temperature trend is positive, and it is getting warmer in Kibaha due to climate change. If it is horizontal, no clear trend is seen, and if it is going down, conditions in Kibaha are becoming colder over time. In the lower part the graph shows the so-called warming stripes. Each colored stripe represents the average temperature for a year - blue for colder and red for warmer years. Figure 4.7 shows an estimate of mean total precipitation for the larger region of Kibaha. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the precipitation trend is positive, and it is getting wetter in Kibaha due to climate change. If it is horizontal, no clear trend is seen and if it is going down conditions are becoming drier in Kibaha over time. In the lower part the graph shows the so-called precipitation stripes. Each colored stripe represents the total precipitation of a year - green for wetter and brown for drier years. *From the figures 4.6 and 4.7 it is clear that alternate change in climatic conditions i.e. rainfall and temperature may cause the deterioration of the strictures.*
Morogoro	Figure 4.8 shows an estimate of the mean annual temperature for the larger region of Morogoro. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the temperature trend is positive and it is getting warmer in Morogoro due to climate change. If it is horizontal, no clear trend is seen, and if it is going down, conditions in Morogoro are becoming colder over time.

Region	Climatic change scenario
	In the lower part the graph shows the so-called warming stripes. Each colored stripe represents the average temperature for a year - blue for colder and red for warmer years. Figure 4.9 shows an estimate of mean total precipitation for the larger region of Morogoro. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the precipitation trend is positive and it is getting wetter in Morogoro due to climate change. If it is horizontal, no clear trend is seen and if it is going down conditions are becoming drier in Morogoro over time. In the lower part the graph shows the so-called precipitation stripes. Each colored stripe represents the total precipitation of a year - green for wetter and brown for drier years. *From the figures 4.8 and 4.9 it is clear that alternate change in climatic conditions i.e., rainfall and temperature may cause the deterioration of the strictures.*
Dodoma	Figure 4.10 shows an estimate of the mean annual temperature for the larger region of Dodoma. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the temperature trend is positive and it is getting warmer in Dodoma due to climate change. If it is horizontal, no clear trend is seen, and if it is going down, conditions in Dodoma are becoming colder over time. In the lower part the graph shows the so-called warming stripes. Each colored stripe represents the average temperature for a year - blue for colder and red for warmer years. Figure 4.11 shows an estimate of mean total precipitation for the larger region of Dodoma. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the precipitation trend is positive and it is getting wetter in Dodoma due to climate change. If it is horizontal, no clear trend is seen and if it is going down conditions are becoming drier in Dodoma over time. In the lower part the graph shows the so-called precipitation stripes. Each colored stripe represents the total precipitation of a year - green for wetter and brown for drier years. *From the figures 4.10 and 4.11 it is clear that alternate change in climatic conditions i.e. rainfall and temperature may cause the deterioration of the strictures.*
Singida	Figure 4.12 shows an estimate of the mean annual temperature for the larger region of Singida. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the temperature trend is positive and it is getting warmer in Singida due to climate change. If it is

Region	Climatic change scenario
	horizontal, no clear trend is seen, and if it is going down, conditions in Singida are becoming colder over time. In the lower part the graph shows the so-called warming stripes. Each colored stripe represents the average temperature for a year - blue for colder and red for warmer years. Figure 4.13 shows an estimate of mean total precipitation for the larger region of Singida. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the precipitation trend is positive and it is getting wetter in Singida due to climate change. If it is horizontal, no clear trend is seen and if it is going down conditions are becoming drier in Singida over time. In the lower part the graph shows the so-called precipitation stripes. Each colored stripe represents the total precipitation of a year - green for wetter and brown for drier years. *From the figures 4.12 and 4.13 it is clear that alternate change in dimatic conditions i.e. rainfall and temperature may cause the deterioration of the strictures.*
Tabora	Figure 4.14 shows an estimate of the mean annual temperature for the larger region of Tabora. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the temperature trend is positive and it is getting warmer in Tabora due to climate change. If it is horizontal, no clear trend is seen, and if it is going down, conditions in Tabora are becoming colder over time. In the lower part the graph shows the so-called warming stripes. Each colored stripe represents the average temperature for a year - blue for colder and red for warmer years. Figure 4.15 shows an estimate of mean total precipitation for the larger region of Tabora. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the precipitation trend is positive and it is getting wetter in Tabora due to climate change. If it is horizontal, no clear trend is seen and if it is going down conditions are becoming drier in Tabora over time. In the lower part the graph shows the so-called precipitation stripes. Each colored stripe represents the total precipitation of a year - green for wetter and brown for drier years. *From the figures 4.14 and 4.15 it is clear that alternate change in dimatic conditions i.e. rainfall and temperature may cause the deterioration of the strictures*

Region	Climatic change scenario
Shinyanga	Figure 4.16 shows an estimate of the mean annual temperature for the larger region of Shinyanga. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the temperature trend is positive and it is getting warmer in Shinyanga due to climate change. If it is horizontal, no clear trend is seen, and if it is going down, conditions in Shinyanga are becoming colder over time. In the lower part the graph shows the so-called warming stripes. Each colored stripe represents the average temperature for a year - blue for colder and red for warmer years. Figure 4.17 shows an estimate of mean total precipitation for the larger region of Shinyanga. The dashed blue line is the linear climate change trend. If the trend line is going up from left to right, the precipitation trend is positive and it is getting wetter in Shinyanga due to climate change. If it is horizontal, no clear trend is seen and if it is going down conditions are becoming drier in Shinyanga over time. In the lower part the graph shows the so-called precipitation stripes. Each colored stripe represents the total precipitation of a year - green for wetter and brown for drier years. *From the figures 4.16 and 4.17 it is clear that alternate change in climatic conditions i.e. rainfall and temperature may cause the deterioration of the strictures*

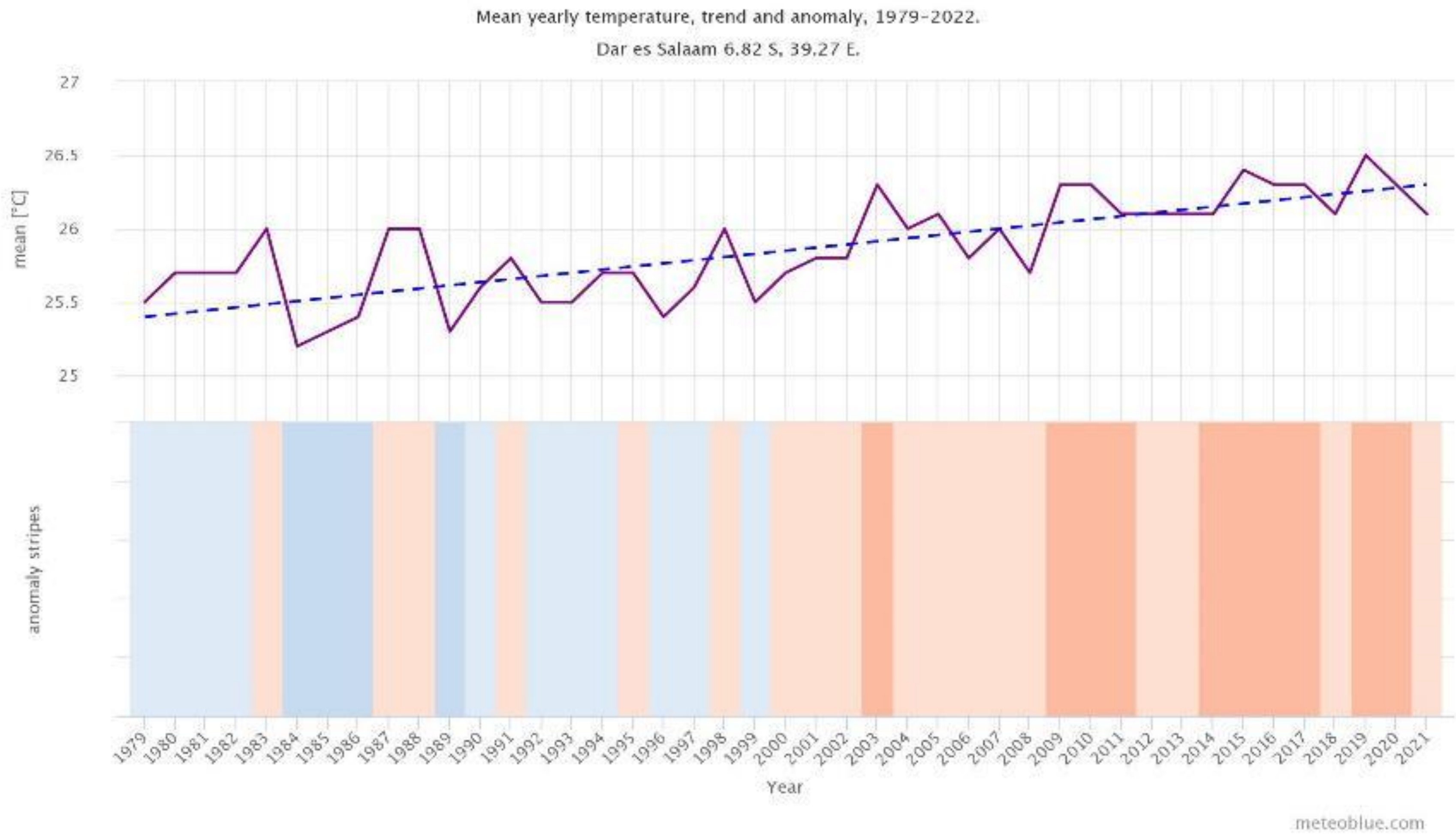


Figure 4.4: Mean yearly temperature trend for Dar es Salaam

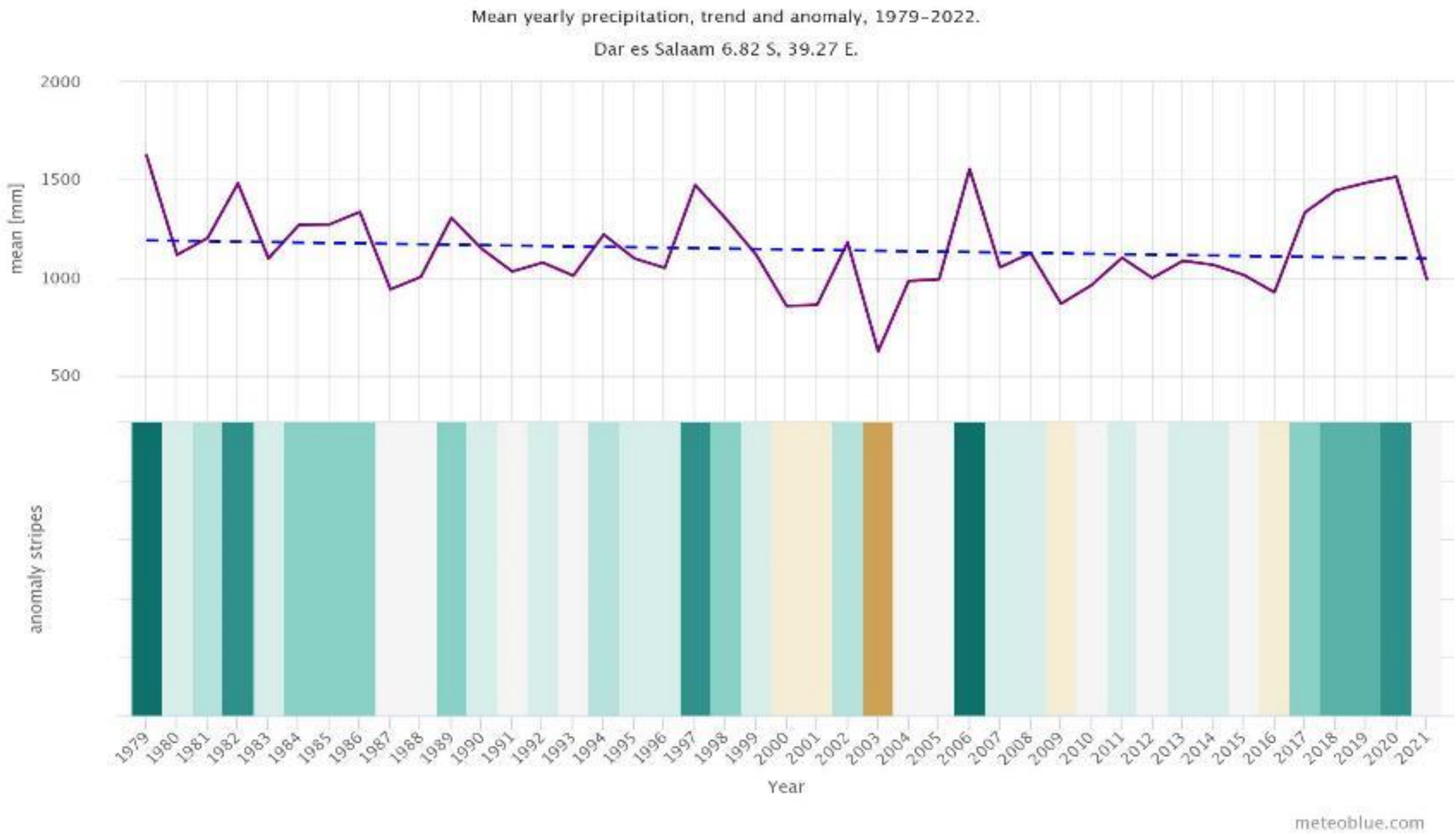


Figure 4.5: Mean yearly precipitation trend for Dar es Salaam

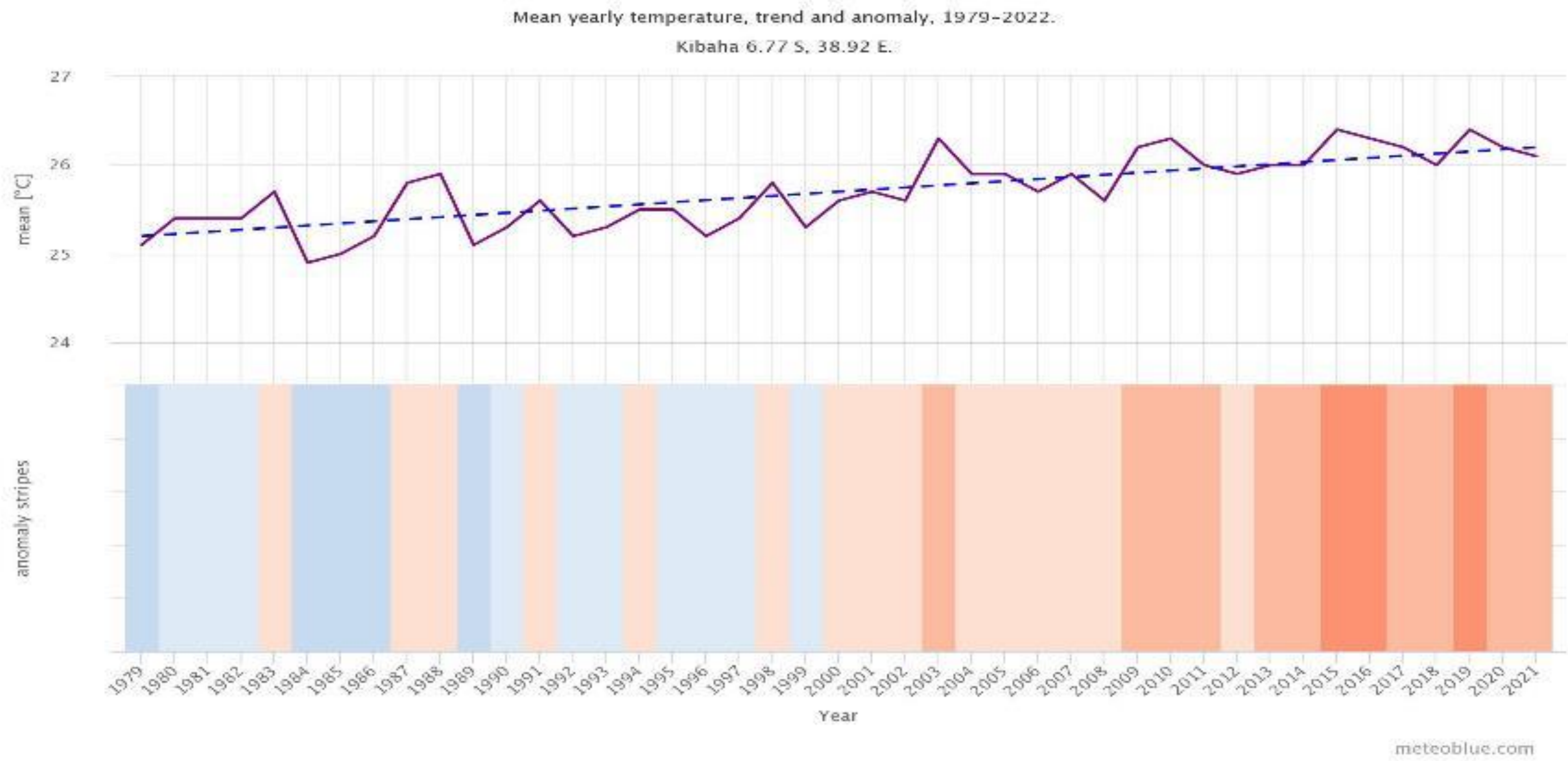


Figure 4.6: Mean yearly temperature trend for Kibaha

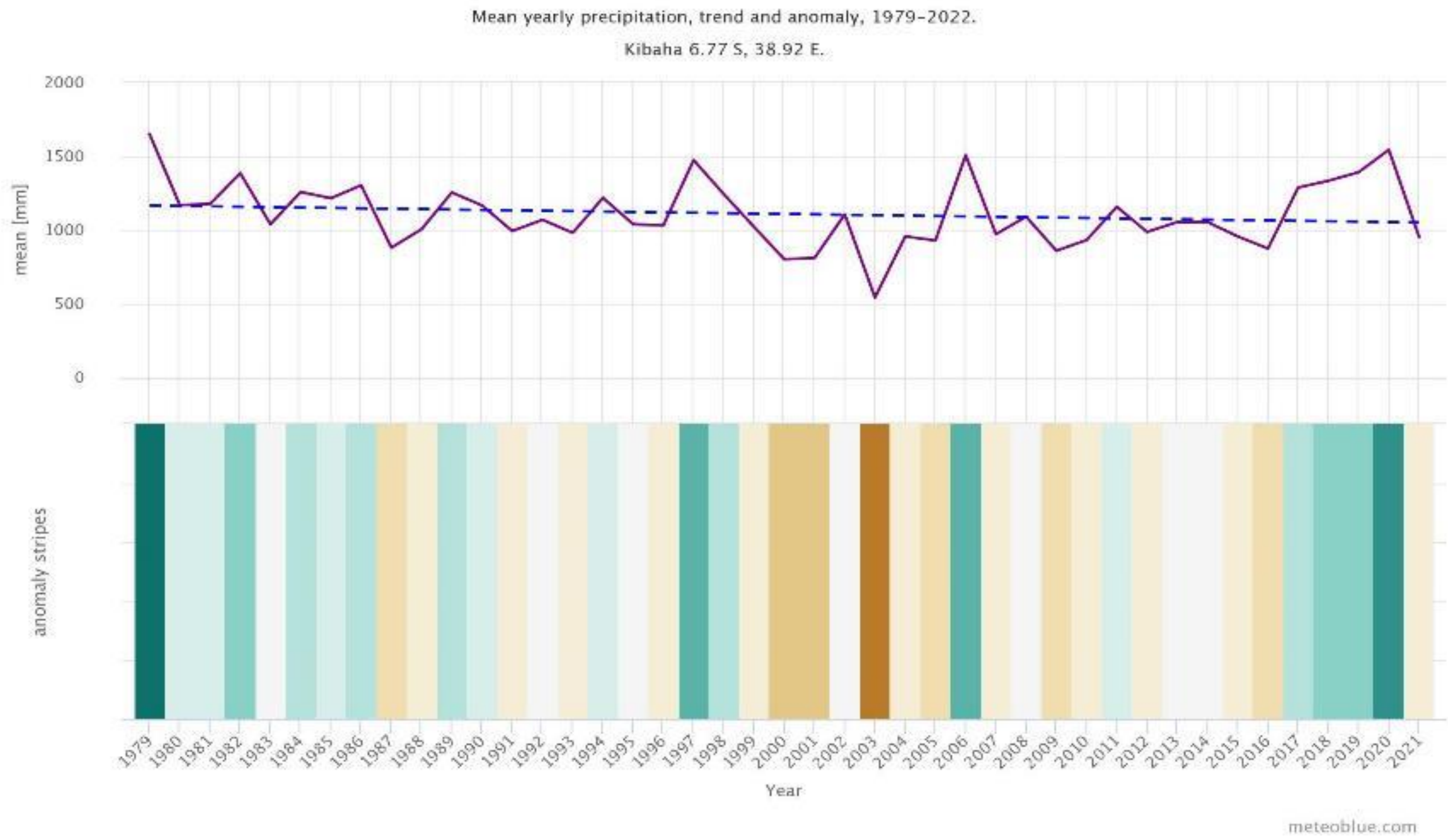


Figure 4.7: Mean yearly precipitation trend for Kibaha

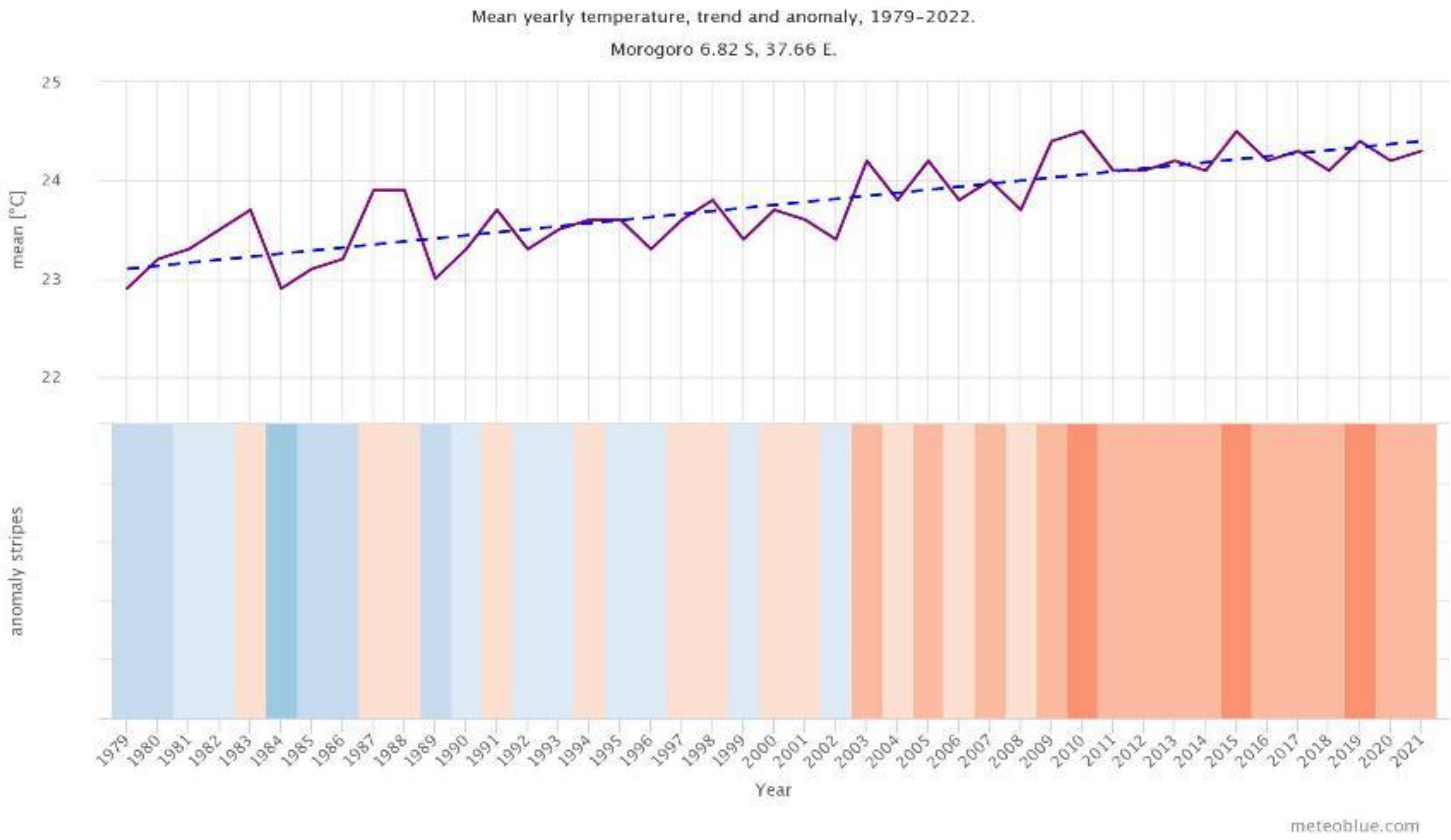


Figure 4.8: Mean yearly temperature trend for Morogoro

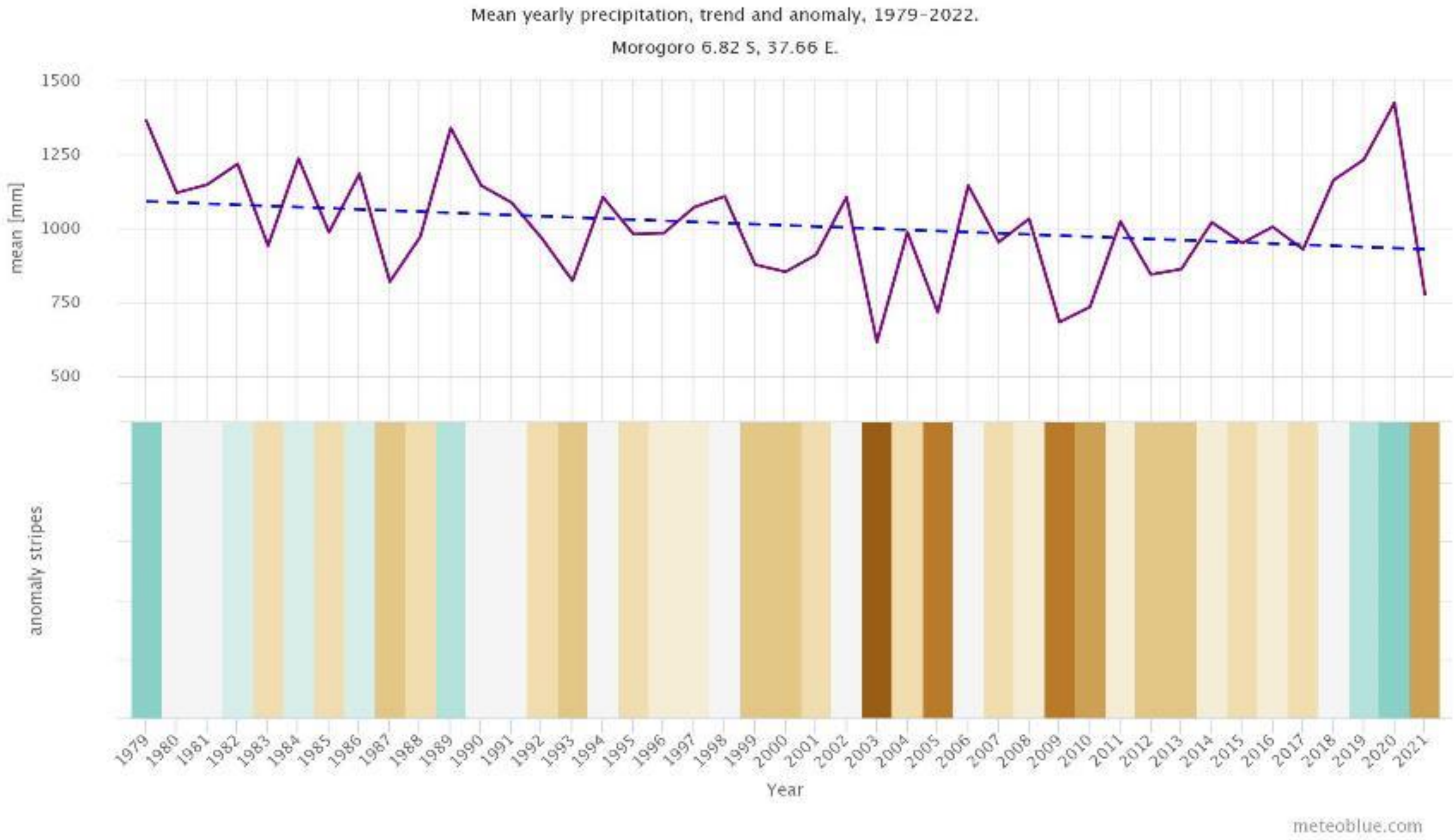


Figure 4.9: Mean yearly precipitation trend for Morogoro

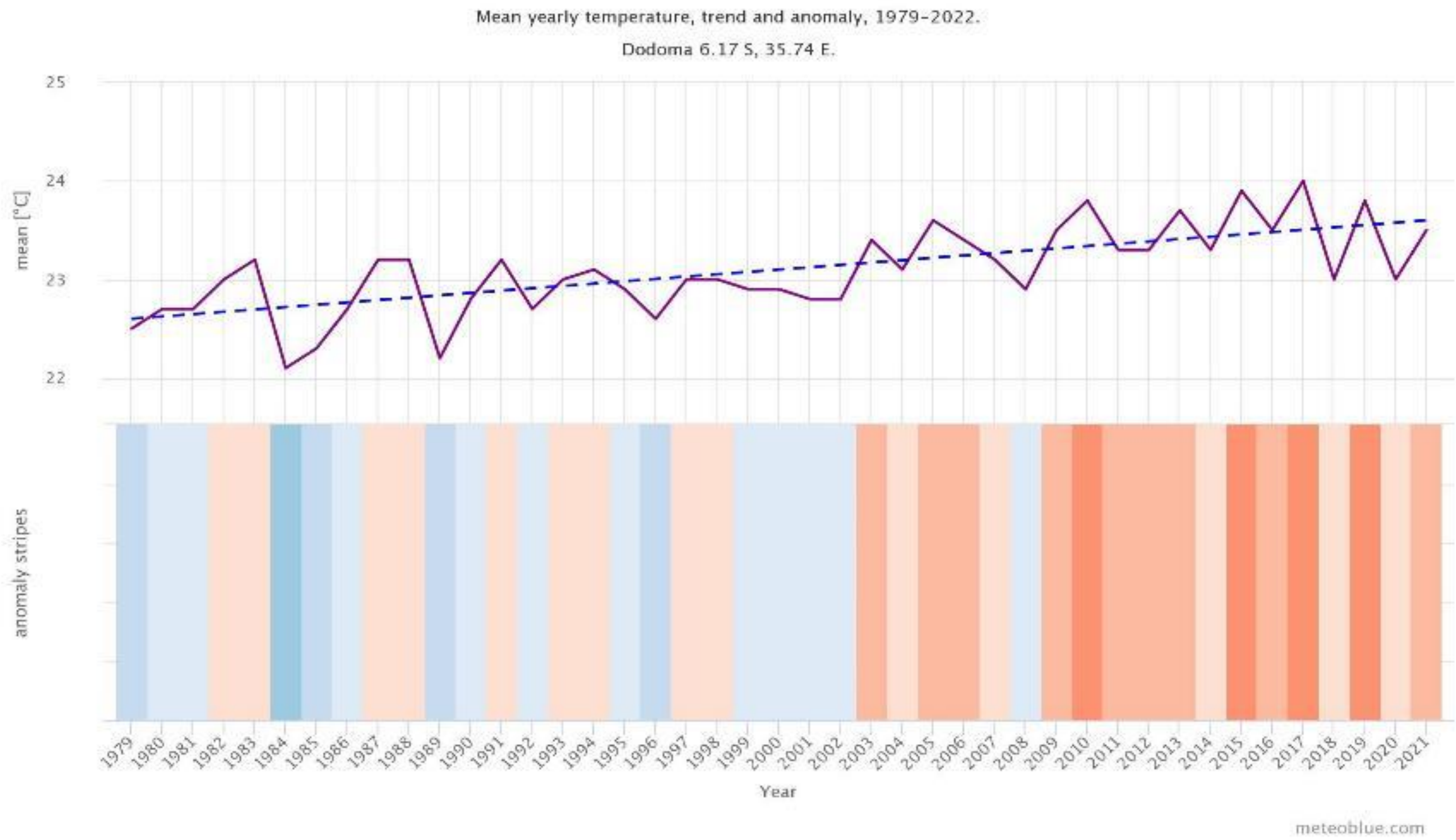


Figure 4.10: Mean yearly temperature trend for Dodoma

Figure 4.11: Mean yearly precipitation trend for Dodoma

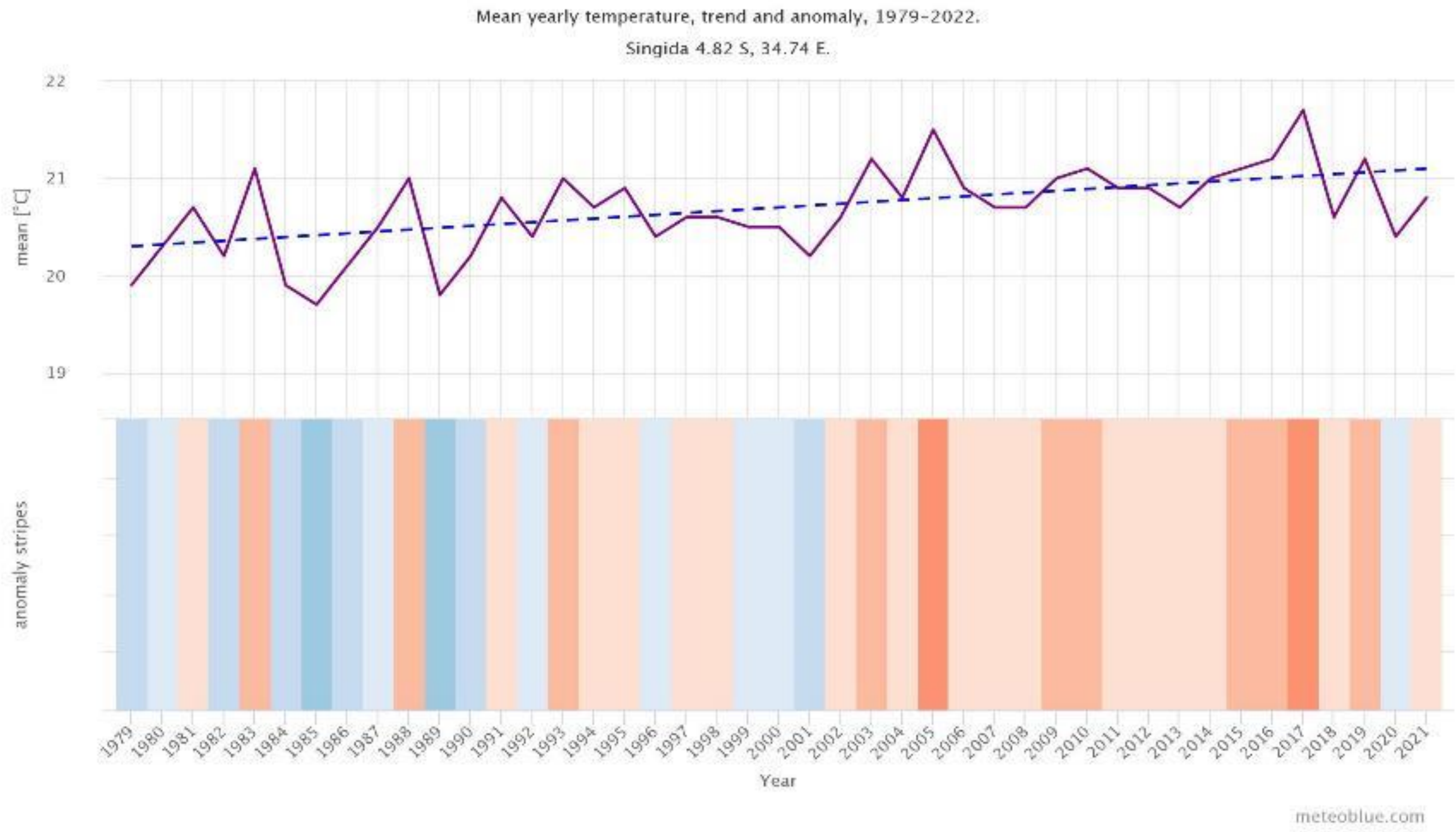


Figure 4.12: Mean yearly temperature trend for Singida

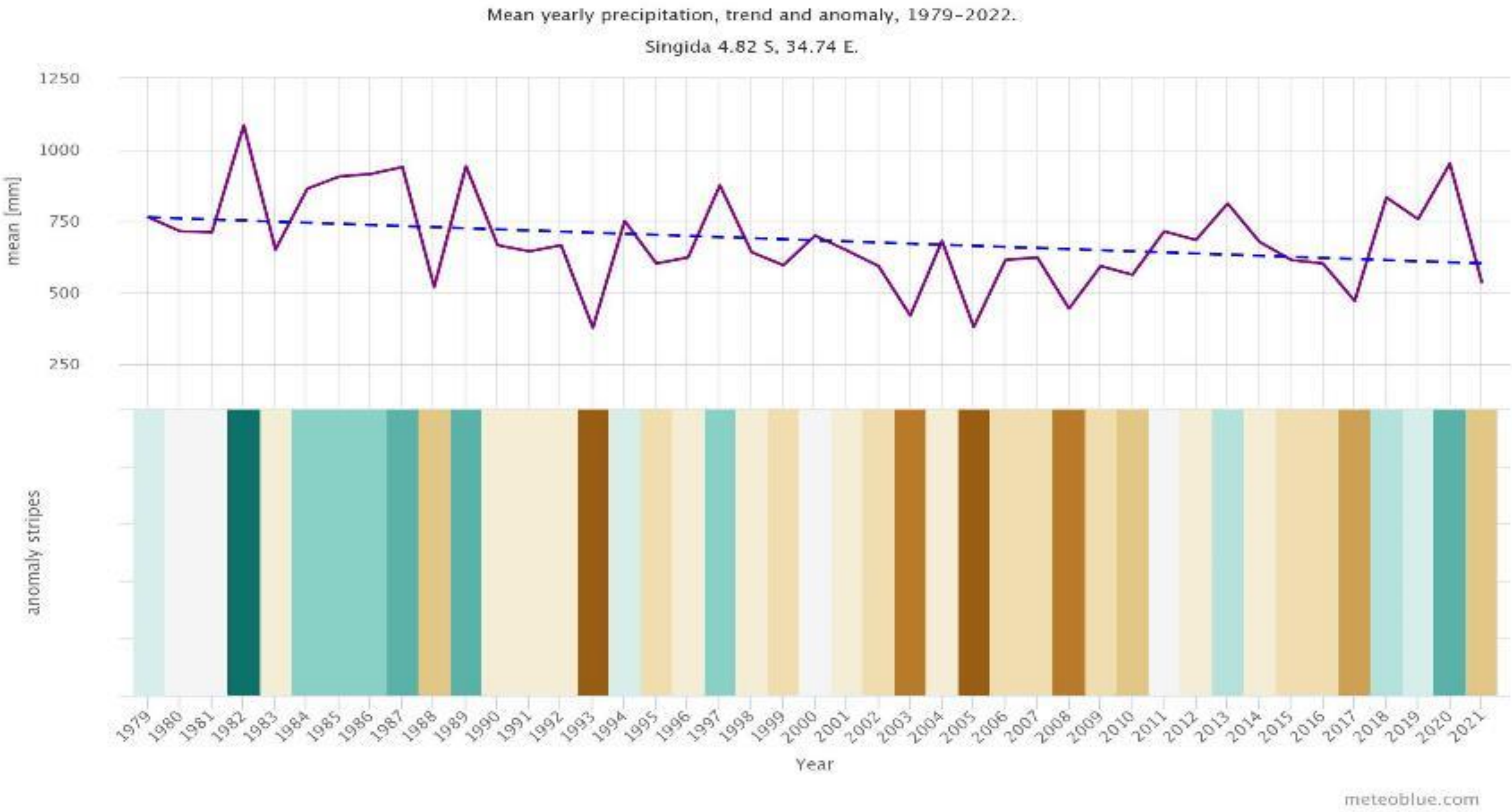


Figure 4.13: Mean yearly precipitation trend for Singida

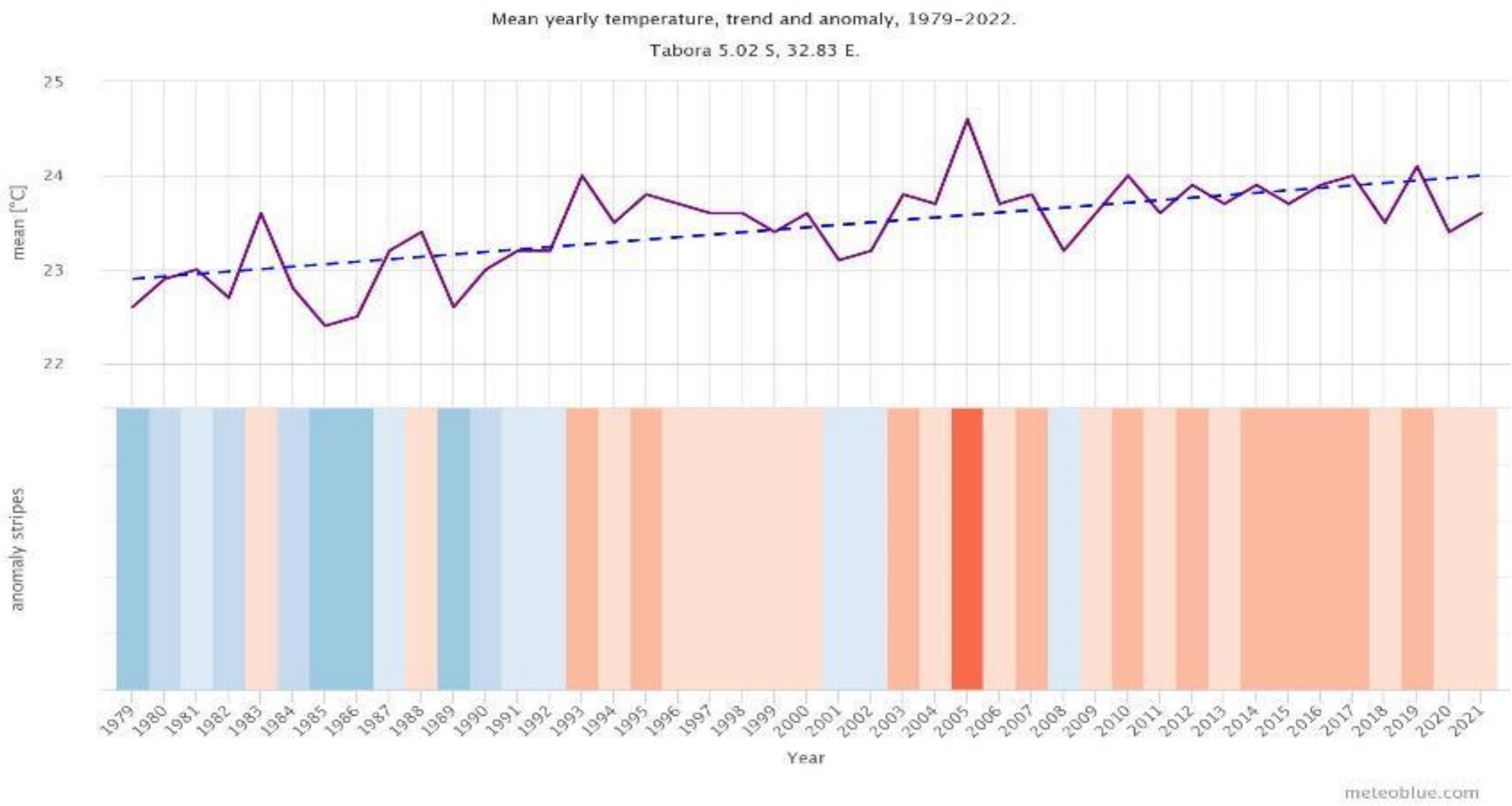


Figure 4.14: Mean yearly temperature trend for Tabora

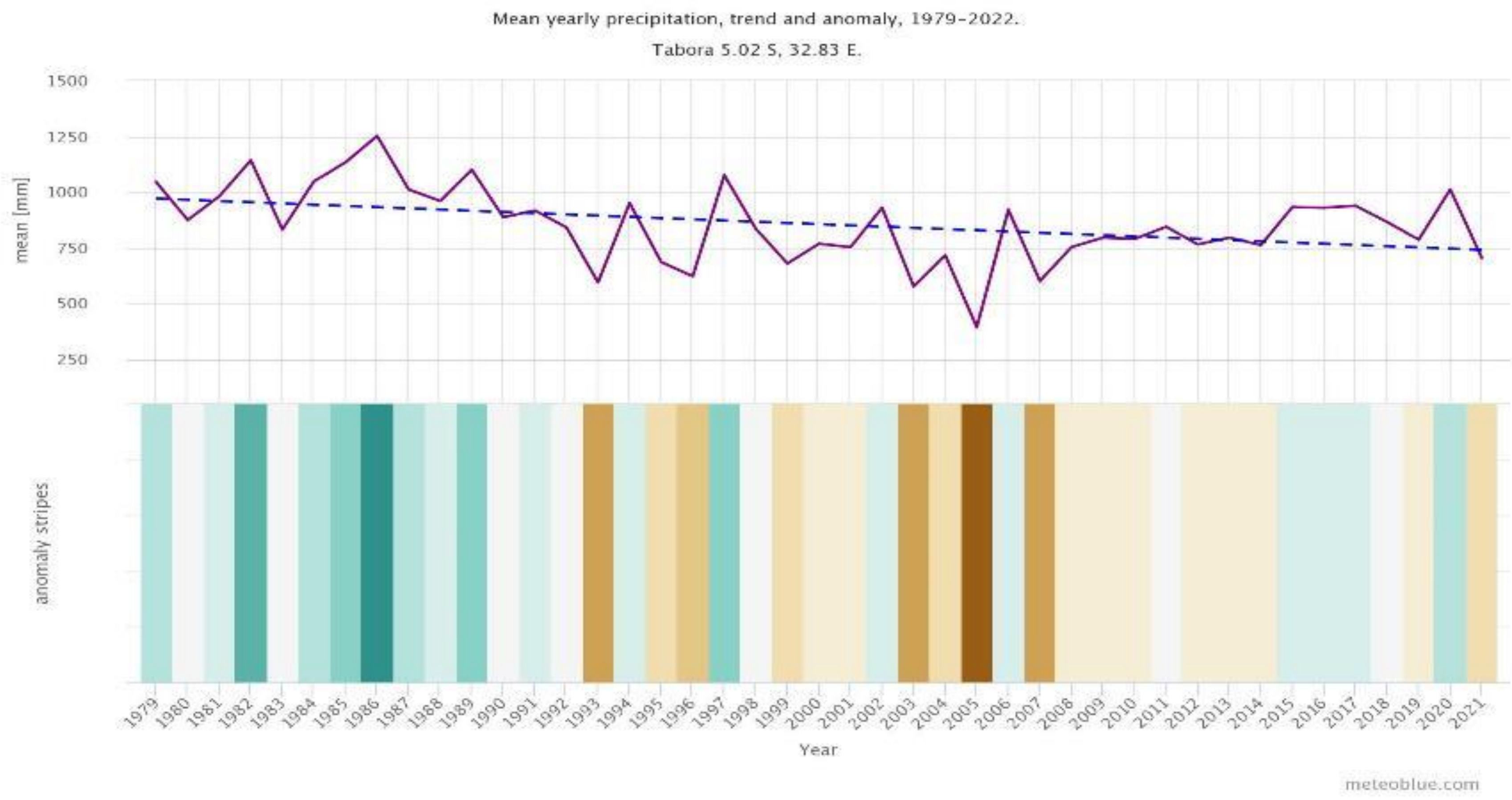


Figure 4.15: Mean yearly temperature trend for Tabora

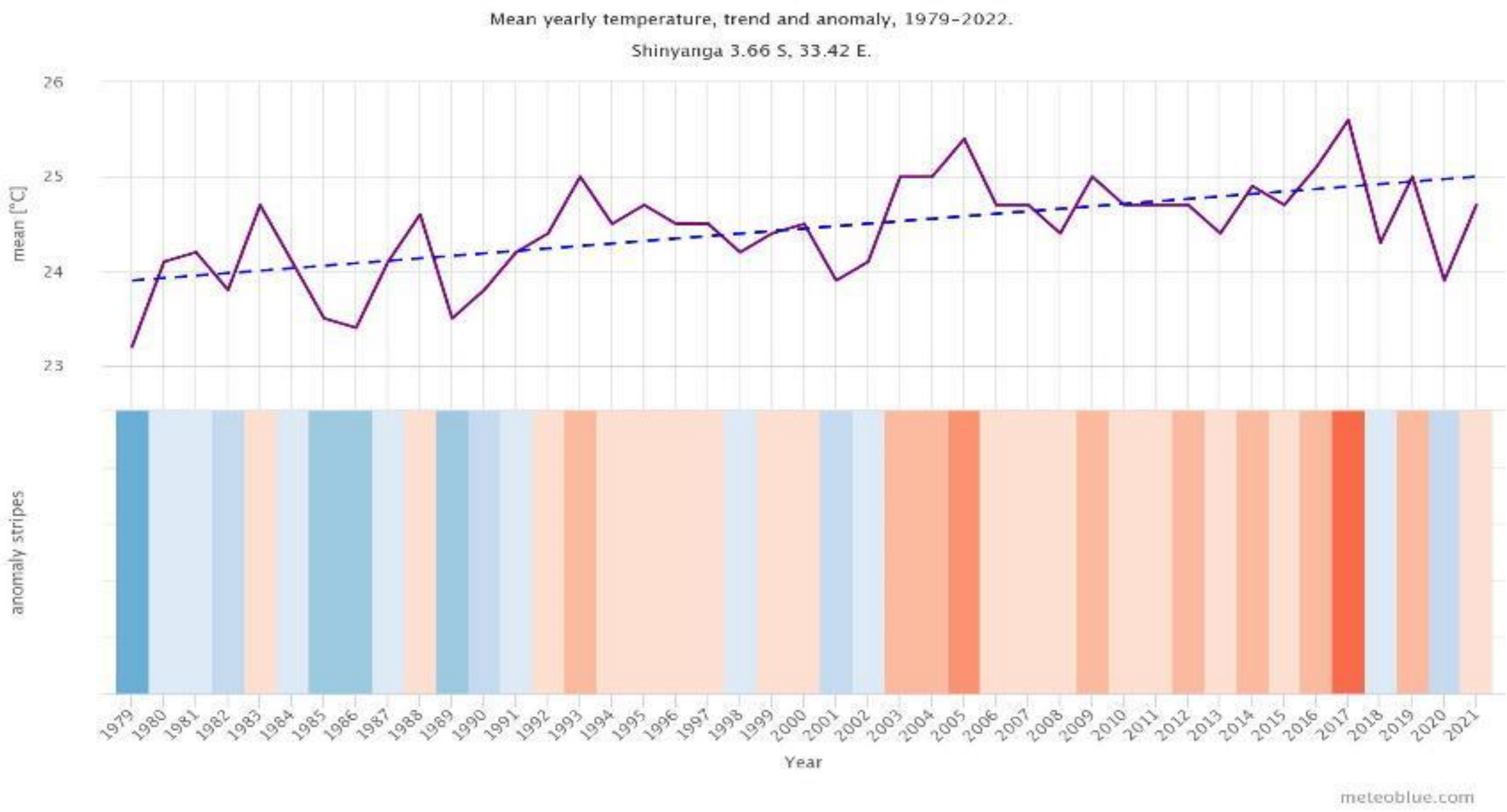


Figure 4.16: Mean yearly temperature trend for Shinyanga

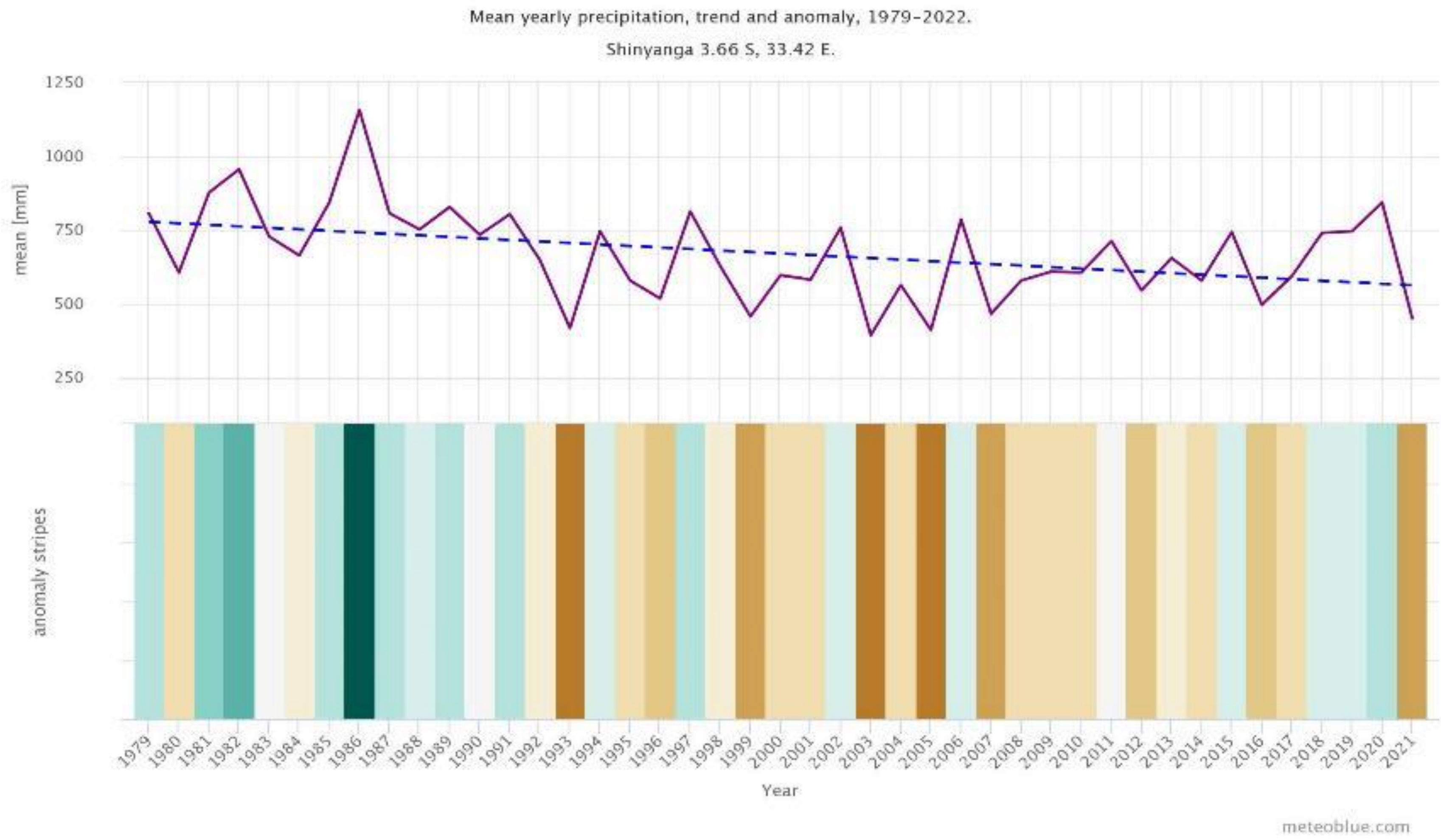


Figure 4.17: Mean yearly temperature trend for Shinyanga

- Wind Distribution

Wind rose diagrams plotted using data recorded during the 1/1/2021 - 00:00 to 1/2/2022 - 02:00 were shown in the **Figure 4.18 to 4.31**. From the results, it can be clearly stated that each region depicts its own wind pattern at different period of time. Thus, the direction of the pollutant to the particular region could be different as it is explained

Region	Wind pattern Description
Dar es Salaam	The wind rose shows that during this particular sampling period the wind blew from the Southeast - 9.75% of the time, and from the northeast 3.9% of the time see figure 4.18 and 4.19. The longest time with the highest wind speed is observed from southeast direction. Thus, the highest pollutant movement will follow that direction of wind at that particular time of the project phase.
Pwani	The wind rose shows that during this particular sampling period the wind blew from the SouthEast 9.2% of the time, southwest 1.84% and from the northeast 3.68% of the time see figure 4.20 and 4. 21. The longest time with the highest wind speed is observed from southeast direction. Thus, the highest pollutant movement will follow that direction of wind at that particular time of the project phase.
Morogoro	The wind rose shows that during this particular sampling period the wind blew from the Southeast 14% of the time, east 11.2% and from the northeast 5.58% of the time see figure 4.22 and 4. 23. The longest time with the highest wind speed is observed from southeast direction. Thus, the highest pollutant movement will follow that direction of wind at that particular time of the project phase.
Dodoma	The wind rose shows that during this particular sampling period the wind blew from the Southeast 20.2% of the time, east 12.1% and from the northeast 4.04% of the time see figure 4.24 and 4.25. The longest time with the highest wind speed is observed from southeast direction. Thus, the highest pollutant movement will follow that direction of wind at that particular time of the project phase.
Singida	The wind rose shows that during this particular sampling period the wind blew from the Southeast 28.9% of the time and from east 5.77% of the time see figure 4.26 and 4. 27. The longest time with the highest wind speed is observed from southeast direction. Thus, the highest pollutant movement will follow that direction of wind at that particular time of the project phase.
Tabora	The wind rose shows that during this particular sampling period the wind blew from the Southeast 17.1% of the time and from east 6.84% of the time

Region	Wind pattern Description
	see figure 4.28 and 4. 29. The longest time with the highest wind speed is observed from southeast direction. Thus, the highest pollutant movement will follow that direction of wind at that particular time of the project phase.
Shinyanga	The wind rose shows that during this particular sampling period the wind blew from the Southeast 12.7% of the time and from northwest 2.53% of the time see figure 4.30 and 4.31. The longest time with the highest wind speed is observed from the southeast direction. Thus, the highest pollutant movement will follow that direction of wind at that particular time of the project phase.

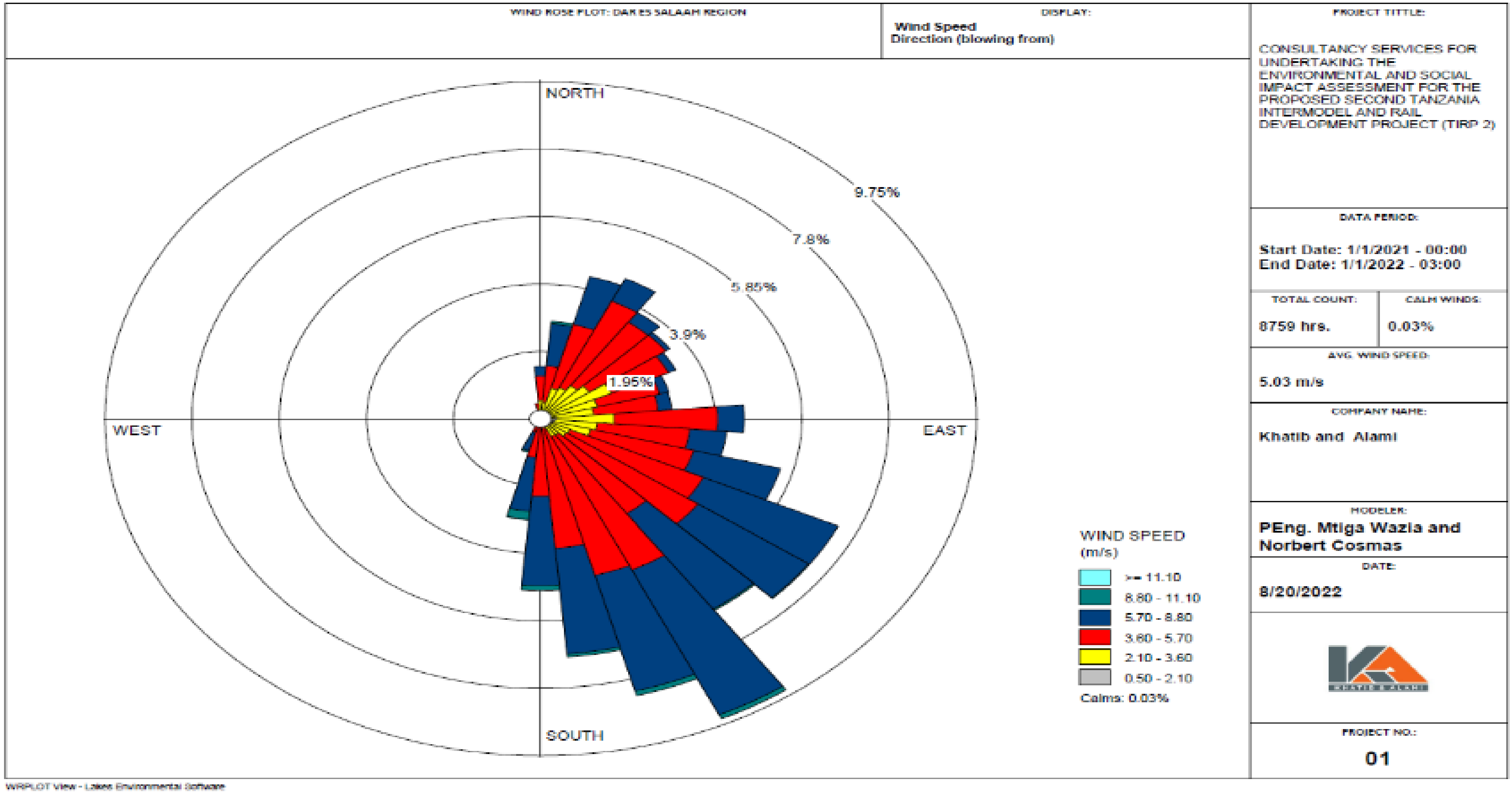


Figure 4.18: Wind Rose for Dar es Salaam Region

Source: Wind Plot 2022

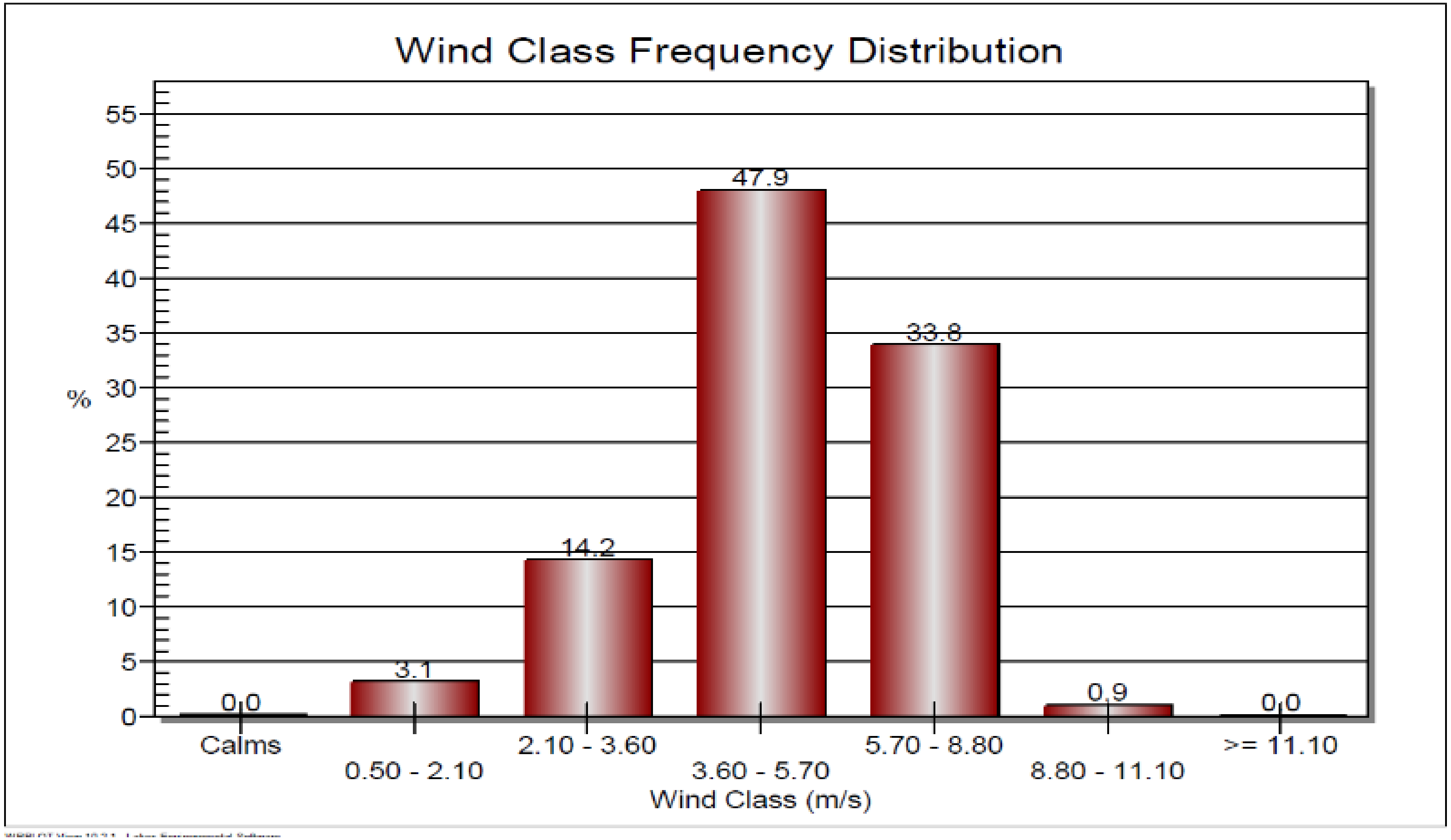


Figure 4.19: Wind Graph for Dar es Salaam Region

Source: Wind Plot 2022

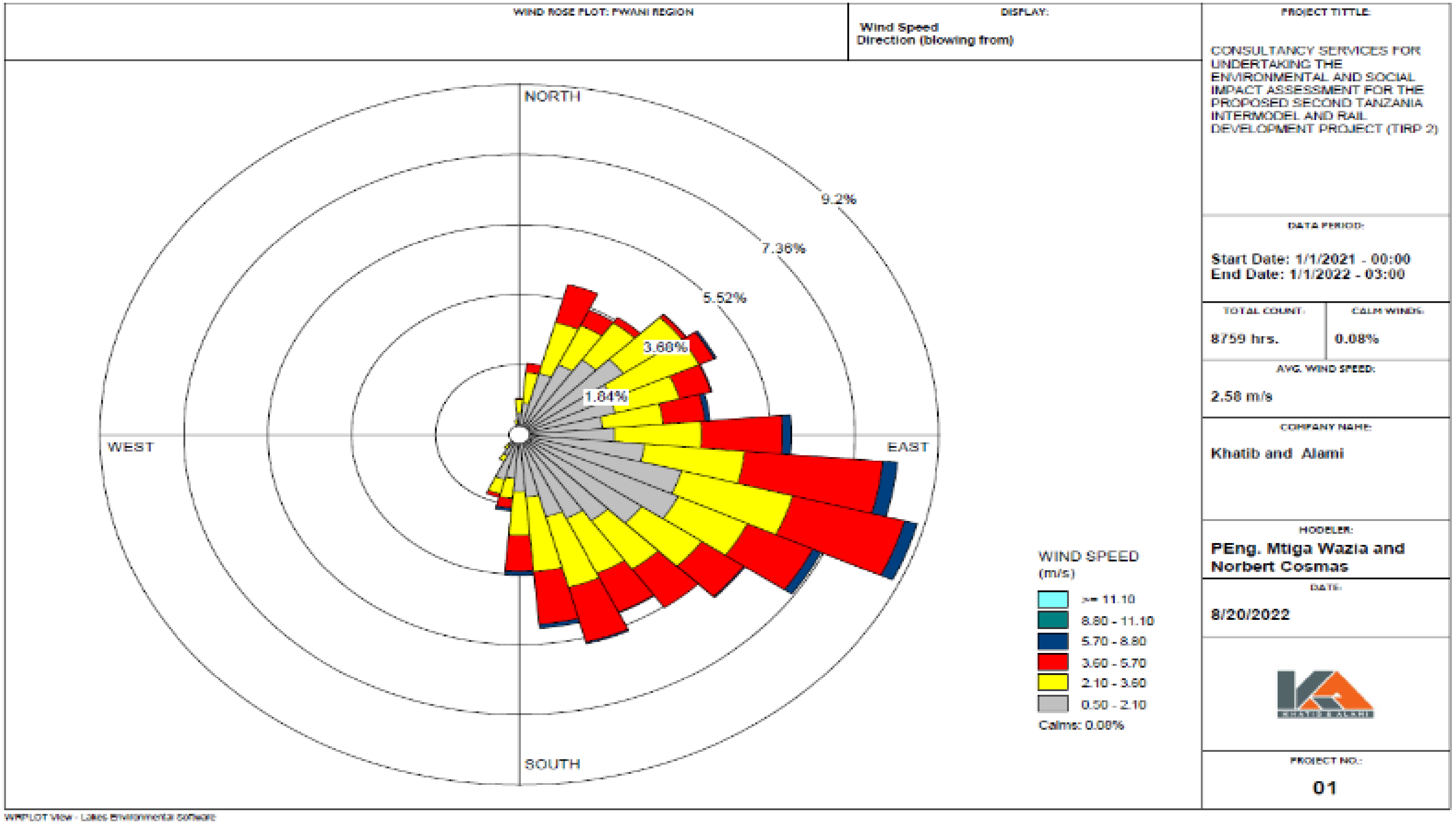


Figure 4.20: Wind Rose for Pwani Region

Source: Wind Plot 2022

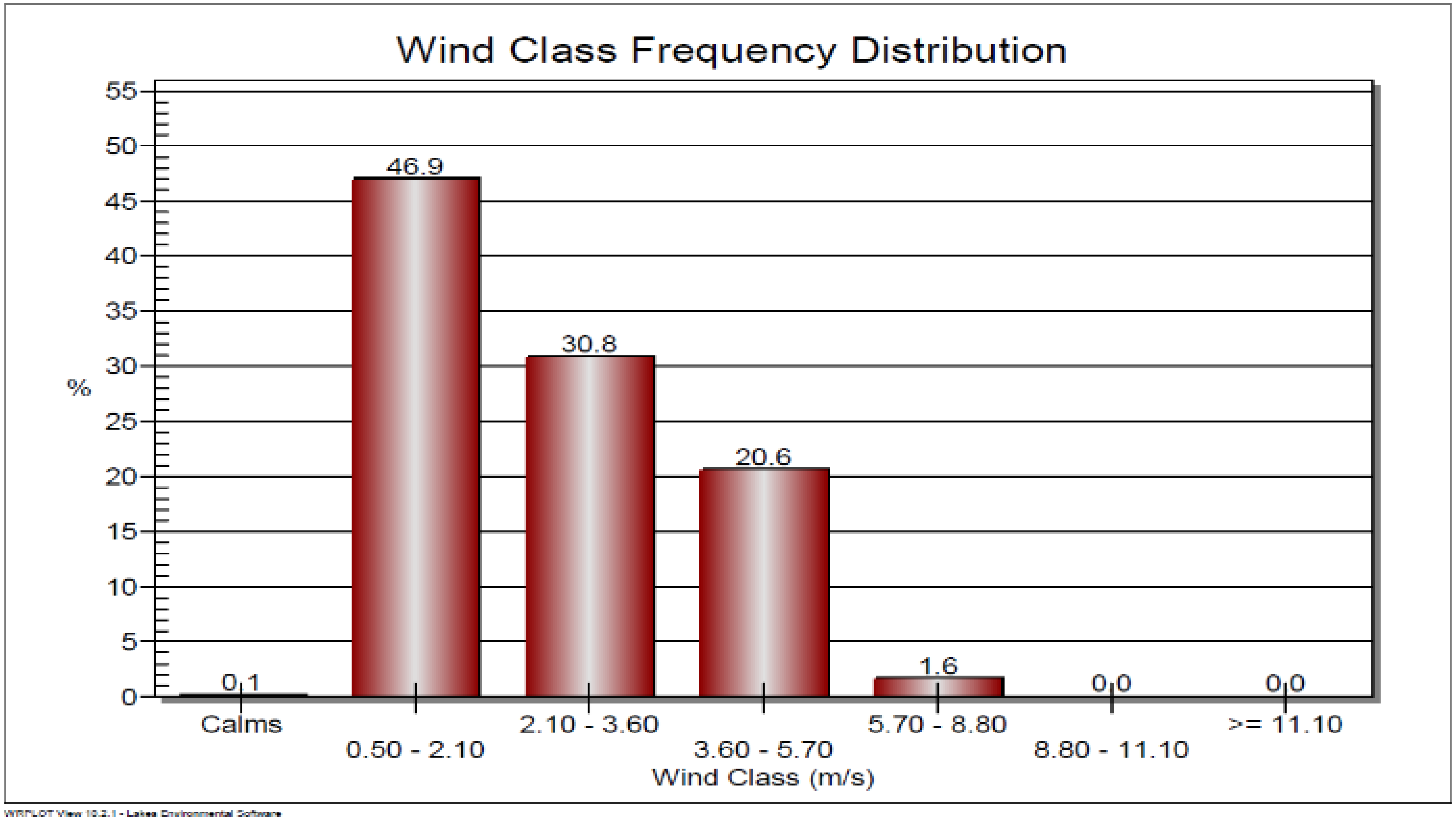


Figure 4.21: Wind Graph for Pwani Region

Source: Wind Plot 2022

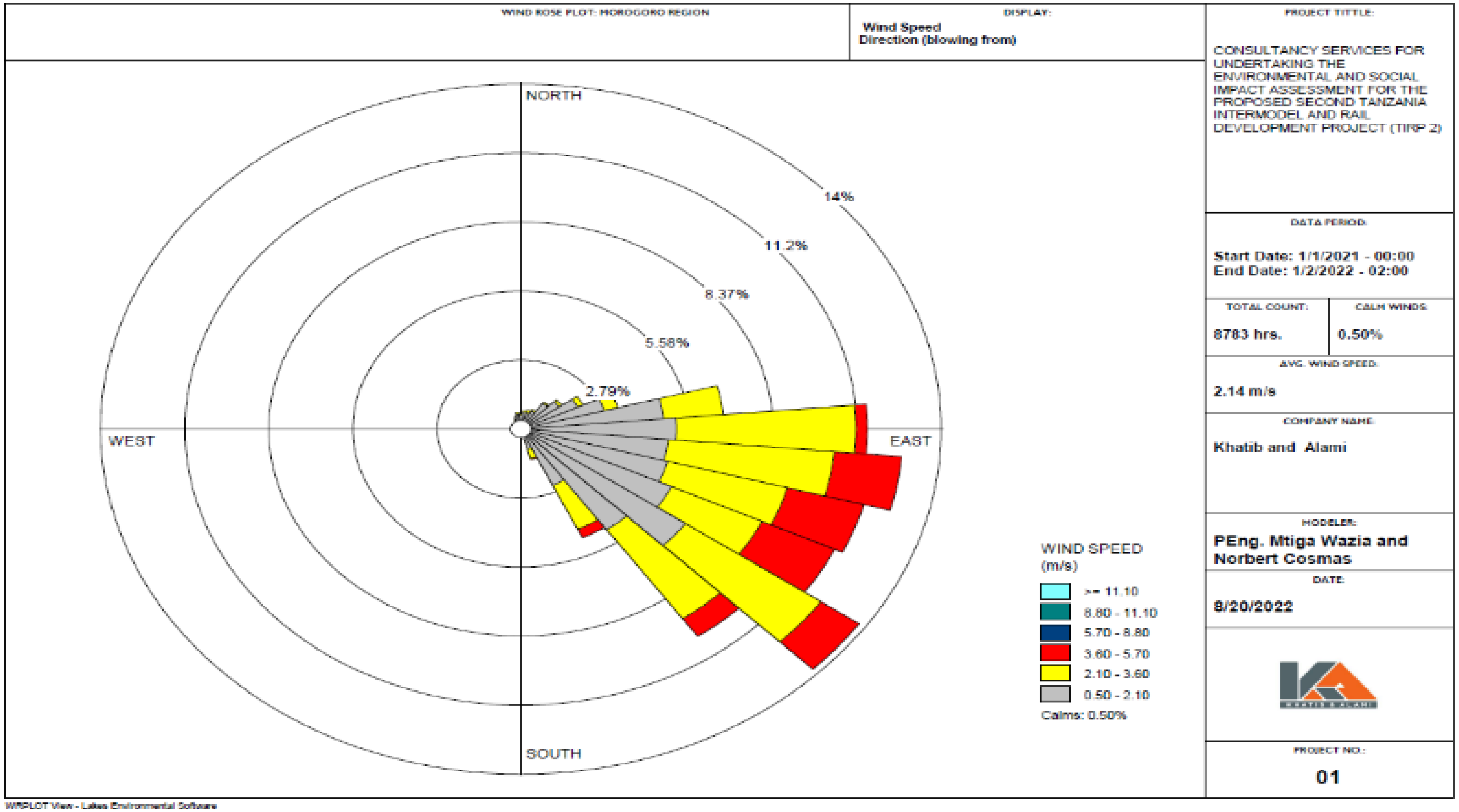


Figure 4.22: Wind Rose for Morogoro Region

Source: Wind Plot 2022

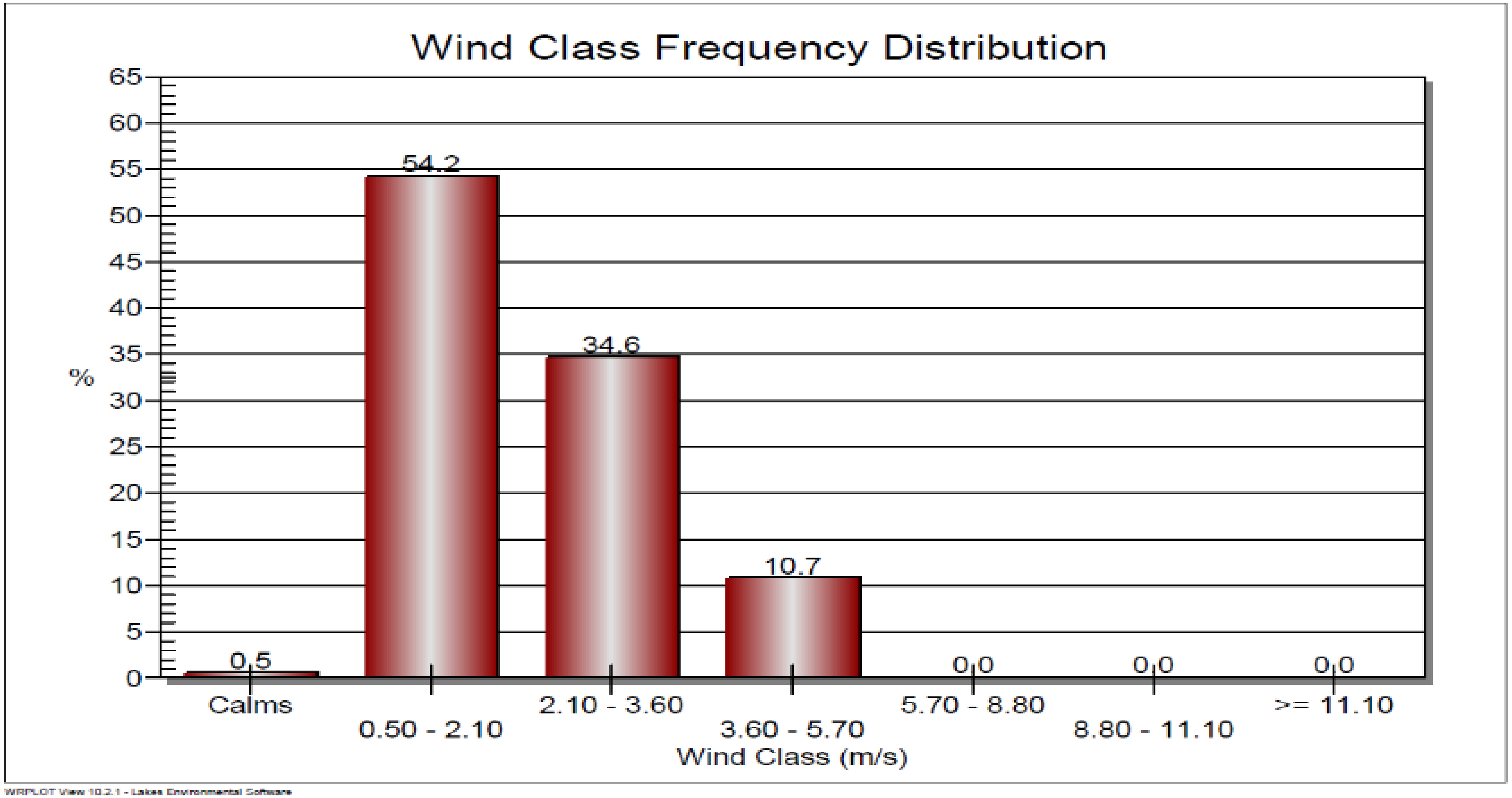


Figure 4.23: Wind Graph for Morogoro Region

Source: Wind Plot 2022

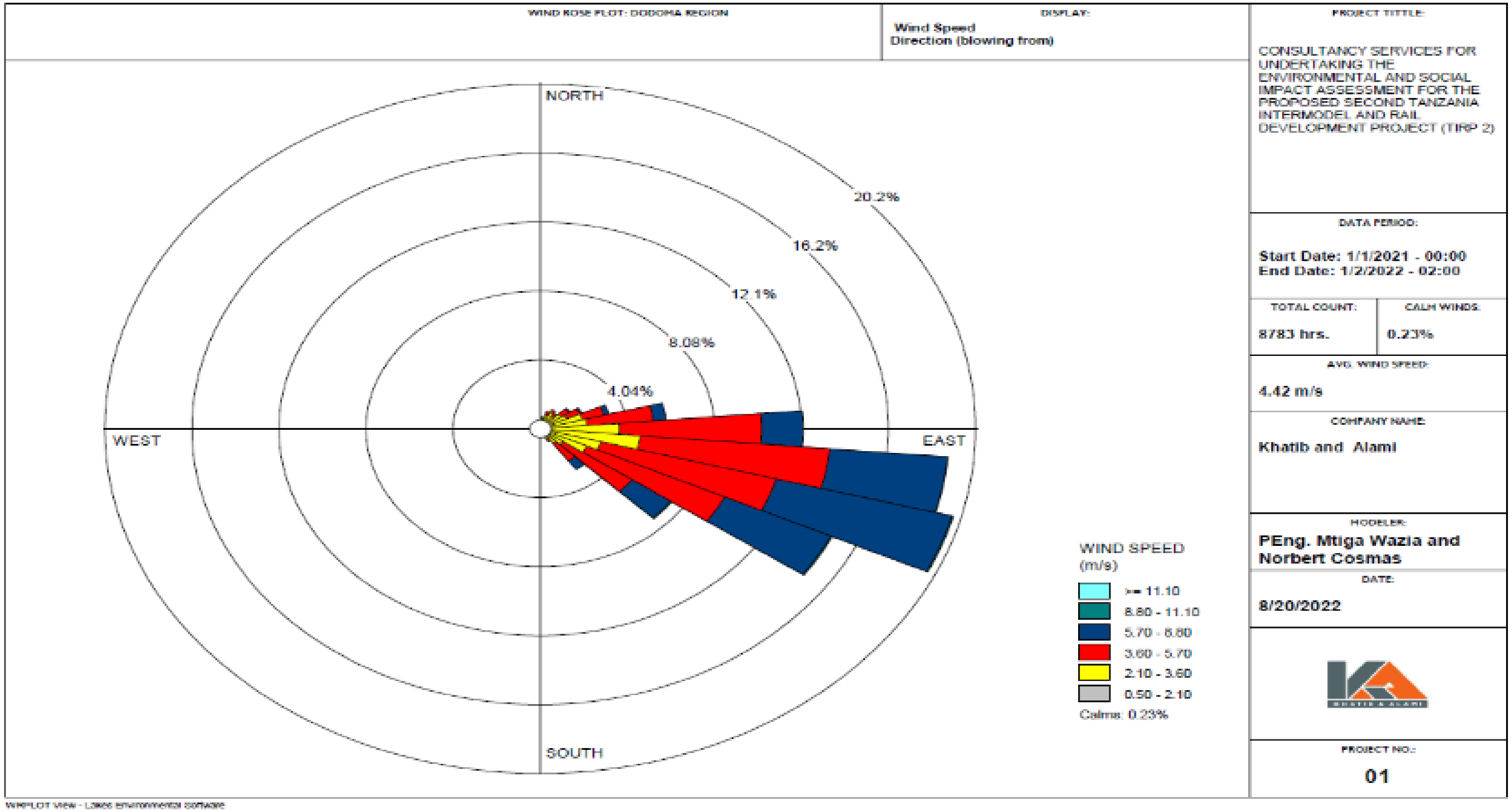


Figure 4.24: Wind Rose for Dodoma Region

Source: Wind Plot 2022

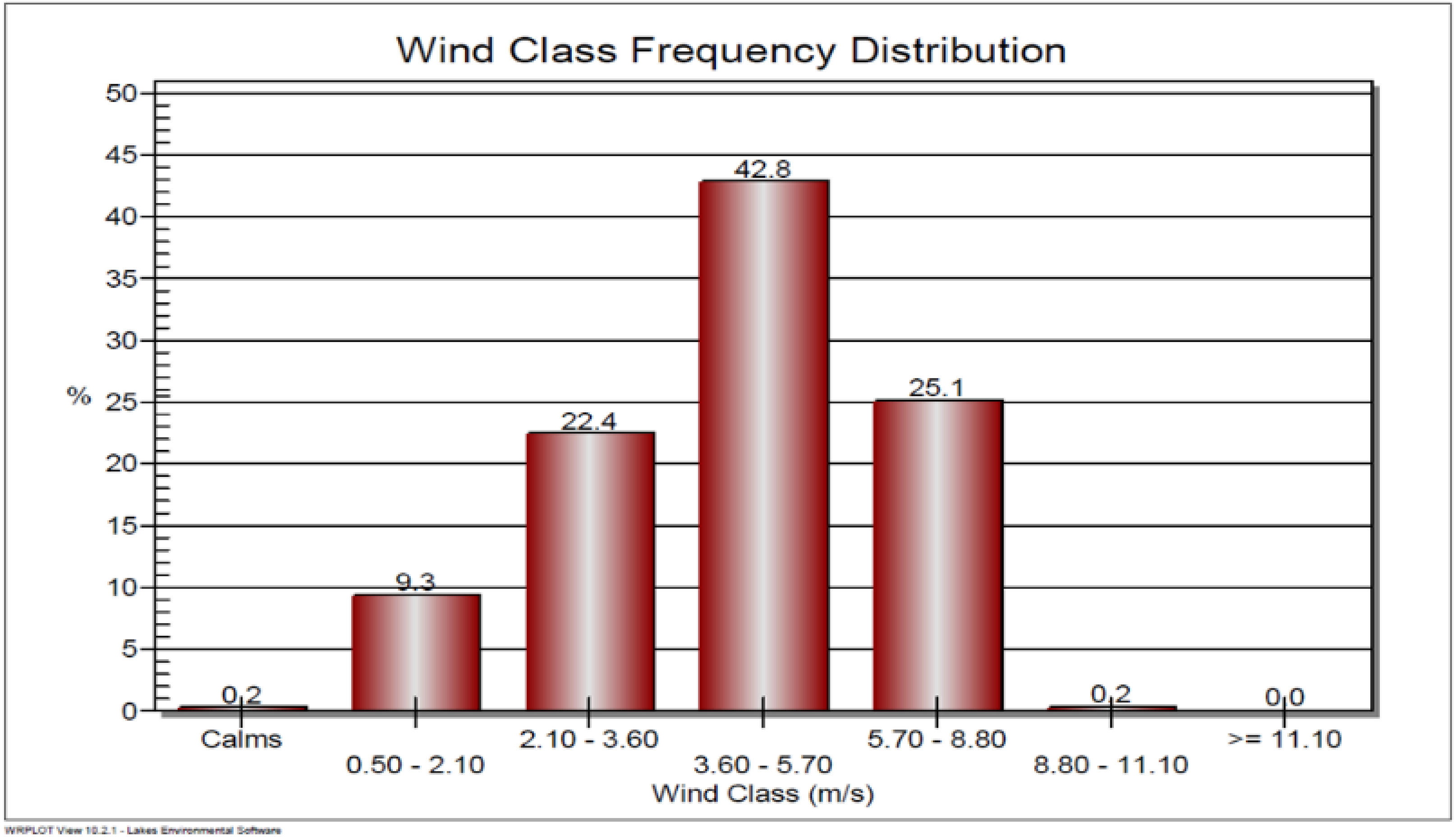


Figure 4.25: Wind Graph for Dodoma Region

Source: Wind Plot 2022

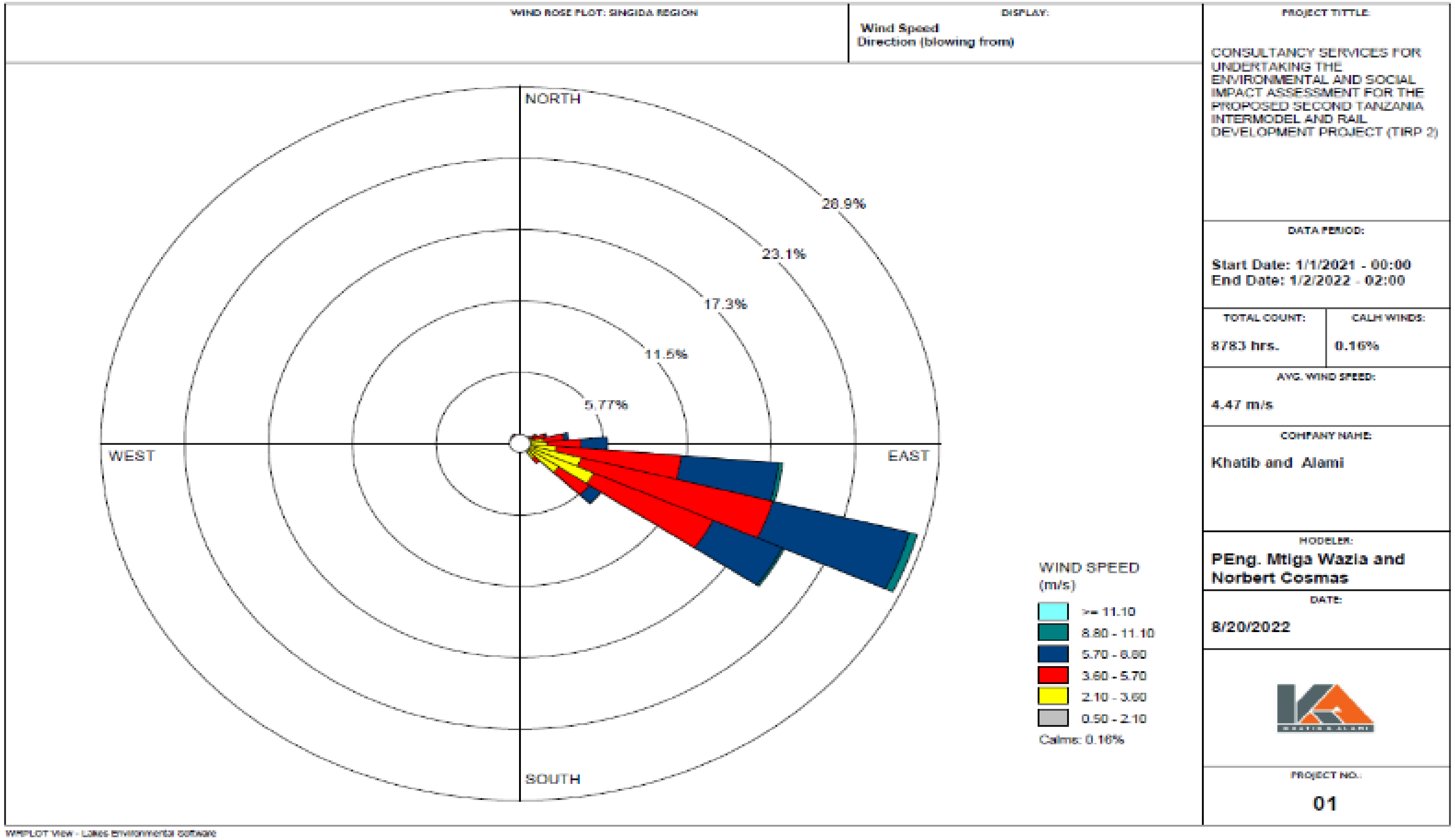
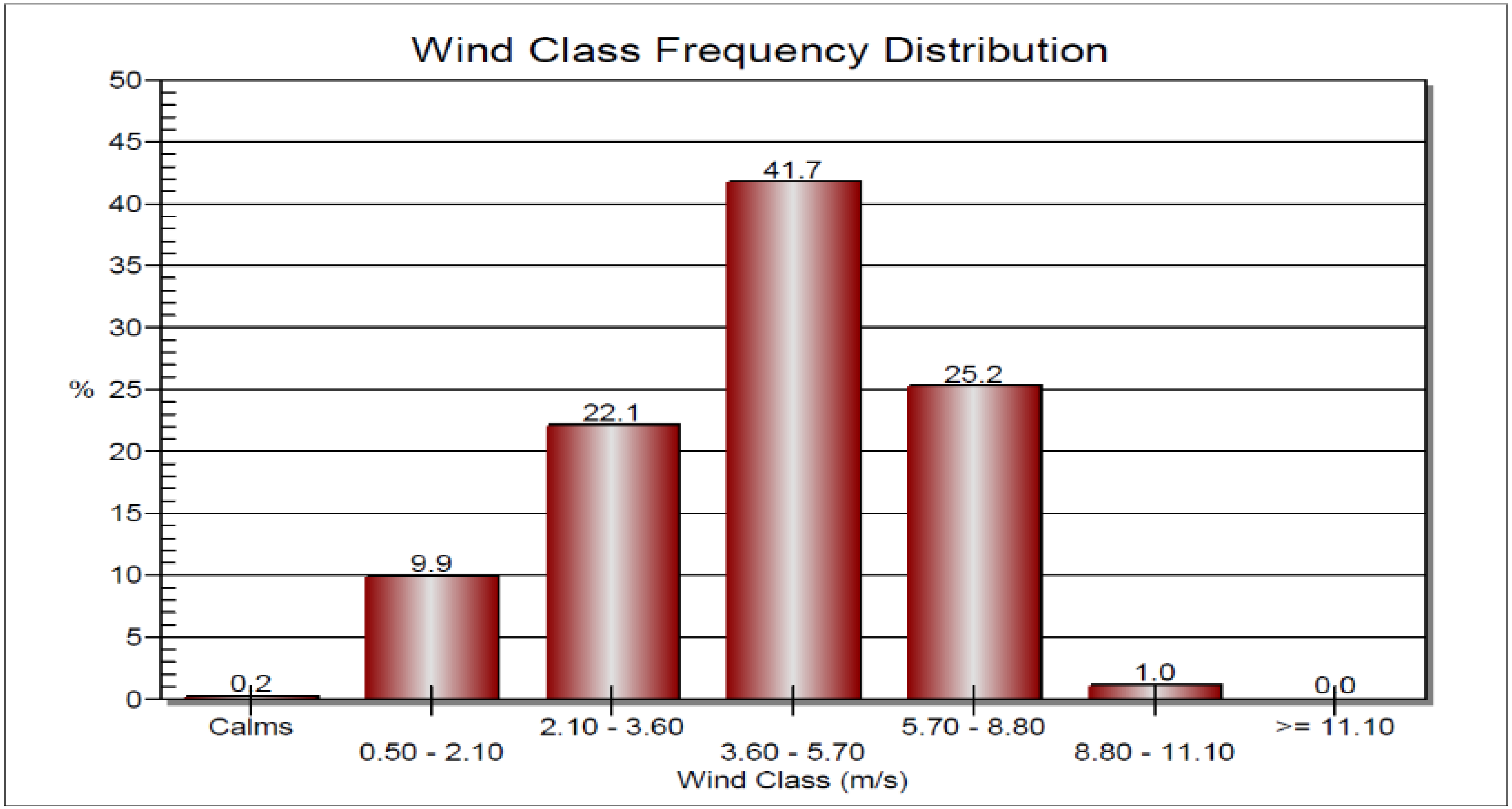


Figure 4.26: Wind Rose for Singida Region

Source: Wind Plot 2022



WRPLOT View 10.2.1 - Lakes Environmental Software

Figure 4.27: Wind Graph for Singida Region

Source: Wind Plot 2022

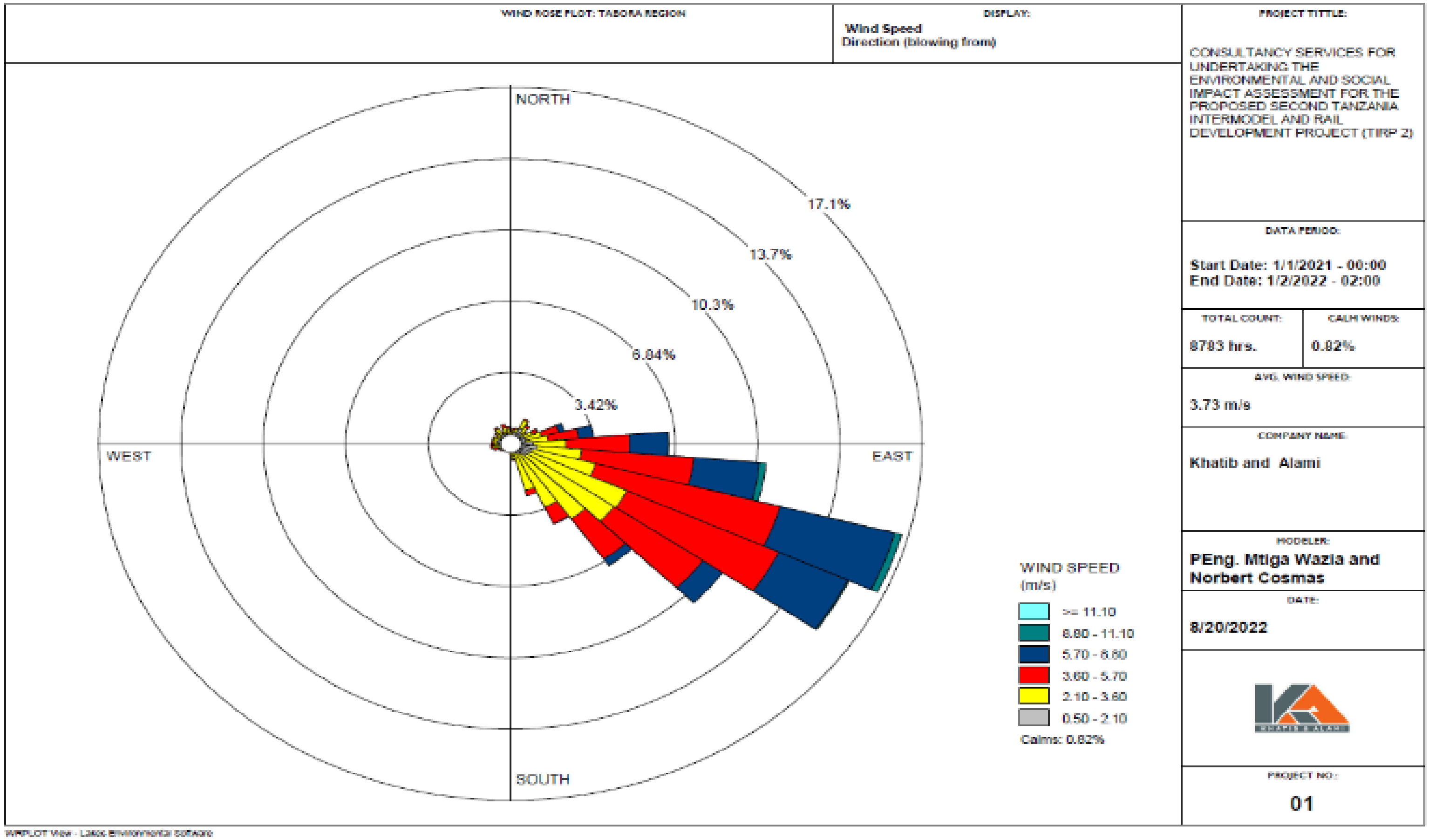


Figure 4.28: Wind Rose for Tanga Region

Source: Wind Plot 2022

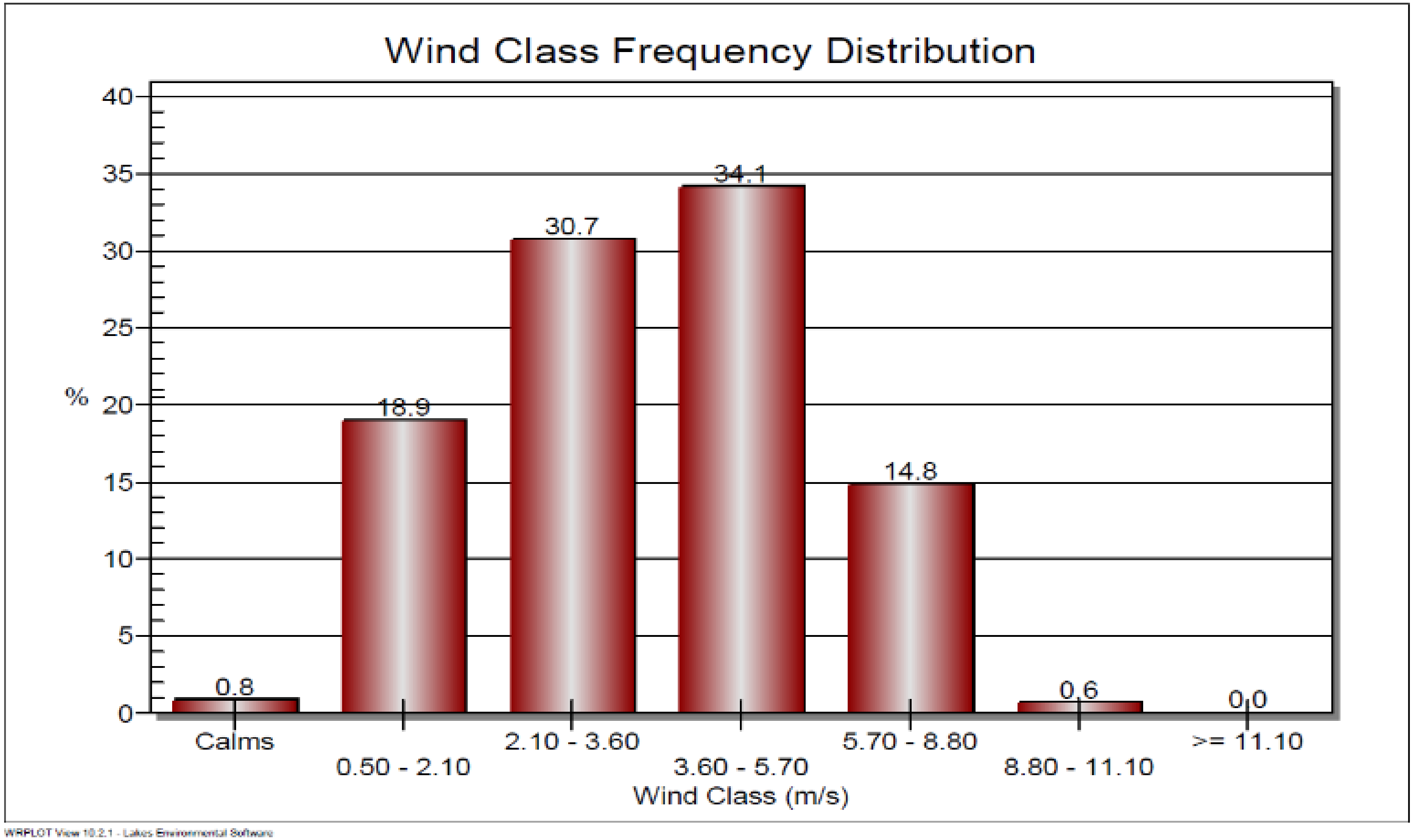


Figure 4.29: Wind Graph for Tanga Region

Source: Wind Plot 2022

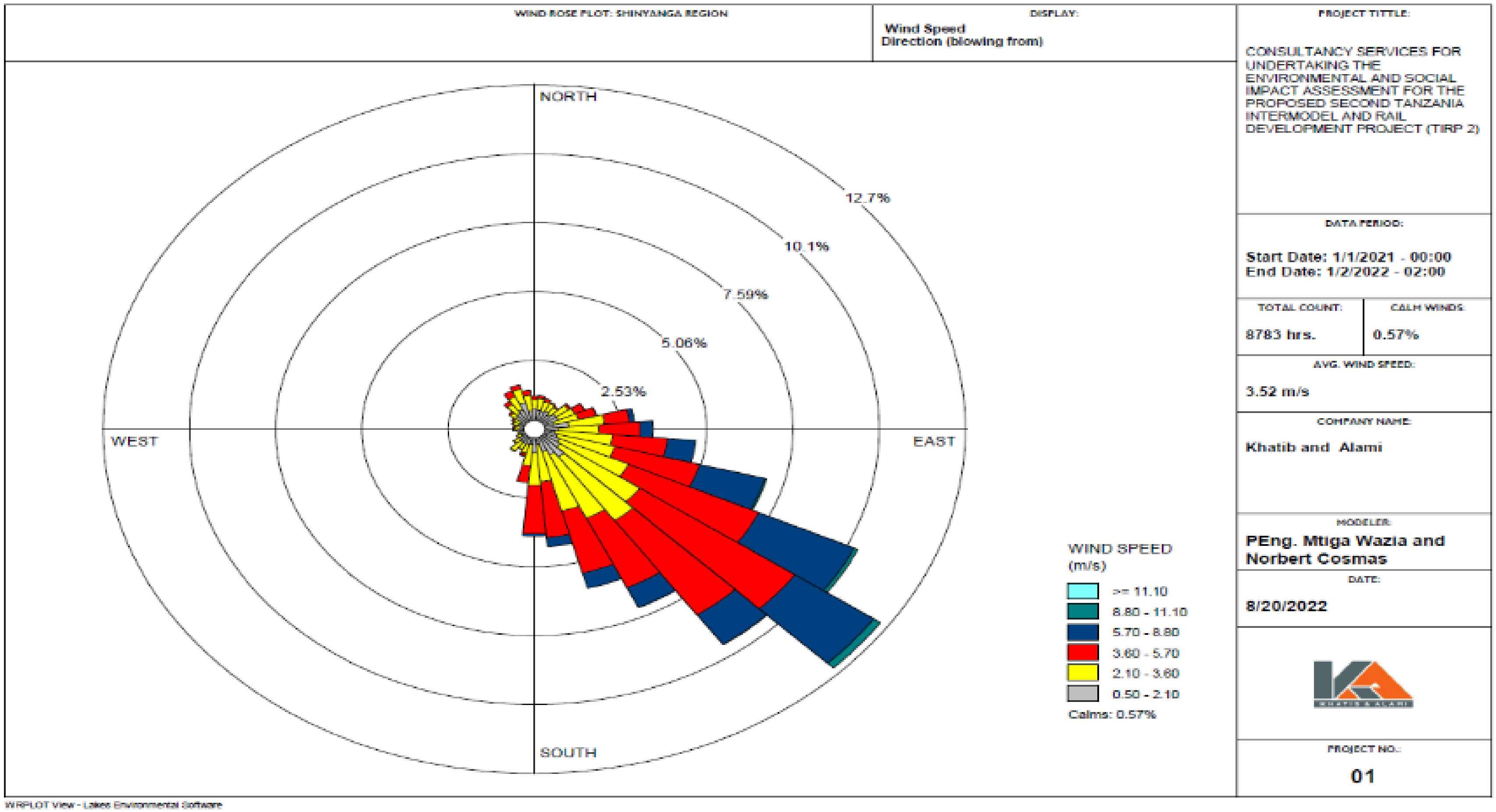
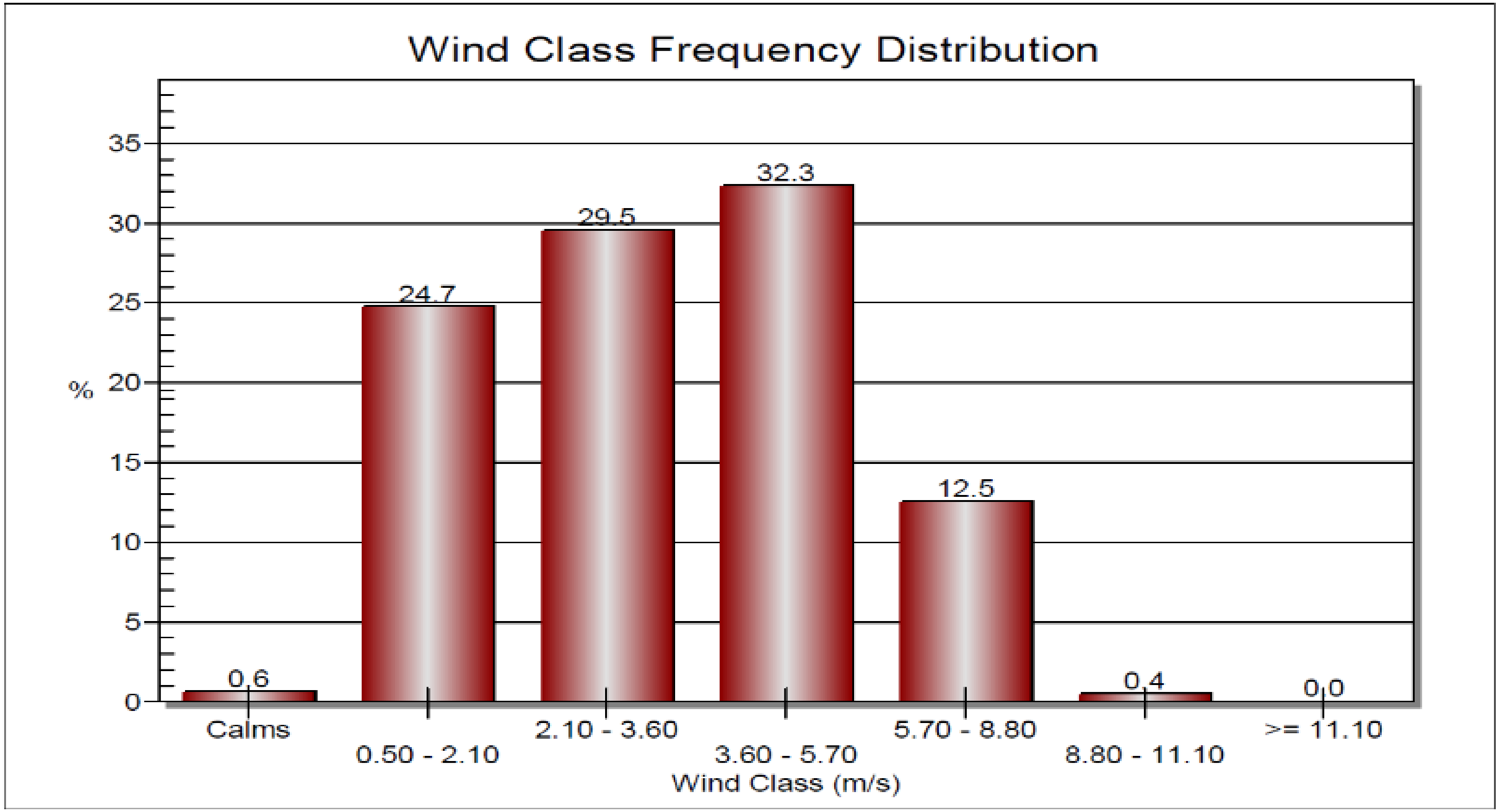


Figure 4.30: Wind Rose for Shinyanga Region

Source: Wind Plot 2022



WRPLOT View 10.2.1 - Lakes Environmental Software

Figure 4.31: Wind Graph for Shinyanga Region

Source: Wind Plot 2022

4.5.1.2 Topography

The topography of the project area is characterised by mixed residential buildings, industrial buildings, infrastructural and high concentrations of trade and other services and manufacturing activities. The terrain of the project area has modified due to the developments done around the project area. The general elevation in the site decreases as you go Far East from end point of the project to the Indian Ocean as indicated in the figure 5.32.

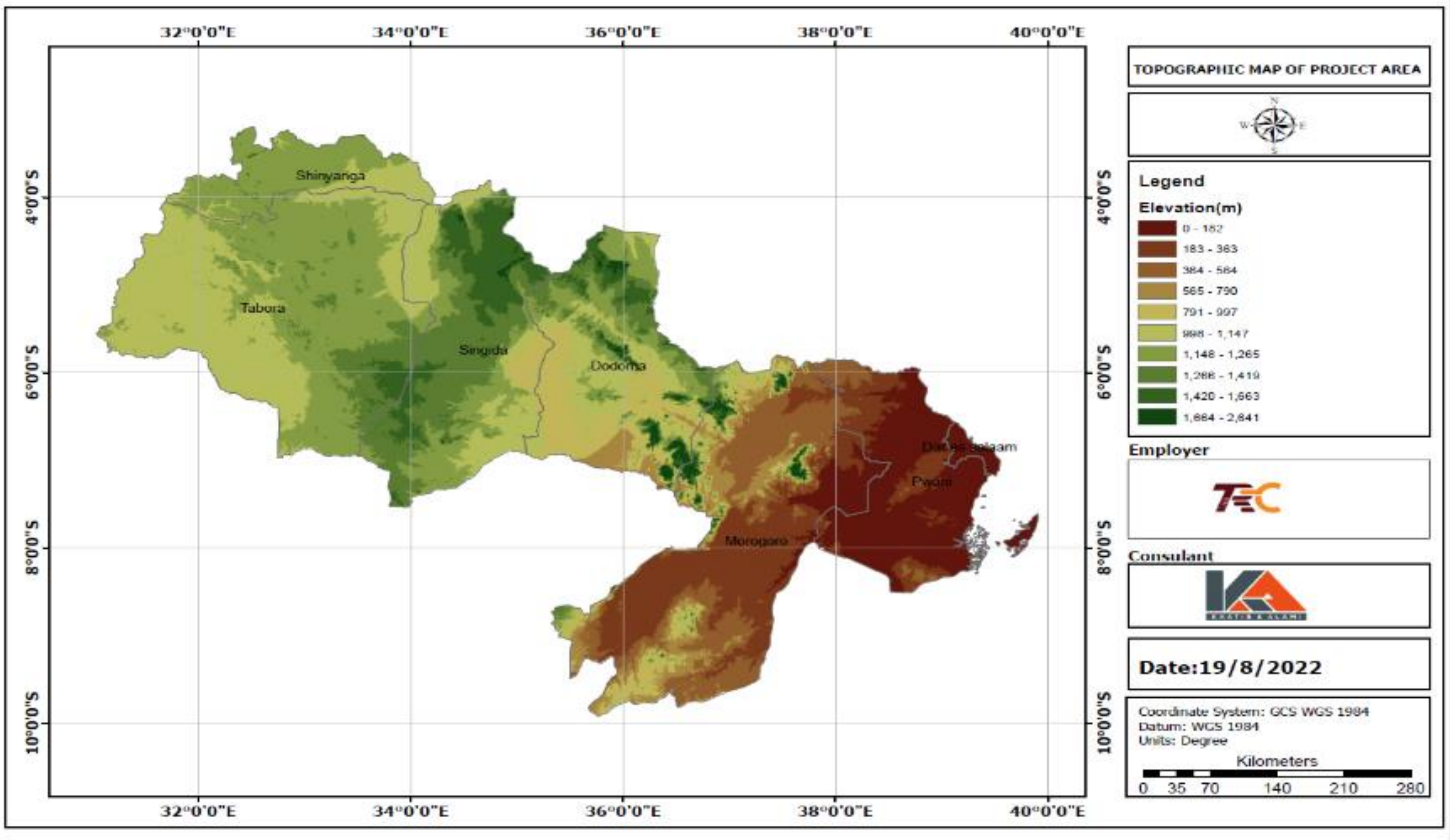


Figure 4.32: Topography of the area

4.5.1.3 Soil and geology

According to the World Reference Base for Soil Resources (WRB), Tanzania has 19 dominant soil types. The proposed MGR alignment passes through numerous soil types from Dar es Salaam to Isaka see figure 4.33 to 4.35. Based on the information acquired from FAO and Tanzania soil map published by GST Ferric Acrisols (at Singida and Dodoma region) is the major type of Soil that dominate the stretch along which the project site is existing. The age, mineralogy, and extensive leaching of these soils might lead to low levels of plant nutrients, excess aluminium, and high erodibility of which might make problematic to the railway track.

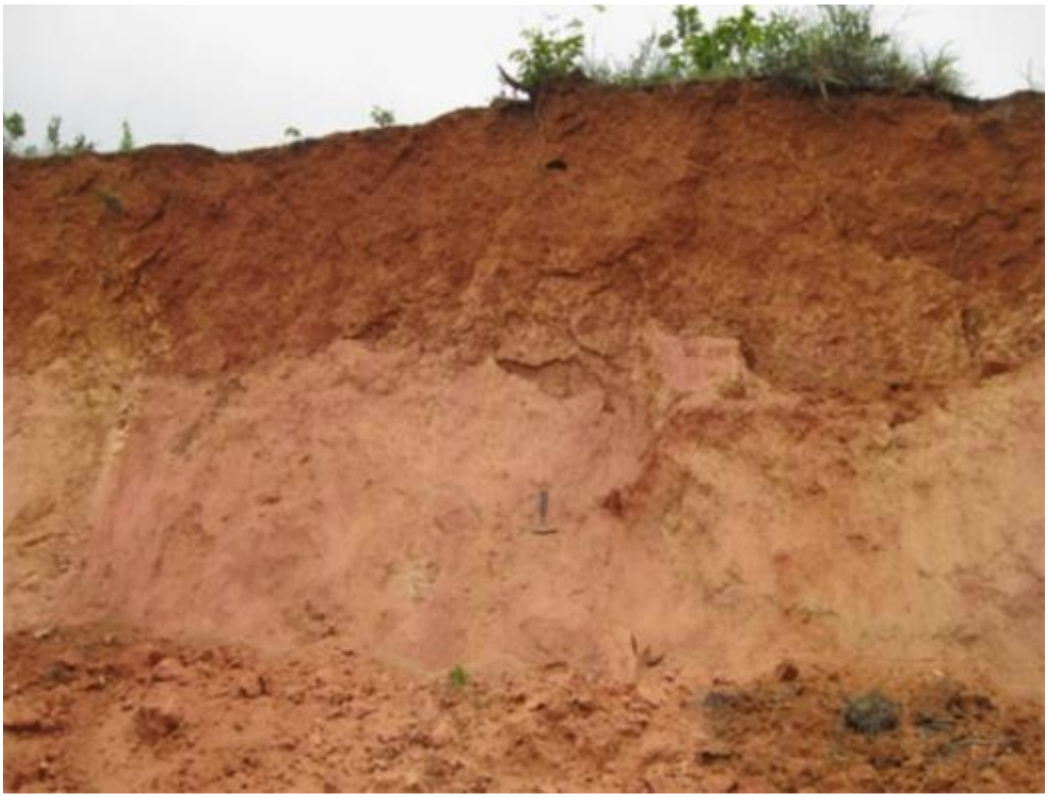


Figure 4.33: Soil along project corridor

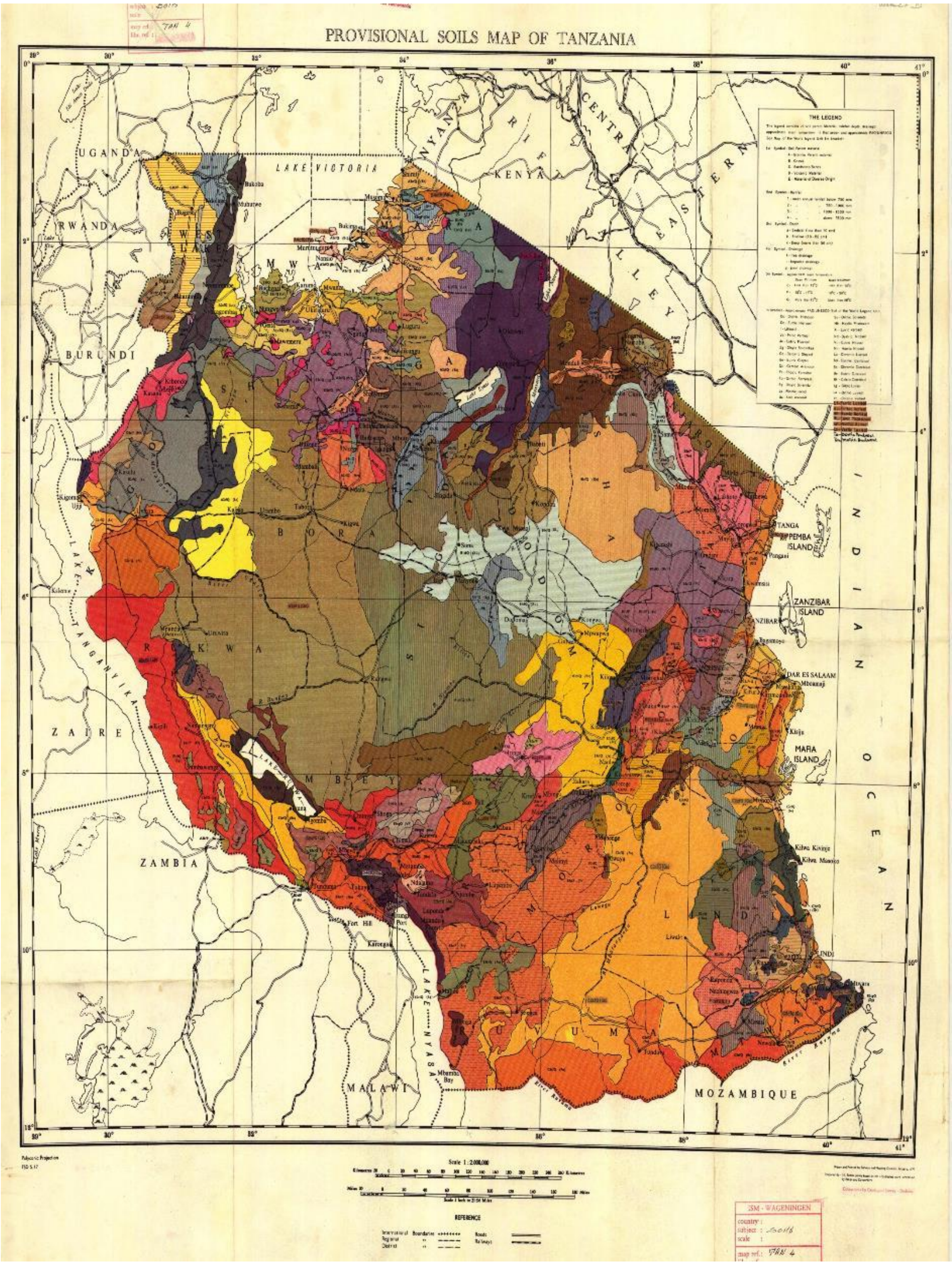


Figure 4.34: Provision Soil Map of Tanzania

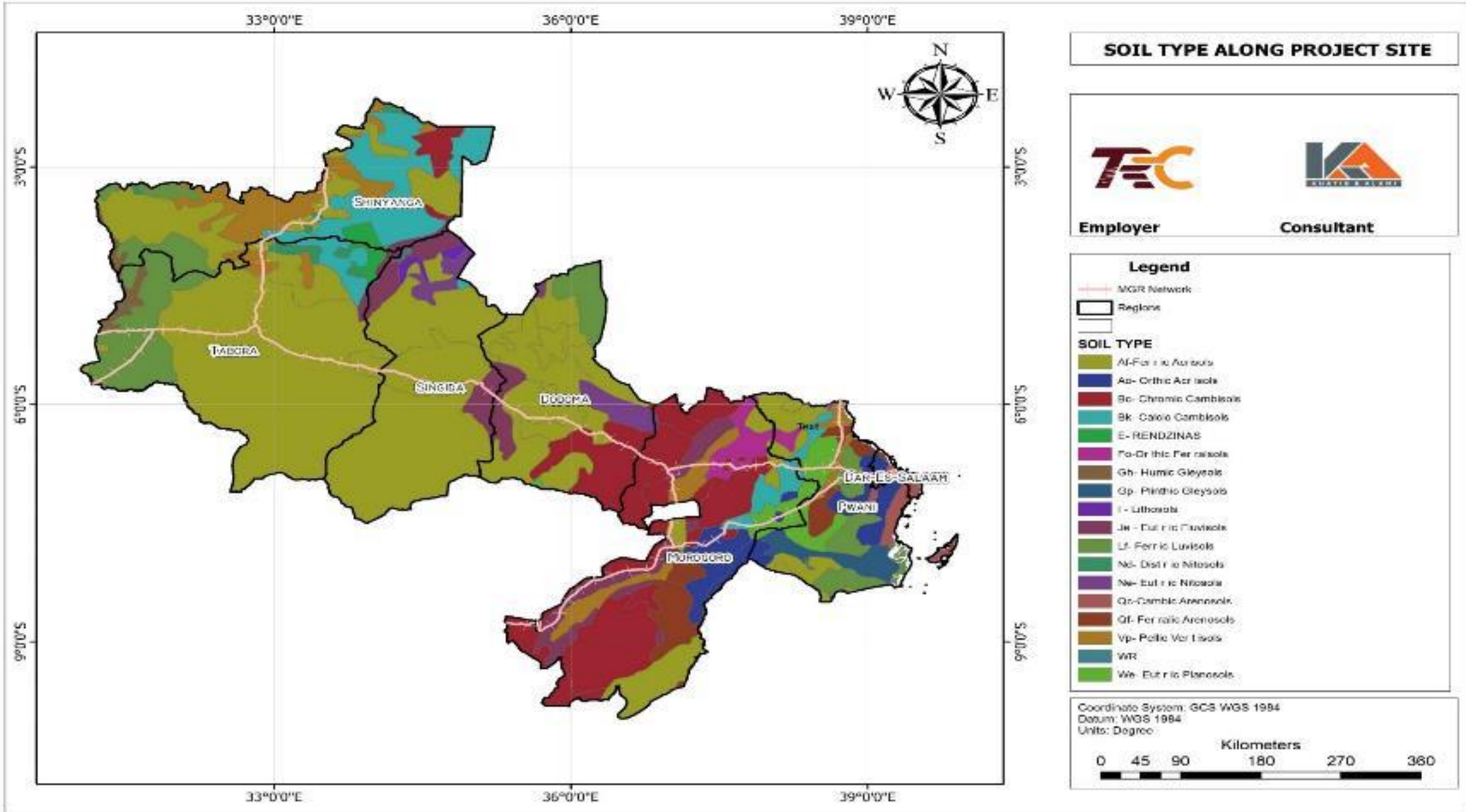


Figure 4.35: Soil Type along project area

4.5.1.4 Mineral Resources

There are several mineral resources and deposits in different regions traversed by the Project rail line. Three groups of mineral resources within the regions traversed by the proposed railway line Project are found close to the Project Area of Influence. These include kiln kaolin (ceramic and refractory minerals) in Dar es Salaam region and coloured stones (amethyst, quartz, citrine, aventurine, etc.) in Morogoro and Dodoma regions. While Singida, Tabora and Shinyanga are subjective to Gold and Diamond. The direct area of influence for this Project does not have mineral resources.

4.5.1.5 Hydrology

The project site passing through two major catchment area in Tanzania which area Wami Ruvu Catchment and Internal Drainage Catchment.

The IDB is situated in the north-eastern part of Tanzania. It is the second largest basin in the country, which extends over six regions of Arusha, Shinyanga, Manyara, Dodoma, Singida, and Tabora with a nominal area of 153,800 km2. The average annual rainfall in most parts of the IDB ranges from 600 - 900 mm/year. However, the north-eastern part (near border of Kenya) gets more than 1,000 mm/year.

The IDB is divided into nine sub-basements/sub-basins/sub-catchments and almost all rivers in it are Seasonal (either Ephemeral or Intermittent) and flow into lakes and swamps (as elaborated earlier) of varying size from December to July but are completely dry in the rest of the year.

The Wami/Ruvu River Basin, on the other hand, is located in the eastern part of Tanzania and has a catchment area of 66,294 km2. The basin has two major rivers of Wami and Ruvu with approximate catchment areas of 43,742 km2 and 17,789 km2, respectively, with coastal rivers located to the Eastern part of the Basin flowing into Indian Ocean, most of which are located in Dar es Salaam Region.

The source of Wami River is Chandama highland (El. +1511m) in the northern Tanzania and the catchment has an area of 43,742 km2 and 637 km long. The Wami River runs through Dodoma, Bahi, Chamwino, Mpwapwa, Kilosa, Mvomero and Bagamoyo districts and drains into the Indian Ocean.

On the other hand, the Ruvu River is originating from Mt. Uluguru with a catchment area of 11,789 km2 and 316 km long. It runs through Morogoro, Kibaha and Bagamoyo districts and drains out to the Indian Ocean.

The drainage patterns and scenarios of the project area majorly governed by rivers and streams, with drain ditches flowing along the railway to discharge runoff away from both the nearby communities as well as the highway pavement structure. Thus, the study looked at the rivers/streams and how they impact the railway track as well as the provided drainage structures and channels for the conveyance of the resulting runoff.

The rail alignment crosses both perennial and seasonal watercourses and spans regions with differing rainy seasons and means annual precipitation (refer figure 4.36). The railway track also crosses in various flood plain area along its way which are

- Ruvu River flood plain

The Ruvu River is an important water source for Dar es Salaam and experiences high turbidity levels (FAO, 2009). The Ruvu floodplain provides important ecosystem goods and services. Higher upstream flood levels could affect agricultural land and nearby communities. The rail embankment may affect the hydro morphology of the river and impact on the natural migration of the main channel within the floodplain,

- Mkondoa River flood plain

The Mkondoa River is an important water source for Kilosa, Kidete, Godegode and Gulwe areas and experiences high turbidity levels. The Mkondoa floodplain provides an important ecosystem goods and services. It provides flood storage during periods of high flows and acts as a deposition zone for sediment and nutrients. Higher upstream flood levels could affect agricultural land and nearby communities.

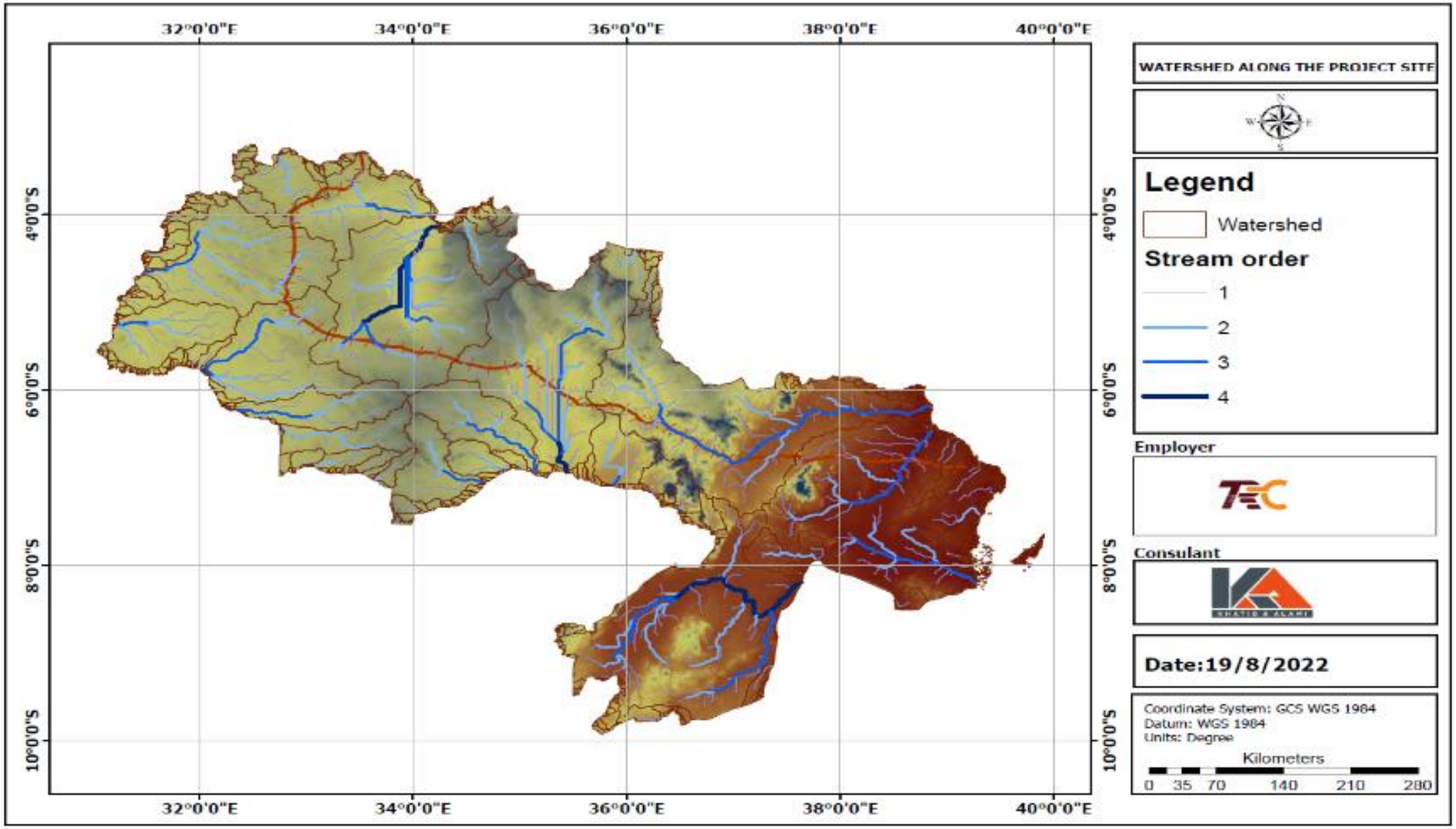


Figure 4.36: Orders of streams along and crossing the project

It is worth noting that the ongoing study of assessment of Climate vulnerability and Disaster risks along Dsm-Isaka railway will provide recommendations that shall be included in ESIA and ESMP once ready.

4.5.1.6 Flooding Events along the Proposed Project

The existing MGR line has experienced impacts from flooding and sedimentation events at Kilosa, Kidete and Gulwe sections. A total of 40 flood events occurred between Kilosa and Dodoma during 2011–2014, out of which 22 (55 percent) flood events occurred at two specific locations of Km 349 and at Km 365.6 which fall at Gulwe and Godegode areas (JICA et al., 2016). The Kilosa, Kidete and Gulwe sections have experienced repeated flooding events in 1962, 1968, 1992, 1997/1998, 2009/2010, 2011, 2014 and the most recent event in January, 2018. The impacts of these floods have included railway damage in terms of scouring around substructure piers and/or embankments and outflows of track and/or rail-bed. The occurrence of these floods is attributed to the fact that the railway crosses the Kilosa to Dodoma section consisting of two major rivers; the Kinyasungwe and Mkondoa Rivers. TRC has implemented several recovery emergency response measures to ensure quick reopening of railway operations but not serious preventative measures due to limited funds. However, in recent there is a study which is undergoing with the government so as to come with pertinent solutions for the problem in the flood areas. In addition, *It is worth noting that the ongoing study of assessment of Climate vulnerability and Disaster risks along Dsm-Isaka railway will provide recommendations that shall be included in ESIA and ESMP once ready.*

4.5.1.7 Air Quality

The project alignment crosses Dar es Salaam, Coast, Morogoro, Dodoma and Singida, Tabora and Shinyanga Regions. Along its way it crosses number of anthropogenic activities thus, Air quality of the Project Area is expected to be influenced by pollutants from existing stationary sources, fugitive /mobile sources, and small combustion facilities. Existing stationary sources of air pollutants includes fuel burning at residential, burning of solid waste, industries, and factories. During the study number of industries were mostly found in Dar es Salaam and Morogoro town. Most communities along the railway stretch use firewood for cooking and heating are also classified as stationary sources of air pollutants.

The air pollutants associated with stationary sources include nitrogen oxides (NOx), sulfur dioxide (SO2), carbon monoxide (CO), and particulate matter (PM), as well as other air pollutants including certain volatile organic compounds (VOCs).

The fugitive sources of pollutants include cars and trucks crossing the railway and the diesel-powered locomotives (existing trains). Other sources include turbines located at Ruvu and boilers in various industries located in Dar es Salaam, Dodoma, Tabora and Morogoro. The fugitive emissions may also Include VOCs, NOx, SO2 and CO mainly generated from combustion processes in vehicle engines, turbines, and boilers. The spatial distribution for sources of air pollutants along the proposed railway stretch covers a very small area since the proposed project passes across undeveloped land-forests and bushlands.

Ambient Air Quality Results

Ambient air quality monitoring was done at the mentioned locations in table 1.4, table 1.5 and appendix 2. The maximum, minimum and average values of PM2.5 and PM10 are represented in table 4.2 and Gaseous Pollutants such as (Sox, NOx, H2S & CO) are presented in table 4.3to 4.8. Using the WHO Standard limits, most of the sampled areas in the Project area are already above limits.

Table 4.2: Monitored PM10 & PM2.5 Values

Sl. No.	Region	Sampling Location	PM10 ($\mu g/Nm^3$)			PM2.5 ($\mu g/Nm^3$)			WHO Standard Limit (EHS Guidelines)	
			Min	Max	Avg.	Min	Max	Avg.	PM10 ($\mu g/Nm^3$)	PM2.5 ($\mu g/Nm^3$)
1.	Dar es Salaam	AQM S-1	74	86	80	60	66	63	50	25
2.		AQM S -2	68	72	70	65	71	68		
3.		AQM S -3	60	64	62	49	52	50.5		
4.		AQM S -4	58	66	62	50	58	54		

Sl. No.	Region	Sampling Location	PM10 (µg/Nm³)			PM2.5 (µg/Nm³)			WHO Standard Limit (EHS Guidelines)	
			Min	Max	Avg.	Min	Max	Avg.	PM10 (µg/Nm³)	PM2.5 (µg/Nm³)
5.	Pwani	AQMS -5	50	60	55	45	53	49		
6.		AQMS -6	55	62	58.5	50	58	54		
7.	Morogoro	AQMS -7	58	68	63	48	56	52		
8.		AQMS -8	60	66	63	54	61	57.5		
9.		AQMS -9	52	56	54	44	51	47.5		
10.	Dodoma	AQMS -10	66	74	70	58	63	60.5		
11.		AQMS -11	60	68	64	52	60	56		
12.		AQMS -12	56	62	59	50	58	54		
13.	Singida	AQMS -13	70	76	73	63	68	65.5		
14.		AQMS -14	62	68	65	51	53	52		
15.		AQMS -15	59	65	62	50	58	54		
16.	Tabora	AQMS -16	74	80	77	63	70	66.5		
17.		AQMS -17	68	76	72	59	68	63.5		
18.		AQMS -18	55	56	55.5	50	54	52		
19.		AQMS -19	52	60	56	41	48	44.5		

Sl. No.	Region	Sampling Location	PM10 (µg/Nm^3)			PM2.5 (µg/Nm^3)			WHO Standard Limit (EHS Guidelines)	
			Min	Max	Avg.	Min	Max	Avg.	PM10 (µg/Nm^3)	PM2.5 (µg/Nm^3)
20.	Shinyanga	AQM S -20	56	66	61	44	50	47		
21.		AQM S -21	60	70	65	47	53	50		

Note: For PM10 -The Environmental Management (Air Quality Standards) Regulations, 2007; PM2.5 - National Ambient Air Quality Standards, US EPA.

Table 4.3: Results of Gaseous Pollutants (Sox, NOx, H2S & CO) at Dar es Salaam

Sl. No	Pollutants	Measured values (µg/Nm^3)			Limit	Standard
		AQMS-1	AQMS-2	AQMS-3		
1.	Sox	0.001	0.004	0.00	100 µg/Nm^3	The Environmental Management (Air Quality Standards) Regulations, 2007.
2.	CO	0.002	0.002	<1	10,000 µg/Nm^3	
3.	NOx	0.001	0.004	<1	120µg/Nm^3	
4.	H2S	<0.1	<0.1	<0.1	20 PPM	OSHA Standards

Table 4.4: Results of Gaseous Pollutants (Sox, NOx, H2S & CO) at Pwani

Sl. No	Pollutants	Measured values (µg/Nm^3)			Limit	Standard
		AQMS-4	AQMS-5	AQMS-6		
1.	Sox	0.001	0.00	0.00	100 µg/Nm^3	The Environmental Management (Air Quality Standards) Regulations, 2007.
2.	CO	0.00	0.001	0.00	10,000 µg/Nm^3	
3.	NOx	0.001	0.002	0.00	120µg/Nm^3	
4.	H2S	<0.1	<0.1	<0.1	20 PPM	OSHA Standards

Table 4.5: Results of Gaseous Pollutants (Sox, NOx, H2S & CO) at Morogoro

Sl. No	Pollutants	Measured values (µg/Nm³)			Limit	Standard
		AQMS-7	AQMS-8	AQMS-9		
1.	Sox	0.002	0.00	0.001	100 µg/Nm³	The Environmental Management (Air Quality Standards) Regulations, 2007.
2.	CO	0.001	0.00	0.003	10,000 µg/Nm³	
3.	NOx	0.00	0.00	0.001	120µg/Nm³	
4.	H2S	<0.1	<0.1	<0.1	20 PPM	OSHA Standards

Table 4.6: Results of Gaseous Pollutants (Sox, NOx, H2S & CO) at Dodoma

Sl. No	Pollutants	Measured values (µg/Nm³)			Limit	Standard
		AQMS-10	AQMS-11	AQMS-12		
1.	Sox	0.00	0.00	0.00	100 µg/Nm³	The Environmental Management (Air Quality Standards) Regulations, 2007.
2.	CO	0.001	0.001	0.001	10,000 µg/Nm³	
3.	NOx	0.002	0.00	0.003	120µg/Nm³	
4.	H2S	<0.1	<0.1	<0.1	20 PPM	OSHA Standards

Table 4.7: Results of Gaseous Pollutants (Sox, NOx, H2S & CO) at Singida

Sl. No	Pollutants	Measured values (µg/Nm³)			Limit	Standard
		AQMS-13	AQMS-14	AQMS-15		
1.	Sox	0.00	0.00	0.00	100 µg/Nm³	The Environmental Management (Air Quality Standards) Regulations, 2007.
2.	CO	0.00	0.001	0.00	10,000 µg/Nm³	
3.	NOx	0.00	0.00	0.00	120µg/Nm³	
4.	H2S	<0.1	<0.1	<0.1	20 PPM	OSHA Standards

Table 4.8: Results of Gaseous Pollutants (Sox, NOx, H2S & CO) at Tabora

Sl. No	Pollutants	Measured values (µg/Nm³)			Limit	Standard
		AQMS-16	AQMS-17	AQMS-18		
1.	Sox	0.00	0.00	0.00	100 µg/Nm³	The Environmental Management (Air Quality Standards) Regulations, 2007.
2.	CO	<1	0.00	<1	10,000 µg/Nm³	
3.	NOx	79	0.00	5	120µg/Nm³	
4.	H2S	<0.1	<0.1	<0.1	20 PPM	OSHA Standards

Table 4.9: Results of Gaseous Pollutants (Sox, NOx, H2S & CO) at Shinyanga

Sl. No	Pollutants	Measured values (µg/Nm³)			Limit	Standard
		AQMS-19	AQMS-20	AQMS-21		
1.	Sox	0.00	0.00	0.00	100 µg/Nm³	The Environmental Management (Air Quality Standards) Regulations, 2007.
2.	CO	0.00	0.00	0.00	10,000 µg/Nm³	
3.	NOx	79	0.00	0.00	120µg/Nm³	
4.	H2S	<0.1	<0.1	<0.1	20 PPM	OSHA Standards

Note: The recorded exceedance values are highlighted in the above tables

Discussion

During the study, the average values of PM2.5 was observed between 44.5 - 68 µg/Nm³ and for PM10 the average values were observed between 54 – 80 µg/Nm³. The highest value of PM10 and PM2.5 was recorded at AQMS 1 i.e., at Kamata. The reason of higher label of particulate at AQMS 1 are due to resuspension of the fine dust particulates because of the heavy traffic in the area. The particulate matter can be reduced drastically by sprinkling of water. With respect to gaseous pollutants, all the parameters were of insignificant to all monitoring locations. The recorded values of the gaseous pollutant it doesn't mean the absence of it but the measured parameters might also be less than the detectable limit of the instrument used.

4.5.1.8 Noise Quality

The ambient noise monitoring was done to observe the ambient noise level in the area near to the project area. The aim of this noise monitoring was to record the noise level to the receptors within the study area especially to the human settlement for future reference. The monitoring was done at three locations per region in the vicinity of the project area on a 24-hour basis. Modeling was done to indicate the noise contour to the receptors at each region under open environment conditions see figure 4.38 to 4.44. Result is given in Table 5.10 and the monitoring locations are shown in table 1.4 and in the appendix 2. The major sources of noise were observed mainly from vehicles, road traffic and markets.

Noise Monitoring Results

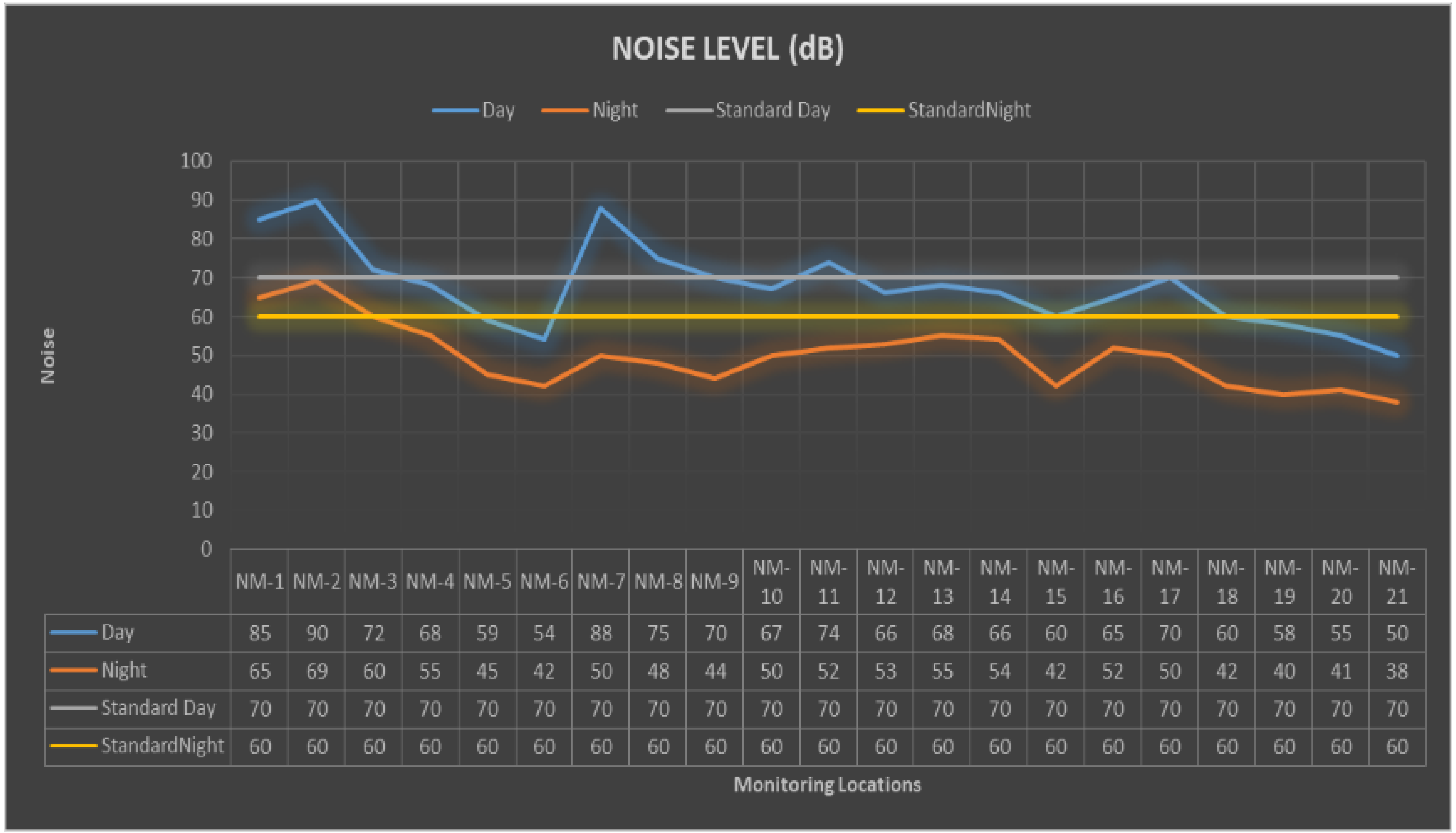
Noise levels during day-time, in the area were observed to be in the range of 50 dB (A) to 90 dB (A), where six points are above the limit as per Environmental Management (Standards for the Control of Noise and Vibration Pollution) Regulations, 2011. Noise levels at these locations are due to vehicular movements as well as other human activities in the area.

Noise level during night-time was observed to be in the range of 38 dB (A) to 69 dB (A) where only two points are above the limit as per Environmental Management (Standards for the Control of Noise and Vibration Pollution) Regulations, 2011. Noise levels at these locations are due to vehicular movements as well as other human activities in the area. Day and night noise levels with their respective locations, along with coordinates are given in Table 4.10 and figure 4.37.

Table 4.10: Summary of Ambient Noise Levels Monitored in the Study Area

Sl. No.	Region	Location Code	Category of Area	Monitored Noise Levels LAeq (dBA)		IFC Standard (EHS Guidelines) One Hour LAeq (dBA)	
				Day	Night	Day	Night
1.	Dar es Salaam	NM-1	Industrial, Commercial and Residential	85	65	55	45
2.		NM-2		90	69		
3.		NM-3		72	60		
4.	Pwani	NM-4	Rural, Commercial and Residential	68	55	55	45
5.		NM-5		59	45		
6.		NM-6		54	42		
7.	Morogoro	NM-7	Industrial, Commercial and Residential	88	50	55	45
8.		NM-8		75	48		
9.		NM-9		70	44		
10.	Dodoma	NM-10	Industrial, Commercial and Residential	67	50		
11.		NM-11		74	52		
12.		NM-12		66	53		
13.	Singida	NM-13	Rural, Commercial and Residential	68	55	55	45
14.		NM-14		66	54		
15.		NM-15		60	42		
16.	Tabora	NM-16	Industrial, Commercial and Residential	65	52	55	45
17.		NM-17		70	50		
18.		NM-18		60	42		
19.	Shinyanga	NM-19	Rural, Commercial and Residential	58	40	55	45
20.		NM-20		55	41		
21.		NM-21		50	38		

Note: The recorded exceedance values are highlighted in the above tables



	NM-1	NM-2	NM-3	NM-4	NM-5	NM-6	NM-7	NM-8	NM-9	NM-10	NM-11	NM-12	NM-13	NM-14	NM-15	NM-16	NM-17	NM-18	NM-19	NM-20	NM-21
Day	85	90	72	68	59	54	88	75	70	67	74	66	68	66	60	65	70	60	58	55	50
Night	65	69	60	55	45	42	50	48	44	50	52	53	55	54	42	52	50	42	40	41	38
Standard Day	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
StandardNight	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60

Figure 4.37: Noise levels

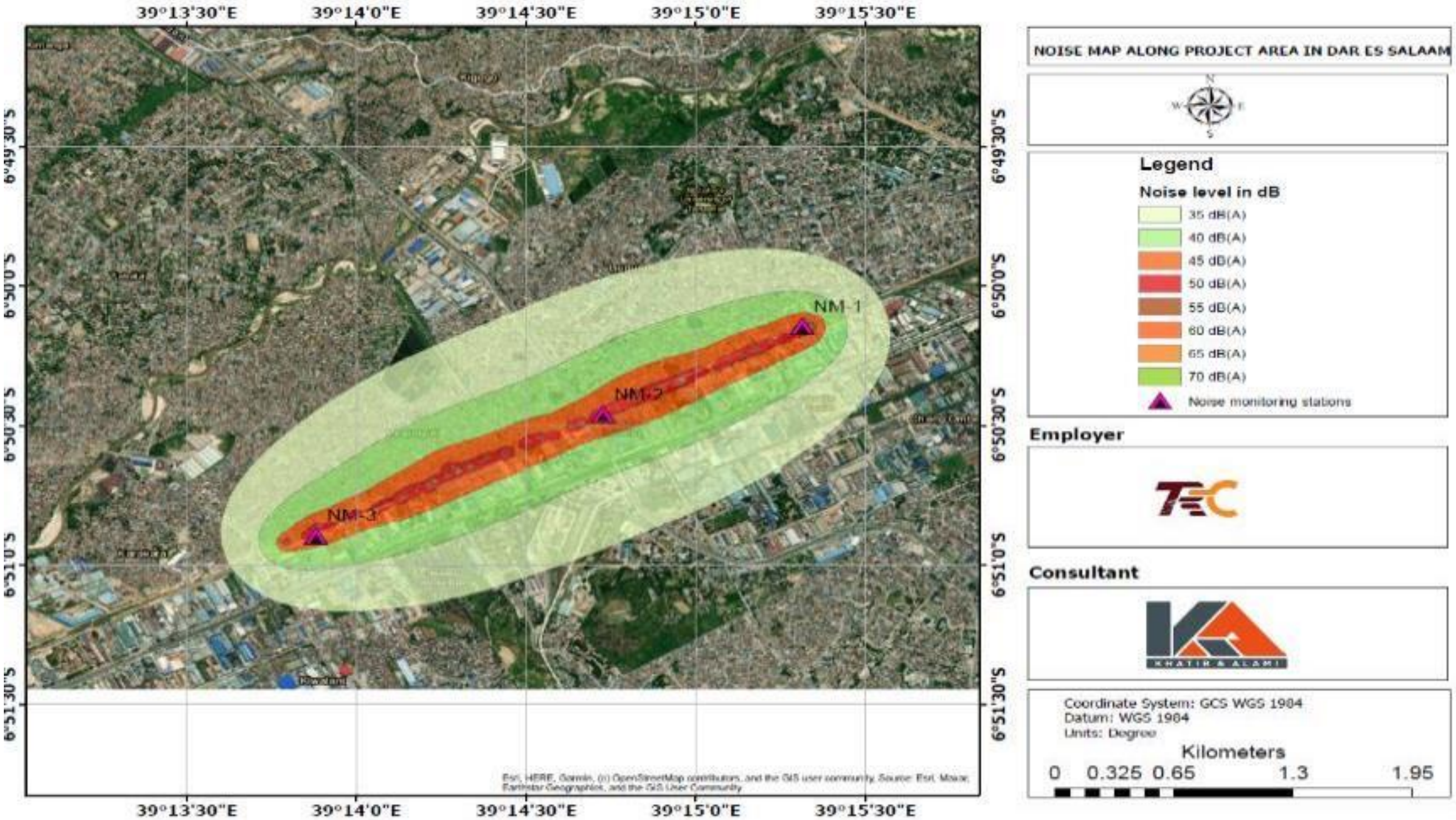


Figure 4.38: Noise contour at Dar es Salaam

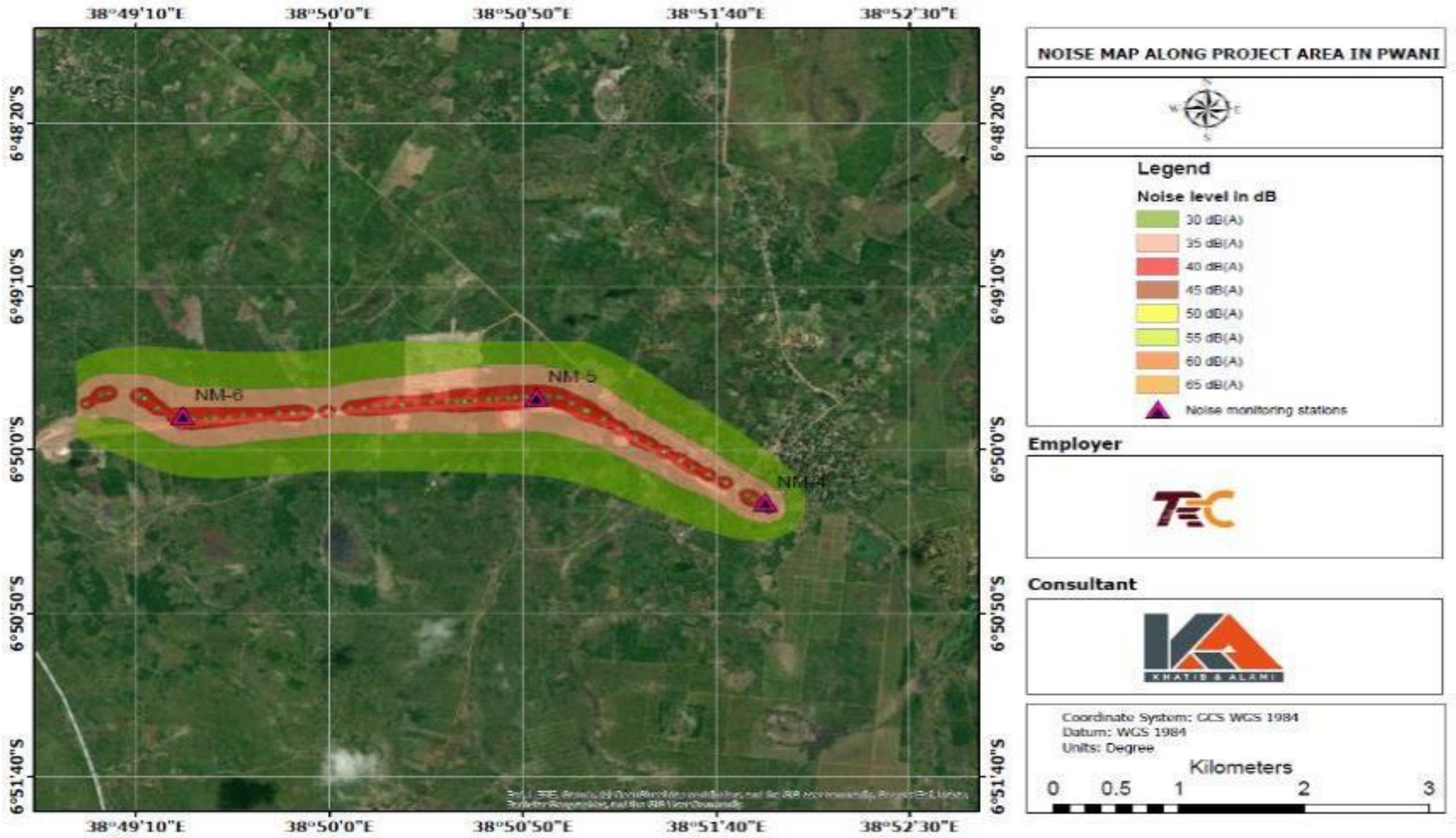


Figure 4.39: Noise contour at Pwani

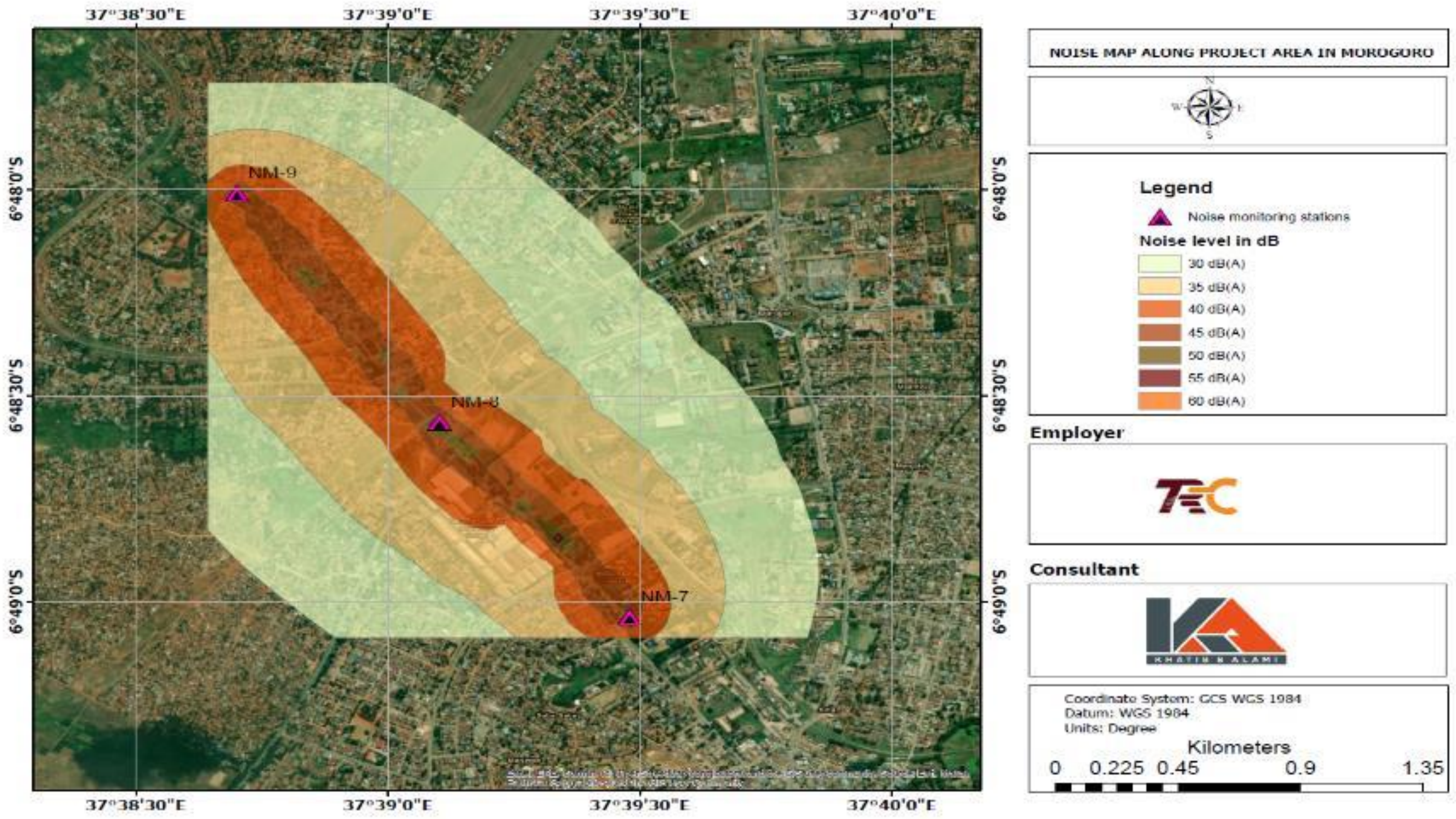


Figure 4.40: Noise contour at Morogoro

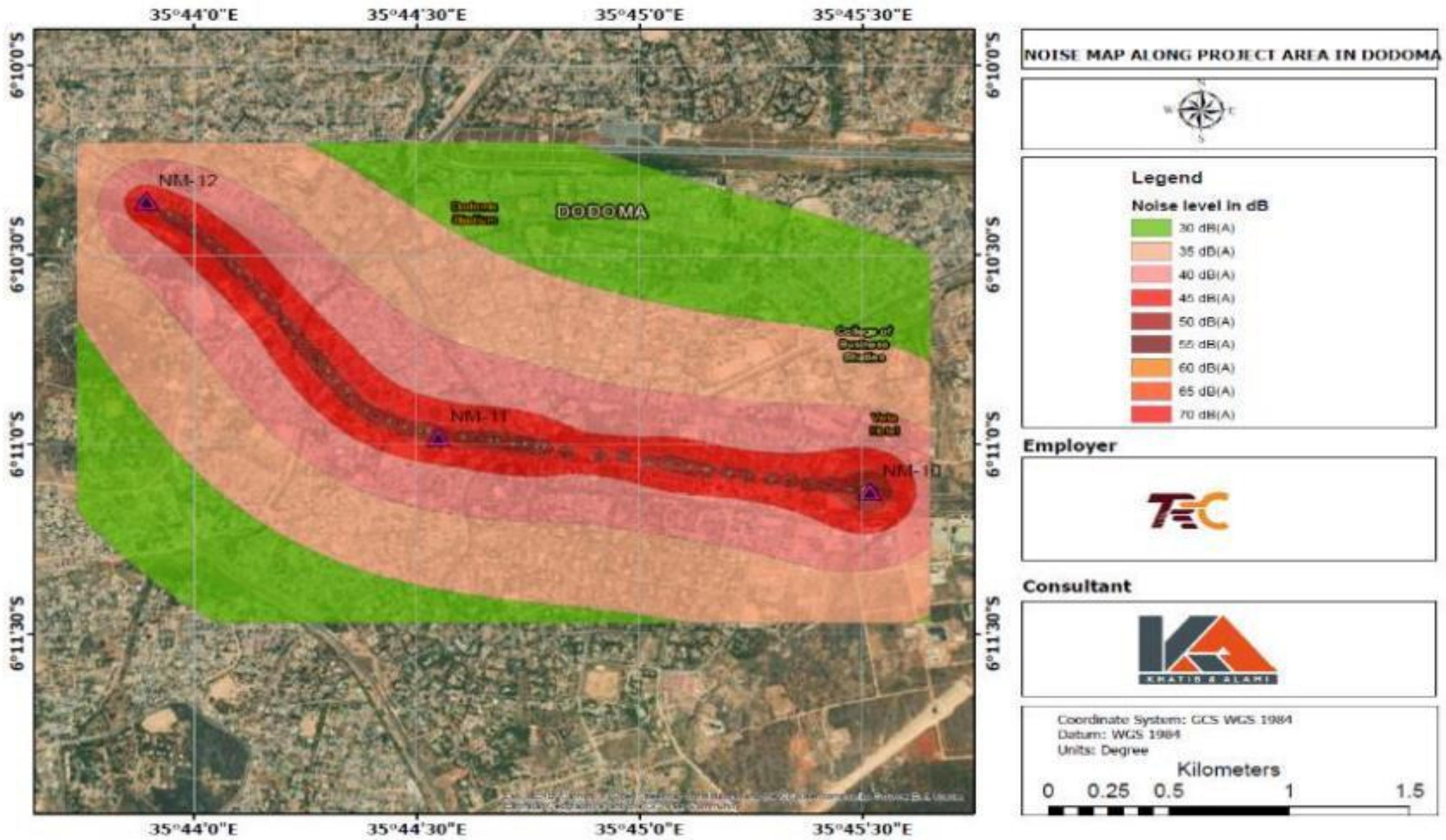


Figure 4.41: Noise contour at Dodoma

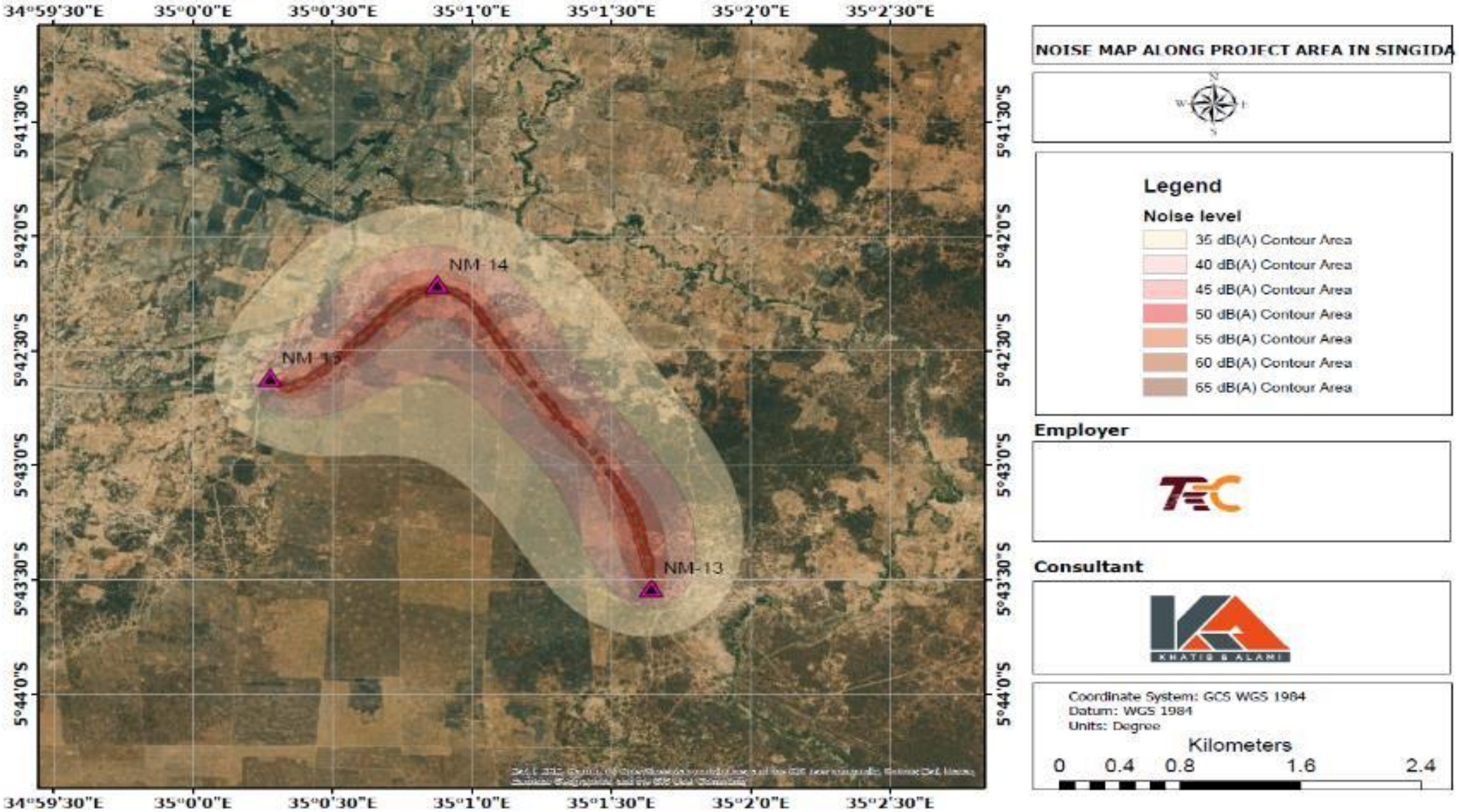


Figure 4.42: Noise contour at Singida

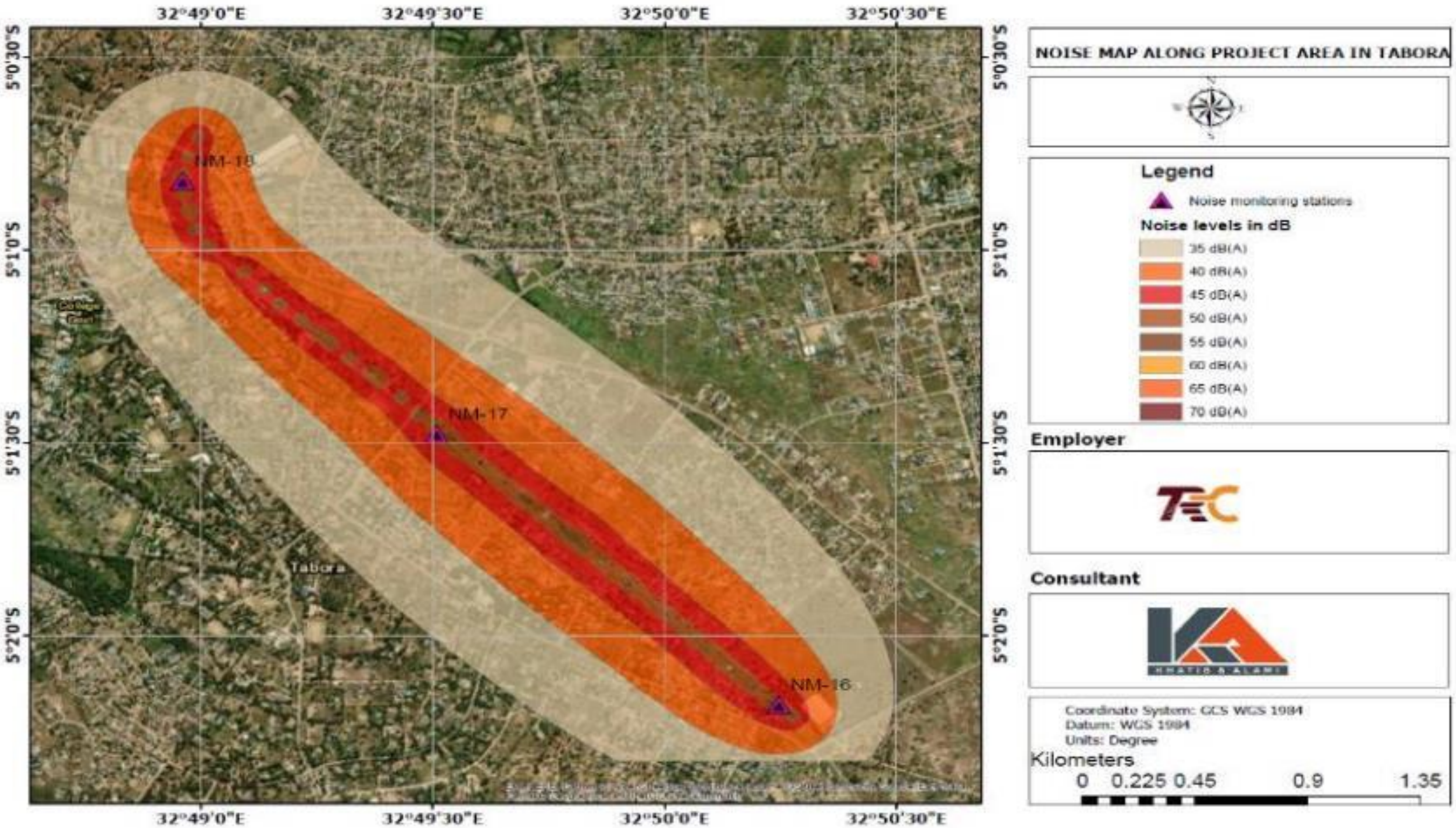


Figure 4.43: Noise contour at Tabora

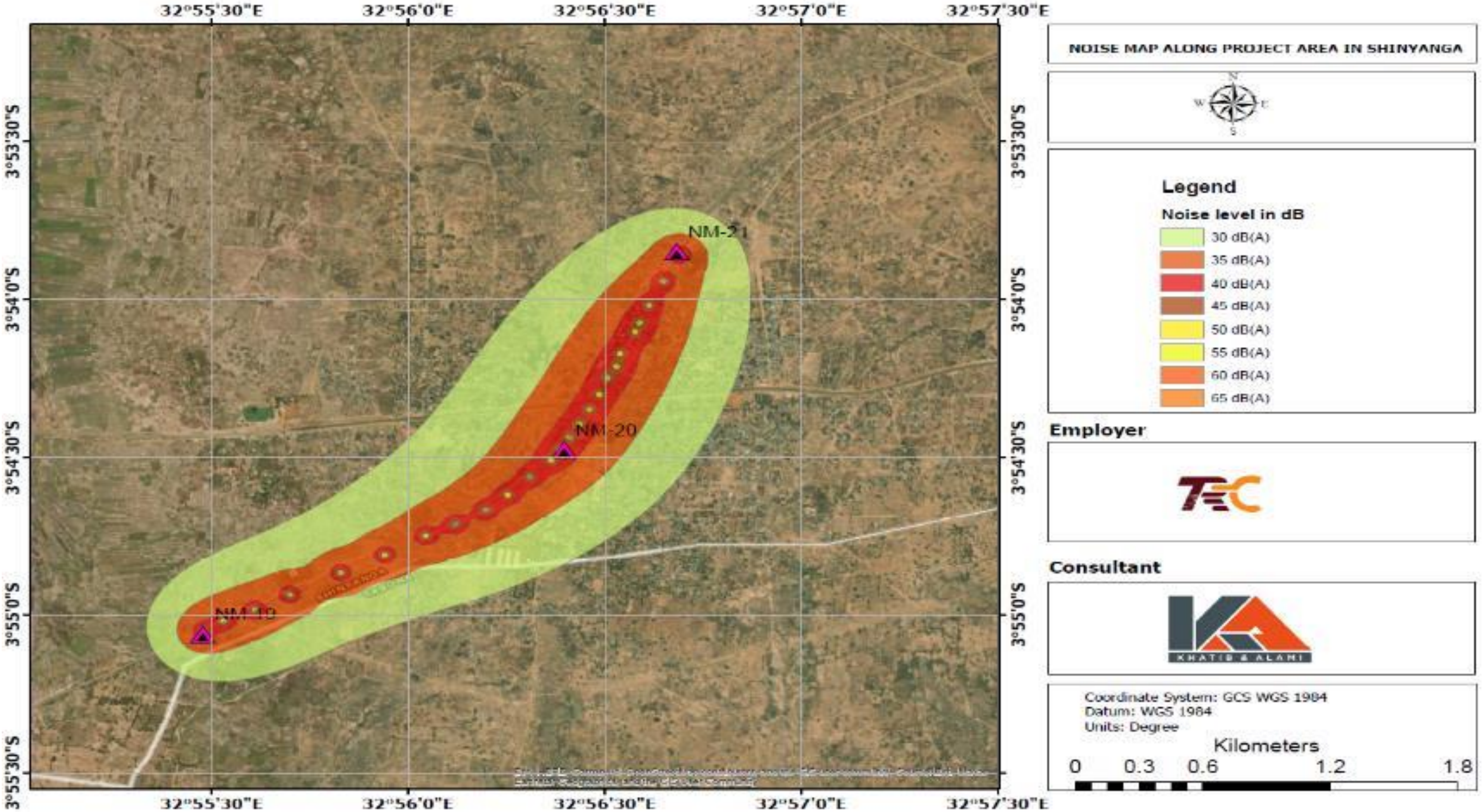


Figure 4.44: Noise contour at Shinyanga`

4.5.1.9 Water quality

Analysis of water quality

The key water quality parameters monitored at stations are analyzed to reflect the status of water quality of and the trend for water quality. The water samples were analyzed for Biological and physicochemical characteristics. The physicochemical parameters were analyzed if there are any parameters exceeding TBS Standard for the Protection of Human Health and the Protection of Aquatic Life.

pH:

The pH values of the samples ranged from 5.75- 7.11, where the water samples at location tested in the study were found to be in the permissible range of pH value recommended by TBS 6.5-9.6. The pH value measure at Ruvu River, Mkondoa River and Kidete River are 6.61, 6.35 and 6.82 respectively. Mkondoa River has pH value bellow that 6.5 which indicate the slightly weak acidic property that might be caused due to the presence of human activities such as Agriculture in some areas up stream.

Electrical conductivity

Electric conductivity at the study areas was found to be very low over all points in the study area i.e. Ruvu River measure 96 μ S/cm, Mkondoa River measure 69 μ S/cm and Kidete River measure 51 μ S/cm. Laboratory result show that the electrical conductivity in the study area varies between 51 to 96 μ S/cm which is below the prescribed standard established by TBS (2000 μ S/cm).

Total Dissolved Solids (TDS):

TDS values varies from 25 to 48. Mg/l. The maximum value of TDS was at Ruvu River 48 Mg/l which definitely caused due to the presence of agricultural activities taken upstream of the sampling location. Total dissolved solids describe the amount of inorganic salts of calcium, magnesium, sodium etc. and small proportion of organic matter present in the water, where a high value of the same have been reported to be related to acute myocardial infarction as well as ischemic heart diseases detailed see table 5.11.

Phosphate:

The phosphate content in the study area found to range from 0.96 to 3.02 mg/l where the maximum value found at Mkondoa River where upstream of the sampling point found to have agricultural activities. This maximum value can be associated with use fertilizers with Sulphur contents.

Phosphate is rarely found in high concentrations in waters as it is actively taken up by plants. High concentrations of phosphates can indicate the presence of pollution and are largely responsible for eutrophic conditions. The anthropogenic additions of phosphorus to the river have a considerable effect on the quality of the water. Such phosphate is derived mainly from domestic sewage and the runoff from agricultural areas.

Metals:

Iron: The analysis of the data revealed that at all three sampling locations iron concentration are within the TBS limit table 4.11.

NB. The presence of other metals in the samples were analyzed and most of them were found to be below the detection limit.

Turbidity

The measure value of the turbidity in the samples collected has the lowest value of 4 NTU at Ruvu River and highest value at Kidete River which 15 NTU in details see table 5.11. The highest value at Kidete River was caused due to the human activities mainly domestic activities such as water fetching, laundry etc. found during sampling.

The haziness or cloudiness of a fluid due to various individual particles (TSS or TDS) that can be seen with naked eyes (like smoke in air) is known as turbidity. High concentrations of particulate matter affect light penetration and productivity, recreational values, and habitat quality, and cause lakes to fill in faster. In streams, increased sedimentation and siltation can take place, which might result in harming the habitat areas for fish and other aquatic life. Particles also provide attachment places for some other pollutants, especially bacteria and metals. That's why, turbidity readings are used as an indicator of potential pollution in a water body.

Color

As far as three samples is considered varieties of Color were observed during sampling time. Thus why, laboratory analysis of the color was recommended and the result presented in the table 5.11 show that all sample has the value bellow TBS standard.

Ammonia nitrogen (NH3)

Water samples collected during monitoring period no any sample were exceeding the TBS limit table 5.11. Ammonia is primarily released during the decomposition of organic matter by bacteria and other microorganisms. The degradation of proteins and amino acids by deamination reactions releases ammonia. Un-ionized ammonia nitrogen (NH3) is toxic to fish at a concentration of 0.02mg/L. The release of wastewater containing ammonia into surface water can result in anaerobic conditions due to oxygen consumption by nitrifying bacteria.

At this location, higher level of NH3 can be associated by agriculture activities including grazing.

Fecal coliform (FC)

A **fecal coliform** (British: **faecal coliform**) is a facultative anaerobic, rod-shaped, gram-negative, non-sporulation bacterium. Coliform bacteria generally originate in the intestines of warm-blooded animals. The presence of fecal coliform in aquatic environments may indicate that the water has been contaminated with the fecal material of humans or other animals. Fecal coliform bacteria can enter rivers through direct discharge of waste from mammals and birds, from agricultural and storm runoff, and from human sewage.

All samples taken shows high levels of Fecal and Total coliform contamination which are all above TBS standard as for fecal coliform table 5.11. The highest values found due to the fact that the rivers along the project corridor are the main source of water supply to all villages serving both humans and animals. It was observed during field visit, animals drink directly from the rivers as well as the humans do wash directly which can be a major source of contamination.

Table 4.11: Lab Result

Parameter	units	Ruvu River	Mkondoa River	Kidete River	TBS: 789: 2003 standards
pH		6.61	6.35	6.82	6.5 to 9.6
Color	Hazen	69	96	59	5850
Turbidity	NTU	4	13	15	25
Electrical conductivity	μ S/cm	96	69	51	2000
TDS	Mg/l	48	35	25	2000
Ammonium Nitrogen	Mg/l	0.325	0.315	0.269	0.5
Phosphate	Mg/l	0.96	3.02	2.16	na
Iron	Mg/l	0.665	0.435	0.012	1.0
FC	Counts/100Ml	6×10^2	4×10^2	7×10^2	0

4.5.2 Biological environment

Biological and ecological investigations were conducted with emphasis on terrestrial and aquatic flora and fauna biodiversity. Fauna biodiversity focused on large mammals, small and medium sized mammals, birds and herptiles (reptiles and amphibians) see figure 5.47. Flora biodiversity emphasized on vegetation physiognomies, types and plant life forms in particular the identification of trees, shrubs, herbs, sedges, lianas, climbers and grasses see figure 5.46. As part of the biodiversity baseline surveys; aquatic surveys were conducted with emphasis on fish, macro-invertebrates, and riparian vegetation.

The railway track passing wetlands and floodplain areas which are used for agriculture, cultivating rice, beans, maize, millet, potatoes and onion see figure 4.45. Parts of woodland habitats and riparian vegetation that consist of grassland were utilized as pasture and this provide lifeline during the dry season. Locals make charcoal and firewood out of the trees from different woodland and bush land habitats in the project areas.

Figure 4.45: Wetland at Msoga Village which is near the railway track

Figure 4.46: Flora in the project corridor

Figure 4.47: Cattle crossing the project corridor

4.5.2.1 Protected areas (wildlife and forest)

The project passes through a number of ecologically sensitive areas including of the known protected land include Pugu Hills (Pugu Kazimzumbwi Nature Forest Reserve) and Ruvu South Forest reserves. Also, along the way the railway track passes on the outskirts of Mikumi National Park, the Eastern Miombo Woodlands form a part of a wide belt of miombo woodland, stretching about 200km along the railway alignment. The other biotope is Southern Acacia-Commiphora Bushlands and Thicket located in northern and central Tanzania, dominated by Acacia, Commiphora and Crotalaria species. Also, along and near the railway alignment there exists the following reserves: Nyahua-Mbuga, Uruma, Kigwa Ruruga, Uyui-Kigwa. Ruruga, Ilomero Hill, Igombe and Makere Forest reserves. In addition, there are other village forest reserves in Tura, Malonje Karangasi and Goweko.

It should be noted that, the project will be implemented in existing railway passing in these areas for the past 100 years hence the environmental ecosystems around are well adapted to the continuous operational activities of this railway making no significant biodiversity requirements as per ESS6.

4.5.2.2 Wildlife corridors

The project crosses wildlife corridors namely;

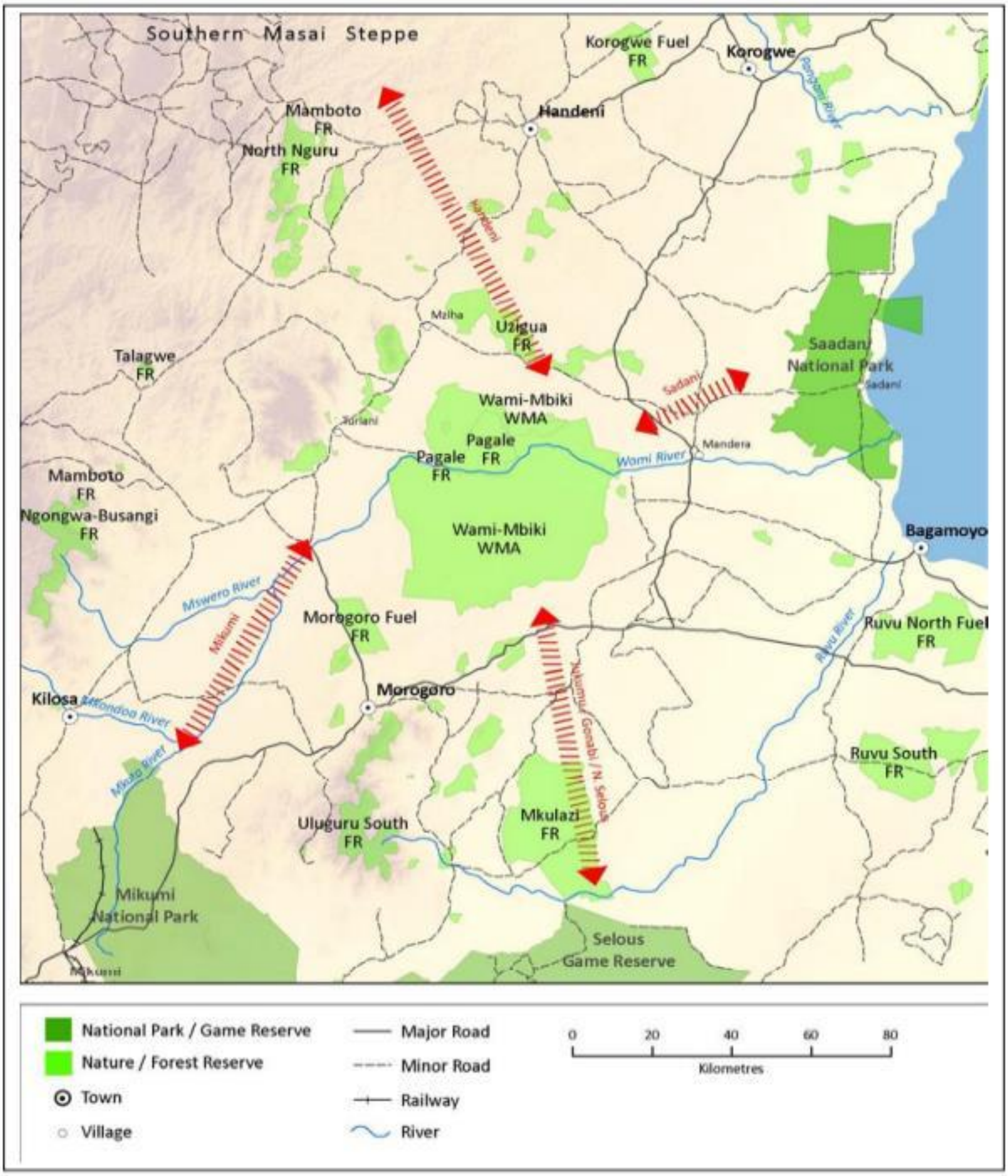
(i) The Selous – Wami Mbiki Wildlife Corridor has an approximate length of 160 km, located in the east of Morogoro in the districts Morogoro Rural, Chalinze, Bagamoyo, Kibaha, and Kisarawe. The corridor connects Wami Mbiki WMA to Selous Game Reserve through the Mkulazi Forests, Jukumu/Gonabis WMA, Ruvu River and adjacent riverine forests. This route, also known as the Wami Mbiki - Jukumu/Gonabis/Northern Selous Wildlife Corridor is described by TAWIRI (2009) as an unconfirmed corridor (type A corridor), with uncultivated lands between two protected areas without documentation on animal movements or whether wildlife actually uses the area to move between the protected areas (Figure 4.48).

(ii) The Mikumi - Wami Mbiki Wildlife Corridor is located between Morogoro town and Kilosa District Council town with an approximate length of 70 km in Mvomelo and Kilosa Districts. This corridor is categorised by TAWIRI (2009) as providing potential connectivity between important habitats (type E corridor) linking Mikumi National Park and Wami Mbiki Wildlife Management Area (WMA). Mikumi National Park borders the Mkata plains in the North and Tindiga Swamps in the North West of the Park. The link between Mikumi National Park and Wami Mbiki WMA is via the Mkata River, Msowelo River and Mkondoa River to the Wami River along riverbeds/banks and riverine forests from either side of the wildlife corridor (Figure 4.48).

(iii) The Swagaswaga-Muhesi/Kigosi corridor: Baseline survey recorded elephant movement crossings in different locations from Makutopora to Tabora at various points. This major wildlife corridor also contributes to existence of multiple crossing points around Manyoni and Itigi Districts (Figure 4.49). The Kizigo and Muhesi Game Reserves located about 19.5km south of MGR alignment forms an extended wildlife area that connects with Swagaswaga Game Reserve, which is located north of the MGR alignment at about 93 kms.

(iv) Other corridors including those crossing from Nyahua Forest reserve through Goweko-Kigwa/Rubuga_to Puge South to Ilomelo-Igombe to North Makere Reserves that go all the way to Muyovosi/Malagarasi Game reserves and back.

(v) Nzubuka River may be related to wildlife movements between Igombe river/Ilomelo hill forest reserves on the west of the alignment and Uyui-Kigwa Forest reserve on the east of the MGR alignment (Figure 4.50).



<u>Dotted lines indicate Wildlife corridor</u>

Figure 4.48: Wami-Mbiki Wild Life Management Areas to Selous/ Saadani

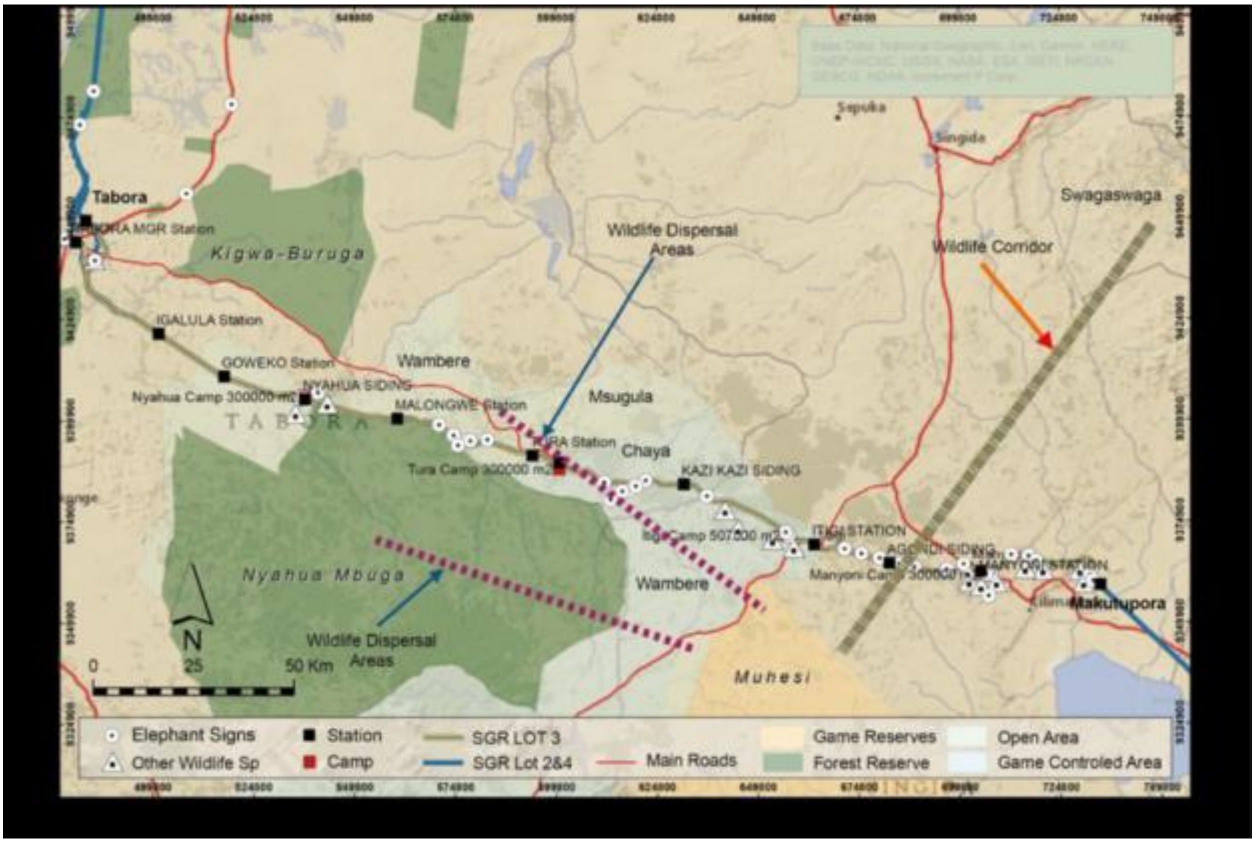


Figure 4.49: Swagaswaga-Muhesi/Kigosi wildlife corridor

Other corridors including those crossing from Nyahua Forest reserve through Goweko-Kigwa/Rubuga_to Puge South to Ilomelo-Igombe to North Makere Reserves that go all the way to Muyovosi/Malagarasi Game reserves and back (Figure 4.50).

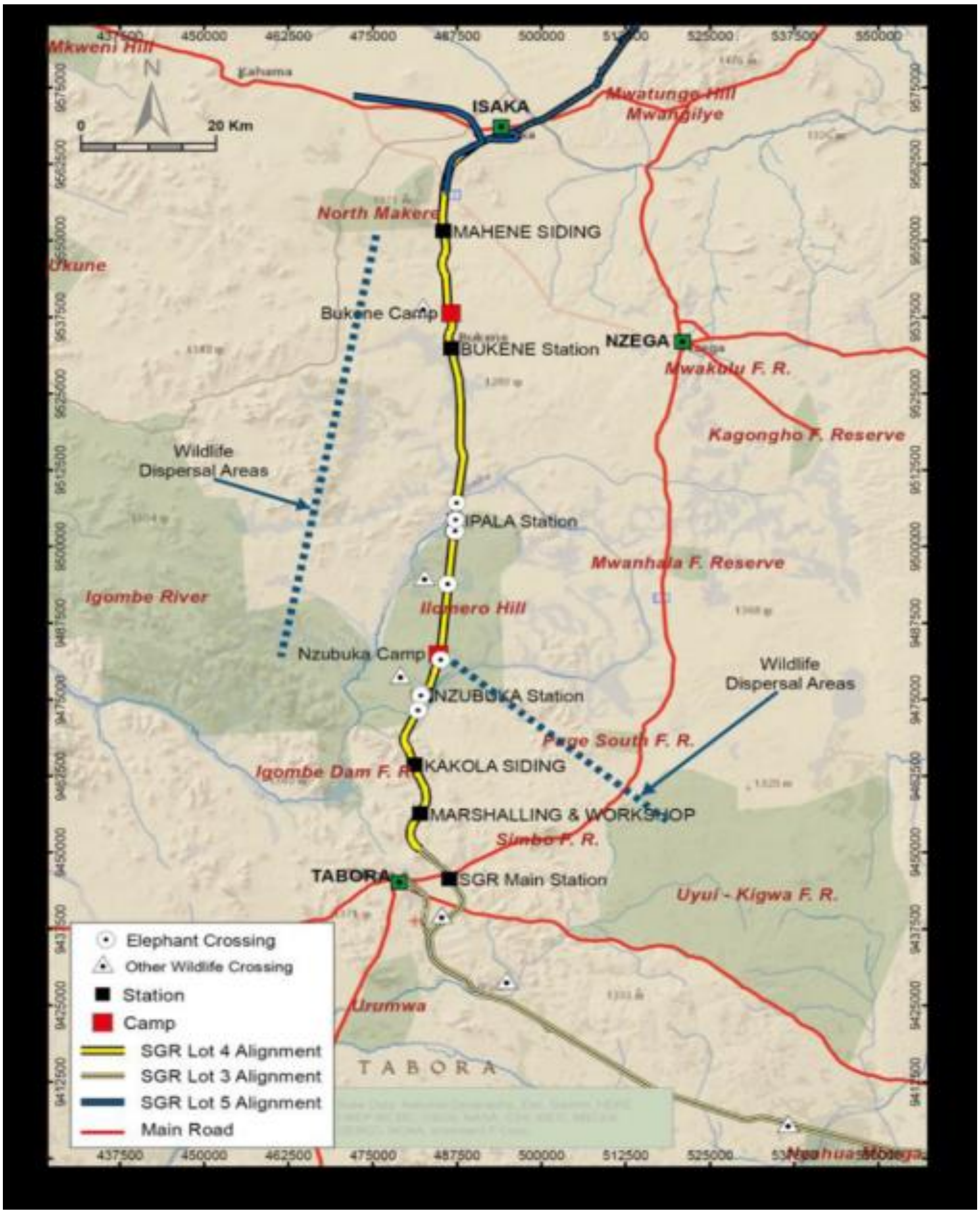


Figure 4.50: Wildlife crossing in the section from Tabora to Isaka

4.5.2.3 Vegetation cover

The vegetation in the project area varies depending on soil characteristics and terrain. *Acacia-miombo* woodlands, bushlands, and scrub forest with groups of scattered trees mainly baobabs (*Adansonia digitata*) and *Commiphora africana* characterize the uncultivated project areas. Along most of the project route, natural vegetation has been replaced largely by anthropogenic activities such as livestock grazing and crop production, mostly scattered cultivation with maize, millet, sesame, sorghum, beans, sunflower, rice, and vegetables, etc., intertwined with human settlement.

Riverine vegetation dominated by *Ficus sur, Ficus sycomorous, Ficus lutea* and *Phragmites mauritianus* was observed at Mkondoa, Kinyasungwi and Bubu rivers. Wetland and floodplain with aquatic vegetation were observed at Mkondoa, Kigwe, Bahi and Kintinku. The original vegetation in most parts of the Railway line is indicated by the remnants of *Acacia* and miombo woodlands. The observation made along the buffer zone of the project corridor has spotted the presence of invasive species (see appendix 9). The species observed are *Xanthium strumarium,* Altenanthera *pungens*, *Datura stramonium*, *Calotropis procera*, *Conyza floribunda* and *Ricinus communis*. The area dominated with these species are in Railway section between Pugu and Ngerengere, Kilosa and Dodoma as well as Bahi and Itigi section.

4.5.3 Social Economic Environment

4.5.3.1 Introduction

This Section describes the current socioeconomic baseline conditions in the Study Area at the National, District, Ward and Village level. Where possible and based on the information available, the socioeconomic conditions of the communities that will be affected by the proposed Project are described, in order to determine the impacts and associated mitigation measures required to minimize negative impacts and enhance positive impacts.

The baseline information was determined through the review of existing secondary information, such as past done ESIA reports along the project corridor, the Resettlement Action Plans (RAP) with the primary data collected for the ESIA team during field work. The baseline also relies on secondary information from publicly available online sources and studies.

This socioeconomic baseline section is further organized into the following subsections:

- **Summary of the National Context**: provides a detailed overview of the socioeconomic environment in Tanzania.
- **District Level Context:** provides an overview of relevant socioeconomic conditions in the districts through which the project passes.
- **Key Elements of the Social Area of Influence:** describes the key socioeconomic baseline elements in the Social Area of Influence that will inform the assessment of impacts and provide a starting point for future implementation of monitoring plans.

4.5.3.2 Methodology

Secondary data sources rely on government census data and online sources including a number of available studies on livelihoods in Tanzania. As mentioned above, the primary data used was gathered in the context of the ESIA for the Project. The ESIA primary data was gathered from a sample of communities in the social area of influence or Study Area and complemented with more specific information collected as part of the household census surveys conducted. The following approaches were used:

- **Key informant interviews (KIIs):** KIIs were undertaken to gather information from those that are likely to have an influence on the project and / or that are experts in a specific topic area. These included meetings with Regional Commissioners (RC), Regional Administrative Secretaries (RAS), Regional Secretariat experts, District Commissioners (DC), District Administrative secretaries (DAS), Chief Executive Officers (CEOs) of City/District/Municipal Councils, utilities agencies, wards and village leaders.
- **Focus Group Discussions (FGDs):** Focus groups were undertaken to gather information on various topic areas and to gather Project perceptions from specific groups. FGDs include women, ward leaders, economic venture groups, influential elders, self-help groups, teachers, income generating groups, livestock keepers, farmers, disabled, businessmen etc.

4.5.3.3 Area of Influence

The socioeconomic Area of Influence (AoI) includes all the settlements totally or partially within a 500 m corridor (250 m either side of the centerline). These communities will be directly (e.g. through land acquisition, resettlement and loss of livelihoods (if it may be applied), community health and safety, noise and other related impacts) and indirectly (e.g., through in-migration or indirect economic impacts) impacted. This corridor includes the main centers and towns that are situated within the affected districts that may experience impacts to the economy through procurement and sale of goods and services during construction and to passengers at a later stage, including the capital city Dar es Salaam and the district capital of other regions. It is expected that most indirect and induced impacts, in particular those related to employment creation and procurement of goods and services will be experienced in these locations.

Additionally, the Project will not require acquisition of land within or outside the RoW for the establishment of borrow pits, dumping sites, quarry sites, construction of marshalling yards, stations and campsites since the Rail project is existing one and has all facilities and infrastructures in place. The communities in the Area of Influence are depicted in figure 4.51 for Dar es Salaam while others see in Appendix 2.

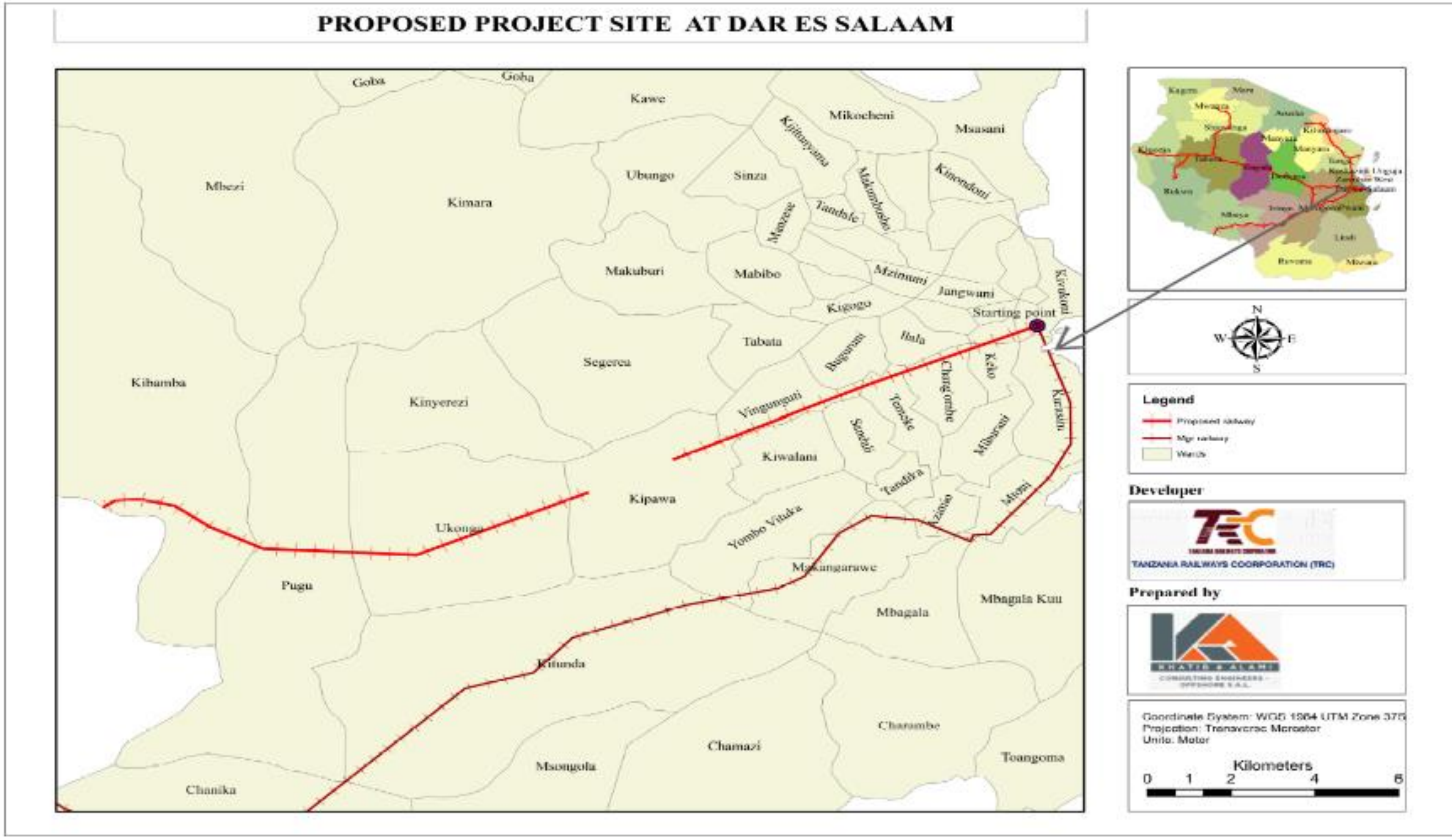


Figure 4.51: Communities falling under area of influence of the project

4.5.3.4 Population and Demographics

The project area covers seven regions in Tanzania, which are Dar es Salaam, Pwani, Morogoro, Dodoma, Singida, Tabora and Shinyanga. Across these regions the project is crossing eighteen districts administrative covering a total area of 9.96 km^2. The total population here is 7,508,219 as per population census 2012 (NBS 2016), Where by 3,671,775 are males (48.89%) and 3,736,444 are females (51.10%). The average house hold size is per person per household (NBS 2013). The annual growth rate of the districts between 2002 and 2012 is 2.7 % (NBS 2013)

The 2012 and 2022 projected population of districts falling under the project site is provided in the following **Table 4.12**

Table 4.12: Population of Eighteen districts

	Population (2012)						Projected population (2022)	
S/N	**Region**	**Districts**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**
1	Dar-es-salaam	Ilala	1,220,611	595,928	624,683	1,288,965	629,300	659,665
2		Temeke	1,368,881	669,056	699,825	1,445,538	706,523	739,015
3	Dodoma	Bahi	221,645	105,975	115,670	226,964	108,518	118,446
4		Chamwino	330,543	158,882	171,661	338,476	162,695	175,781
5		Dodoma Urban	410,956	199,487	211,469	420,819	204,275	216,544
6		Mpwapwa	305,056	147,306	57,750	312,377	150,841	59,136
7	Morogoro	Kilosa	438,175	218,378	219,797	448,691	223,619	225,072
8		Morogoro District Council	286,248	140,824	145,424	293,118	144,204	148,914
9		Morogoro Municipal Council	315,866	151,700	164,166	323,447	155,341	168,106
10		Mvomero	312,109	154,843	157,266	319,600	158,559	161,040

11	Pwani	Kibaha	70,209	34,515	35,694	71,894	35,343	36,551
12		Kisarawe	101,598	50,631	50,967	104,036	51,846	52,190
13	Shinyanga	Kahama District	523,802	256,463	267,339	534,802	261,849	272,953
14	Singida	Manyoni	296,763	146,030	150,733	303,589	149,389	154,200
15	Tabora	Nzega	502,252	245,003	257,249	516,817	252,108	264,709
16		Sikonge District Council	179,883	88,947	90,936	185,100	91,526	93,573
17		Tabora Urban	226,999	111,361	115,638	233,582	114,590	118,992
18		Uyui	396,623	196,446	200,177	408,125	202,143	205,982
	Total		**7,508,219**	**3,671,775**	**3,736,444**	**7,775,941**	**3,802,670**	**3,870,870**

(Source: NBS 2016)

Out those districts where the project has passing Dar es Salaam (Temeke and Ilala) were found to have high population which might imply that the project could cause the following:

- Accident risks
- Traffic jam
- Facilitating transport, etc.

Population characteristics

The population of the project area is represented by two main characteristics which are age and sex see figure 4.52.

- **Age composition:** According to Tanzania Census of 2012, population is notable to be low at younger age and decreases as the age increase. The relationship is shown by the **Figure 4.52**. The most dominant age is 15-64, followed by 0-14 while the lowest percentage is above 65+.Age characteristic shows the population is dominated by young individuals.
- **Sex Composition:** The population composition consists of 48.89% males and 51.10% female, where this is depicted in the population composition

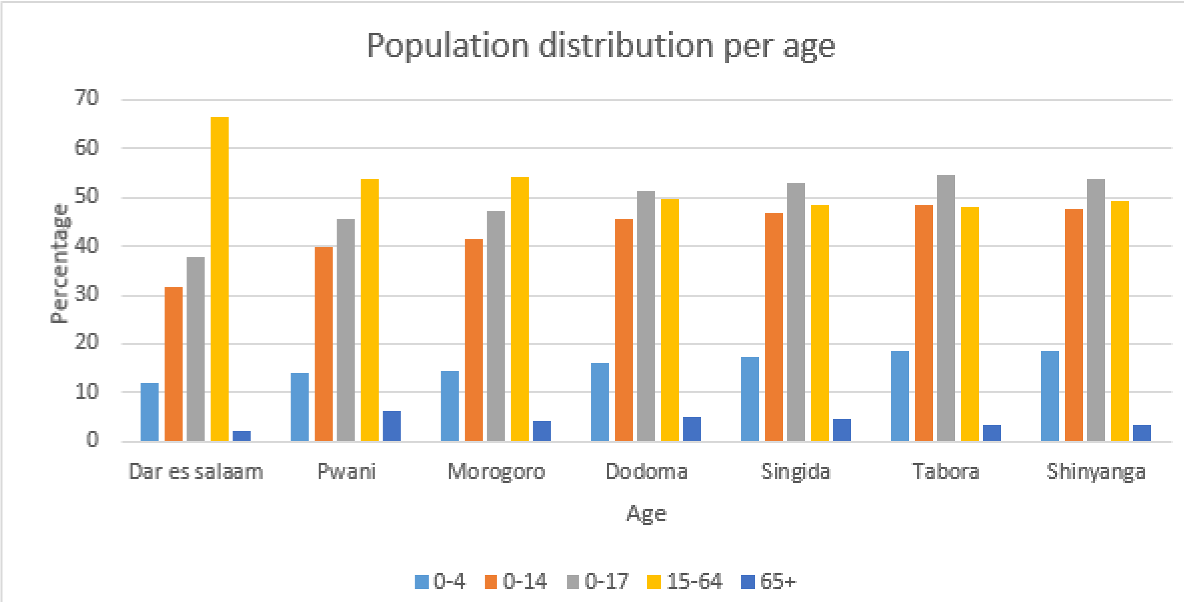


Figure 4.52: Population percentage as per Age (NBS 2016)

4.5.3.5 Language

In the project area Swahili is the most commonly spoken language. Whereby across the districts there are variable native language spoken. The native languages spoken includes Zaramo, Nyakyusa, Nyamwezi, Wanyaturu, Wanyiramba, Ruo, Sukuma, Wagogo. As Swahili is the most widely used language across the project one implies the following:

- Easy communications
- Facilitate social interaction among the individuals
- Reduce the communication conflicts and enhance relationship among the project members and the community

4.5.3.6 Ethnic groups:

Along the project area present different native origins as shown in the **Table** 4.13 where by population growth introduced other tribal groups

Table 4.13: Population Growth

S/N	Region	Districts	Ethnic groups
1	Dar-es-salaam	Ilala	Zaramo, Ndereko, Mbuga
2		Temeke	Zaramo, Ndereko, Mbuga
3	Dodoma	Bahi	Gogo, rangi, Sandawe, Burungi
4		Chamwino	Gogo, rangi, Sandawe, Burungi
5		Dodoma Urban	Gogo, rangi, Sandawe, Burungi
6		Mpwapwa	Gogo, rangi, Sandawe, Burungi
7	Morogoro	Kilosa	Luguru, Ndamba, Pogolo, Sagara, Mbuga, Kutu
8		Morogoro District Council	Luguru, Ndamba, Pogolo, Sagara, Mbuga, Kutu
9		Morogoro Municipal Council	Luguru, Ndamba, Pogolo, Sagara, Mbuga, Kutu
10		Mvomero	Luguru, Ndamba, Pogolo, Sagara, Mbuga, Kutu
11	Pwani	Kibaha	Kwere, Zaramo, doe, Ndereko, Zigula, Ngindo, Rufiji, Luguru, Kutu
12		Kisarawe	Kwere, Zaramo, doe, Ndereko, Zigula, Ngindo, Rufiji, Luguru, Kutu
13	Shinyanga	Kahama District	Sukuma, Taturu, Sumbwa, Nyiramba, Wahadzabe
14	Singida	Manyoni	Turu, Datooga, Nyamwezi, Isaanzu
15	Tabora	Nzega	Nyamwezi
16		Sikonge District Council	Nyamwezi
17		Tabora Urban	Nyamwezi
18		Uyui	Nyamwezi

Source (NBS 2016)

4.5.3.7 Literacy Rate

Literacy is the ability to read and write with an understanding a short simple sentence on everyday life. Literacy rate is the percentage of population that can read and write in both Swahili and English or any other language. Most of people in the project area have finished primary education and some secondary education and few higher-level educations as shown in the **Table** 4.14

Table 4.14: Literacy rate along the project corridor

S/N	Region	Districts	Literacy rate
1	Dar-es-salaam	Ilala	97.1
2		Temeke	95.4
3	Dodoma	Bahi	51.5
4		Chamwino	57.2
5		Dodoma Urban	80.9
6		Mpwapwa	68.5
7		Kilosa	66.6
8	Morogoro	Morogoro District Council	57.7
9		Morogoro Municipal Council	85.2
10		Mvomero	68.5
11	Pwani	Kibaha	89.5
12		Kisarawe	73.6
13	Shinyanga	Kahama District	60.8
14	Singida	Manyoni	62.9
15		Nzega	56.1
16		Sikonge District Council	58.6
17	Tabora	Tabora Urban	84.7
18		Uyui	83.8

Source (NBS 2016)

This data can help to identify

- Number of people that will be able to perform literacy work and illiteracy work
- To identify ability of people read and understand sign so that to minimize accident

4.5.3.8 Education Facility

Education system in Tanzania provides free education for primary and secondary level whereas it takes 7 years in primary school, 6 years in secondary while university or collage takes three to four and above years. From the project area, there are primary schools, secondary schools together with colleges and universities, in which Ilala (17%), Dodoma urban (13%) and Morogoro urban (12%) districts have got more educational institutions compared to other districts as indicated in the **Table 4.15** The conductance of the project may bring about challenges to the schools and colleges nearby the project site such as increase of accidents near the institutions, eruption of noise from the construction and operation phases of the project to the institutions and thus effective mitigate measures have to be assigned to overcome the challenges for a clear learning environment to the students.

Table 4.15: Number of Education Facilities in the project area

S/n	Region	District	Number of Schools	Number of colleges	Number of universities	% Percentage by district
1	Dar-es-salaam	Ilala	39	26	2	17
2		Temeke	16	5	3	6
3	Dodoma	Bahi	0	0	0	0
4		Chamwino	4	0	0	1
5		Dodoma Urban	22	25	3	13
6		Mpwapwa	12	0	0	3
7	Morogoro	Kilosa	13	0	0	3
8		Morogoro	2	0	0	1
9		Morogoro Urban	32	12	2	12
10		Mvomero	4	0	0	1
11	Pwani	Kibaha	2	0	0	1
12		Kibaha Urban	5	0	0	1
13		Kisarawe	2	0	0	1
14	Shinyanga	Kahama	8	0	0	2
15		Kishapu	20	0	0	5
16		Shinyanga	30	1	0	8
17		Shinyanga Urban	18	8	0	7
19	Singida	Manyoni	27	1	0	7
20	Tabora	Nzega	11	0	0	3
21		Sikonge	1	1	0	1
22		Tabora Urban	28	1	0	7

S/n	Region	District	Number of Schools	Number of colleges	Number of universities	% Percentage by district
23		Uyui	1		0	0
		Total	**297**	**80**	**10**	

Source (Open Street map, 2022)

The presence of school in the project area implies the following

- There are quite a number of people who can read and write which makes it easier to understand the signs and to adhere with the rules provided
- Protection must increase in areas where there is school so that to avoid accidents.

4.5.3.9 Markets

Markets are the area where commercial activities like purchasing and selling are conducted. In the project site there are 140 markets of which many of them are found in Ilala and Temeke.

The presence of markets makes the acceleration of business and market activity in remote areas where the project passes as shown in the **Table** 4.16 Existence of the project will accelerate the economy of the markets during and after project construction.

Table 4.16: Number of markets within the project area

S/N	Regions	Districts	Number of Markets
1	Dar-es-salaam	Ilala	79
2		Temeke	35
5	Dodoma	Dodoma Urban	5
8	Morogoro	Morogoro	2
9		Morogoro Urban	8
10		Mvomero	2
11	Pwani	Kibaha	1
16	Shinyanga	Shinyanga	1
17		Shinyanga Urban	2
18	Simiyu	Maswa	1
19	Singida	Manyoni	1

S/N	Regions	Districts	Number of Markets
20	Tabora	Nzega	2
22		Tabora Urban	1

Source (Open Street map, 2022)

The presence of markets in the project area will initiate the following:

- Transportation of goods in and out where the project passes
- Easy buying of goods and products for the project.

4.5.3.10 Employment

The project area conducts both small scale and large- scale employment activities, in which people are either self-employed, unemployed or employed by the informal sectors and various public institutions. The activities include administrators, professionals, technicians, farmers, small businesses, street vendors, shopkeepers, livestock keepers and fishermen.

The unemployed persons include those who are not working but are looking for work, full time students, home caring and maintenance persons and the disabled (sick or too old to work).

Conductance of the project shall bring about various employment opportunities to the persons residing near the project site and thus reduce unemployment rates hence raise economic status of the people. The rates of employed and employed on the project site are indicated by the table below 4.17;

Table 4.17: Employment status of the project area

S/N	Region	Districts	Employment		
			Total Population	Percentage Employed	Percentage Unemployed
1	Dar-es-salaam	Ilala	921,997	51	49
2		Temeke	1,030,708	51	49
3		Bahi	142,871	59	41
4	Dodoma	Chamwino	214,420	64	37
5		Dodoma Urban	293,058	55	45
6		Mpwapwa	199,836	65	35
7		Kilosa	302,216	73	27

S/N	Region	Districts	Employment		
			Total Population	Percentage Employed	Percentage Unemployed
8	Morogoro	Morogoro District Council	199,862	76	25
9		Morogoro Municipal Council	235,595	51	49
10		Mvomero	213,763	74	26
11	Pwani	Kibaha	51,418	61	39
12		Kisarawe	73,925	69	31
13	Shinyanga	Kahama District	210,407	67	33
14	Singida	Manyoni	191,751	67	34
15		Nzega	321,973	64	36
16		Sikonge District Council	113,233	68	32
17	Tabora	Tabora Urban	155,728	54	46
18		Uyui	247,975	72	28

(Source: NBS 2016)

4.5.3.11 Road

The road network in the proposed project area falls either under Tanzania national roads agency (TANROAD) or Tanzania Rural Road Agencies (TARURA). Roads fall in the project zone are further categorized into primary roads and secondary roads, which are further categorized into paved, unpaved and asphalt roads as shown in **Figure 4.53.** Road network across the project facilitate easy transportation of materials to the project site, easy transport of labor and equipment and easy transportation of goods and services such as agricultural products, industrial raw materials, construction materials, etc.

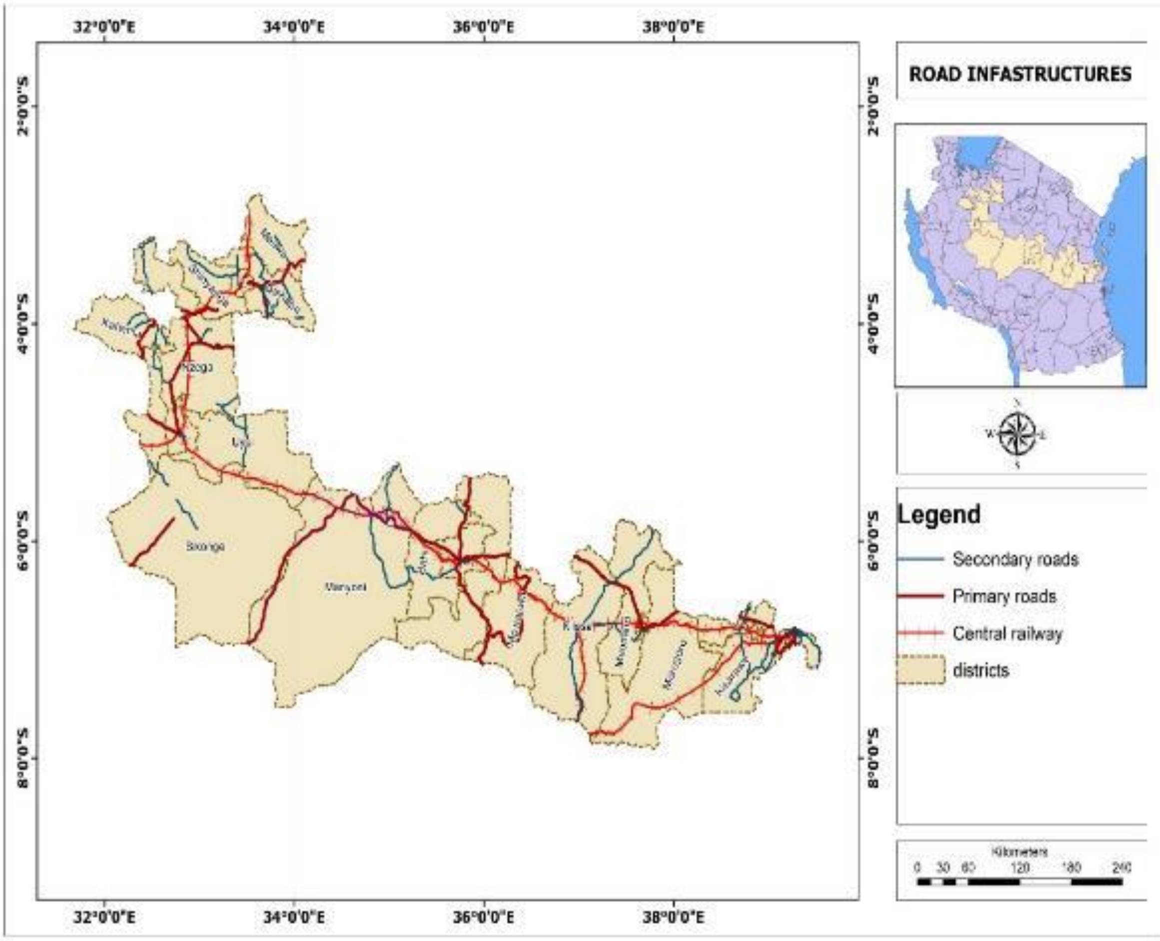


Figure 4.53: Road access in the project area

4.5.3.12 Health Facilities

There are number of healthy facilities along the project area which include pharmacies, hospitals, clinics and dispensaries. Dar es salaam specifically ilala and Temeke Districts are leading districts with large number of health facilities than any other districts along the project corridor. The other districts with large number of facilities are as followed Morogoro, Tabora and Singida, Shinyanga and Pwani. Within the project area there is total number of 54 hospitals, 357 clinics and 713 Pharmacies as shown in the **Table** 4.18

Table 4.18: Number of Both Public and Private Health Facilities

S/N	Region	Districts	Pharmacies	Hospitals	Clinics
1	Dar-es-salaam	Ilala	387	11	83
2		Temeke	178	7	30
	Dodoma	Bahi		0	32
4		Chamwino	1	0	51
5		Dodoma Urban	16	10	58
		Mpwapwa	2	2	37
	Morogoro	Kilosa	0	0	1
8		Morogoro	1	0	1
9		Morogoro Urban	61	7	40
10		Mvomero	1	2	1
12	Pwani	Kibaha Urban	1	0	0
16	Shinyanga	Shinyanga	4	6	5
17		Shinyanga Urban	19	4	2
19	Singida	Manyoni	6	2	6
20	Tabora	Nzega	4	1	2
22		Tabora Urban	32	2	8
	Total healthy facilities		**713**	**54**	**357**

Source (Open Street map, NBS 2016)

The processes of the hospitals and pharmacies to the project area smoothen the possibility of the people to get first aid in case of emergencies when any incident occurred during any phase of the project.

4.5.3.13 Solid waste management

Solid waste management involves all activities of monitoring the waste generated in the particular area. Involve solid waste sorting, solid waste collection, solid waste transfer by authorized entity or municipals, and dumping the waste to the authorized dumping site. Along the project corridor solid waste management is done as shown in the **Table** 5.19. Where by collection is done more regularly in Dar es Salaam and Shinyanga regions by the authorized companies including the hazardous solid wste management where its will be stored temporarly at site and taken by the licenced contractors as per ESS3 of the WB-ESF. Where by statistics on the Table 5.18 shows due to irregularities in solid waste collection and having few dumping sites in most of the regions results to alternative method for disposing of waste such as road side dumping, open burning as indicated in the **Table 4.19**

Table 4.19: Shows the percentage of solid waste management methods on the project area

District	Total	Regularly Collected	Irregularly Collected	Burnt	Roadside Dumping	Burying/ Pit	Other Dumping
Tabora Region	**379,770**	**2.6**	**0.9**	**17.9**	**1.7**	**24.4**	**52.5**
Nzega	85,773	0.8	0.6	27.8	1.2	47.4	22.2
Uyui	59,791	0.8	0.4	22	0.8	67.5	8.5
Tabora Municipal	47,241	0.7	0.2	25.7	1.4	30.8	41.1
Shinyanga Municipal	**32,952**	**17.6**	**3**	**43.7**	**1.4**	**18.8**	**15.5**
Shinyanga	52,197	0.2	0.2	32.4	2.3	18.5	46.4
Kahama	82,283	1	0.8	11.4	1.8	22.2	62.9
Kahama Town	48,251	2.6	1.2	25.2	1.7	29.7	39.5
Singida Region	**255,613**	**1.5**	**0.9**	**21.7**	**0.8**	**32.7**	**42.3**
Manyoni	58,464	0.1	0.4	18.9	1.1	38.3	41.2
Dar es Salaam Region	**1,083,381**	**25.9**	**17**	**16.9**	**1.7**	**16.9**	**21.6**
Dar es Salaam City	297,750	27	12.9	20.5	1.1	22.1	16.4
Temeke Municipal	344,391	23.9	10.5	14.8	1.7	19.6	29.5
Pwani Region	**254,810**	**1.4**	**1.4**	**35.6**	**1**	**45.4**	**15.3**
Kibaha	16,892	1.4	1.2	26.7	1.1	50.8	18.9

District	Total	Regularly Collected	Irregularly Collected	Burnt	Roadside Dumping	Burying/ Pit	Other Dumping
Kisarawe	25,475	1.8	1.1	41.9	0.6	40.1	14.5
Morogoro Region	**501,794**	**5.6**	**2**	**24.9**	**1**	**43.9**	**22.6**
Kilosa	102,443	0.8	0.6	27.8	1.2	47.4	22.2
Morogoro	67,671	0.1	0	28.5	1	31.8	38.7
Kilosa	102,443	0.8	0.6	27.8	1.2	47.4	22.2
Morogoro	67,671	0.1	0	28.5	1	31.8	38.7
Dodoma Region	**450,305**	**2.4**	**0.9**	**20.4**	**1**	**38.3**	**36.9**
Dodoma Municipal	92,978	9.4	3.2	22.4	0.7	35.3	29
Bahi	49,287	0.1	0.1	9.9	1.7	40.4	47.8
Mpwapwa	66,275	1.7	0.7	21.5	1.1	41.4	33.6
Chamwino	73,807	0	0.1	20.7	0.6	32	46.6

Source (NBS 2016)

4.5.3.14 Water sources

Water sources available in the project area includes Surface water sources and ground water sources. The water from the sources is supplied by authorized suppliers in urban area and rural area as indicated in the Table 4.20 and 4.21 along the project corridor. Dar es salaam and Morogoro have large percentage of improved water supply sources which are 78.9% and 62.4% followed by Dodoma (54.3%), Pwani (50.6%), Shinyanga (42.9%), Singida (38.2%) and Tabora (0.1)%. Areas such as ilala, Temeke, Kibaha, Dodoma municipal, Morogoro, Morogoro municipal, Singida, Mpwapwa and Chamwino will accelerate more the project phase more than other districts due to high availability of improved water supply than the rest of the districts.

The improvement of other area water supply will enhance the project activities, and reduce cost of drawing water far from the project site example areas such as Tabora are notably having the scarcity of improved water supply (NBS 2016). Due to such conditions, plan for alternative sources to cover the project are necessary.

Table 4.20: Main improved water sources along the project site corridors

Region	Total	Piped Water into dwelling (%)	Piped Water to yard/plot (%)	Public tap/ standpipe (%)	Tube well/ borehole (%)	Protected dug well (%)	Protected Spring (%)	Total Improved (%)
Dar es Salaam	**1,083,381**	**19.9**	**12.8**	**18.7**	**19.3**	**7.9**	**0.3**	**78.9**
Dar es Salaam City	297,750	13.6	9.1	15.2	27	15.1	0.4	80.4
Temeke Municipal	344391	15.7	10.7	19.5	34.1	8.4	0.2	88.6
Pwani	**254,810**	**11.1**	**9.9**	**15**	**4.7**	**9.5**	**0.4**	**50.6**
Kibaha	16,892	26.8	20.1	9	0.2	4.9	0.8	61.8
Kisarawe	25,475	4.6	3	8.6	4.8	13.7	0.7	35.4
Dodoma	**450,305**	**10.7**	**6.5**	**26.7**	**5.8**	**4**	**0.6**	**54.3**
Mpwapwa	66,275	9.1	3.9	29.3	5.6	4.1	2.6	54.6
Chamwino	73,807	6.3	2.7	34.1	6.1	6	0.1	55.3
Dodoma Municipal	92,978	25.4	21.2	24.4	2.4	2.1	0.1	75.6
Bahi	49,287	1.8	0.6	12.7	5.1	6.4	0.3	26.9
Singida	**255,613**	**4.8**	**1.8**	**14.1**	**9.8**	**7.2**	**0.5**	**38.2**
Singida	41,257	3.2	0.6	12.4	8.7	6.4	0.5	31.8
Manyoni	58,464	2.9	2.7	13.3	5.8	8.6	0.7	34
Singida Municipal	30,383	13.6	6.4	29.3	10.4	12.3	0.2	72.2
Tabora	**379,770**	**3.6**	**3.1**	**4.6**	**4.2**	**11.4**	**0.3**	**0.1**
Nzega	85,773	2.3	2	5.1	6.3	11.9	0.3	0.1
Uyui	59,791	0.2	0.1	1.4	3.4	9.3	0.3	0.1
Tabora Municipal	47,241	21.7	19.2	16.4	2.5	15.8	0.2	0.1
Shinyanga	**258,981**	**8.3**	**8.5**	**8.7**	**5.4**	**11.7**	**0.3**	**42.9**
Shinyanga	52,197	3.5	0.6	15.2	7.1	8.3	0.3	35
Kahama	82,283	1.4	0.9	6.4	9.1	20.7	0.3	38.8
Kahama Town	48,251	17.5	19.3	7.9	2.6	14.1	0.3	61.7
Morogoro	**501,794**	**12.9**	**9.1**	**19.7**	**13.2**	**7.1**	**0.4**	**62.4**
Kilosa	102,443	8	5.8	18.6	17.5	9.3	0.4	59.6
Morogoro	67,671	5.8	2.1	15.9	8	7.5	0.4	39.7
Morogoro Municipal	76,039	40.9	34.1	12.7	0.4	0.2	0.1	88.4
Mvomero	72,013	8.1	4.9	21.2	10.3	7.7	0.4	52.6

Source (NBS 2016)

Table 4.21: water supply

Region	Water supply	Water source
Dar es Salaam	DAWASA	Lower and upper Ruvu, Ground water, Mtoni plant and Kizinga river
Dar es Salaam City	DAWASA	Lower and upper Ruvu, Ground water, Mtoni plant and Kizinga river
Temeke Municipal	DAWASA	Lower and upper Ruvu, Ground water, Mtoni plant and Kizinga river
Pwani	DAWASA	Lower and upper Ruvu, Ground water, Mtoni plant and Kizinga river
Kibaha	DAWASA	Lower and upper Ruvu, Ground water, Mtoni plant and Kizinga river
Kisarawe	DAWASA	Lower and upper Ruvu, Ground water, Mtoni plant and Kizinga river
Dodoma	DUWASA & RUWASA	Ground water from Makutupora basin
Mpwapwa	DUWASA	Ground water from Makutupora basin
Chamwino	DUWASA	Ground water from Makutupora basin
Dodoma Municipal	DUWASA	Ground water from Makutupora basin
Bahi	DUWASA	Ground water from Makutupora basin
Singida	SUWASA	Ground water
Singida	SUWASA	Ground water
Manyoni	SUWASA	Ground water
Singida Municipal	SUWASA	Ground water
Tabora	TUWASA&RUWASA	Igombe dam, Ground water

Region	Water supply	Water source
Nzega	TUWASA&RUWASA	Igombe dam, Ground water
Uyui	TUWASA&RUWASA	Igombe dam
Tabora Municipal	TUWASA&RUWASA	Igombe dam
Shinyanga	SHUWASHA	ground water
Shinyanga	SHUWASHA	ground water
Kahama	KASHWASA	ground water
Kahama Town	KASHWASA	ground water
Morogoro	MORUWASA	Mindu dam and Ngerengere river
Kilosa	MORUWASA	Mindu dam and Ngerengere river
Morogoro	MORUWASA	Mindu dam and Ngerengere river
Morogoro Municipal	MORUWASA	Mindu dam and Ngerengere river
Mvomero	MORUWASA	Mindu dam and Ngerengere river

Source (NBS 2016)

4.5.3.15 Sanitation

Sanitation refers to public health conditions related to clean drinking water and treatment and disposal of human excreta and sewage. In project a most urban area where there are lot of people tend to have high number of improved water source that it is accessible for drinking and that means diseases that are related to water outbreak can be prevented hence protect also people who will be working in the project area. Improved water source includes piped water into dwelling, piped water to yard/plot, public tap/standpipe, protected borehole and unimproved water source unprotected dug well, unprotected spring, surface water. Main Source of Drinking Water in each district as shown in the table 4.22.

Table 4.22: Main Source of Drinking Water in the region project passes

S/N	Region	Districts	Total Improved (%)	Total Non-Improved (%)
1	Dar-es-salaam	Ilala	80.4	19.7
2		Temeke	88.6	11.4
3		Bahi	26.9	73.1
4	Dodoma	Chamwino	55.3	44.2
5		Dodoma Urban	75.6	24
6		Mpwapwa	54.6	44.8
7		Kilosa	59.6	40.5
8	Morogoro	Morogoro District Council	39.7	60.4
9		Morogoro Municipal Council	88.4	11.6
10		Mvomero	52.6	47.5
11	Pwani	Kibaha	61.8	38.2
12		Kisarawe	35.4	64.5
13	Shinyanga	Kahama District	38.8	61.2
14	Singida	Manyoni	34	66.1
15		Nzega	28	71.9
16		Sikonge District Council	21.8	78.3
17	Tabora	Tabora Urban	75.9	24
18		Uyui	14.8	85.2

(Source: Municipal profile 2017)

As we cannot speak of sanitation without speaking of toilet facility as it involves disposal of human excreta and sewage. Most of Tanzania regions used to use traditional toilet but after the censor 2012 Tanzania came with the slogan "NYUMBA NI CHOO" which emphasize

Tanzanians to use more improved toilets like Ventilated improved pit latrine, pit latrine with washable slab and to wash their hands every time they come out of toilet.

This makes most of houses to have toilet with improved system as to adhere with the present slogan. This means that diseases that are the outbreak of poor sanitation practice like cholera and diarrhea which protects people that will be involved in both phases of the project means construction operation and decommissioning from getting infected with those diseases. (see table 4.23).

Table 4.23: Type of Toilet Facility in the region project passes

S/N	Region	Districts	Total Improved	Total Non-Improved
1	Dar-es-salaam	Ilala	89.8	10.2
2		Temeke	88.9	11
3	Dodoma	Bahi	7.7	92.3
4		Chamwino	9.4	90.9
5		Dodoma Urban	53.9	46
6		Mpwapwa	15	85
7		Kilosa	59.6	40.5
8	Morogoro	Morogoro District Council	39.7	60.4
9		Morogoro Municipal Council	88.4	11.6
10		Mvomero	52.6	47.5
11	Pwani	Kibaha	42.6	57.4
12		Kisarawe	25.2	74.9
13	Shinyanga	Kahama District	14.8	85.1
14	Singida	Manyoni	13.2	86.7
15		Nzega	14.1	86.1
16		Sikonge District Council	12.7	87.4
17	Tabora	Tabora Urban	49.3	50.6
18		Uyui	7	92.9

(Source: Municipal profile 2017)

4.5.3.16 Power supply

The project site is power supplied with Tanzania Electric Supply Limited (TANESCO), a Governmental organization responsible for electricity generation, transmission, distribution, and sale of electricity to the Tanzanian mainland and to the island of Zanzibar. Power outage is a major problem in the project area, and thus people with good economic conditions have back up power supply such as generators and solar panels in case of power cuts.

According to the 2012 census, it is noted that some parts of the project sites are well powered and have got a high percentage of people using electricity as their source of energy such as Kilosa district in Morogoro, Ilala and Temeke district in Dar es salaam region while some areas have inadequate transmission lines which leads to less percentage of people using electricity as their main source of energy in areas like Bahi and Chamwino district in Dodoma region, Sikonge district in Tabora region, Manyoni in Singida region. The percentages are tabulated 4.24

Table 4.24: Distribution of power supply in project area

S/N	Region	Districts	Total population	Population (2012)	
				percentage using electricity	percentage with no electricity
1	Dar-es-salaam	Ilala	1,220,611	62.5	37.5
2		Temeke	1,368,881	59.9	40.1
3		Bahi	221,645	5.4	94.6
4	Dodoma	Chamwino	330,543	4.7	95.3
5		Dodoma Urban	410,956	33.8	66.2
6		Mpwapwa	305,056	9.1	90.9
7		Kilosa	438,175	82.1	17.9

S/N	Region	Districts	Total population	Population (2012)	
				percentage using electricity	percentage with no electricity
8	Morogoro	Morogoro District Council	286,248	64.3	35.7
9		Morogoro Municipal Council	315,866	60.5	39.5
10		Mvomero	312,109	43.8	56.2
11	Pwani	Kibaha	70,209	26.2	73.8
12		Kisarawe	101,598	12.8	87.2
13	Shinyanga	Kahama District	523,802	22.6	77.4
14	Singida	Manyoni	296,763	9.3	90.7
15		Nzega	502,252	9.3	90.7
16		Sikonge District Council	179,883	8.8	91.2
17	Tabora	Tabora Urban	226,999	45.8	54.2
18		Uyui	396,623	7.6	92.4

Source (NBS 2016)

4.5.3.17 Telecommunication

The major means of telecommunication throughout the project area seems to follow under the same pattern. Which generally is through mobile phone through which the network is provided by the 6 companies Airtel, Tigo, Halotel, Vodacom, Zantel and TTCL. Tough there are some places which not all the 6 company reaches due to its remoteness but through the project, it will emphasize this companies to establish and provide network in those area due its increase in trade activities in those areas were the project passes.

4.5.3.18 Archaeological and Cultural Heritage Resources

There are no archaeological, heritage resources or key historical sites of national or international importance in the project areas. However, there is one old town, Kilosa which is having historical buildings. Kilosa is one among the oldest towns in Tanzania established by the Germans and Arabs during the colonial era. There are few historical buildings in Mkadage Village which is an old site like Kilwa.

Site investigation and in-depth interviews with officials from the department of antiquities and local experts along the project corridor have not indicated signs of presence of potential on surface archaeological and historical heritage resources within the RoW. However, during the survey, some graves were observed to be within the way leave mainly at Pugu, Kilosa, Godegode, Gulwe, and Chamwino. If unavoidable, the affected graves will be relocated with careful consideration, thorough involvement of all key stakeholders and compliance to the WB- ESF-ESS8 and national statutory requirements especially the Graves Removal Act. No 9 of 1969 before commencement of the project.

4.5.3.19 Status of HIV/AIDs

Based on the information obtained from NBS, 2021, Prevalence of HIV infection among adults aged 15 years and older in Tanzania was 4.9% (6.3% among females, and 3.4% among males). This corresponds to approximately 1.4 million PLHIV aged 15 years and older in the country. Prevalence among adults aged 15-49 years was 4.7% for the entire country, 4.8% in Tanzania mainland and 0.4% in Zanzibar. HIV prevalence among females aged 20-24 years, 25-29 years, 30-34 years, and 35-39 years was higher than in males in corresponding age groups. § The burden of HIV infection varies across the country; HIV prevalence ranged from less than 1.0% in Zanzibar and Lindi to 11.4% in Njombe. Overall, HIV prevalence reduced with increasing education level for both males and females. Per regional wise the HIV prevalence are as shown in the table 4.25

Table 4.25: HIV prevalence by demographic characteristics: Ages 15-49 years

Characteristic	Males		Females		Total	
	Percentage HIV positive	Number	Percentage HIV positive	Number	Percentage HIV positive	Number
Residence						
Urban	2.8	3,435	7.8	5,174	5.5	8,609
Rural	3.2	7,536	5.1	9,455	4.2	16,991
Tanzania Mainland/Zanzibar						
Mainland	3.1	10,422	6.4	13,822	4.8	24,244
Urban	2.9	3,253	8.0	4,942	5.6	8,195
Rural	3.3	7,169	5.3	8,880	4.3	16,049
Zanzibar	0.0	549	0.8	807	0.4	1,356
Unguja	0.0	414	1.0	585	0.5	999
Pemba	0.0	135	0.4	222	0.2	357
Region						
Dodoma	2.5	154	5.8	204	4.2	358
Arusha	2.0	139	1.8	218	1.9	357
Kilimanjaro	1.1	159	3.1	236	2.2	395
Tanga	3.5	204	7.2	281	5.4	485
Morogoro	1.5	247	5.9	391	3.9	638
Pwani	2.6	573	7.7	852	5.3	1,425
Dar es Salaam	2.0	619	6.3	939	4.3	1,558
Lindi	0.0	127	0.7	132	0.3	259
Mtwara	1.3	142	3.1	156	2.1	298
Ruvuma	4.5	657	6.6	803	5.5	1,460
Iringa	6.6	443	15.5	617	11.2	1,060
Mbeya	4.9	450	13.2	634	9.2	1,084
Singida	1.6	100	5.3	146	3.5	246
Tabora	4.2	1,182	5.5	1,373	4.8	2,555
Rukwa	3.0	747	5.1	1,023	4.1	1,770
Kigoma	2.7	258	3.4	344	3.0	602
Shinyanga	4.0	840	7.2	1,005	5.5	1,845
Kagera	6.1	324	7.6	367	6.8	691
Mwanza	4.3	459	8.9	572	6.5	1,031
Mara	2.5	285	4.0	407	3.3	692
Manyara	1.2	160	2.4	205	1.8	365
Njombe	6.1	267	16.1	409	11.6	676
Katavi	2.9	854	8.0	1,119	5.4	1,973
Simiyu	3.2	245	3.7	362	3.5	607
Geita	3.5	319	6.9	388	5.2	707
Songwe	4.7	468	6.5	639	5.6	1,107
Kaskazini Unguja	0.0	87	1.5	136	0.8	223
Kusini Unguja	0.0	83	0.0	99	0.0	182
Mjini Magharibi	0.0	244	1.1	350	0.5	594
Kaskazini Pemba	0.0	54	0.0	91	0.0	145
Kusini Pemba	0.0	81	0.7	131	0.4	212

4.6 Social issues learnt from TIRP1.

Below chapter presents social aspects that project uncounted during TIRP1. TIRPII will be implemented in same areas, thus all learning and experience from TIRP1 will be appropriately adopted and integrated throughout the TIRPII phase.

During assessment and implementation of TIRP 1, there were several identified risks along the Project area of which the Project came up with various approaches to manage those risks. The Project will adopt measures that worked out and improve more if necessary for best Project delivery. The following are issues that prevailed during the TIRPI.

- Issues related to Labor Management
- Influx of additional population for labor seeking for employment opportunities
- Conflict on sourcing of local workforce
- Provision of social services to workers at site such as drinking water, food, first aid services, site mobile toilets and transportation.
- Legal compliance with labor regulations for workers by the Contractor

The Labor Management Plan was developed to ensure proper process of employing people along the Project corridor is in place and functioning. The Contractor was obliged to obtain casual labors from the nearby working section through using the local leaders. The process was transparent, i.e., contractor was obliged to prepare a job advert and place it in all village noticeboards. Additionally, there were an awareness creation to workers on their rights and obligation as per labor law including working hours, wages, leave and termination/redundancy procedures.

Contractors complied with Tanzania labor laws which includes provision of code of conducts, working hours and paying of acceptable wages to the workers as well as other laborers hired from the communities residing along the project.

i. Gender Based Violence and Sexual Exploitation and Abuse (GBV)/SEA)

Due to the population influx and intermingling of people in the Project areas, GBV/SEA cases were experienced between workers-workers, worker-suppliers, and worker-community member. These cases raised the alarm to the Project whereby TRC and contractor put some measures to manage GBV and Sexual exploitation and abuse during TIRPI implementation. TRC put various measures to combat GV including development of GBV policy, establishment of specific Gender Desk at TRC through railway network and conducting awareness campaign to TRC staff, Contractors, consultants, and community members. TRC forged collaboration with other key stakeholders who practically work, offer services, and support actions in addressing GBV/PSEA in Tanzania including Railway Police, District Social Welfare Officers, Children's Dignity Forum – CDF, C-sema, WILDAF, WOPATA, TAWLA and PAICODEO. This working arrangement helped to reduce and mitigate possibility of GBV and SEA issues. Similar working arrangement will be adopted during the TIRPII.

ii. Community grievances handling

As part of the Project implementation in TIRPI, several grievances were received involving those related to workers as well as throse from surrounding communities include labor issues, dust and noise pollution, delayed payments, etc. TRC received 217 grievances from 2018 to 2020 from Lot 1(51) grievances, Lot 2 (59) Package B Lot 1(60) Lot 2(47) where by 196 related to workers and 21 were related to communities for both Package A&B.TRC in collaboration with contractors addressed all griviences. Key successful factor included ensuring comprehensive awareness of the GRM process to all key stakeholders including impacted communities.

iii. Occupational and Community Health & Safety

During the TIRPI, the project experienced some safety incidents, mainly related to communities crossing railways. The incidents were reduced by development and effective implementation of Traffic Management Plan, Health and Safety Plan, Emergency preparedness and response plan. Some extent, these helped to reduce safety incidents up to 70%

4.7 Existing Social Economic Issues

The rehabilitation of the Railway line from Dar es Salaam to Isaka is expected to have some positive and negative social implications. The team identified several social issues which will need to be considered to comply with WB Environmental Health and Safety Guidelines and Social safeguards. The details of the social-economic issues that were identified in the field reconnaissance and literature review are discussed below;

- **Section A: Dar es Salaam - Ngerengere**

i. Encroachment

The Right of Way or railway reserve along the railway line varies depending on the status of the area it crosses. According to the Railways Act No. 4 of 2002 as amended in 2017, in cities and towns the right of way is 15m from the center line of the railway line on both sides (left and right sides), while in other areas outside cities and towns it is 30m. This means that the railway Right of Way in urban and rural areas is 30m and 60m respectively, anything undertakings within these measures are regarded as encroachment.

Involuntary resettlement will be expected due to the presence of encroachers along the Right of Way of the railway. As stated above the presence encroachers trigger the World Bank ESS5 which recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons. The Bank's policy on involuntary resettlement treats encroachers and non-encroachers in the same way.

The field observations from Dar es Salaam to Ngerengere has shown presence of encroachers along the Right of Way of the railway line. A stretch from Dar es Salaam railway station to Gongo la Mboto (km15/0) is the most encroached areas in Dar es Salaam. Permanent structures were observed from chainage km3/3 on the right-hand side of the railway station at Ilala to Buguruni junction (km3.5). Also, from Buruguni junction (km3.5), there are several permanent structures (residential Houses, Viosk, Timber vendors, etc.) towards Vingunguti area (km6/0). The distance of the observed structures from the center of railway line ranged from 7m to 12m which falls within the railway Right of Way. At Gombo la Mboto area, there are several non-permanent structures and vendors working within the Right of Way on both sides of the railway line. The number of structures and vendors doing business in the railway right of way (see figure 4.54).

Figure 4.54: Street vendors at Gombo la Mboto area

ii. Presence of Graves

Some graves were found at chainage 17/4 in Pugu area see figure 4.55, which were within the 15m Right of Way of the railway corridor on the right-hand side from Dar es salaam station. ESS8 recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present, and future. People are identified with cultural heritage as a reflection and expression of their constantly evolving values, beliefs, knowledge, and traditions. The presence of graves means that the ESS8 (Cultural Heritage) will be triggered. Where also, according to Tanzania Graveyard Removal Act No. 9 of 1969, acknowledges shifting of these graves with proper procedures mentioned as a sensitive activity to undertake.

However, under second TIRP, this section of the railway will not be attended since it was on the completed sections under first TRIP whereby the grave area was isolated and not touched by the Contrator, left with no negative effect.

Figure 4.55: Graveyard at 17/4

- **Section B: Ngerengere – Kilosa**

i. Floods

A flood prone area between Ngerengere and Kilosa was observed at chainage km251/8 to km260/5. The railway line in this section traverses a lowland area which is prone to floods and erosion. Work in this area will exacerbate erosion especially during construction period. Therefore, the design for the new Railway Line is recommended to this area see figure 4.56.

Figure 4.56: Mkondoa River

ii. Encroachment

The issue of encroachment was also observed between Ngerengere and Kilosa package. Two houses and one toilet in Morogoro region have been constructed within 15m on the right-hand side from Dar es Salaam near Morogoro railway station. Furthermore, as you move from Morogoro station, there are several non-permanent structures on the left-hand side of railway line which are used for small businesses. One house at chainage 208/4 (S.06.75726 and E03764313) has a wooden fence, which falls within the wayleave of 15m. The same ESS5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons therefore TRC has to make sure both parties have reached an agreement on the paving a way for the project corridor.

iii. Agricultural activities

Permanent crops within the Right of Way were observed between Ngerengere and Kilosa, especially as you approach Morogoro railway station. The common crops grown include banana, Mango trees, palm oil, planted trees (Ticks). ESS5 recognized that for those with agricultural livelihoods, the resettlement plan provides for an option to receive replacement land of equivalent productive value or demonstrates that sufficient land of equivalent value is unavailable. Where replacement land is available. Thus, TRC has to make sure that this has to be attained before any replacement for any agricultural land is effectuated.

iv. Public infrastructure

The field reconnaissance noted the presence of a public well within the Right of Way at Mikese railway station. Since the well is located just adjacent to the railway line, it is likely that the rehabilitation activities will affect this infrastructure and the quality of water from leaks and accidental spills of fuel and lubricants from construction machinery and vehicles at construction site. Also, since the well is close to the railway line, it is likely that access to the well will be limited.

- **Section C: Kilosa – Itigi**

i. Flooding Area

The Central Line segment between Kilosa (Km 282) and Gulwe (Km 366) runs in relatively narrow river valley besides the Mkondoa River (Kilosa–Kidete) and the Kinyasungwe River (Kidete–Gulwe). Flash floods of the Mkondoa River carry a huge volume of soils and sand sediments, which originate from erosion prone, Kinyasungwe River floodplain, upstream of Gulwe. The stretch from Gulwe, Msagali to Igandu (at chainage 398/0 to 415/9) the railway line traverses a flood prone area. This river disappears for much of the dry season but is subject to flash flooding and changes in alignment during the rainy season. These have led to seven separate relocations of the rail alignment in the past century, especially between Km 315 and El Niño rains in 1997/98 caused severe damages to the rail bed and structures, resulting in service suspension for eight months. Heavy rains in 2011/12 also resulted in serious damages at 32 locations for a total length of 4.64 km, disrupting operations for six months. Although this work will be confined within the Right of Way or adjacent areas, it is crucial to ensure that the railway is protected from upstream sedimentation and frequent flooding challenges as of now.

The ongoing study on flood analysis and possibilities of strengthening of sedimentation ponds by the Government's multi-sectoral technical committee will recommend the short term and long-term practical measures to ensure the railway track is protected from frequent flooding events. Furthermore, a Climate and Risk Assessment Study from Dar es Salaam to Isaka (supported by Quality Infrastructure Investment Partnership Bank) is currently undertaken in order to identify the vulnerable areas with the objective of protecting them as well as coming with an effective practical emergency response preparedness system on place. Upon completion of these studies, the recommended measures will be incorporated in the updated ESMP for implementation accordingly.

ii. Soil Erosion

Soil erosion was noted to occur around Kigwe and Kikombo in Dodoma Region. Soil erosion is critical at chainage (chainage 426/8, at coordinate S.06.22161 and E035.98035 and chainage 480/5 at Kigwe– further investigation is needed to assess the area and come up with recommendations on the appropriate ways to control erosion in the area.

iii. Boulder Falls and Landslides

There are potential risks and hazards of boulders falling during construction and operation caused by train movement and vibrations. This was observed in Zuzu - Kigwe section in Dodoma region (chainage 474/2 – 474/9) where the railway line traverses deep rock cut area. Evidence of small boulders and sand were seen in the area.

iv. Encroachment

No issue of encroachment was observed from Gulwe – Dodoma to Itigi since most of the houses are located far from the RoW, although the team noted most of the rice, maize and vegetable farms are within the RoW between Kilosa and Kikombo.

- **Section D: Itigi - Isaka**

i. Soil Erosion

Soil erosion was observed in Malongwe village at chainage 730/5 in Tabora region. The soil erosion in this area is threatening the sustainability of the Malongwe Bridge.

ii. Encroachment

No issue of encroachment was observed from Itigi – Isaka since most of the area is bare land utilized as rice, maize and vegetable farms within the RoW.

iii. Agricultural Activities

Encroachment in the form of agricultural activities was also observed. According to Civil Engineering Manual (TRC, 1998), cultivation within the railway reserve by outside parties (non- railway employees) is not permitted. In special circumstances, Headquarters may grant a license to an applicant to cultivate within the Railway Reserve. Agricultural activities within the Right of Way are taking place from Isaka to Tabora. Most of the crops grown between Isaka and Tabora railway station are seasonal such as rice, maize and beans, therefore, does not a significant implication in the resettlement process because farmers can be allowed to harvest their crops before commencement of construction activities.

4.8 Gender Based Violence

4.8.1 Methodology

Stakeholder's consultation meetings through oral interviews (key informants' interviews) and focus group discussions during public meetings conducted in wards and villages located along project corridor. Structured and semi-structured questionnaires were used for interviewing key informants and to guide systematic focus group discussions in wards and villages. A purposive sampling technique was used by consultants to obtain participants of the survey who represented targeted subpopulation groups in the communities including village/ward leaders, women and children, cattle herders, students and teachers, traders, religious leaders, drivers of bodaboda/bajaji and commuter buses, people with disabilities and representatives of NGOs and CSOs engaging in GBV community outreach programmes along the proposed railway track route. The FDG were conducted taking into account ethical consideration, where by it was not asking direct questions on GBV, it was counted with the information on service providers who are working on the ward and village level, and it was conducted by a trained facilitator in a safe space

4.8.2 Responses of GBV in Project Communities

During focus group discussions organized in the villages along project; the participants highlighted the two main causes of GBV in their communities/families. The first one is excessive consumption of alcohol among married couples and those in spousal relationships; the most preferred local alcohol is bamboo juice normally available in abundance during rainy season at cheaper price which is affordable to many. Secondly, male domineering culture which is prevailing in the communities; whereby women are being overwhelmed by various tasks like fetching water, collecting firewood, cooking, washing clothes, cleaning houses, cultivating crops and selling food/vegetables. Moreover, village chairmen and VEOs have revealed about frequency of GBV reported cases range from two to four times a month.

4.8.3 Existing GBV Situation on Project Communities

(b) Awareness on Gender Based Violence

The participants indicated to know the meaning of gender-based violence in their respective villages. According to them gender-based violence is a practice of assaulting, humiliating and confronting male or female human in a family, community and nation at large. So, GBV implies the following:

- Domestic violence i.e., beating of wives and husbands, biting of husbands, beating of male and female children, raping of women and school female children and sodomizing of male school children.
- Emotional violence i.e., using abusive language, insults, defamation and segregation between spouses and to the children
- Child labour abuse; recruiting or forcing children under 18 years of age to work in farms and other casual jobs
- Forced marriage of girls to spouses who are chosen by their parents

(c) Existing Forms of Gender Based Violence in Project's Communities/Families

According to participants of FGDs held during community consultation meetings forms of GBV are as follows:

- Exclusion of widows from family inheritance after their loved ones passed away while they have greatly contributed in acquisition of those assets i.e., houses, farms and other family properties.
- Traditions that bound women from ownership of valuable assets like land, farms
- Wives are being condemned by husbands/ their close relatives for inability of conceiving and bearing children (infertility)
- Parents/guardians ignoring children when they wish to express their person issues
- Psychological torture to male and female children by parents/guardians depriving them to basic needs like school, medical care, clothing, food and accommodation

(d) Reporting of Gender Based Violence Issues in Communities/Families

There are various levels where families/communities report GBV issues:

- At family level; GBV issues are being reported to Ten Cell Leader
- At hamlet/sub-village/street level; GBV issues are being reported to hamlet/subvillage/ street chairman/person
- At Village level; GBV issues are being reported to Village Executive Officer
- At Ward level; GBV issues are being reported to Ward Executive Officer, or Social Welfare Officer, and or Police Post for law enforcement
- From Ward to divisional level; GBV issues are being reported to Gender Desk at Police Station
- At District level; GBV issues are being reported to Social Welfare Officer at District Council level/ and District Court for legal action

(e) Assistance Which Communities/Families Get from Authorities to Resolve Gender Based Violence Issues

The authorities which are responsible for resolving GBV issues practice the following: -

- From Ten Cell Leader to Village Executive Officer; GBV issues are being handled by Social Welfare Office through peaceful resolution/ or conciliation between the two persons involved

- From Ward Executive Officer to Police Post/Station; GBV issues are being handled by Ward Council through filing a case to court of law for legal proceedings
- District Court; ruling of GBV issues is given against the persons involved

(f) The Outcomes of Gender Based Violence Faced by Project's Communities/Families

GBV outcomes can be positive and negative depending on the resolutions reached at different levels as indicated above: -

- Family separations/divorces
- Injuries
- The shrinkage of family income as the foundation is shaken with conflicts
- Children happiness and welfare is threatened and degraded
- School dropout for male and female children
- Reconciliation among two persons involved
- Fines are being imposed to the accused persons
- Jail sentence for accused persons

Based on the findings from the assessment done along the project corridor, several conclusions regarding with the existing GBV issues in the project corridor i.e. from Dar es Salaam to Isaka can be made.

- Traditional gender roles persist

The sex-based division of labor which is inherited and passed over generations was found to influence what a woman or man, girl or boy should be like. As a result, the rest of one's life becomes pre-defined and pre-determined to the extent that change is very difficult to impose. These normative divisions of labor and determined gender roles form the foundation of a person's attitudes and behavior that affect all other life aspects and dimensions.

- Social norms are strongly embedded

Customs, norms and culture, rather than religion, influence gender roles. The assessment found very few aspects that could be linked to faith and religious beliefs. In fact, Islam contradicts the traditional gender roles and shared household responsibilities for instance.

- **Men dominate decision-making**

The cited customs, norms and traditions favor men against women in decision-making processes. As a result, men and boys in the studied communities are more powerful than women and girls. In some cases, younger boys were entrusted to make decision regarding older women. This pattern of decision making disempowers women and girls both at the household and the community level.

- **Discriminatory practices exist in all studied sites**

Different forms of discriminative practices were found to exist in all studied communities with slight differences in their intensity and severity. Several government efforts responding to such practices were cited and appreciated for their contribution to reduce discriminatory acts and practices against women and girls. Moreover, additional efforts from Non-Governmental Organisations (NGOs) appear to complement the government's efforts. Unfortunately, both the efforts from the government and NGOs have not successfully reached rural communities.

- **Few discriminatory practices have been eradicated**

So far, only a few undesirable and discriminatory practices have been successfully reduced to an acceptable level. FGM is one critical example. Corruption and heavy bureaucratic systems characterized by long procedures were cited as barriers for women and girls to access and claim their rights without long delays.

CHAPTER FIVE
5. INTER-AGENCY AND PUBLIC/NGO CONSULTATION

5.1 Overview

Stakeholder engagement refers to a broad, inclusive, and continuous process to engage persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively.

Stakeholder engagement enhances the effectiveness, efficacy, and accountability of the ESIA process. When undertaken in a transparent, balanced manner, it can reduce conflicts and strengthen the sense of ownership of a project and the project's sustainability.

Stakeholder engagement often collaboratively identifies issues and options, and helps make decisions based on input received via the stakeholder engagement process.

5.2 Objectives of Public Consultations and Engagement

Objectives of public consultations and engagement for the proposed Second Tanzania Intermodal and Rail Development Project (TIRP 2) From Dar es Salaam to Isaka are:

- Provide clear and accurate information about the project to the communities
- Disseminate information to affected stakeholders to raise their awareness of the proposed project.
- Increase stakeholder understanding about the proposed project, including its context, aims, opportunities and constraints.
- Accumulate feedback from affected stakeholders to inform project development and ensure that outcomes appropriately meet the relevant needs of those concerned.

Consultation will seek to:

- Document stakeholders' concerns and preferences;
- identify any issues and constraints existing in the project's areas which may affect the design;
- Assess and document the commonality and relevance of issues and concerns identified through the consultation to feed the ESIA process.

- Provide updates about consultation outcomes to the stakeholders involved, to keep them informed.
- Influence the perception and attitude among stakeholders consulted to enable and obtain acceptable levels of feedback from stakeholders.
- Inform communities along the way leave about the projects' schedule
- Gathering from population and their representatives about main environmental and social concerns and perceptions regarding the rehabilitation of the railway,
- Gather opinions and suggestions directly from the communities on their preferred mitigation measures and
- Gather opinions and concerns of the various minority groups of women, children, disabled and youth on the proposed railway rehabilitation.

5.3 Stakeholders Analysis

After identifying and grouping stakeholders, stakeholder analysis was used to characterize stakeholder groups' interests, how they will be affected by the proposed project and to what degree, and how those groups may influence the project. The stakeholder analysis process revealed important differences among groups, including their concerns and priorities.

Communities and other stakeholders that will be affected by proposed project have to be engaged as early as possible during project phases. By engaging with stakeholders early, it may be possible to avoid, mitigate, or decrease the project's impact. It is generally not practical or feasible to engage with every single stakeholder group at every level.

5.3.1 Project Stakeholders

The main stakeholders of this particular project can be classified into the following categories:

Ministry of Works, Transport, and Communication: Road Sector Environment Section under the department of Works is responsible for overseeing management of environment within the railway sector and the preparation/implementation of ESIA required in the rail way sector.

The project proponent - Tanzania Railway Corporation (TRC).

Dar es Salaam, Pwani, Morogoro, Dodoma, Singida, Tabora and Shinyanga Regions as well as their respective municipalities or councils where the project passing: the following department executives are relevant to this project; Planning and Liaison Officers, Forest Officer, Game

Officers, Bee Officers, Water Engineers, and Environment Management Officers(responsible for promoting environmental awareness in the Regional/ district related to the protection of the environment and the conservation of natural resources).

Government institutions: Tanzania Telecommunication Company Ltd, Tanzania Electric Company Ltd, National Environment Management Council (NEMC), Tanzania Forest Services, Ministry of Health, Ministry of Water, Ministry of Work through OSHA, etc.

During the ESIA study most of the above stakeholders were consulted as shown by stakeholder consultation attendance lists in Appendix 3 which bear a signature of each of the stakeholders who was consulted for the project.

5.3.2 How Stakeholders Were Involved

5.3.2.1 Consultation with statutory bodies

Consultation with statutory bodies and institutions were made through direct personal interviews see figure 5.1 to 5.12. The agenda for these consultations included:

- Presenting the Project, i.e., provide a briefing on the TRC Second Intermodal and Rail Development Project
- Defining the Regional/District institutional framework
- Discussing recent experience with respect to compensation eligibility criteria and entitlement packages
- Obtaining from the authorities their environmental and socio-economic concerns and perceptions regarding the proposed railway track
- Domestic water supply profile in the project area, locations and distribution of domestic water utilities along and across the railway track
- Environmental profile in the project area, possible environmental impacts of the project and mitigation measures
- Identify environmental and socio-economic concerns and perceptions regarding the proposed TRC rehabilitation and discussion on the role of the authorities in public information dissemination, monitoring and management plan
- Whether there is any wildlife or forestry protected area in the neighborhood of the project area.

Implications of the project with respect to TANESCO, TARURA, TANROADs, RUWASA, Urban Water Authorities infrastructures and services along and off the project and interests as well wishes of utility authorities that have to be borne in mind during the execution of the project.

The general public was consulted through public meetings which were conducted at selected villages. The main objectives of community consultations were:

- To provide clear and accurate information about the project to the communities along the railway track
- To obtain main concerns and perceptions of the population and their representatives regarding the railway track;
- To obtain opinions and suggestions directly from the affected communities on their preferred mitigation measures
- To ensure that these groups participated in meetings, advance notices were sent to village government leaders to inform the communities, including disabled, women, aged people, and youth of the meeting. Secondly, every village indicated the convenient date, time, and convenient venue to convene the meetings. In collaboration with village leaders, central locations were identified for the meeting venues.

5.3.2.2 Consultation with public

Consultations and public meetings were held from July to August 2022 in almost all representative settlements along the project to allow community members to participate fully by arranging consultations close to their residences. People from groups of different interests were involved as well as ward, village and district officials whereby varying views, concerns and questions about the project were expressed by communities and other stakeholders. They were collected by the consultant team for review and further use. Prior to holding meetings, notification by letter or mobile phone contact was made with the village/ward office to seek appointments.

During consultation the stakeholders were briefed on the proposed project as well as the ESIA process, and the governing environmental legislation. The public was then given opportunities to air their views and opinions concerning the project. Potential impacts – both positive and negative impacts as well as mitigation measures were also gathered as presented in the preceding section. Relevant photographs provide visual evidence of the occurrence of the consultation meetings.

The meetings were chaired by village chairmen and recording of minutes was done by village Executive officers. Copies of minutes of the meetings are attached as Appendix 3. Notably although the minutes were recorded by the village representatives, the consultant also recorded issues, concerns, and views of the participants to be included in the public consultation chapter of this report to ensure that all discussed issues do not pass unrecorded.

Each meeting was hosted by local authorities and was conducted for an average of 1-2 hrs and the summary of discussions are as depicted in table 5.1.

5.3.3 Project Information Disclosure

In order to achieve an in-depth exchange of views and information an Informed Consultation and Participation (ICP) was anticipated through disclosure of information including providing information on:

- The purpose, nature, and scale of the Project;
- Any risks to and potential impacts on such communities and relevant mitigation measures and
- The envisaged stakeholder engagement process.

As such, the Agenda for the Community consultative meetings included:

- Presenting the TRC Project – verbal explanation (in Kiswahili);
- Learning from the past rehabilitation and management of the project phases;
- Defining the local institutional framework and stakeholders;
- Obtaining from the local population their socio-economic concerns and perceptions regarding the proposed rehabilitation of the central railway and
- Facilitating identification by the communities of the main land uses and land tenure issues along the Row.

Table 5.1: Supplementary Issues and Concerns Raised By Stakeholders in the Project Area

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
1.	**Ministry of Water – Dodoma City**	Ms. Emmyelda J. Mcharo – Senior Community Development Officer and Eng Abdillah Mataka – Principle Engineer	• The office acknowledges the involvement and consultation of the TRC project to rehabilitate the railway, • Existing railways has been highly affected with floods; hence rehabilitation should focus to reduce such incidents, • Consultation to be conducted in each basin officer relation to the regional were the railway crosses • Draft consultation report and ESIA documents to be shared to the ministry office • To those who encroaches the railway reserve, especially settlements and agriculture activities should be notified and abide to the reserve, • Demarcation of the railway reserve should be earmarked from the beginning of the railway to End • Rehabilitation of meter gauge (TRC) should blend with the construction of SGR especially to infrastructure like road and pedestrians crossing areas, • Railway station should be rehabilitated to satisfy the increase human population especially to village and towns centers,	• Noted • Further consultation at each basin office shall be conducted before and during project implementation • TRC will share the final ESIA report for review • Railway reserve has been identified to the master plan and community knows, only some are neglecting to observe shall be accountable • Noted	• ESMP • Project management and mitigation plans • Project drawing and bidding documents

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
			- Contractor's camp should be constructed in a way that will be used after project end, as the buildings for dispensary or housing for teachers and etc.		
2	**Ministry of Lands, Housing and Human Settlements Development-Dodoma**	Walter Nnko – Regional Planner and Mtaki Fabian – Principal Town Planner	- The Ministry has planned the use of land by classifying the use of railways and other uses after railway reserve - For trespassers within the railway areas TRC are responsible for maintaining and protecting their areas, - TRC are responsible to identify and demarcate all their areas - Awareness education to be provided to all citizen along the railway on the importance of railways system and other infrastructure, - Village and town canters along the railway should collaborate with TRC to prepare land use of the area, - During railway rehabilitation TRC should consider provision of a way for new roads that shall cross the railway, as emerged after city or town growth, - If TRC shall need to acquire more land for the rehabilitation procedures for compensation shall be followed	Noted	
3	**TANZANIA ELECTRIC**	Amani Kyango – Environmentalist	- TANESCO Way leave should be observed during project activities	Noted for implementation	

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
	SUPPLY COMPANY - HQ		• Involvement of all stakeholders, community and village leaders prior to project implementation		
4	**NATIONAL ENVIRONMENT MANAGEMENT COUNCIL- HQ DSM**	Emmanuel Salyeem - Environmental Management Officer	• TRC should inform the Council of any changes to the development undertaking • Ensure that the mitigation measures are implemented accordingly as stated in the Environmental Management Plan (EMP) • Ensure that all forms of hazardous waste, i.e., are managed as required in the (Hazardous Waste Control and Management) Regulations, 2021 • Ensure to adhere to the Specific and General conditions which are printed at the back of the Certificate during all project phases	EMP shall be updated Hazardous waste and all waste shall be managed as per the regulations Noted	**Project EMP and ESMP**
3	**City Council of Dodoma**	Ally S. Mfinanga- City Environmental Management Officer and Dickson Kimaro Ag. City Directors office	• Gulwe and Mpwapwa section has been eroded frequently due to floods • Laws and regulation on the Railway reserve areas shall be incorporated into the Dodoma city master plan • Areas to be used as a sourced for Building materials (Sand, Gravel) need to be identified earlier and TRC need to pay the service levy • Provision for Pedestrians and livestock crossing areas to be improved as Dodoma is now populated especially to livestock crossing areas	Shall be indicated in the ESIA report	**Project drawing, ESMP and Monitoring**

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
			- Railway accidents has been regularly occurring in the city centers (Azina area) hence improve railway crossing signs and if possible construction of gate at the crossing area - If rehabilitation shall involve replacement of rail bars and disposal of old/used bars then TRC to engage registered hazardous waste collectors	All safety measures to safeguard human and railway infrastructure shall be installed	
		Ms Hidaya Mizega – Senior Community Development Officer	- Community engagement need to be conducted effectively to all the areas that the railway crosses in collaboration with regional and local government office, - Temporally employments opportunity to community during rehabilitation - Railway station to be rehabilitated, specifically sanitary rooms, as well as improving environment conditions to enable community to conduct small business, such as foods & drinks or money points - Travel cost for railway passengers to be affordable to the user majority - Pedestrians crossing to be provided as the city has now populated - Trains to be improved to include human service such as food, Money point, first aid section, as it will also improve tourism in the country	Shall be included in Management plan Contractor will source local workers	

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
4	**Chamwino District Council Office**	Abdul Mbimbi – Ag. District Executive Director	- In all phases of the project rehabilitation ensure to report at each village or ward office before any activates commenced	Noted	
		Elizabeth R. Sorwa – Environmental Management officer, Jane J. Maguwo – District Forest officer and Wakuru Nyaratna – Community Development officer	- Designing of sustainable HIV/AIDS preventive campaigns should be provided to prepared the community before project commence - If rehabilitation shall involve railway expansion, community needs to be prepared and engaged - To the areas where the railway crosses, forest reserve, water sources and cultures historical or spirituous sites, to be preserved and not polluted in any how - Occupational health and safety to all workers during rehabilitation need to be adhered	Awareness campaigns on HIV/AIDS shall be conducted during construction phase Noted and shall be incorporated in the management plan	Contactor's Site Specific ESMP, Monthly Progress Reports & Monitoring Plan,
			- Once the project commences ensure to report to the District Directors office before going to the communities	TRC shall report once the project commences	
5	**Mpwapwa District Council Office**	Mwanahamisi H. Ally – District Executive Director	- Rehabilitation shall focus most to reduce flooding that affect most the railway	Noted	**Project Implementation Documents**
		Theodory D. Mulokozi – District Environmental Management Officer,	- Rehabilitation should focus in railway culverts and drainages system for storm water as the area is mostly flooded during rains seasons,	Noted for implementations	

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
		James Makori – Tanzania Forest Service and Khamlo M. Njovu – District Community Development Officer	- Communities and local government authorities should be engaged in all project phases - Train station should be rehabilitated especially sanitary rooms - If the project shall involves clearing of trees TRC should seek for permit to the District office		
6	**Bahi District Council Office**	Boniphace Wilson – Ag District Executive Director, Wilbard Ntongani – District Land Natural Resources officer, Neema Ntibagwe – Ag. District Community development officer, RC. Katalyeba - Ag. District Human Resources officer, Laurent M. Charles - Ag. District Environmental Management Officer and Evaristo M.	- There is a water catchment in (Bahi Sokoni) that's was used by the village community for irrigation in the rice farms, but SGR construction blocked the water flow - Rehabilitation to include additional crossing ways for livestock - Railway stations to be rehabilitated specifically to sanitary rooms and waiting lounge - If rehabilitation shall include new construction of infrastructure, TRC to consult Bahi district council office - Planting of trees to the railway stations - Community harassment has been happening especially to SGR construction - Temporally employment opportunity to youth and women during rehabilitation should be a priority to Bahi District	- Rehabilitation of the MGR shall not involve any construction; rather than to rehabilitate the existing one - Additional crossing shall be identified in the design - Sanitary rooms will be included for rehabilitation - Consultation shall be done to all phase of the project - Contractor shall source local workers	

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
		Makula – District Forest Officer			
7	**Singida Regional Administrative Secretary Office (RAS)**	Helina Mdamo (Personal secretary) **For RAS**	- The railway that crosses Manyoni to Singida to be revived and rehabilitated to help business activities in the city - Demarcations to railway reserve areas to be conducted to prevent community encroachment - Awareness education on the railway reserve should be provided to community especially Itigi – Manyoni - The district council should be aware of the TRC railway reserve	- Noted - Awareness campaigns shall be conducted	
8	**Manyoni District Council Office**	Fadhili Chimsala – Ag District Executive Director	- Railway reserve area should be identified and demarcated, since the population of Manyoni has increase and railway tend to cross residential and farms area,	- Demarcation shall be included in the designs	
		Seif M. Swedi – District Environmental Health Officer	- Clearing of bushes within the railway reserve by involving the local community - Other utilities infrastructure within the railway reserve to be preserved and avoid clearing using fire - There is a seasonal stream at (Kipondoda) that's has been directed to the settlements - During project implementation TRC to collaborate with DED office in all project phases	- The contactor is liable to prioritize employment needs of the communities along the railway	Contactor's Site Specific ESMP, Monthly Progress Reports & Monitoring Plan

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
			- Project waste management plan should be known to DED office, for monitoring and conducting inspections to areas such a (borrow pits, campsites) - Final copies of the ESIA report to be submitted to the district Council		
		Heri Sagali – Ag. District Community Development officer Zakayo Ijojo – Ag. District Agriculture and Hamis Omari – District Forest officer	- Stakeholders' engagement and consultation to be conducted frequently during project construction and operation in collaboration with officer from the district office - At Manyoni roundabout there are several road accidents happening, hence we request for provision of gate during train crossing or safety man to alert drivers - Special areas for Livestock crossing to be identified and demarcated to prevent destruction of rail infrastructure - Train to be rehabilitated to include proper waste handling and management (such as toilets)	- Stakeholders' engagement shall be conducted - Safety procedures to prevent railway- road accidents shall be provided	ESMP, Monthly Progress Reports
9	**Itigi District Council Office**	Mkinguzi M. Mgalula – Ag District Executive director	- Rehabilitation to include construction of new pedestrian and vehicles crossing at Mabondeni, Kitalaka and Kitopeni villages - Itigi primary school was established to serve children's whom their parents are working for	- Noted	Project drawings, Environment al management and

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
		Nohny J. Kigoda - (Ag. District Environmental management officer, Suzana J. Mushi – District Community development officer, Elinam A. Macha – District Natural Resources officer and Mfwimi Abraham – Land officer	TRC hence, rehabilitation to include school infrastructure especially toilet - Sanitary rooms in the train station to be improved - TRC to ensure cleanliness in their railway reserve - At Kitalaka and Aghondi there are wild animal crossing such as elephant, hence rehabilitation to consider this - All waste generated during project phases to be properly managed - Awareness on HIV/AIDS should be provided before project commence as well as distribution of condoms - Community along the railway to be notified earlier once the project commence	Management of wild animals shall be prepared Waste management plan shall be prepared Community engagement and Awareness campaign shall be conducted	monitoring plan
10	**Msalala District Council Office**	Leonard M. Mabula – Ag. District Executive Director Mathias N. Gungumka – District Environmental management officer	- The office shall provide all the necessary support required for the project - All the infrastructure for the train such as toilets and waiting lounge to be improved as well - Waste management plan should be prepared and effective followed		
11	**Regional Administrative Secretary - Tabora**	Msalika R. Makungu - RAS	- He welcomed the team for consultation and insist to proceed with other consultation to another officer in the region		

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
12	**Tabora Municipal Council**	Nyanja Peter Maiga- Municipal Executive Director Mwamvua Fundikira – Environmental management officer	- Several train - vehicles accidents have been occurring at town centre, hence TRC should improve safety sign to alerts other road users - TRC should be responsible to conserve their environmental - There should be a Proper waste management plan inside the train - Sanitary condition inside the train and station to be improved - Railway reserve should be demarcated to prevent human activities within the reserve area - Some of the local communities should be stopped conducting farming inside the railway reserve as its cause soil erosion	- Noted Waste management inside the train shall be improved Railway reserve area shall be demarcated and engaged local awareness	
13	**District Administrative secretary - Uyui**	Moses L. Pesha – DAS	- TRC should pay service levy on the operation of the quarry site - TRC have poor communication/collaboration with Uyui District Council and other institutions, - Uyui District council are rejected to conducted inspection on the train - TRC should revise its policy on Corporate Social Responsibility	- Noted for implementation	

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
14	**Uyui District Council Office**	Karugutu Zuberi – Ag. District Executive Director Praxeda Kanja – District Community Development officer	- He welcomed the team and allowed the discussion to proceed - Most of the people constructed permanent house within the railway reserve, hence TRC to conduct regular awareness to the local community to observe railway reserve, and demarcate their area	- Awareness campaign shall be conducted	Management and Monitoring plan
		Moses Y. Bartow – Ag District Environmental Management Officer	- TRC owns a quarry site at Tabora but fails to comply with the Environmental management Act, 2004 - Train stations should also be rehabilitated and ensure cleanliness of the railway area by slashing glasses	- TRC shall need to comply with the EMA, Act 2004	
		Dr. Kija A. Maige – District Livestock and fisheries officer and Chrispo D. Kisoma – Forest officer	- Provision of new livestock crossing areas - To areas where cutting of trees shall be required to construct new road TRC to consult the District Council office	- Noted - Consultation shall be made to Uyui District Council	

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
15	**Nzega District Council office**	Kiomoni Kibamba – District Executive Director	- Pedestrians crossing from one direction to another as the railway crosses settlements areas and human activities	- Noted	Project drawing
		Christina J. Mahingu – District Forest officer	- TRC railway crosses Ilomba Hills, Igombe river and Mwakatundi forest reserve hence there should be a proper waste management plan	- Noted	
		Ladislaus Mageni – District Environmental management Officer	- If rehabilitation shall involve borrow pit, hence restoration plan shall need to be prepared - Awareness to the community in all project phases concerning increase of human interactions, health and safety to children - Rehabilitation shall also increase influx of people and increase demand of social service, hence resource such as water and hospital shall also be increased - Contractor should ensure to participate in corporate social responsibility (CSR)	- Rehabilitation plan shall be prepared once required - Awareness campaign shall be conducted - Labor management plan shall be provided	Project Management and Monitoring plan
		Elisha j. Lupindye – Valuer	- Awareness campaign on the railway reserve to be conducted - Buildings at Ipala stations to be rehabilitated to avoid communities' encroachment - Employment opportunities to be prioritized to the local communities and villages along the railway	- Awareness campaign shall be conducted - Noted - Contractor shall source local workers	Project management and monitoring plan

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
16	**Morogoro Regional Secretary office**	Dr. Rozalia Rwegasira – Ag. RAS	- There are several train and vehicle accidents at TANESCO and Msamvu-Town, hence TRC should consider construction of a gate or traffic light during train crossing - Railway at Kilosa section have been flooded each year, hence rehabilitation shall also focus to reduce flood - There are water ponds in Kilosa that were built to stabilize water pressure, hence to be rehabilitated as well - Farms lands have been destructed due to failure of water ponds at Kilosa - Wild animals at Mikumi and pastoralist should be provided with safety crossing areas	- Management of accidents shall be provided - Noted - Rehabilitation of water ponds shall be considered	
17	**Morogoro Municipal Council Office**	Joyce R. Mugambi – Municipal community development officer and Dauson Jeremiah – Environmental Management Officer	- Communities should be educated on the importance of protecting railway infrastructure - Engagement and involvement of local communities on the protection of infrastructure - Safety signage and symbols to be provided at the railway crossing areas - Railway and road intersection to be provided with gate or traffic light to prevent accidents - Precaution awareness on HIV/AIDs and Covid-19 to be provided, especially to school children - Rehabilitation plan for borrow pit after projects ends	- Awareness campaign shall be conducted - Safety signs shall be provided to major areas - Rehabilitation for borrow pit shall be provided if required	Management and monitoring plan

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
18	**Morogoro District Council office**	Edwin M. Mashala – Ag. District Executive director	He welcomed the team for discussion and to conduct consultation with other department		
		Rosemary Semiono – District Environmental Management officer,	Waste management plan should be prepared to conserve natural environment during rehabilitation process Rehabilitation plan for borrow pit after projects decommissioning Replacement of trees to area that will be affected by the project's activities Proper Management of pollution such as dust, noise and if blasting shall be involved Water suppression on dust area to control dust during project phases	The contractor shall be responsible for preparation of specific ESMP and its implementation under supervision of the Project Engineer.	EMP & ESMP
		Clarence S.A Manyamu – Community Development Officer and Dickson L. Mpokwa – principle land officer	Rehabilitation of railway shall enhance country and regional development, but during project phases interaction of people shall increase spread of HIV/AIDs, hence awareness education should be provided to communities Priority of Employment opportunities to community along the railway Train Stations should be rehabilitee to create favourable conditions for doing business	Awareness campaign shall be conducted Constrictor shall source local workers	Project monitoring

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
			- There are elephant at Kidungulo and Ngerengere hence TRC through CSR should help in controlling elephant by provision of beehives		
19	**Kinonko Village Office**	Hassan S. Kingoe – Member and Juma B. Shabani - VEO	- No any environmental challenges on the railway - Provision of pedestrian crossing way at Kinonko - Trains wagons that's are old and unused should be removed from the railway areas - During project implementation phased priority for employments opportunities to village citizens	- Well noted	
	Kilosa District Council Office	Joseph M. Kayzere – Ag. District Executive Director	- TRC railway has been damaged due to floods that has been happening from December – January and this is due to failure of Kidete pond, that helps in decelerating speed of water	Rehabilitation shall involve rehabilitation of railway infrastructure	
		Anthony H. Mbise – Ag. District Environmental Management Officer	- Sediments in Kidete ponds should be removed to allow the pond to store water for a period of time - Additional of alternative ponds from a great river (Nyakatango – Kidete) will help to decelerate water flow and reduce impact of flood to the railway - Removing of sediments will help in getting building materials and saves water for agriculture and fishing	- TRC shall take this into consideration during rehabilitation of the railway - Waste management plan shall be developed - Water suppression mechanism shall be applied to reduce dust	Project Management and Monitoring plan

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
			- Nyakatango River tends to shift its natural flow hence, TRC to considered rehabilitating riverbanks and enforce Environmental Management Act, 2004 of No permanent structure of 60m from the highest watermark - During construction of SGR some of the area have been impacted with dust from haulage to and from borrow pits		
		Simforosa Mollel – Ag. District Community Development officer	- Growth of human activities has led to encroachment of railway reserve - There is a need to make awareness to the community on the importance of environmental conservation and planting of trees - Local community should be empowered to move from riversides areas and TRC to consider providing them with trees as it will create sense of ownership with TRC project - Precaution measures on HIV/AIDs awareness should be provided - Local leaders should be involved in all project phases - Temporally employments opportunities should be prioritized to local community - Construction of SGR has provided crossing way for Kilosa – Sabasaba, but TRC railway did not	- Awareness campaign shall be conducted prior to project implementation - Involvement of the local leaders have already commenced by conducting stakeholders meeting - Procedures for allocation of gravel shall be followed if required	

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
			provide one and it is difficult for community to access other side, hence rehabilitation should consider this - If rehabilitation shall involve allocation of graves prior notification should be provided to the District council office		
		Diana S. Mahimbali – Ag. District Natural Resources Officer	- TRC to collaborate with the Ministry of agriculture in rehabilitations of the ponds as were used in farming activities - Other alternative source of water for agriculture activities to be known to the communities who depends on river Nyakatango before there are stopped depending on it	- Noted for implementation	
20	**Kibaha District Council Office**	Butamo Ndalahwa – District Executive director Shukuru Lusanjala – District Community Development officer Tumaini B. Katila – District Environmental Management Officer	- SGR construction has blocked pedestrians and livestock crossing area, and it is difficult to access other side, hence TRC rehabilitation to consider provision of accessible crossways - Waste management plan should be prepared and shared to the district council office - Communities should be engaged in all project phases - Priority of employment to local people - TRC rehabilitation should consider construction of new pedestrians and vehicles crossing areas		

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
	Boko Mnemela Ward Office	Albert N. Daudi – Member Kibaoni	- On the month of June – July it happens to occur a train accident at Mpiji station - Most of the train station have been abandoned and unfixed, hence rehabilitation should include improvement of station infrastructure as well - Provision of vehicles, pedestrians and livestock crossing area at Chekereni (47km + 00 and 42km +00) - Provision of all necessary safety signs and symbols to congested communities' areas	- Noted for implementation	
		Mariam Salehe – Member Kibaoni,	- Request for new train station at Ngeta, as the ones available were demolished	- Noted	Project drawing
		Justine J. Kipundwa – (Secretary),	- There is a gentle slope and shard corners from Pugu to Mpiji area, that's needs to be lowered - Rehabilitation to include maintenance of Bridge over Mpiji River which is broken	- Noted	
		Hamisi S. Mfaume – Member Mpiji	- Maintenance of the railway has been delayed due to small number of workers at the stations - Stations should be rehabilitated to create favourable conditions for doing business - Train route should be improved from once to twice a week	- Noted	

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
		Saidi A. Mwenegoha (Chairperson – Mpiji)	- Previous each station had three workers but current no any workers this leads to growth of glasses in the railway		
		Lilian Sanasio – Village Executive Officer Kibaoni, and Salehe P. Mbagile – member Mpiji	- Priority of employment to local communities during project implementation - There is a small culvert at 42km+00 from Dar es salaam should be redesign to a larger size - Provision of small train stop at Mnemela Kibaoni around 48km+00 due to increase of human settlements at the area	- Contractor shall consider employment to local community - Noted for action	
	Soga ward Office	Shomari Juma – Chairperson, Grace Butu – Ward Executive Officer, Alphonce Mohamedi – Member, Tatu Hasani Idd – Member, Ahedra Cosmass – Member, Fadhiri H. Ziamba – Member, Selemani Hamisi – Village executive officer, Mauvi Ukulule –VEO Soga, Neema Shanga	- Provision of pedestrians and vehicles crossing ways - Train station should be rehabilitated to create good conditions for community to conduct business - Pedestrians crossing and safety signs and symbols has to be provided - New train station should be constructed as the village population has now increase - Priority for employment opportunities to communities along the railway during rehabilitation	- Noted for implementation	Project drawing, ESMP

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
		– VEO Vikuge, Happy Kabambo -VEO			
	Kisarawe District Council Office	James C. Chitumbi – Ag District Executive Director, Douglas P. Mwella –Ag District Environmental Management Officer, Waziri S. Mkumbwa – Ag District Forest officer, Joseph E. Makyao – Ag. District Community Development Officer	- Rehabilitation should consider minimizing sharp corner and steep slopes - Ensure forest reserve is not destructed in any project phases - Community should be informed on the proposed project and priority of employment to local peoples - Awareness on HIV/AIDs should be conducted prior to project implementation	- Rehabilitation shall not involve any realignment or construction of new rail - Forest reserve shall be managed - Community engagement shall be conducted	Project management plan
	Visegese Hamlet Office	Mohammed Nundu – Ward Executive officer Visegese, Abdallah M. Mangaya – Chairperson Visegese, Mwashamba M. Genda – Village Executive Officer Visegese,	- We are grateful for the government on the rehabilitation of TRC railway, moreover the project should focus much on reduction of corners and slope where possible - Priority of Employment opportunities to local communities as it will create security for the TRC infrastructure - Provision of new train station at Visegese - There were train accidents in between of Mpiji and Kigodi Camp (28&29)	- Rehabilitation shall not involve any realignment or construction of new rail - Positive - Constrictor shall consider employment to local communities	ESMP and Monitoring plan

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
		Hamisi A. Mkino – Member, Kondo O. Kanawana – Member, Asha K. Samora – Member, and Idd Athumani Nyato – Member	- At 33/32KM of the SGR railway, TRC to consider provision of pedestrians crossing	- Rehabilitations shall also focus on accidents' reduction	
	Kisarawe Hamlet Office	Sophia N. Magwagu – Ward Executive officer, Amiri Hemedi Matary – Chairperson, Sophia A. Mahamba – Member, Haule Edward Nyoka – Member, Shamsa Y. Seleman – Village Executive Officer	- Citizens who lived along the railway reserved area were allocated from their home without compensations - Some of the communities who had family graves along the railway were compensated and some were not, - We proposed TRC to construct a warehouse and small station at Kisarawe to receive trains cargos as it will increase district revenue - TRC through its CSR should help provision of medical devices and human social service at Mwambisi, Kisopwa dispensary - Rehabilitation should also consider construction of other service road along the railway to help transportation accessibility at Kisarawe - For the TRC house to be rehabilitated, TRC to consider providing an office for Village - Participation in each project phases of the project	- Compensation status shall be crosscheck - Taken for implementation - Stakeholders' consultation has been conducted to all local government	

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
	Buguruni Madenge Mtaa Office	Mwanaidi S. Mazola – Chairperson, Fadhil S. Kalugira – Mtaa executive officer, Shukuru J. Tindwa – Member, Christina E. Mganga – (on practical), Hawa H. Mussa – Member	- During rehabilitation of the TRC railway, ground level vibration analysis especially at Madenge Mtaa should be conducted to acquired data for soil stability as the construction of SGR has destructed soil stability due to construction of bridge and SGR flyovers - Provision of safety signs and symbols to areas railway interacts with road - Some of the existing infrastructures were destructed by SGR Construction such as storm water drainages system - Construction of new train station, pedestrians crossing and Drainage system - Community should be notified prior to the project implementation - Priority of employment at Buguruni mtaa office - Railway demarcations should be marked and known at Buguruni Mtaa and local residents	- Ground vibration analysis shall be conducted - Safety sign shall be installed - Drainage system shall be rehabilitated - Community engagement shall be conducted	
	Gerezani ward Office	Fatuma A. Ally – Councillor, Abdallah M. Chihumpu – Ward executive officer, Asha Johari-Councillor Special seats, Zainab N. Jenga – Chairpeson-,	- Infrastructure for storm water drainage system at Kamata Goldstar has been blocked & destructed due to the construction of SGR, and TRC railway has been flooded during rainy season and affects human activities - Drainage infrastructure should be rehabilitated before construction begins	- Rehabilitation should include rehabilitation of drainage system - Safety signs and symbols should be replaced - Contractor shall source local workers	

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
		Zaida M. Mligite – Community Developmeny officer, Dotto Muhombozage – (Building inspector, Asha Mungi – Healthy officer, Jane S Kazimoto- Mtaa Executive officer, A/insp Jumanme M. Mahegere – Police, Alatukesemela B. Vahaye – Education coordinator, Ikingu A.M – Health officer, Mohamed A. Ibrahim – Chairperson, and Alice R. Kabaka – Mtaa executive officer Gerezani West	• Construction of gate at the Railway and road intersection to prevent accidents • Rehabilitation should include replacement of safety railway signs and symbols • Construction of fencing to area that are risk to accidents • Priority of employment during rehabilitation process • Construction of new stations for passengers • Old railway steels that's are not useful should be removed from the road side with proper management • TRC building and housing for workers should also be rehabilitated • Local government authorities and Communities should also be engaged during all project phases	• Management of hazardous waste should be as per the regulations • Community engagement shall be conducted • Management of hazardous waste shall be as per the regulation	

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
	Ilala Ward Office	Haji K. Bechina – Chairperson Karume, Amini M. Mtipa – Chairperson Kasulu, Ally Mshauri – Chairperson Mafuriko, Tatu Kassim – Mtaa Executive officer – Mafuriko, Wilhermina Ngo'mbe – Mtaa executive officer Karume, Leonard Madaha – Mtaa executive officer Kasulu and Kiondo J. Stanley – Ag. Ward Executive officer	- Rehabilitation should specifically target areas that's are congested with human activities and rehabilitation of drainage system - Engagement of local office during project phases, - Priority of employment during project phases - The office acknowledges the engagement of the TRC project before its implementation - During project implementation the local office and communities should be informed,	- rehabilitation shall involve Dar to Isaka railway - Community engagement shall be conducted - Contractor shall source local workers	
	Pugu Stesheni Mtaa Office	Shukuru Mwinjuma – Chairperson, Robert Zabron – War executive, Tunza H. Mkandama – Chairperson, Issa R. Mahiki –	- Crossing areas for pedestrians, vehicles, and livestock should be improved and consider constructing new ones, due to urbanizations and growth of human activities - There are settlements in-between TRC and SGR railway that's are in risk area for accidents, hence should be reallocated to a safer place.	- Existing settlements should be assessed and proposed mitigation measures shall be provided - Contractor shall source local workers	

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
		Chairperson, Mwanaisha O. Muhunzi Chairpeson	- Priority of employment to local communities during project implementations - Local government and community should be well engaged in all project phases - Measurement of railway reserve should be conducted with realist instruments and not by gestures and observation as it was done before - International contractors are abusive to local communities during constructions phases	- Community engagement shall be conducted	
Community Based Organisation (CBOs) and Non-Government Organisation (NGOs)					
	PUGU HILL	Sairis Lucia Bugebaha - Coordinator	- Ensure flora and Fauna along The project site are maintained, - Once required to cut the tree contractor has to seek for the permit from relevant authority, - Encourage to replant the trees to the area that affected by the project	- Contractor will prepare SSESMP to be adhered at each segment of the project, - Permit for cutting trees will be requested	
	KIVULI CHA UTUNZAJI WA MAZIBGIRA	Efrasia Martine – Chair person	- Ensure waste are properly managed, - Construction crew are requested protect the surrounding environment, - Contractor requested to participate on the forest management programs, - Contractor requested to contribute cleanness equipment	- Contractor will prepare SSESMP to be adhered at each segment of the project,	

S/No	Institution/ Village/NGO	Name & Position	Issues and Concerns	Responses	Project's Document Ref
				- Waste management plan shall be developed, - Equipment provision will be considered	
	SAUTI YA VIJANA	Florida Frank	- Employment opportunity to the nearby communities has to be considered, - Health and safety awareness should be provided to the community,	- Employment opportunity will be considered, - Health and Safety awareness will be provided	

5.4 Major Issues Raised by Stakeholders during consultation

Employment: The issue of employment during project rehabilitation process was raised by almost all stakeholders, the issue can be divided into four groups:

I. All unskilled labour must be sourced from the villages along the Project Area
II. Recruitment process should be open and transparent
III. Preferably local leaders should be involved directly
IV. Public consultations with communities highlighted the priority for employment opportunities specifically for women

Spread of HIV/AIDS, other sexually transmitted infections and COVID-19; impaired community safety and risk of disease intensifications, especially HIV/AIDS. TRC and contractors are to officially make a formal contract with an institution that will be carrying out the HIV/AIDS prevention campaign through dissemination of relevant and appropriate HIV/AIDS prevention awareness seminars and campaigns.

Drainage: Rehabilitation should include environmental safeguard and sustainability; improvement of the drainage systems and structures to ensure the bridges and culverts are properly designed to counter the effect of flooding.

Solid waste management during rehabilitation: Proper solid waste management during project rehabilitation phases was emphasized by stakeholders. During the construction phase there shall be a lot of hazardous waste, scrap and packaging materials, debris, etc. The contractor must develop a waste management plan as part of C-ESMP to ensure that wastes are collected and disposed in a manner that it does not pollute the environment.

Flooding at the railway has been emphasized the most by stakeholders. Floods damage the railway and cause tremendous effects to the infrastructure, and hinder transportation systems of the railway area. However, *i*t is worth noting that the ongoing study of assessment of Climate vulnerability and Disaster risks along Dsm-Isaka railway will provide recommendations that shall be included in ESIA and ESMP once ready.

Provision of crossing areas for pedestrians and vehicles. Construction of Standard Gauge Railway (SGR) has blocked accessibility of pedestrians and vehicles in many cities, town, villages and wards; hence rehabilitation of the Meter gauge Railway shall consider construction new crossing area where accessible by many users.

Gender Based Violence: Based on the experiences gained from the first phase of TRC rehabilitation, community members expressed their concerns that during railway rehabilitation more people will come to work in the project area and hence may likely fuel gender-based violence in their communities because of interactions of people from different cultural backgrounds. They call upon the contractor to emphasize employees of the project to respect to human dignity by abiding to traditional customs and norms instead of being the cause of fuelling of GBV related issues in the project area.

Railway safety awareness creation to the communities: It has been always observed and witnessed the increase in number of road- railway accidents, which are fatal, and leave affected with disabilities.

Recruitment of local labourers during construction phase: Each village being transverse should be given first priority in the provision of unskilled and semi-skilled labourers in the project. The contractor should therefore adhere to local content policy in executing the project during recruitment of labourers, commodities, and services supply chain

Community engagement and participation in project phases. Local leaders such as village and ward have emphasized participation in the project phases from the begging to the end as it will also create ownership to local communities and ensure sustainability of the project.

Gang houses should be rehabilitated to eliminate hideout areas for thieves.

The proposed project transverses pasture lands where cattle are always crossing. Thus, the rehabilitation needs to accommodate animal crossings in several sections to serve livestock and people,

Graves, places of worships, and shrines may be affected thus contractor has to ensure the places are protected from project operations.

Utilities Authority: The execution of the project is likely to cause service provision disruption due to the need to shift parts and components of utilities infrastructures and facilities. Therefore, pertinent costs should be borne by the project and formal notification should be made to them before project execution.

Cross ducts should be provided all along the project to serve as suitable and convenient means for utility line passage across the railway track to improve the existing situation and provide for future needs at all cross points.

Figure 5.1: Consultation meeting with Local leaders at Kazimzumbwi ward, Visegese hamlet

Source: Sociologist, July, 2022

Figure 5.2: Consultation meeting with Local leaders at Kisarawe hamlet

Source: Sociologist, July 2022

Figure 5.3: Consultation meeting with Local leaders at Bokomnemela ward

Source: Sociologist, July 2022

Figure 5.4: Consultation meeting with Local leaders at Gerezani Mtaa

Source: Sociologist, July 2022

Figure 5.5: Consultation meeting with Manyoni District Directors and other staffs

Source: Sociologist, July 2022

Figure 5.6: Consultation meeting with Itigi District Council officers

Source: Sociologist, July 2022

Figure 5.7: Consultation meeting with head teacher at Igandu

Source: Sociologist, July 2022

Figure 5.8: Awareness and information seeking from Igandu Primary School Students

Source: Sociologist, July 2022

Figure 5.9: Consultation with train users at Bahi Station

Figure 5.10: Consultation meeting with Local leaders and community at Nzubuka

Source: Sociologist, July 2022

Figure 5.11: Consultation meeting with community and Local leaders at Malola

Source: Sociologist, July 2022

Figure 5.12: Consultation meeting with community and Local leaders at Igalula

Source: Sociologist, July 2022

NOTE: The in-depth concerns of stakeholders can be seen in appendix 3 of this report.

CHAPTER SIX

6. IDENTIFICATION AND ANALYSIS OF POTENTIAL IMPACTS

6.1 Introduction

This chapter presents analysis of impacts of various components of the project. Several techniques and methods are available for the prediction and analysis of impacts. Examples of such methods include mathematical models, mass balance models, statistical models, physical, image, or architectural models, field and laboratory experimental methods, and analogue models.

The methods that were used in this study were mainly the field method and analogue model. The field method used existing data inventories, which was supplemented by field surveys to predict impacts on receptors.

The Analogue Model make predictions based on analogue situations, including comparing the impacts of the proposed project with a similar existing project, comparing environmental conditions at one site with those at similar sites elsewhere, comparing an unknown impact (e.g., concrete on human skin) with a known environmental impact. The model was developed from field surveys and investigations, review of literature, accessing expert opinion, and drawing on the ESIA experts own expertise obtained from previous experience.

The impacts are either positive (beneficial) or negative (adverse). Whether positive or negative, the impacts are classified into direct short term, direct long term, and indirect impacts, reversible or irreversible. Negative impacts need to be abated, while those identified as positive will need to be strengthened so that the objective of the project is enhanced.

6.1.1 Direct Impacts

Direct impacts are caused by the rail way itself that means truck construction processes such as land take, removal of vegetation, and severance of farmland. For example, the removal of gravel material from a borrow pit, for use in surfacing the truck, is an obvious direct impact of truck construction. In this case, the land area in which the pit site is located has been directly affected by activities associated with the project. Direct impacts are generally easier to identify, assess, and control than indirect impacts, since the cause-effect relationship is usually obvious.

6.1.1.1 Direct Short-Term impacts

Direct short-term impacts are direct impacts that may be apparent only during the construction stage of the project. Such impacts include impacts that are related to construction works.

6.1.1.2 Direct Long-Term impacts

These are direct impacts that will appear after the construction has been completed, and include impacts related to each construction works and the use of the truck.

6.1.2 Indirect Impacts

Indirect impacts are sometimes called secondary, tertiary or chain impacts, depending on how many steps there are between the original source activity and its impact. They are not a direct result of the project action but occur away from the original source of impact or as a result of a complex pathway. They are linked closely with development projects and may have more profound consequences on the environment than direct impacts.

Indirect impacts are not easy to identify, assess, and control due to difficulties in understanding the cause-effect relationships, but can ultimately be more important. Over time they can affect larger geographical areas of the environment than anticipated. Examples of indirect impacts include degradation of surface water quality by the erosion of land cleared as a result of a new railway track and urban growth near a railway track.

A subset of indirect impacts is generated impacts: where one type or phase of development attracts or facilitates another. An example of a generated impact is a new transport link to a remote area which triggers new housing and employment development. Indirect impacts are identified by using a causal chain diagram (or causal network diagram).

6.1.3 Cumulative Impacts

Cumulative impacts are caused by combined results of past, current and future activities. Over time, direct and indirect human activities combine to collectively impact the environment. The impacts may differ from the original, individual activities. For example, ecosystems can be damaged by the combined effects of human activities, such as air, land, and/or water pollution, improper handling of industrial waste, and other human development activities. Global warming is the cumulative effect caused by too much greenhouse gases, and it may then cause a loss in biodiversity and acid rain.

The process of cumulative environmental change can arise from any of the four following types of events:

- Single large events, i.e., a large project
- Multiple interrelated events, i.e., projects within a region
- Catastrophic sudden events, i.e., a major landslide into a river system; and
- Incremental, widespread, slow change, such as a poorly designed culvert or drainage system along a long railway track extending through a watershed.

These can generate additive, multiplicative or synergetic effects, which can then result in damage to the function of one or several ecosystems (such as the impairment of the water regulation and filtering capacity of a wetland system by construction of a road across it), or the structure of an ecosystem (such as placement of a new railway track through a forest, leading to in-migration or land clearing which results in severe structural loss to the forest).

A cumulative impact, in the context of railway track development, might be the de-vegetation and eventual erosion of a railway track side pull-out. The scenario might unfold as follows: a railway track cutting through a mountain range offers some spectacular views, and in the absence of designated rest areas, motorists stop indiscriminately. Railway track side vegetation is damaged by vehicle and foot traffic, and the soil is left unprotected. Subsequent rainfall causes erosion and siltation of nearby watercourses. The vegetation never has enough time to recover (because of high traffic volume on the railway track), and the problem is exacerbated over time.

During study period broad categories/groups of potential ecological Valued Environmental and Social Components (VECs) were identified and are listed as follows:

- Terrestrial biodiversity these are protected forest reserve to mention few are Pugu Hills (Pugu Kazimzumbwi Nature Forest Reserve) and Ruvu South Forest reserves etc. Wildlife corridors which are Wami- Mbiki northern Selous and Wami Mbiki Mikumi.
- Freshwater biodiversity these are fish, invertebrates and other freshwater macro and microorganisms.

- Physical environment and landscape these are surface water resources such as Ruvu River, Mkondoa River, Gode gode River as well as other streams. Soils i.e. Areas of high-value soils and soils sensitive to erosion or compaction example Kilosa Gulwe and gode gode area.
- Cultural heritage these are graves nearby the project road to be re allocated,
- Socio-economic and health which cover Employment and economic development, road accessibility, community health, traffic and road safety.

6.1.3.1 Other projects and external drivers

Other Projects

The range of programs and projects identified during the social studies development process are presented below.

- Construction of Standard Gauge Railway Line (SGR) from Dar es Salaam to Shinyanga implemented by TRC,
- Development of Rural Roads implemented by TARURA to mention few are at Pugu Mnadani area Ngerengere, Bahi, Morogoro DC,
- Development of Regional and Trunk Roads implemented by TANROADs at Buguruni Area, Kkoo Gerezani Area, Morogoro Road, i.e., these are a few areas where rail crosses Roads,
- Maintenance Water Utilities owned by RUWASA and Urban Water Authorities to mention a few this are at Kilosa area, Godegode area,
- Maintenance Telecommunications lines owned by TTCL to mention few this is at Buguruni area, Morogoro Municipality, Tambuka Reli Area,
- Maintenance of Electrical Lines owned by TANESCO this happens in most of the areas of the project as the TANESCO transmissions line goes parallel or crossing the Railway line in most of the places in all seventeen districts of the project.

External Drivers

- Climate Change

Nowadays, climate change attributed to the effects of anthropogenic-originated greenhouse gases (GHG), currently represents the greatest environmental, social, and economic threat on the planet. The accumulated level of GHGs in the atmosphere is constantly growing with population and economic activities. If measures are not taken today, it will be increasingly difficult and costly for countries to adapt themselves to the effects of climate change in the present and in the future. Therefore, climate change is an external driver for the project.

- Industrial component

The sources of GHG emissions corresponding to the industrial sector by combustion of fossil fuels are:

- Biomass boiler: although this equipment will be fueled by biomass (waste from wood handling and the removal of brown pulp), fuel oil will be used as starting fuel, to stabilize the production process and eventually to oxidize non-condensable gases when deviated to the biomass boiler;
- Recovery boiler: in the same way, although the main fuel for this equipment is of biogenic origin (black liquor), the fuel oil will also be used as initial fuel, and for stabilizing the production process;
- Internal transport of materials and waste: diesel and / or LPG will be used

The project passes in the Cities having number of industrial components that in one way or another triggered similar impact to the environment same as that produced from project operation. Therefore, Industrial component is an external driver for the project.

6.1.4 Residual Impacts

Residual impacts are those impacts that remain following the implementation of the mitigation measures proposed for each project phase, taking into account the background environmental conditions and the impacts from existing, committed and planned projects.

The impacts considered in this study pertain not only to the railway track right-of-way but also to sites associated with the railway track. These will include:

- Deposit and quarry and borrow sites
- Construction equipment and materials storage yards
- Materials processing areas
- Detours and access roads

- Construction camps

In order to identify the impacts easily and effectively, each phase of the project has been broken down into main activities, from which possible impacts have been derived. The identified potential Environmental Impacts have been classified in accordance with activities causing them. The Prediction and evaluation of environmental impacts of the proposed project have been done using the matrix in Table 6.1. The likely interactions between the development actions/activity and the impact subjects are described (rated) in terms of magnitude and importance on a common scale of between -3 through +3 for both positive and negative impacts as follows:

+3 = Major Positive, +2 = Moderate Positive, +1 = Minor Positive,

0 = No Impact,

-3 = Major Negative -2 = Moderate Negative, +1 = Minor Negative,

It is important to note that the impacts discussed below are presented as worst-case scenarios, in the absence of any best management practices (e.g. proper waste disposal) or mitigation measures, such as horizontal realignment to avoid excessive clearing of trees or improvement of sight distance to enhance railway track safety.

Table 6.1: Impact Matrix

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
Creation of employment	+2	+2	+2	+2	+2	+2	+1	+1	+1	0	+1
Loss of vegetation and farmlands	-1	-2	-2	-2	-1	-2	0	0	0	-2	0
Deterioration of aesthetics as related to discoloration of vegetation and buildings, unreinstated borrow pits	0	-2	-2	0	0	0	0	0	0	0	0
Impacts related to generation of solid wastes	0	-1	-2	0	-1	-1	-2	-1	0	-1	-1
Generation of noise and vibrations	-1	-2	-2	-2	-2	-2	-2	-2	-1	-2	-1

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
Deterioration of ambient air quality by particulate (dust)	-2	-3	-3	-1	-2	-2	0	0	-2	+3	-1
Deterioration of ambient air quality exhaust: fumes (SO_2, NO_x, CO)	-1	-2	-2	-1	-1	-1	-1	-1	-1	-2	-1
Deterioration of ambient air quality by hydrocarbon fumes	0	0	0	0	0	-2	0	0	0	0	0
Risk of accidents to livestock and human due to borrow pits	-1	-2	0	0	0	0	0	0	0	-2	-2

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
Road traffic accidents to human and animals	-1	-2	-2	-2	0	0	-2	-1	-1	-2	-1
Accidents related to blasting, drilling, and rock excavation	0	-2	0	0	0	0	0	0	0	0	0
Soil erosion	1-	-1	-2	0	-2	0	0	0	0	-2	0
Impact to wildlife areas	0	-2	-1	0	0	0	0	0	0	-2	0
Displacement and loss of properties	0	0	-3	0	0	0	0	0	0	0	0

PROJECT PHASE	**M**	**C**						**D**		**O & M**	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
Disruption of domestic water supply systems	0	0	-2	0	-1	0	0	0	0	0	0
Disruption of optic fiber cable	0	0	-2		-2	-2	0	0	0	0	0
Increased consumption of energy in the form of fuel and lubricants	-1	-2	-2	-2	-1	-2	-2	-1	-1	+2	-1
Increased consumption of forestry products	-1	-1	-1	-1	-1-	--1	-1	-1	-1	-2	-2
Resource use conflict	0	0	-2	0	0	-2	-2	0	0	0	0

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
Reduction in river flows	-1	-1	-2	-2	-2	-2	-2	-1	-1	0	0
River banks erosion during riparian zone construction	0	0	-2	-2	-2	0	0	0	0	0	0
Surface water and soil pollution by oil, concrete/concrete slurry	0	0	0	-2	-1	-2	0	0	0	0	0
Surface water and soil due to possible of leakage of hazardous wastes	-1	-1	-1	-1	-1	-1	-1	0	0	-1	-1

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
Modification of surface water flow pattern	0	0	-2	-2	0	0	0	0	0	-1	0
Modification of water table	0	0	-2	-2	0	0	0	0	0	-1	0
Disruption of community access to dwellings and business areas	0	0	-2	0	-2	0	0	0	0	0	0
Impact to cultural sites	0	0	-2	0	0	0	0	0	0	0	0
Health problems associated with handling of cement and	-2	0	0	-2	-2	-2	-2	0	0	0	0

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
wet cement products											
Fire and explosion risks	0	0	0	0	0	0	-2	0	0	0	0
Reduction in domestic water supply for local people	-1	0	-1	-1	0	-1	0	0	0	0	0
Occupational health and safety related impacts	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2
Risks of leakage of hazardous materials	-1	-1	-2	-2	-1	-2	-2	-1	-1	-1	-1

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
Marital and social conflicts	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Increase in unwanted pregnancies	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Poaching of wildlife by construction workers	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0
Physical hazard due to fall from height or being hit by falling objects	-2	-1	0	-2	-1	0	-2	0	0	0	0
Physical hazard due to stepping on sharp object or striking/	-2	0	0	-2	-2	0	-2	-1	0	0	0

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
stumbling on objects											
Physical hazard due to manual handling (over-exertion)	-2	0	0	-2	-2	0	-2	0	0	0	0
Physical hazard due to workers being struck or crushed by mobile equipment	0	-2	-2	-2	-2	0	-1	0	0	0	0
Physical hazard due to electrocution	-1	-2	0	0	0	-2	0	0	0	0	0
Chemical health hazard due to			-1	-2	-2	-2	-2	0	0	0	0

PROJECT PHASE	**M**	**C**						**D**		**O & M**	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
chemical contact with skin											
Chemical health hazard due to inhalation of harmful chemicals	-1	-2		-2	-2	-2	-2	0	0	0	0
Physical health hazard due to noise and vibrations	-1	-2	-2	-1	-1	-1	-1	-1	-1	-2	-1
Biological health hazard due to drinking unsafe water or eating contaminated food	-2	-2	-2	-2	-2	-2	-1	-2	-2	0	0

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
Biological health hazard due to exposure to ionizing radiation	0	0	-2	0	0	0	0	0	0	0	0
Increased infection of HIV/AIDS	-1	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Improved hydrology and drainage	0	0	0	0	+2	0	0	0	0	+3	0
Reduction in vehicle operating costs	0	0	+1	+1	+1	+1	+1	+1	+1	+3	+3
Reduced travel time and comfort to passengers	+1	+1	+1	+1	+1	+1	+1	+1	+1	+3	+3

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
Diversification of local economy	0	0	0	0	0	0	0	0	0	+3	+3
Improved access to social services	0	0	0	0	0	0	0	0	0	+3	+3
Increased interaction of people drives for social change	0	0	0	0	0	0	0	0	0	+2	+3
Increased investment	0	0	0	0	0	0	0	0	0	+2	+3
Reduced transport and transportation costs	0	0	0	0	0	0	0	0	0	+3	+3

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
Increased household income due to increased trading activities	0	0	0	0	0	0	0	0	0	+2	+2
Access to and increased farm produce to the markets	0	0	0	0	0	0	0	0	0	+2	+2
Improved Management of wildlife and forestry protected areas	0	0	0	0	0	0	0	0	0	+2	+2
Improved tourism	0	0	0	0	0	0	0	0	0	+2	+2

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
Improved growth of vegetation due to reduced generation of dust	0	0	0	0	0	0	0	0	0	+2	+2
Improved quality of water courses across the railway track	0	0	0	0	0	0	0	0	0	+2	+2
Complementary to other development initiatives	0	0	0	0	0	0	0	0	0	+2	+2
Facilitation of poaching and illegal logging	0	0	0	0	0	0	0	0	0	+2	+2

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
Increased costs of living	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2
Increased rate of crimes	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2
Abuse of railway track corridor	0	0	0	0	0	0	0	-1	-1	-2	-2
Reduced economic activities after closure of the project	0	0	0	0	0	0	0	-2	-2	-2	0
Contribution to climate change effect due to emission of GHGs	0	0	0	0	0	0	0	0	0	-1	-1

PROJECT PHASE	M	C						D		O & M	
Impact	Construction of a camp	Extraction processing and delivery of construction materials	General earthwork	Construction cross drainage structures	Construction of railway track side drainage systems	Concrete and welding works	Operation of construction camps	Demolition of temporary structures	Disposal of demolition material	Operation of the railway track	Repair and maintenance of the railway track
Contribution to depletion of ozone layer	0	0	0	0	0	0	0	0	0	-I	-I
Reduced life span of the railway tracks due to climate change	0	0	0	0	0	0	0	0	0	-I	-I

NB: M stand for Mobilization Phase, C stand for Construction Phase, D stand for Demobilization Phase, O stand for Operation Phase and M stand for Maintenance Phase.

6.2 Impact assessment

6.2.1 Identification of Impacts

Definition of actions in each stage of the project was done, which were considered as actions caused by a simple, concrete, well-defined and located cause of the impact see table 6.2.

Table 6.2: Concrete Actions on the Project Phases

Phase	Action
Planning	Evaluation of Properties and compensations, Permitting and/Licensing
Mobilization	Delimitation of working zones
	Land clearing, Setup & construction of contractor's camp/s including provisional facilities (building offices, machinery and equipment warehouses, concrete plant, crusher and screens)
	Transportation of consumables, equipment, materials and Staff
	Storage of materials, equipment and machinery
Construction	Construction/Maintenance of access road to borrow pits/quarry site
	Sourcing/preparation and transport of construction materials, including stone quarrying, blasting of rocks, gravel, sand and stone borrowing, preparation of cement, timber, reinforcement bars, casting of pre-cast materials such as concrete culverts etc.
	Construction & Maintenance of Diversions
	Site clearing works, including cutting of trees
	Earth works including removal of topsoil, river's dredging, excavation, cutting/filling, and compaction
	Demolition/relocation of existing structures
	Construction of bridges, which will include such activities as welding works, concrete works, metal works, bridge protection works
	Creation of storm water drainage channels, relief culverts on bridge approaches
	Collection and disposal of dredges, spoilt materials removed from excavation of existing railway track
Operation & Maintenance	Transportation of people and goods
	Land restoration in provisional railway track and temporarily disturbed areas
	Truck maintenance
Site Abandonment/ Decommissioning	Dismantling and demolition of structures
	Cleaning and rehabilitation

6.2.1.1 Impacts' affected environs

In this section, key biological, physical, and social receptors were selected from the baseline data. The impacts of the Project activities on each of these "Valued Ecosystem Components " were evaluated using a significance ranking process see table 6.3.

The environment complexity and its systemic nature was broken down into several levels to obtain simple and concrete factors:

Table 6.3: Components and Factors of the Environment

Environment	Component		Factor
Abiotic	Climate		Microclimate, Temperature, Rainfall
	Atmosphere		Air Quality
			Noise
	Land		Structure
			Quality
			Relief
	Surface water		Surface drainage (run-off patterns)
			Quality
	Groundwater		Aquifers recharge
			Quality
Biotic	Flora	Terrestrial	Habitat
			Distribution
			Species within any category
	Ecosystem		Biodiversity
Landscape	Landscape		Quality-vegetation cover, soil erosion
Socioeconomic	Economic		Change of land use
			Jobs
			Local and Regional Development
	Services Demand		Water
			Energy
			Communication
			Waste management and disposal

6.2.1.2 Focused Approach Impacts Mapping/Identification

This is a collaborative process of reflecting the reality along the proposed project in order to find implementable solutions/mitigations to avoid or reduce the impacts. See table 6.4 below.

Table 6.4: Impacts mapping-focused approach during construction and operation phases of the project(specific Impacts per location)

Chainage			Group list of	Impact	Mitigation	Re
Start	**Intermediate**	**End**				
130+100		**282+2**	1) Presence of stations facilities 2) Multiple Commercial residential houses out of 15m RoW in LHS and RHS along the project stretch. 3) Open markets at LHS and RHS of the railway 4) Road crossing 5) Culverts and bridges across the chainage. 6) Gangs on stations along the chainage, some in not good condition 7) Presence of wetlands in some	Rehabilitation of railway and Isaka station will result to a. Generation of solid waste during demolition/maintenance of offices, railway, and worker's houses b. Generation of hazardous waste such as scrap metal, used oil from railway c. Dust and noise generation will affect the people involved in commercial –residential near the railway also the workers d. Cracking of building may occur because of equipment used and the shortest distance to building from railway such as dry port	During rehabilitation process the following should be done as the mitigation measure complying to mandatory requirement of EMA 2004 and the world bank environmental and social framework (ESF): a) Minimize the solid waste generation by collecting, sorting at source, re-use or disposal to authorized dump site as b) All hazardous waste should be collected and transported properly to railway HQ for disposal c) Sparing water to working area, cover tracts which carry material and frequency maintained of equipment used during rehabilitation process	During project rehabilitation Contactor should abide to these mitigation measures and all the listed or explained strategies so as to eliminate and minimize the environmental impacts as per EMA Act 2004

Chainage			Group list of	Impact	Mitigation	Re
Start	Intermediate	End				
			areas along the stretch. 8) Seasonal streams 9) Water pipes along the line, 10) TANESCO and TTCL transmission lines 11) Animal and wildlife crossing. 12) Presence of forest reserve	e. Employment opportunities for people along the railway chainage f. Accident may occur when rehabilitation is done on railway crossing as the place having more trucks g. Transportation through railway will be affected as the rehabilitation taking place h. Pollution to the perennial streams and rivers i. Environmental pollution in the forest reserve j. Dam/pond may be polluted even though need more detail to categorize the place if is the dam or pond in which water stagnate. k. Natural drainage flowing during the rainy season may be blocked during construction and cause	d) On the railway cross the work should be shifted to night house since there is less movement of truck and to find the alternative pass during working time e) Good environmental practices such as avoiding open defecation to prevent stream pollution and Igombe forest reserve. f) Frequency motoring of small dam if the deep detail will be taken g) Implement storm water management plan during construction h) The design of culverts/water drainage structure should consider historical rainfall data i) The pipelines should be protected with metallic pipe casing/s of larger diameter during construction that will also provide maintenance	and the world bank environmental and social frame work (ESF) as well as other multilateral international and national environmental policies.

Chainage			Group list of	Impact	Mitigation	Re
Start	Intermediate	End				
				standing water on the railway track and nearby area. l. Poor design and construction might lead to storm water overtopping and road's banks erosion caused by running water forces m. The railway rehabilitation activities i.e., excavations/earth cut/s might click the water pipelines and cause accidental leaks n. Temporary disruption of water supply to the community o. Tura Quarry site provide the aggregates and sand which may use in maintenances and rehabilitation of railway (easily availability of raw material which can be used in the rehabilitation) p. Cattle crossing/pathway will be temporarily closed during	accessibility during railway operation j) Community should be informed on temporary disruption of water supply services k) Need to rehabilitate/maintain Gangs together with the increases workers who will frequently checking and maintained railway as the way of preventing accident l) On decommission of Tura Quarry site the site should be reforming to initial by planting trees and other activities m) Provision of temporary sanitation facility to workers and application of slogan which conserve environment during rehabilitation n) On the bridge (river /stream) the rehabilitation should be done in segment	

Chainage			Group list of	Impact	Mitigation	Re
Start	Intermediate	End				
				rehabilitation, pastoralists will not be able to cross livestock during construction q. Spread of disease such as HIV/AIDS r. The presence of child labor and gender violence during rehabilitation s. Triggering land slides	o) Contractor should watch on age, and gender based during employment p) Diversions and signs should be in place where the cattle shall cross during construction q) Vehicle speeding should be limited to 30-50km/hr. r) Worker should use PPE's and present of warning sign in the working area s) Provision of education on the preventive measure such as use of condom t) Frequent monitoring of the areas with rock cutting during operation to monitor the stability of the rocks to avoid unnecessary accidents	

6.2.1.3 Integration of Impacts from Identification Methodologies

The purpose is to strengthen the reliability of project's information, validity of the findings and recommendations, and to broaden and deepen understanding of the impacts identified, and how these can be mitigated during and after project's implementation.

Since impacts' mapping is location based, categorization of impacts has resulted into the following factors indicated in table 6.5: Aimed at specific impacts along the project corridor

Table 6.5: Impacts Integration

S/No	Categorized Impacts from Mapping Approach	Impacts from Matrices	
		Component	Factors
1	railway track safety impacts at major crossing	Socioeconomic / economic	At Risk Population / Road Accidents /Occupational Health & Safety
2	railway track safety impacts at community centers	Socioeconomic / economic	At Risk Population / Road Accidents /Occupational Health & Safety
3	railway track safety impact to livestock	Socioeconomic / economic	At Risk Population / Road Accidents /Occupational Health & Safety
4	railway track safety impacts at sharp corners	Socioeconomic / economic	At Risk Population / Road Accidents /Occupational Health & Safety
5	railway track safety impacts at steep hills/slopes	Socioeconomic / economic	At Risk Population / Road Accidents /Occupational Health & Safety
6	railway track safety impacts due to narrowed tracks and bridges	Socioeconomic / economic	At Risk Population / Road Accidents /Occupational Health & Safety
7	Resettlement	Socioeconomic / economic	Resettlement
8	Disruption of water services	Socioeconomic / services	Water
9	Disruption of electrical services	Socioeconomic / services	Electricity/Energy
10	Disruption of communication services	Socioeconomic /services	Communication
11	Interference with market activities	Socioeconomic /economic	Improved Local Trade
12	Interference with worshiping services at mosques or churches	Socioeconomic /economic	Cultural/Religion Values

S/No	Categorized Impacts from Mapping Approach	Impacts from Matrices	
		Component	Factors
13	Damage/s on utilities,	Socioeconomic /services	Energy/water Transfer
14	Disruption of Cargo transfer	Socioeconomic /services	Movement of cargo in central line
15	Transportation inconveniences during construction	Socioeconomic /services	Transportation
16	Clearance of terrestrial vegetation	Flora	Vegetation Coverage/ Species/Category
17	Little Ruaha River' bank erosion	Land	Structure/Topography Erosion/Quality
18	River pollution/Sedimentation	Surface Water	Water Quality/Pollution Downstream Effect
19	Generation Noise & Vibration	Atmosphere	Noise & Vibration
20	Air quality deterioration	Atmosphere	Air Quality

6.2.2 *Impact Prediction and evaluation*

After identification of impacts as a result of the proposed project's activities, their significance were determined, that is, whether they are acceptable or unacceptable and thus require mitigation see table 6.6. The significance of an impact was determined by considering the impact characteristics and the importance (or value) attached to them by the consultant team.

Overall Score = (NxMxS) x (E+D+P)

Where:

N = Nature;

E = Extent

M = Magnitude

D = Duration

P = Probability

S = Significance

Table 6.6: Impacts Methodology Table

Nature				
Negative	Neutral	Positive		
-1	0	+1		
Extent				
Site	Local	Regional	National	International
1	2	3	4	5
Magnitude				
Low	Medium	High		
1	2	3		
Duration				
Short Term (0-5yrs)	Medium Term (5-11yrs)	Long Term	Permanent	
1	2	3	4	
Probability				
Rare/Remote	Unlikely	Moderate	Likely	Almost Certain
1	2	3	4	5
Significance				
No Impact/None	No Impact After Mitigation/Low	Residual Impact After Mitigation/Medium	Impact Cannot be Mitigated/High	
0	1	2	3	

The analysis was conducted on a quantitative basis with regard to the nature, extent, magnitude, duration, probability and significance of the impacts see table 6.7. The following definitions and scoring system applied:

Table 6.7: Impact definitions

Nature (/Status) The project could have a positive, negative or neutral impact on the environment.

Extent • Site – impact within the project site. • Local – extend to the site and its immediate surroundings. • Regional – impact on the region but within the districts. • National – impact on an interregional scale. • International – impact outside of Tanzania.

Magnitude Degree to which impact may cause irreplaceable loss of resources. • Low – natural and social functions and processes are not affected or minimally affected. • Medium – affected environment is notably altered; natural and social functions and processes continue although in a modified way. • High – natural or social functions or processes could be substantially affected or altered

to the extent that they could temporarily or permanently cease.
Duration • Short term – 0-5 years. • Medium term – 5-11 years. • Long term – impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention. • Permanent – mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient
Probability • Almost certain – the event is expected to occur in most circumstances. • Likely – the event will probably occur in most circumstances. • Moderate – the event should occur at some time. • Unlikely – the event could occur at some time. • Rare/Remote – the event may occur only in exceptional circumstances.
Significance Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows 0 – Impact will not affect the environment. No mitigation necessary. 1 – No impact after mitigation. 2 – Residual impact after mitigation. 3 – Impact cannot be mitigated.

On the other hand, if the nature of an impact is 0 (neutral or no change) or the significance is 0 (no impact), then the impact is 0.

Impact Scores will therefore be ranked as indicated in the table 6.8:

Table 6.8: Rating Scale

Impact Rating	Low/Acceptable impact	Medium	High	Very High
Score	0 to -30	-31 to -60	-61 to -90	-91 to -117

Table 6.9: Impacts Characterization

Component	Factor/ Impact	Nature (N)		Extent (E)					Timing				Magnitude (M)			Duration (D)				Probability (P)					Significance (S)						Score
		+ve	-ve	Site	Local	Regional	National	Intern	Planning	Mob & Cons	Deco	Op	Low	Med	High	ST	MT	LT	P	Rare	Unlikely	Moderate	Likely	Certain	Nil	Low	Medium	High	NMS	E+D+P	
Impact Score Value		1	-1	1	2	3	4	5					1	2	3	1	2	3	4	1	2	3	4	5	0	1	2	3			
Climate	Microclimate		Θ		Θ					Θ	Θ	Θ	Θ					Θ						Θ		Θ			-1	10	-10
Atmosphere	Air Quality		Θ	Θ						Θ	Θ	Θ	Θ			Θ						Θ				Θ			-1	5	-5
	Noise		Θ	Θ						Θ	Θ	Θ	Θ			Θ						Θ				Θ			-1	3	-1
	Vibration		Θ	Θ						Θ	Θ	Θ	Θ			Θ					Θ					Θ			-1	3	-1

Component	Factor/ Impact	Nature (N)		Extent (E)					Timing				Magnitude (M)			Duration (D)				Probability (P)					Significance (S)						Score
		+ve	-ve	Site	Local	Regional	National	Intern	Planning	Mob & Cons	Deco	Op	Low	Med	High	ST	MT	LT	P	Rare	Unlikely	Moderate	Likely	Certain	Nil	Low	Medium	High	NMS	E+D+P	
Impact Score Value		1	-1	1	2	3	4	5					1	2	3	1	2	3	4	1	2	3	4	5	0	1	2	3			
Land	Structure/Topography		Θ	Θ						Θ				Θ			Θ						Θ			Θ			-2	7	-14
	Erosion/Quality		Θ	Θ						Θ	Θ		Θ			Θ							Θ			Θ			-1	6	-6
Surfa Wate	Surface drainage /Hydrology		Θ		Θ					Θ			Θ			Θ					Θ					Θ			-1	5	-5

Component	Factor/ Impact	Nature (N)		Extent (E)					Timing				Magnitude (M)			Duration (D)				Probability (P)					Significance (S)						Score
		+ve	-ve	Site	Local	Regional	National	Intern	Planning	Mob & Cons	Deco	Op	Low	Med	High	ST	MT	LT	P	Rare	Unlikely	Moderate	Likely	Certain	Nil	Low	Medium	High	NMS	E+D+P	
Impact Score Value		1	-1	1	2	3	4	5					1	2	3	1	2	3	4	1	2	3	4	5	0	1	2	3			
	Water Quality/Pollution		Θ		Θ					Θ	Θ	Θ		Θ		Θ					Θ					Θ			-2	5	-10
	Downstream Effect		Θ		Θ					Θ	Θ	Θ		Θ		Θ					Θ					Θ			-2	5	-10
Ground Water	Aquifers recharge		Θ		Θ					Θ	Θ	Θ	Θ				Θ				Θ					Θ			-1	6	-6

Component	Factor/ Impact	Nature (N)		Extent (E)					Timing				Magnitude (M)			Duration (D)				Probability (P)					Significance (S)						Score
		+ve	-ve	Site	Local	Regional	National	Intern	Planning	Mob & Cons	Deco	Op	Low	Med	High	ST	MT	LT	P	Rarely	Unlikely	Moderate	Likely	Certain	Nil	Low	Medium	High	NMS	E+D+P	
Impact Score Value		1	-1	1	2	3	4	5					1	2	3	1	2	3	4	1	2	3	4	5	0	1	2	3			
	Ground Water Quality		Θ		Θ					Θ	Θ	Θ	Θ				Θ				Θ					Θ			-1	6	-6
Flora	Vegetation Coverage		Θ	Θ						Θ			Θ			Θ							Θ			Θ			-1	6	-6
	Species /Category		Θ	Θ						Θ			Θ			Θ							Θ			Θ			-1	6	-6

Component	Factor/ Impact	Nature (N)		Extent (E)					Timing				Magnitude (M)			Duration (D)				Probability (P)					Significance (S)						Score
		+ve	-ve	Site	Local	Regional	National	Intern	Planing	Mob & Cons	Deco	Op	Low	Med	High	ST	MT	LT	P	Rare	Unlikely	Moderate	Likely	Certain	Nil	Low	Medium	High	NMS	E+D+P	
Impact Score Value		1	-1	1	2	3	4	5					1	2	3	1	2	3	4	1	2	3	4	5	0	1	2	3			
Fauna-Terrestrial and Aquatic	Habitat		ʘ	ʘ						ʘ			ʘ			ʘ							ʘ			ʘ			-1	6	-6
	Distribution		ʘ	ʘ						ʘ			ʘ			ʘ							ʘ			ʘ			-1	6	-6
	Species/Category		ʘ	ʘ						ʘ			ʘ			ʘ							ʘ			ʘ			-1	6	-6
	Habitat		ʘ	ʘ						ʘ			ʘ			ʘ					ʘ					ʘ			-1	3	-3
	Distribution		ʘ	ʘ						ʘ			ʘ			ʘ					ʘ					ʘ			-1	3	-3

Component	Factor/ Impact	Nature (N)		Extent (E)					Timing				Magnitude (M)			Duration (D)				Probability (P)					Significance (S)						Score
		+ve	-ve	Site	Local	Regional	National	Intern	Planning	Mob & Cons	Deco	Op	Low	Med	High	ST	MT	LT	P	Rare	Unlikely	Moderate	Likely	Certain	Nil	Low	Medium	High	NMS	E+D+P	
Impact Score Value		1	-1	1	2	3	4	5					1	2	3	1	2	3	4	1	2	3	4	5	0	1	2	3			
	Species /Category		ʘ	ʘ						ʘ			ʘ			ʘ					ʘ					ʘ			-1	3	-3
Ecosystem	Biodiversity		ʘ	ʘ						ʘ	ʘ		ʘ			ʘ					ʘ					ʘ			-1	3	-3
Landscape	Quality	ʘ			ʘ							ʘ		ʘ				ʘ						ʘ		ʘ			2	6	12
	Change of Land use	ʘ				ʘ						ʘ		ʘ				ʘ						ʘ			ʘ		2	11	22

Component	Factor/ Impact	Nature (N)		Extent (E)					Timing				Magnitude (M)			Duration (D)				Probability (P)					Significance (S)						Score
		+ve	-ve	Site	Local	Regional	National	Intern	Planning	Mob & Cons	Deco	Op	Low	Med	High	ST	MT	LT	P	Rare	Unlikely	Moderate	Likely	Certain	Nil	Low	Medium	High	NMS	E+D+P	
Impact Score Value		1	-1	1	2	3	4	5					1	2	3	1	2	3	4	1	2	3	4	5	0	1	2	3			
	Land Acquisition & Resettlement		ʘ	ʘ					ʘ					ʘ		ʘ								ʘ			ʘ		-4	7	-28
Soci	Jobs/Employment	ʘ			ʘ					ʘ	ʘ		ʘ			ʘ							ʘ			ʘ			1	7	7

Component	Factor/ Impact	Nature (N)		Extent (E)					Timing				Magnitude (M)			Duration (D)				Probability (P)					Significance (S)						Score
		+ve	-ve	Site	Local	Regional	National	Intern	Planing	Mob & Cons	Deco	Op	Low	Med	High	ST	MT	LT	P	Rare	Unlikely	Moderate	Likely	Certain	Nil	Low	Medium	High	NMS	E+D+P	
Impact Score Value		1	-1	1	2	3	4	5					1	2	3	1	2	3	4	1	2	3	4	5	0	1	2	3			
oeconomic Services	Local and Regional Development	Θ				Θ						Θ		Θ				Θ						Θ			Θ		4	11	44
	Traffic		Θ		Θ							Θ			Θ				Θ			Θ					Θ		-9	9	-81

Component	Factor/ Impact	Nature (N)		Extent (E)					Timing				Magnitude (M)			Duration (D)				Probability (P)					Significance (S)						Score
		+ve	-ve	Site	Local	Regional	National	Intern	Planning	Mob & Cons	Deco	Op	Low	Med	High	ST	MT	LT	P	Rare	Unlikely	Moderate	Likely	Certain	Nil	Low	Medium	High	NMS	E+D+P	
Impact Score Value		1	-1	1	2	3	4	5					1	2	3	1	2	3	4	1	2	3	4	5	0	1	2	3			
	Occupational Health & Safety		ʘ	ʘ						ʘ	ʘ			ʘ		ʘ						ʘ					ʘ		-4	5	-20
	Local Life Style	ʘ			ʘ					ʘ	ʘ	ʘ		ʘ				ʘ					ʘ				ʘ		4	9	36
	Improved Local Trade	ʘ			ʘ					ʘ	ʘ	ʘ		ʘ				ʘ					ʘ				ʘ		4	9	36

Component	Factor/ Impact	Nature (N)		Extent (E)					Timing				Magnitude (M)			Duration (D)				Probability (P)					Significance (S)						Score
		+ve	-ve	Site	Local	Regional	National	Intern	Planning	Mob & Cons	Deco	Op	Low	Med	High	ST	MT	LT	P	Rare	Unlikely	Moderate	Likely	Certain	Nil	Low	Medium	High	NMS	E+D+P	
Impact Score Value		1	-1	1	2	3	4	5					1	2	3	1	2	3	4	1	2	3	4	5	0	1	2	3			
	Migrant Population		Θ		Θ					Θ				Θ		Θ						Θ					Θ		-4	5	-20
	Gender Based Violence		Θ		Θ					Θ	Θ		Θ					Θ				Θ					Θ		-2	8	-16
	Spread of HIV/AIDS		Θ				Θ			Θ			Θ					Θ				Θ					Θ		-2	9	-18

Component	Factor/ Impact	Nature (N)		Extent (E)					Timing				Magnitude (M)			Duration (D)				Probability (P)					Significance (S)						Score
		+ve	-ve	Site	Local	Regional	National	Intern	Planning	Mob & Cons	Deco	Op	Low	Med	High	ST	MT	LT	P	Rare	Unlikely	Moderate	Likely	Certain	Nil	Low	Medium	High	NMS	E+D+P	
Impact Score Value		1	-1	1	2	3	4	5					1	2	3	1	2	3	4	1	2	3	4	5	0	1	2	3			
	Community Stability		ɵ		ɵ						ɵ	ɵ	ɵ	ɵ				ɵ				ɵ					ɵ		-2	8	-16
	Cultural/Religion Values		ɵ		ɵ					ɵ			ɵ			ɵ						ɵ				ɵ			-1	6	-6

Component	Factor/ Impact	Nature (N)		Extent (E)					Timing				Magnitude (M)			Duration (D)				Probability (P)					Significance (S)						Score
		+ve	-ve	Site	Local	Regional	National	Intern	Planning	Mob & Cons	Deco	Op	Low	Med	High	ST	MT	LT	P	Rare	Unlikely	Moderate	Likely	Certain	Nil	Low	Medium	High	NMS	E+D+P	
Impact Score Value		1	-1	1	2	3	4	5					1	2	3	1	2	3	4	1	2	3	4	5	0	1	2	3			
	Improved railway track Condition	Θ				Θ						Θ		Θ				Θ					Θ				Θ		4	10	40
	Tourism	Θ				Θ						Θ	Θ					Θ				Θ					Θ		2	9	18
	Water		Θ		Θ					Θ			Θ			Θ						Θ				Θ			-1	6	-6
	Energy /Electricity		Θ		Θ					Θ			Θ			Θ						Θ				Θ					

Component	Factor/ Impact	Nature (N)		Extent (E)					Timing				Magnitude (M)			Duration (D)				Probability (P)					Significance (S)						Score
		+ve	-ve	Site	Local	Regional	National	Intern	Planning	Mob & Cons	Deco	Op	Low	Med	High	ST	MT	LT	P	Rare	Unlikely	Moderate	Likely	Certain	Nil	Low	Medium	High	NMS	E+D+P	
Impact Score Value		1	-1	1	2	3	4	5					1	2	3	1	2	3	4	1	2	3	4	5	0	1	2	3			
	Energy /Fuel Transfer		ʘ					ʘ		ʘ				ʘ		ʘ						ʘ				ʘ			-2	9	-18
	Communication		ʘ		ʘ					ʘ			ʘ			ʘ						ʘ				ʘ			-1	6	-6
	Waste Management & Disposal	ʘ			ʘ					ʘ	ʘ		ʘ			ʘ						ʘ				ʘ			1	6	6

6.3 Impact Description

The description of the impact in the following subsections shall be done following the project phases.

6.3.1 Planning Phase

As noted earlier, the main activities during planning phase of the project will be the acquisition of the licensing and other information necessary for the execution of the project therefore only identified impact to this is creation of the employment to the people and increase in money circulation to the community.

6.3.2 Mobilization Phase

The main activities during mobilization phase of the project will be the transportation of construction equipment to the site, establishment of camps, and establishment of sources of naturally occurring construction materials.

The camps will be required for the storage of construction materials and equipment, material processing, carpentry workshop, steel workshop, mechanical workshop, and pre-cast yard. The camp will also be required to provide site office and accommodation for Supervising engineering firms and a few senior staff of the Contractors. Accommodation may not be necessary for workers coming from the project area. Mobilization activities are expected to bring about the following impacts.

POSITIVE IMPACTS DURING MOBILIZATION

6.3.2.1 Creation of Employment

Establishment of construction camp site will create direct and indirect employment to the local as well as people from other places. Direct employment will be in the form of skilled labor as well as non-skilled labor. Indirect employment will include employment of food vendors (especially women) and other small businesses like soft drinks. The WB ESF, especially ESS2, will be applied because the project shall need to recruit workers and to give them contract that will ensure the labor Working conditions and management of worker relationships is complied.

The Impact is cumulative estimated to be positive, direct, short term, and moderate.

NEGATIVE IMPACTS DURING MOBILIZATION

6.3.2.2 Loss of Vegetation

Clearing works during establishment of camps and material borrow areas will involve removal of vegetation, including trees. Clearing of vegetation apart from exposing soil to water erosion, it will remove fertile top soil which is good for supporting plant growth. ESS6 recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development. Thus, TRC through project consultant will make sure that contractor will protecting and conserving biodiversity and sustainably managing living natural resources as per requirement of EMA, 2004 as well as WB ESF, especially ESS6 which clearly indicate mitigation hierarch to prevent or mitigate any adverse impact from project.

The impact is cumulative indicated as negative and is gauged to be a direct long term, moderate, and irreversible.

6.3.2.3 Deterioration of Scenic and Visual Quality

Loss of aesthetic quality will result from accumulation of top soil cleared from camp sites, construction material wastes such as concrete, nails, timber, steel, and iron sheets, and material packing such as cement bags. This will create an eye-sore to the by passers-by.

The negative impact will be direct, short term, minor, and reversible.

6.3.2.4 Generation of Noise and Vibration

Pollution due to noise and vibrations will result from operations of construction equipment and trucks during transportation and delivery of construction materials, and works at the camps. Increased traffic movement across and along settlements is likely to cause considerable noise and vibration. This is likely to interfere with audio communication. The impact is likely to be pronounced if the equipment and trucks are poorly maintained. Since there are no settlements in the neighborhood of potential sources of construction materials, the impact due to noise and vibration due to material extraction activities is only likely to be felt by construction workers. For that case TRC through project consultant will make sure that contractor will abide with labor and working conditions articulated in the Tanzanian labor Law as well as WB- ESF especially ESS2. ESS 2 on noise and vibrations applies to the project because of the possible impact on Occupational Health and Safety (OHS) issues that may be encountered during project implementations. The negative impact due to noise and vibrations will be ***cumulative direct, moderate, but short term. The impact is residual since it cannot be mitigated fully***.

6.3.2.5 Deterioration of Ambient Air Quality by Dust

Deterioration of ambient air quality will be due to generation of dusts at the campsite, during site preparation, construction activities especially those involving the use of cement and extraction of materials at material borrow sites. Deterioration of ambient air quality will also arise from transportation and stockpiling of construction materials at camp sites. In addition, the transport trucks may generate clouds of dust as they move across settlements. This impact will rise concern for ESS 3 to the project because of the possible impact on air quality due to the emission of the pollutant that may be encountered during project implementations. The impact is negative and estimated to be ***cumulative direct, moderate, short term, and reversible. The impact will be residual since dust cannot be mitigated fully***.

6.3.2.6 Risk of Road Traffic Accidents

The impact is related to the requirement of the WB- ESF especially ESS4 due to the fact that Project activities during mobilization phase will increase the traffic volume and movements. This is likely to increase the likelihood of accidents, especially along materials stock/ source routes and road crossings, especially settlement centers. Settlements that are likely to be affected most are the relatively high populated ones such as Pugu, Msoga, Ngerengere, Makutopola, Buhene, and Itigi etc. During this stage contractor will be directed to prepare the comprehensive traffic management plan as per requirement of the WB- ESF.

The impacts due to pressure on traffic and road safety are gauged to be negative, ***cumulative direct, moderate, short term, and irreversible***.

6.3.2.7 Soil Erosion

Clearing of vegetation during establishment of camps and material borrow areas will remove fertile top soil which is good for supporting plant growth as well as expose soil to water and wind erosion this will trigger the WB's ESS3 since if there is no feasible measures for improving efficient consumption of raw materials, as well as other resources in the project a lot of chaos other than erosion of soil will be developed in the project phases. ***The negative impact will be cumulative direct, short term, moderate, and irreversible***.

6.3.3 Construction Phase

Number of activities are expected to be done during construction phase. The activities predicted to have both positive and negative impact to the project environment as described in the following sub sections

POSITIVE IMPACT DURING CONSTRUCTION PHASE

6.3.3.1 *Creation of Employment*

The construction phase of the project will create both direct and indirect employment for both women and men. Directly employed people will be those working in the direct construction of the railway track and will include skilled labor (engineers, surveyors, technicians, machinery and equipment operators, drivers, artisans etc.) and unskilled labor. Indirectly employed people will include food vendors (especially women) and other small businesses like soft drinks, which are likely to be concentrated in village centers, active construction sites as well as in the neighborhood of campsites. Creation of Employment is related to WB- ESF ESS2 since during phases of the project workers will be required to be paid on a regular basis as required by national laws and labor management procedures. Additional to that all employment opportunities to the project shall be conducted to ensure Protection of the work force, Grievance mechanism are followed and Occupational Health and Safety (OHS) issues are obeyed,

This will be a positive, ***cumulative direct, moderate, and short-term impact, since it will only occur during the construction period of the project***.

6.3.3.2 *Increased Income to Residing Villagers*

Enlarging in size of employment of semi-skilled and unskilled labourers will enhance chance for increased income to local people who will be engaged to the construction works. On the other hand, some villagers, especially women will also get opportunity to sell food items to the construction workforce, thus increase income at the household level.

This will be a positive, ***cumulative direct, moderate, and short-term impact, since it will only occur during the construction period of the project***.

NEGATIVE IMPACT DURING CONSTRUCTION

6.3.3.3 Gender-Based Violence (GBV)

Gender-based violence (GBV) can be a concern during railway construction. The World Bank's Environmental and Social Framework (ESF) recognizes the importance of addressing GBV to ensure the safety and well-being of project-affected people. Here's are GBV impacts causes based on World Bank ESF standards.

I. *Labor Influx*

There will be a possibility of labor influx during construction period which leads to the following;

- **Risk of social conflict**

During construction phase Conflicts may arise between the local community and the construction workers, which may be related to religious, cultural or ethnic differences, or based on competition for local resources. Tensions may also arise between different groups within the labor force, and pre-existing conflicts in the local community may be exacerbated. Ethnic and regional conflicts may be aggravated if workers from one group are moving into the territory of the other.

This will be a negative impact, ***cumulative direct, moderate, and short-term impact, since it will only occur during the construction period of the project***.

- **Increased risk of illicit behavior and crime**

The influx of workers and service providers into communities may increase the rate of crimes and/or a perception of insecurity by the local community. Such illicit behavior or crimes can include theft, physical assaults, substance abuse, prostitution and human trafficking. Local law enforcement may not be sufficiently equipped to deal with the temporary increase in local population.

This will be a negative impact, ***cumulative direct, moderate, and short-term impact, since it will only occur during the construction period of the project***.

- **Influx of additional population (“followers”)**

Especially in projects with large footprints and/or a longer timeframe, people can migrate to the project area in addition to the labor force, thereby exacerbating the problems of labor influx. These can be people who expect to get a job with the project, family members of workers, as well as traders, suppliers and other service providers (including sex workers), particularly in areas where the local capacity to provide goods and services is limited.

This will be a negative impact, ***cumulative direct, moderate, and short-term impact, since it will only occur during the construction period of the project***.

II. *Sexual Harassment and Assault:*

Increased risk of construction workers or project-affected individuals experiencing sexual harassment or assault due to the presence of a predominantly male workforce and limited safe spaces. This could also be experienced in the Project related community members due to interractions between workers and locals.

This will be a negative impact***, moderate, and short-term impact, since it will only occur during the construction period of the project.***

6.3.3.4 Extraction, Processing, and Delivery of Naturally occurring Construction Materials

Environmental Impacts due to borrowing of materials from borrow pits, sand pits as well quarrying activities will include loss of vegetation, waste disposal, deterioration of aesthetics, and generation of noise and vibrations. Extractions of construction materials from the pits and quarries identified for this project are likely to cause the following negative environmental impacts:

- **Loss of Vegetation and Farmland**

Borrowing of natural gravel and quarrying from the identified potential sites will obviously involve excavation and so clearance of vegetation around. Clearance of vegetation is likely to result into degradation of the production value of farmlands and forestry due to loss of fertile top soil. Removal of vegetation will amount to further degradation of land and landscape, making the area susceptible to water and wind erosion. In addition, quarrying and excavation will destroy the economic and aesthetic value of the quarry site. The impact Related to the

WB's ESS6 due to the fact that during clearance of the sites to obtain construction materials will also disturb the existence of the natural habitat available at that particular area. Thus, the impact is gauged to be direct negative moderate, reversible, and long term because once the vegetation has been cleared, it will take substantial time for the cleared vegetation to regenerate.

Generation of Noise and Vibration

Generation of noise and vibrations will result from the blasting of rocks at quarry sites discussed earlier. In addition, noise and vibrations will be generated by construction equipment and trucks during extraction (borrowing), transport, and delivery of construction materials to the project site. The problem is likely to be worse if the equipment and trucks are poorly maintained. However, since there are no settlements in the neighborhood of the identified quarry and borrow sites, the impact due to noise and vibrations will only be felt by construction workers which then will trigger the requirement of the WB's ESS2. Nonetheless, increased traffic movement across settlements and material routes during transport of materials will cause increased noise and vibrations. Increased generation of noise and vibration will in turn interfere with audio communication between workers. Referring WB's ESS6 If the borrow pits are located within wildlife areas, for example, (as discussed earlier), the wild animals will be scared and disturbed, and the animals may eventually:

I. Experience interference with their behaviors due to restriction of their free movement
II. Experience interferes with their home range (grazing, resting, and water drinking area)
III. Be forced to migrate
IV. Be forced to hesitate in migration, especially if the borrow areas are located nearby a migration corridor,

The negative impact is gauged to be cumulative direct, moderate, reversible, and short term, since it will only be felt during the construction phase of the project. The impact will be residual since it cannot be mitigated fully.

Deterioration of Ambient Air Quality

The impact related with WB's ESS3 as during construction phase of the project ambient air dust will arise from transportation and stockpiling of construction materials. Gravel materials will generate dust as they are being transported in uncovered trucks or being off loaded at the site. In addition, the transport trucks may generate clouds of dust as they move across village settlements whose road is not paved.

Although dust is a permanent feature along the unpaved road, especially during the dry season, it is likely to increase beyond the current levels, causing alarming effect to the locals. Furthermore, dust will be generated by stone crusher at the quarry sites. Moreover, the Wb's ESS4 will be triggered from production of dust by transport trucks near settlements along the road since the impact is likely to affect human health. The dust is likely to cause bronchial problems, including URTI (Upper Respiratory Tract Infection) to the villagers and workers, in addition to being a nuisance to the environment.

Pollution of ambient air will also occur at materials borrow and quarry sites. This will be due to emission of SO_2, NOX, CO, and CO2 from exhaust fumes from material extraction equipment and stone crusher at quarry sites. TRC through project consultant will make sure that contractor will protect the health, safety, and security risks on project-affected communities as per requirement of EMA,2004 as well as WB- ESF especially ESS4

The impact is estimated to ***be cumulative direct, major, reversible, and short term since it will only occur during the construction phase of the project***.

- **Deterioration of Scenic and Visual Quality**

A common source of deterioration of scenic and visual quality during extraction of materials is the presence of borrow pits after materials have been extracted. The ESIA Expert's past experience has shown that most contractors prefer to borrow materials very close to the edge of the railway track in order to minimize haulage distance. The other thing is that, more often than not these borrow pits are not reinstated after completion of their use. Borrow pits and access roads left after extraction of construction materials will impair aesthetics, especially if located close to the railway track.

WB's ESS4 will since the dust generated by construction equipment, machinery, and vehicles will have the possibility to impair visibility and making construction sites prone to traffic accidents. In addition, stockpiles of construction materials on road sides will impair scenic and visual quality.

Discoloration of buildings and vegetation along the construction site will occur due to the dust blown by wind. The impact due to deterioration of scenic and visual quality ***is weighed to be cumulative direct, short term, moderate, reversible, and short term, since it will occur during the construction phase of the project***.

Risk of Accidents to Livestock and Humans

If pits and quarry sites, especially if located near settlements, are left un-reinstated, they may become filled with rainwater and become dangerous to livestock and humans, in particular children, due to possible drowning. Considering WB's ESS4, they may also create breeding sites for vectors such as mosquitoes and snails which harbour the bilharziasis agent, when filled with rainwater. The scenario creating environmental and safety hazards to nearby communities. The impact due to accidents to human and animals due to un-reinstated borrow pits will be direct, moderate, reversible, and short term if mitigated as soon as they are no longer in use.

Impact on Soil

With the reference of the WB's ESS3 the land within the project (access roads and camp sites) will be directly impacted due to removal of topsoil, compaction and spillage of chemical. During construction phase stripping of topsoil up to depth of 15cm is anticipated to be directly affected during clearing and grubbing. The compaction of soil due to plying of traffic, stockpiles, and temporary facilities is also likely to impact soil structure with potential to impact organism activity, water retention capacity and nutrient retention. There is also possibility of contamination of soil from leakage and spillage during handling and storage of fuels and chemicals. The land within the project corridor will be directly impact due to removal of topsoil, compaction and spillage of chemical. If there will be any preexisting contamination on land the soil will be treated for disposal as per requirement of the EMA, 2004 and ESS 4 of WB ESF.

Clearing of vegetation during extraction of construction materials is also likely to cause soil erosion in pits and quarries. Soil erosion will occur because vegetation and topsoil are either removed or disturbed, leaving behind loose soil, which is too poor to sustain good plant growth and resist erosion due to surface runoff. The impact is likely to be worse if borrow sites are located on steep slopes and near a water course, because higher velocity of runoff is likely to transport loose material to the water course causing serious sedimentation. The impact due to soil erosion will be ***direct, moderate, reversible, and long term***.

- **Impact to Wildlife Areas**

As noted earlier, the railway track is crossing through some wildlife corridor such as Mkata corridor and Wami Mbiki northern Selous. The presence of the corridors within the project triggers WB's ESS6 since there might be killing of the wildlife by accident or poaching by the construction workers. Addition to that If borrowing and quarrying of materials is done within the wildlife habitats, the unreinstated borrow pits and quarries will become accident black spots for wild animals. This will rise requirement of the WB's ESS 6 which recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development. Biodiversity is defined as the variability among living organisms from all sources including, inter alia, terrestrial. The impact will be ***cumulative direct, moderate, long term, and irreversible.***

- **Impacts Related to Blasting, Drilling and Rock Excavation**

Blasting is used to loosen or break up rocks for removal. Blasting will involve drilling of rock and loosening rock with the aid of explosives. Potential environmental impacts will include dust (air quality), contaminant spills, sedimentation, safety (workers, storage), fly rocks, and debris, noise and explosive detonation effects on people, and structures. The negative impact will ***be direct and indirect, moderate and short term***.

6.3.3.5 General Earthworks during Truck and Culverts Construction

- **railway track side soil erosion**

Truck side soil erosion will occur because, vegetation will be cleared, and top soil will be removed/ disturbed, leaving behind infertile soil, which is too poor to sustain good plant growth and susceptible to wind and water erosion. Where earth works involve materials cuttings or cut embankment (construction across a hill). But where earth works involve material filling (construction across a flood plain or a river), the truck sides slope away from the road. In both cases, the trackside slopes will be prone to shallow mass movements or development of gullies.

As noted in above sub-sections, the project traverses floodplains areas see figure 6.1 (i.e., at Kilosa Gulwe, Godegode, etc.). Thus, the construction of high fill embankments or elevated bridge will be necessary across these flood plains. The embankments are prone to shallow mass movements and formation of gullies. Erosion of the embankment will undermine the truck road and thus will activate the requirement of the WB's ESS4 since it may cause health risk to the users.

The negative impact will be cumulative *direct, moderate, long term, and reversible if appropriate mitigation measures are not put in place.*

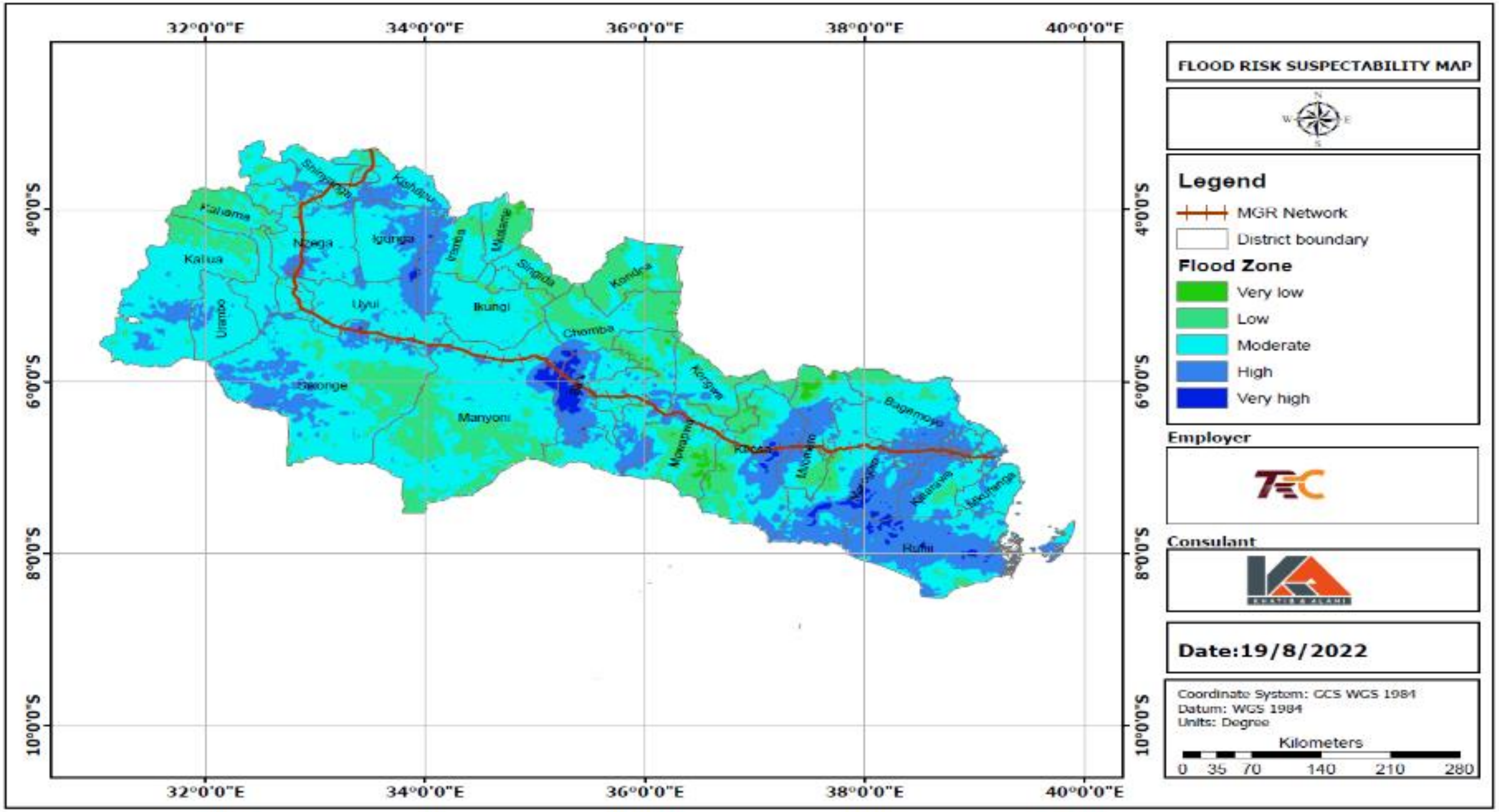


Figure 6.1: Flood Risk at the Project Area

Displacement and Loss of Properties

Most of the properties along the project are located outside the RoW. Nevertheless, there are a few that are located within the RoW. These will have to be demolished/ impacted with the project activities during construction works. The properties consist of graves, buildings, land, and crops. WB ESS5 notes that even if people are compensated it may be difficult for them to get comparable sites. Some are within prime business areas and it could be difficult for these people to obtain similar sites and if they manage to do so it might be at a high cost and customers might be difficult to get. Additionally, there are difficulties of adjusting to new areas and for older people who are uprooted it will result in increased stress and even early deaths.

The issue of settlement is thus an area of potential conflict between the people and the government and has social, political, and legal implications.

The negative impact due to displacement will be *direct, moderate, long term, and irreversible*.

Disruption/Destruction of Public Utilities and Service

Chapter four has given details of public utilities that are likely to be affected by the rehabilitation of the project these are electric power lines, domestic water supply pipe lines and water storage tanks, and telecommunication lines see figure 6.2.

Figure 6.2: Water supply pipe crossing the project site at Iyumbu

A number of domestic water supply pipelines either run very close or cross the project in several settlements along the railway track. The pipelines, domestic points, and open traditional wells are likely to be disrupted by earthworks during the railway track upgrading where also referring the WB's ESS4 the community health might be triggered if there will be contamination to the water supply pipes or sources. The impacts ***will be negative, cumulative direct, moderate, short term, and reversible.***

- **Disruption of telecommunication and electrical lines**

Electrical and telecommunication lines are found all along the railway track. The WB's ESS3 requires efficient use of energy to contribute to sustainable development. Construction activities, in particular areas are likely to disrupt the cable and cause serious interference to electrical and communication and data transfer. The scenarios will lead to the use of alternative sources of energy that may likely to cause pollution to the environment. The impacts will be negative, ***cumulative direct, moderate, short term, and reversible.***

- **Generation of Noise and Vibrations by Construction Equipment**

Earth moving, compaction, and other construction activities will generate noise and vibrations due to reactions between earth and the equipment. Movement of the machinery, equipment, and trucks will also generate noise and vibrations. The noise and vibrations generated will agitate and impair audio communications at settlements along the project. The noise impact will also be felt by construction workers and locals. Referring WB's ESS6 other impacts of noise and vibrations will be scaring/ disturbance of wildlife in WMA and forest reserves because noise and vibrations will:

I. Interfere with animals' behaviors due to restriction of their free movement
II. Interfere with animals' home range (grazing, resting, and water drinking area)
III. Cause animals to migrate
IV. Cause animals to hesitate to migrate through animal migration route, especially if stationary equipment is located near migration corridor

The impact will be cumulative direct, reversible, of moderate significance, for short periods near dwellings and wildlife areas during the day and evening. It is a residual impact since it cannot be mitigated fully.

Deterioration of Ambient Air Quality by Dust and Fumes

Deterioration of ambient air quality will be due to production of fumes from exhaust from stationery as well as moving construction machinery and equipment. The emission will involve SO2, NOX, CO, and CO2. Considering WB's ESS2 and ESS4 the impacts due to fumes will affect residents along the project area as well as construction workers. In addition, moving of earth as well as movement of construction machinery and vehicles will generate clouds of dust. Although dust is a permanent feature along the project during the dry season, it is likely to increase beyond the current levels due to increased traffic volume and movements. Apart from nuisance, excessive dust level can negatively affect human health. Dust can cause several bronchial problems, including URTI (Upper Respiratory Tract Infection).

In addition, dust particles can affect the growth the crops and other vegetation. Dust abrading leaf surfaces, dust blocking stomata (clogging of pores) of plants, dust increasing the amount of absorbed incident radiation. These are just several different impacts dust can have on vegetation and plants. But overall, the effects seem to be a reduction in photosynthetic abilities, the result of which can be stunting their growth due to shading effect and clogging of the plant's pores.

The negative impact will be direct, of moderate significance for short periods near active construction sites and dwellings during the day and evening. The impact will be *residual as it cannot be mitigated fully*.

Generation of Solid and Liquid Wastes

Among the wastes that will be generated during construction are:

I. Topsoil and cleared greens from along rivers, existing railway track and general clearing works Excess (spoil) material, excavated from the track,
II. Demolition materials from existing railway track structures, concrete (from demolished concrete culverts), and steel reinforcements (from demolished culverts), etc.
III. Material wastes such as sand, fill material, aggregates, gravel, concrete etc.
IV. Sanitary wastes from project staff working outside the campsite
V. Apart from impairing the scenic and visual quality of the project site, the wastes generated are likely to cause the following impacts:
VI. Pollute surface water resources if exposed to surface runoff
VII. Cause waterborne or airborne diseases (sanitary wastes) if improperly disposed of

The negative impact will be cumulative direct, moderate, reversible, and short term as disposal of solid and liquid wastes shall be part and parcel of the construction activities of the project.

Road Traffic Congestion and Accidents

During the construction phase, increased project activities will increase traffic volume as well as movements. These activities will cause traffic congestion and disruption; and possibly accidents to the nearby communities. Moreover, the WB's ESS4 shall also triggered along materials stock routes, and specifically at railway track crossings, especially village/settlements centers, road where accidents may occur during construction phase. Other accident black spot areas are where school pupils and students have to cross the project example at Igandu area where there is Igandu Primary School.

The negative impact due to pressure on traffic and road safety will be cumulative direct, moderate, reversible and long term since they will span over construction as well as operation phase of the project.

Increased Consumption of Energy and Natural Resources

Energy will be consumed to operate construction machinery and equipment as well as other transportation facilities. More energy in the form of fuel and lubricants will be consumed during the construction stage of the project. In addition, pressure on natural resources will increase due to increased consumption of natural resources in the form of fuel wood and charcoal which will trigger WB's ESS3. Past experience by the Environmental Expert in the supervision of railway track construction projects has shown that some Contractors have tendencies of cutting/ using firewood as a source of energy for cooking. In addition, Contractors cut trees to make railway track markers pegs, claiming that the pegs have been made from trees cleared from railway track side or borrow pits. If not prevented to do so by the Engineer, it is likely that Contractors will cut trees from the forest protected areas as well as other unprotected forests to make marker pegs which is contrary to the National Laws and WB's ESS6. The impact will be ***indirect, moderate, short term, and reversible***.

Resource Use Conflict

Presence of worker's camps is potentially a source of social and environmental problems as a result of interaction of local people and workers in the project area. Conflicts between the two groups of people may result due to sharing of social services, like water resources for domestic and construction activities, especially when it is considered that drinking water is scarce in the project area. The negative impact will ***be cumulative direct, moderate, and short term***.

Reduction in River Flows

Abstraction of water from the seasonal rivers for construction works, including dust suppression is likely to reduce the discharges of rivers and so affect the flow rate for other users in the downstream. Referring WB's ESS3 the use of water from rivers located within wildlife protected areas discussed for construction works will affect the availability of drinking water for wild animals. Similarly, the use of water from these rivers across villages for construction works; especially during the dry season when their flows are low, will deprive the local people of their access to drinking water, especially when it is considered that drinking water is very scarce in the project area. This is likely to create conflicts between the contractors and the local communities. The impact will be negative, ***cumulative indirect, moderate, short term, and reversible.***

Deterioration of Visual and Scenic Quality

Increased traffic movement and speed will increase the generation of dust. Clouds of dust generated by construction equipment will impair visual quality, making the site prone to traffic accident. The generated dust will impair visual quality due to discoloration of vegetation and buildings along the railway track.

Another source of deterioration of visual and scenic quality will be cuts across hills. The cuts will impair visual and scenic quality if the cuts are located across settlements. The impact will be negative, ***direct, moderate, reversible, and short term***.

Construction of Cross Drainage Structures

Construction across water courses will encompass among others demolition of existing and construction of new culverts. The following impacts are anticipated:

I. Riverbanks Erosion during Riparian zone Construction

Works across rivers, drainages, and in the riparian zones during the construction of culverts is likely to disturb or cause losses of vegetation along their banks and riparian zone, consisting of natural and exotic riverine trees. Since all the existing bridges and culverts will be replaced with new ones, all the water courses across the project will be substantially affected because significant earthworks will be carried out along their riparian zones.

The impact due to riverbank erosion and sedimentation of river systems due to work across rivers and in the riparian zone will be direct, moderate, reversible, and long term.

II. Surface Water and Soil pollution

During construction of culverts, pollution of river systems and soil may occur due to sedimentation, accidental spillage of hazardous material such as concrete, fuel, and oils from construction equipment. Spillage of hazardous material to water courses is potentially very detrimental to aquatic fauna such as fishes so that it may trigger the requirement of WB's ESS6. Though one cannot predict the location or type of spillage, any spillage to water will be local in nature. This is an unwelcome possibility.

Deposition of concrete and fine sediments during construction across the permanent rivers and other semi-permanent rivers is likely to affect fish (though very few) and their habitats. Works in the river systems, such as piling and dredging may cause fish mortalities due to entrainment in excavator's buckets etc.

The negative impact due to water and soil pollution will be direct, moderate, long term, and reversible since once it has occurred; it will take long term for the ecosystem system to regenerate itself.

III. Modification of Surface and Ground Water Regime

Surface water flow modification

Construction of fill embankments will be necessary across all the flood plains. In addition, construction of bridges and culverts across the rivers discussed will involve construction of fill embankment. Construction of railway track fill embankment across the flood plains and rivers is likely to impede or interfere with natural surface water flow patterns, whereby concentrating flow in the upstream, resulting into flooding, soil erosion, channel modification, and sedimentation of streams/rivers far from the vicinity of the railway track. Another potential impact with the surface water flow could be diversion of riverbeds.

IV. Generation wastes

Apart from spoil material, the other types of wastes that will be generated during construction of cross drainage structures will include demolition material such as concrete and reinforcements bars (from old pipe culverts), old culverts, and hard stones (from protection works). These wastes if not properly disposed of will create an eye sore to by passersby. The impact will be ***direct, moderate, long term, and reversible***.

- **Impacts on Wetlands**

The proposed Railway line passes across wetlands in various areas. Wetlands and aquatic ecosystems are very sensitive to soil erosion and soil dumping which would result in accumulation of sediments and high turbidity of the water. High sediment loads and increased turbidity has potential to block light from the sun into the water in wetland. When light no longer penetrates the turbid water, it suppresses growth of aquatic plants, leads to die-off of fish and aquatic invertebrates, and creates effects to many dependent food chains this impact will trigger the requirement of the WB's ESS6. This impact will occur in wetland areas such as the wetland along Mkondoa River, Godegode and Msoga area.

6.3.3.6 Construction of trackside drainage Systems

- **Increased Risk of trackside soil erosion**

Where the railway track traverses through hilly topography with steeper slopes, gullies may easily be formed along ditches, drainage channels, as well as culverts. Formation of such gullies may, apart from destroying farmland and crops beyond the drainage, undermine the railway track itself. Where the track traverses in more or less flat topography, drainage may appear to be difficult. Depending on the adjoining terrain, there may be a need to extend the drainage to longer distance or creating soak pits. This will result into not only increasing construction costs but also clearing vegetation cover. The negative impact due to increased risk of trackside erosion will be negative ***cumulative indirect, moderate, irreversible, and long term***.

- **Disruption of Community Access to their Dwellings and Business Areas**

During construction, disruption of community access to their business activities and residential places at all settlements along the railway track will occur due to creation of barriers. One of the potential barriers is the construction of railway track side drainages. The impact of these barriers would be an increase in travel time for local residents to their business and residential areas. This is related with WB's ESS4 and will be indirect, moderate, reversible, and short-term negative impact.

6.3.3.7 Concrete Works

- **Health Problems Associated with Handling of Cement and Wet-cement Products**

Construction of bridges, culverts and lined trackside drains will expose workers to cement and wet-cement products (mortar and concrete). Construction workers working with cement and wet-cement products are likely to be affected by URTI due to inhaling cement dust and dermatitis infection due to prolonged contact with cement and wet-cement concrete this will trigger the requirement of WB's ESS2. Cement has constituents that produce both Irritant Contact Dermatitis (ICD) and corrosive effects (from alkaline ingredients such as lime) and sensitization, leading to Allergic Contact Dermatitis (ACD) [from ingredients such as chromium VI]. Allergic Contact Dermatitis is inflammation of the skin typically manifested by erythema, mild edema, and scaling. ICD is a nonspecific response of the skin to direct chemical damage that releases mediators of inflammation predominantly from epidermal cells. A corrosive agent causes immediate death of epidermal cells, manifested by chemical burns and cutaneous ulcers

Allergic Contact Dermatitis is an allergic response (immunological response) of the skin as a result of exposure to a chemical. Chemical exposures that may result in allergic contact dermatitis include epoxy resins, chromates, rubber chemicals, amine hardeners, and phenol-formaldehyde resins.

Findings indicate that cement and wet-cement products (e.g. concrete and mortar) should be treated as hazardous materials, and that workers handling such products should reduce exposure wherever possible. OPC contains varying amounts of hexavalent chromium (Chromium VI), a known carcinogenic, and toxin hazardous to skin, eyes and lungs.

Skin contact

The hazards of wet cement are due to its caustic, abrasive, and drying properties. Wet concrete contacting the skin for a short period and then thoroughly washed off causes little irritation. But continuous contact between skin and wet concrete allows alkaline compounds to penetrate and burn the skin.

When wet concrete or mortar is trapped against the skin may cause skin burn or skin ulcer. Cement dust released during bag dumping can also irritate the skin. Moisture from sweat or wet clothing reacts with the cement dust to form a caustic solution, which has a burning effect to the skin.

Allergic skin reaction

Some workers become allergic to the hexavalent chromium in cement. A small yet significant percentage of all workers using cement will develop an allergy to chromium, with symptoms ranging from a mild rash to severe skin ulcers.

In addition to skin reactions, hexavalent chromium can cause a respiratory allergy called occupational asthma. Symptoms include wheezing and difficulty breathing. Workers may develop both skin and respiratory allergies to hexavalent chromium.

Studies have shown that it is possible to work with cement for years without any allergic skin reaction and then to suddenly develop such a reaction. The condition gets worse until exposure to even minute quantities trigger a severe reaction. The allergy usually lasts a lifetime and prevents any future work with wet concrete or powder cement.

Eye contact

Exposure to airborne dust may cause immediate or delayed irritation of the eyes. Depending on the level of exposure, effects may range from redness to chemical burns and blindness.

Inhalation

Inhaling high levels of dust may occur when workers empty bags of cement. In the short term, such exposure irritates the nose and throat and causes choking and difficult breathing. Prolonged or repeated exposure can lead to a disabling and often fatal lung disease called "silicosis". There is a link between crystalline silica exposure and lung cancer (ibid).

- **Soil and Water Pollution by Concrete Slurry and Concrete Wastewater**

Concrete works during construction of culverts of the railway track side drains is likely to cause leakage of concrete slurry. Concrete slurry will pollute soil and affect the growth of young trees which are also contributing the existence of ecological system in many areas. In addition, there is a likelihood of the concrete slurry to find their way to rivers either directly during construction of culverts or through storm water system, especially when concreting is done when raining the scenarios will trigger the requirements of the ESS3 and ESS6.

Lime is a major component of cement and is found in all concrete products. It dissolves in water to produce an alkaline solution that will burn and kill fish, insects, and plants. Water that comes into contact with unset concrete or concrete dust quickly increases in alkalinity and will be highly toxic to aquatic life. Notably, concrete wastewater has a pH of 12 -13 and is as toxic as bleach, while the pH of freshwater is between 6 and 7. Concrete wastewater causes burns in a similar way to a strong acid. A single bucket of concrete wastewater will easily kill hundreds of fishes.

In addition, leakage of concrete slurry to railway track sides is likely to cause soil pollution and so killing or stunting the growth of young trees, especially regenerating ones. TRC through project consultant will make sure that contractor consider requirement of national Laws as well as WB- ESF. The negative impact due to soil and water pollution is weighed to be cumulative direct, moderate, reversible, long term.

6.3.3.8 Operations of a Construction Camp

WB's ESS 2, ESS4 and ESS6 on Operations of a Construction Camp applies because of the possible impact on from the site office, worker's accommodation, mechanical workshops, site stores, medical clinic, as well as sanitary facilities operations as narrated in the following sub-sections.

- **Generation of Solid and Liquid Wastes**

Operations of camps (offices, workshops, storage yards, and kitchens) will generate the following wastes:

I. Solid wastes such as plastic and glass containers, steel and aluminum cans, used tyres, used lead-acid batteries, used oil and fuel filters, litter, used printer cartridges, used metal plastic parts, food wastes,
II. Liquid wastes such as used motor oils and grease, battery acid, grey and black waters
III. Biohazard wastes such as syringes, needles, pharmaceutical products packing material

The concern here is their management. If they are not properly managed, treated, or disposed of, they will impair aesthetic quality of the campsite, cause soil, and/ or ground water. Unsafe disposal of biomedical wastes will pose health hazard to any person coming into contact with it. The impact will be direct, moderate, reversible, and short as well as long-term.

- **Fire and Explosion Risks**

Activities at mechanical workshops during repair and maintenance of construction equipment poses a risk of fire or explosion, although minor. Small quantities of flammable liquids and compressed gases will be stored and used. Liquids will include fuels (petrol, diesel and, paints, and cleaning solvents). Compressed gases will include oxy-acetylene (for welding and cutting). The impact will be direct, moderate, irreversible, and short term.

- **Risks of Leakage of Hazardous Materials**

The project will utilize a number of chemicals during construction and maintenance of construction equipment. Some of the materials will have to be transported from outside the project area, and will therefore require special attention in their transport, handling, and storage. Such materials will include different grades of lubricants (oils, grease etc.), fuels, and all other forms of hydrocarbons compounds, paints and solvents, brake fluids, battery acid.

Leakage of such chemicals poses a risk of soil contamination as well as surface and groundwater pollution. The impact will be direct, moderate, irreversible, and long term since when it occurs, clean-up of chemicals, apart from being very expensive, will take long time.

- **Generation of Human Sanitary Wastes**

Among the wastes that will be generated at the construction camps will be sanitary wastes from construction workers. If sanitation facility is not provided for, they are likely to relieve themselves in the bush causing outbreak of waterborne diseases such as dysentery and diarrhea. The impact ***will be direct, moderate, short term, and reversible***.

6.3.3.9 Marital and Social Conflicts

The WB's ESS2 and ESS10 applies to this due to the fact that the project will employ number of people who will one way or another interact themselves or with the surrounding communities. Thus, there will be a possibility to increase marital and social conflicts because of increased interaction. Project workers with extra earnings could be the sources of conflicts as they engage in extra-marital affairs. The impact will be ***cumulative indirect, moderate, and short term***.

6.3.3.10 Increase in unwanted Pregnancies

The project crosses in number of schools and villages characterized by the people of different gender with different age groups. Regarding to WB's ESS4 It is believed that the project workers will interact with the mentioned groups in many social arenas that could lead to the mating which will result to the Increase of unwanted pregnancies. This will be ***cumulative indirect, moderate, and short-term negative impact***.

6.3.3.11 Poaching of Wildlife by Construction Workers

Apart from disturbance by noise and vibrations that will interfere with wildlife crossing range, another impact to the wildlife protected areas which is contrary with WB's ESS6 will be those related with illegal hunting or poaching by project workers. The impact will be ***indirect, moderate, short term, and reversible***

6.3.3.12 Occupational Health and Safety Hazards

The WB's ESS2 and ESS4 applies to the project because of the possible impact during Mobilization, construction, demobilization phase of the project activities since there might be a possibility of exposer to workers, visitors, and the general public to different Occupational Health and Safety hazards as described below:

- **Physical Hazards**
  I. Falling of people, objects or materials

Working at height during construction of camps (e.g. roofing and block work), construction of box culverts, working above excavation will expose workers to fall hazards resulting into physical injury or fatal accident. In addition, the public will be exposed to excavation fall hazard, especially if the worksite is not physically separated from the surrounding. Similarly, workers working below height (during construction of camp and culverts) and by passers will be exposed to physical injury due to possible fall of object or material from height.

II. Stepping on or striking against objects

Hazards associated with stepping on objects will result from mainly poor housing keeping at work sites and lack of personal protective gears. Hazards will include being punctured by sharp objects (e.g. nails or any other metallic material) left on the ground and tripping/ tumbling on object.

III. Manual Handling Injury -– Overexertion

While handling construction materials manually (e.g. lifting concrete block, cement bags, etc.), workers are likely to be affected through spraining and strains due to over exertion. The effect of which may be to have musculoskeletal injury (total, back injury, upper and lower limb disorders).

IV. Workers being struck or Crushed by Mobile Equipment

Project workers working near mobile equipment such as overhead crane, excavator, articulated crusher, concrete mixer, dozer, grader, wheeled loader, dump truck, etc. or members of the community near such equipment will be exposed to physical hazards due to the possibility of being hit, entangled, or crushed by the equipment during their operations.

V. Transport

Operations of equipment transporting materials etc. will expose workers and members of the community to traffic accidents.

VI. Vibration

Continuous exposure of the hands to high frequencies of vibrations from tools such as pneumatic hammers, concrete breakers, drills, and chipping hammers cause most common injuries (called vibration white fingers). It starts with a slight tingling or numbness in the fingers and eventually causes whiteness to the tips. The attack may last for about an hour and end with a sudden rush of blood to the affected tip, often causing considerable pain.

VII. Noise

Prolonged exposure to high noise levels from plant and machinery on site or in workshops likely to cause irreversible damage to hearing. The general acceptable sound level upper limit in 85 dB (A), where the sound is reasonably steady and exposure is continuous for 8 hours.

Electrical Shock Hazard

A number of stationery construction and workshop equipment will be operated by electricity. Examples of such equipment include stone crusher plant, concrete batch plant, cement-stabilized material mixing plant (pug mill), steel reinforcement workshops machines (bar bender, bar cutter, etc.), and workshop metals machines. When control panels of this equipment are not well insulated, exposed, or not earthed or their cables are poorly insulated, will expose workers to electrocution hazard.

Health Hazards

Construction activities, involving the use of different construction materials will expose workers and the public to health hazards. Health hazards can be categorized into chemical health hazard (due to liquids, dusts, gases, and fumes), physical health hazards to (due to heat, noise and vibrations, compressed air, and manual handling), and biological health hazards.

Chemical Health Hazards

Contact with Skin

Dermatitis is the most occupational skin disease. This will result from exposure to wet cement or cement product

Inhalation of harmful Chemicals

Inhalation of harmful chemicals causes the following respiratory diseases:

I. Silicosis (lung scaring) due to inhaling silica dust and commonly found in many rocks, granite rock, aggregates, sand. Inhalation of dust (including cement dust) also causes asthma
II. Headache, nausea, dizziness, and loss of co-ordination due to inhalation of carbon dioxide from internal combustion engines exhaust, carbon dioxide welding, especially

when working in highly confined space). Headache, dizziness, and vomiting can also be caused by inhalation of solvent vapors. Solvents are used in a wide range of products, which are likely to be used in the construction activities such as adhesives, sealers, paints, solvents, lubricants, and lacquers.

III. Drowsiness, vomiting, loss of muscular control, including death due to cadmium poisoning through breathing of cadmium fumes, released during cutting, welding, or brazing operations of cadmium plated steel (especially in confined space). Fatigue, anemia, colic or wrist-drop due to lead poisoning through breathing lead dust or lead fumes lead poisoning, resulting from demolition of (cutting and burning) old structures covered in lead-based paint.

IV. Metal-fume fever – a flu-like illness due to inhalation of complex welding fumes from the welding parent metal and its coatings. In addition, zinc fumes are evolved from the welding, brazing, and flame cutting of galvanized steel. Breathing them may cause zinc-fume fever

Biological Health Hazards

The likely biological hazard during construction will be drinking of unsafe water, eating contaminated water or food contaminated with rat urine. The diseases that are related with unsafe water are water borne diseases such as diarrhea, cholera, and amoebic dysentery

Another health hazard will be due to exposure to ionizing radiation. Exposure to ionizing radiation will result from the use of a nuclear gauge, which contain radioactive materials and therefore emits ionizing radiation.

6.3.3.13 Increased risk of communicable diseases and burden on local health services:

The influx of people may bring communicable diseases to the project area, including sexually transmitted diseases (STDs), or the incoming workers may be exposed to diseases to which they have low resistance. This can result in an additional burden on local health resources. Workers with health concerns relating to substance abuse, mental issues or STDs may not wish to visit the project's medical facility and instead go anonymously to local medical providers, thereby placing further stress on local resources. Local health and rescue facilities may also be overwhelmed and/or ill-equipped to address the industrial accidents that can occur in a project site.

Increased spread of communicable disease from construction workers to the local people during and after the construction is one big potential challenge that has been addressed in the WB's ESS4 and has to be taken into consideration during and after the construction of the railway track. The negative impact is likely to be ***moderate, long term, and irreversible.***

- ***Other risks and mitigation as per EHS-Guidelines***

The Environmental, Health, and Safety (EHS) Guidelines for Construction Materials Extraction provide guidance on mitigating the environmental and occupational health and safety risks associated with the extraction of construction materials. Below are the risk as per the EHS guidelines for the project and their mitigation

1. Air Emissions:
    - Risk: Dust emissions can be particularly high during material handling, crushing, and screening operations. Blasting activities can release particulate matter and gases into the air.
    - Mitigation: In addition to dust control measures, contractor can use alternative materials or modify processes to reduce dust generation. Monitoring programs to assess air quality and ensure compliance with emission limits should be established. Regular maintenance of equipment and vehicles is crucial to minimize emissions.
2. Water Quality and Quantity:
    - Risk: Extraction activities can generate runoff and sedimentation, leading to water pollution. Excessive water extraction can deplete local water sources, impacting ecosystems and nearby communities.
    - Mitigation: In addition to sediment and erosion control measures, Contractor should implement water management strategies such as recycling and reuse systems. Monitoring programs to assess water quality and ensure compliance with standards should be established. Engaging with local communities and water resource management authorities is essential for sustainable water use.

3. Soil and Land Degradation:
   - Risk: Excavation, surface disturbance, and improper land management can result in soil erosion, loss of topsoil, and degradation of land resources.
   - Mitigation: In addition to soil erosion control measures, constructor should implement measures to restore and rehabilitate land after extraction activities. This may involve re-vegetation, soil stabilization, and contouring to reduce erosion risks. Regular monitoring and evaluation of land rehabilitation efforts are essential to ensure their effectiveness.
4. Occupational Health and Safety:
   - Risk: Workers involved in extraction activities can be exposed to various hazards, including noise, vibration, hazardous chemicals, and working at heights. Accidents and injuries can occur due to equipment malfunction, falls, or contact with moving machinery.
   - Mitigation: Contractor should develop and enforce comprehensive health and safety programs, including hazard assessments, job-specific training, and the provision of appropriate personal protective equipment (PPE). Regular monitoring and auditing of safety practices are necessary to maintain a safe working environment. Emergency response plans should be in place to address potential incidents.
5. Biodiversity Conservation:
   - Risk: Extraction activities can result in habitat loss, fragmentation, and destruction of ecosystems, leading to the displacement or extinction of plant and animal species.
   - Mitigation: Conducting thorough biodiversity assessments prior to extraction can help identify sensitive areas and species. Contructor should implement conservation plans that include measures to protect habitats, promote ecological connectivity, and restore disturbed areas. Engaging with local conservation

organizations and experts can provide valuable guidance in developing effective biodiversity management strategies.

6. Community Health and Safety:

- Risk: Nearby communities may experience health risks due to increased traffic, noise pollution, exposure to dust and emissions, and potential accidents related to extraction activities.
- Mitigation: Contractor should engage with local communities and stakeholders to address their concerns and mitigate potential impacts. This can involve establishing communication channels, conducting regular meetings, and providing information on health risks and protective measures. Implementing traffic management plans, noise barriers, and emission controls can help minimize impacts on local communities.

7. Waste Management:

- Risk: Extraction activities generate various types of waste materials, including overburden, tailings, and solid waste, which, if not properly managed, can contaminate the environment.
- Mitigation: Contructor should develop waste management plans that prioritize waste reduction, reuse, and recycling. Proper disposal of hazardous waste in accordance with regulations is crucial. Implementing control measures to prevent spills, leaks, or releases of waste materials is essential. Regular monitoring and reporting of waste management practices can help ensure compliance and identify areas for improvement.

6.3.4 Demobilization Phase

NEGATIVE IMPACTS DURING DEMOBILIZATION

6.3.4.1 Generation of Solid Wastes

Wastes from site office, mechanical workshop, pre-cast yard, and stores at the end of the construction phase are likely to cause scenic degradation, pollution and become an eye sore. The wastes likely be generated will include demolition materials from temporary structures, storage facilities (pallets), packing (plastic bags, paper and timber boxes), wastes from pre-cast yard (concrete wastes, metal reinforcements etc. The impact will be i***ndirect, minor, short term, and reversible*** since it disposal of solid and liquid wastes shall be part and parcel of the construction activities of the project.

6.3.4.2 Deterioration of Ambient Air Quality

Demobilization, demolition, collection, and transport of demolition wastes will generate dust. The WB's ESS2 and ESS4 recognizes that the dust generated will affect health of workers at the site as well as residents in place of the trucks move across settlements. The impact is negative, gauged to *be direct, moderate, reversible, and short term.*

6.3.4.3 Loss of Employment and Economic Activities at the End of the Project

At the completion of railway track construction activities nearly all workers will be declared redundant and will therefore be laid off. This will automatically result into loss of income. In addition, traders who had established along the railway track during construction of the project will no longer be able to trade, this will affect livelihood of the traders. The impact will be *indirect, moderate, short term, and reversible*.

6.3.4.4 Noise generation

During demobilization the activities such as transportations, demobilization activities etc. will produce noises to the surrounding environs. The WB's ESS2 and ESS4 recognizes that the dust generated will affect health of workers at the site, neighboring communities and other organisms. The impact is gauged to *be negative, cumulative direct, moderate, reversible, and short term*

6.3.5 Operation and Maintenance Phase

POSITIVE IMPACTS DURING OPERATION/ MAINTENANCE PHASE

6.3.5.1 Improved Hydrology and Drainage

The WB's ESS3 related to this impact due to the fact that the rehabilitation of the project will improve the drainage, due construction new culverts, as well as track side drainage with adequate hydraulic capacities as that of SGR. Sedimentation of culverts and railway track side drains will be reduced due to provision control devices and cover vegetation. Sediment carrying storm water runoff from the railway track will be discharged away from the track by drainage channels. Water stagnation within and on railway track sides will be eliminated. Given the fact that during rainy season part of the existing track was either impassable or passable with lots of difficulties, given proper operation of the facilities, the operation of the track will have a major positive, direct, and long-term impact on the hydrology and drainage of the project.

6.3.5.2 Reduction in Vehicle Operating Costs

The WB's ESS3 related to this impact due to the fact that poor track condition imparts extra stress on motor train engines (higher engine revolution per unit time) and so faster engine wear. In addition, improvement of the existing track will result into serving in mileage per litre of fuel as train will be able to travel at relatively higher speeds. Improvement of travel speeds due to upgrading of the track will therefore reduce operating and maintenance costs of train locomotives. This will be ***direct, major, and long-term positive impact***.

6.3.5.3 Reduced Rate of Energy Consumption

The project will increase the transportation of the Cargo in the rail way line which seems to be easy than Road. It will also consume small amount of fuel, safe and smoothen way compared to the use of vehicular tracks on the Road way as suggested in the WB's ESS3. Energy consumption rates for vehicles operating on the railway can be differentiated by comparing changes in traffic operations, as measured by vehicle kilometres travelled and changes in traffic speed. Fuel consumption is proportional to distance travelled, and decreases as speed increases up to about 100 Km per hour (on average). Fuel consumption increases as speed increases above that point. This will consequently lead to decreased consumption of energy per unit distance in the form of fuel. This will be ***a cumulative direct, major, and long-term positive impact***.

6.3.5.4 Reduced Traffic Accidents

Improvement of the railway track will involve improvement of the crossing in major cities this will including increasing in radii of curves and provision of speed restraining humps especially at accident black spots, will significantly improve the safety of the road users, the result of which will be reduction in accident rates this impact triggered the WB's ESS4 as the matter of fact that community exposure to risks and impacts from the project will be minimized. The impact will ***be direct, major, and long term, and irreversible***.

6.3.5.5 Reduced Travel Time, and Comfort to Passengers

Upgrading of the railway track will significantly reduce travel time, since vehicles will be able to travel at higher speeds. It is estimated that the travel time will be reduced to almost one third of the present travel time. The served travel time could be used to other productive ventures. In addition, though cannot be quantified, upgrading of the railway track will improve comfort to passengers, due to the absence of corrugations. It is most likely that better passengers' buses will be plying the routes.

The impact will be direct, major, positive, and long term since it will be felt throughout the operation phase of the project.

6.3.5.6 Increased interaction of people drives for social change with Indigenous Population

The WB's ESS 7 on Tribal/Indigenous Population applies to the project because of many areas (to mention few are Ngerengere, Manyoni, Itigi, Kayombo, etc.) along the project area are inhabited by some indigenous people such as Maasai, Mang'ati, Parakuyo, Akie and Barabaig, unlike in urban centers where there is a mixed group of people from all over Tanzania. In migrants are either business people or employees by government or in informal sector. In such situation it is difficult for people to be innovative since no new ideas and experience can easily penetrate in the community. Upgrading of the project will encourage people from other parts of the country to live in the area where Tribal/Indigenous Population are also available. In migrants will come with new ideas into the project area. Such opportunity will create room for social transformation for both groups, share values, and adopt new cultures and diffusion of cultural values suitable for development. The positive impact will be ***cumulative indirect, moderate, and long term***.

6.3.5.7 Increased investment

The project area has potentials for agriculture, livestock keeping and forestry. It is anticipated that the improved railway track will attract many investors to invest in the above-mentioned areas; this will have a multiplier effect on the availability of other services such as hotels, schools and medical services. This will be an ***indirect, moderate long term positive impact.***

6.3.5.8 Access to and increased Farm Produce to Markets

All the villages along the railway track are known for the production of such crops as maize and sunflower. Upgrading of the railway track will have positive impact on crop production and productivity. This will lead to increased profit margins for both farmers and traders further contributing to food security in the area and beyond. In addition, upgrading of the railway track will enhance the transportation hence enable local people to find more paying markets outside the area. For this reason, they can sell agricultural produce at better prices and increase household income and therefore increase their capability to afford other basic needs. Apart from agriculture and tourism, the project passes through an area with such opportunity's forestry and mining. The impact will ***be direct, major, and long term***.

6.3.5.9 Impact to Forest and Wildlife Areas

i. Improved Management of Wildlife and Forest Areas

The upgrading of the railway track will trigger the WB's ESS6 due to the fact that there will be an accessibility to forest and wild life corridors as other open areas with wildlife by management authorities. This will improve their response to emergencies and combating illegal harvesting of forest products as well as poaching activities. Similarly, improved transport will facilitate the movement of other authorities (District Forest and Game Officers) and so improve monitoring and management of the protected wildlife and forests. The positive impact due to improved management of the protected resources will be ***indirect, major, and long term.***

ii. Improvement of Tourism Industry

Rehabilitation of the project is in line with various Government policies that promotes tourism development in Tanzania. The Tourism Policy of Tanzania promotes high quality – low volume tourism, which is focusing on the development of infrastructures that will attract high paying tourists.

Upgrading of this project will have a significant influence in increasing tourist activities in the Selous Game Reserve and Mikumi Area as the rail way track crosses nearby the Mikumi and Selous Game Reserve therefore it may be easy for tourist to use the train and dropping to the stations which are nearby those tourist areas. The impact due to improvement of tourism will be ***indirect, moderate, and long term***.

NEGATIVE IMPACTS DURING OPERATION/MAINTAINANCE

6.3.5.10 Increased Pressure on Natural Resource

Improved transport due to the rail upgrading is likely to increase the influx of people to the project area, which will result into more demand for timber and land, as people tend to establish new settlement and agricultural lands. The resultant effect will be increased clearing of vegetation. The negative impact will be ***indirect, moderate, reversible, and long term***.

6.3.5.11 Increased Noise and Vibrations Pollution

Improvements of the railway track will definitely result into higher utilization of the track and so higher traffic volume will be generated. Since railway track propagates noise and vibrations much more effectively compared to gravel and loose soil, upgrading of the railway track will increase noise and vibrations will increase. Increased noise and vibrations will likely to change behaviors of wildlife as they will be disturbed/ scared this will trigger the requirement of the WB's ESS6. The increase in noise and vibration impacts due to operation of the railway track is anticipated to be ***direct, long term, irreversible, and minor***. The impact due to noise and vibrations cannot be mitigated by the ensuring proper buffer zone from project site and receiving receptors also by ensuring the project has planted with trees in the buffer zone.

6.3.5.12 Facilitation of Poaching and Illegal Logging

Poaching and illegal logging presents a threat to the wildlife in the protected areas or Forest Reserve. Upgrading of the railway track will facilitate illegal harvesting of wildlife and forestry products from the wildlife and forestry protected areas example wild life corridor Wami – Mbiki and Pugu nature reserve where this will trigger the WB's ESS6. The improved railway track will encourage or facilitate poaching, (for personal consumption and sale to third parties) due to improved mobility. Upgrading of the rail will also promote illegal logging as it will be easier for illegal loggers to transport the wood from forest reserves. The impact will be ***indirect, moderate, long term, and irreversible***.

6.3.5.13 Encroachment

Past experience has shown that local communities along the railway track have a tendency of carrying out activities (like agricultural cultivation) other than those intended for the railway track reserve. Normally any railway track has a reserve, which is utilized for other infrastructure including water supply system, installation of electric, and telephone poles, though the area is under TRC. Other users have to get permission from TRC to be able to utilize the railway track reserve. However, communities have the tendency of using the railway track reserve for farming and other economic activities resulting into soil erosion and eroding the railway track. These have a negative impact on the sustainability of the railway track. The negative impact will ***be indirect, moderate, and long term***.

6.3.5.14 Reduced Economic Activities at Closure of the Project

Traders will establish trading activities points along the route during construction of the railway track, but as construction activities come to a halt, the traders will not be able to trade, this will affect livelihood of the traders. The impact will ***be indirect, moderate, and short term***.

6.3.5.15 Interference with Smooth Traffic Flow

Maintenance activities will interfere with smooth traffic flow due to the increased number of construction trucks. The negative impacts of this are gauged to be insignificantly small will include interference with smooth flow of traffic and effects related to acquisition, storage, processing, and application of construction materials and their equipment. The impact is gauged to be ***direct, insignificantly minor, and short term.***

6.3.5.16 Deterioration of ambient air quality due to Emissions from Vehicles/train

This relates with the WB's ESS2 and ESS4 as Trains operation are significant sources of pollution that can damage the environment and pose public health issues. Everyone has a stake in limiting pollution. Carbon monoxide, nitrogen oxides, and hydrocarbons are released when fuel is burned in an internal combustion engine and when air/fuel residuals are emitted through the vehicle exhaust pipe. Gasoline vapours also escape into the atmosphere during refueling and when fuel vaporizes from engines and fuel systems caused by vehicle operation or hot weather. The impact is long term for the train operation as long as they are normally operated in the corridor.

The pollutants in vehicle emissions (during operation and maintenance) are known to damage lung tissue, and can lead to and aggravate respiratory diseases, such as asthma. Motor vehicle pollution also contributes to the formation of acid rain and adds to the greenhouse gases that cause climate change.

Pollutants emitted directly from vehicles/trains are not the only cause for concern. On warm, sunny days, hydrocarbons react with oxides of nitrogen to create a secondary pollutant, ozone. In many urban areas, motor vehicles are the single largest contributor to ground-level ozone which is a common component of smog. Ozone causes coughing; wheezing and shortness of breath, and can bring on permanent lung damage, making it a cause of crucial public health problems. The impact will ***be direct, moderate, long term, and reversible.***

6.3.5.17 Contribution to climate change effect due to emission of Green House Gases

Increased traffic volume during the operation phase of the railway track will increase the generation of Green Houses Gases (GHGs), particularly CO_2 and N_2O exhaust gases, the result of which will be contribution to greenhouse effect, global warming, and so climate change.

The railway track upgrading will cause amount of greenhouse gases generated by vehicular traffic /trains to increase. Since quantities of vehicular exhaust emissions are roughly proportional to the traffic volume, the rate of greenhouse emission increase will be proportional to the rate of traffic volume increase due to railway track upgrading over the same period of time.

Global warming has several effects on earth. The following effects of the global warming are relevant to the requirement of the WB's ESS3 and ESS6 proposed project:

i. **Global warming effects on animals:** A large number of animal species will disappear from the planet, owing to the loss of habitat triggered by global warming.
ii. **Global warming effects on plants:** Drastic changes in temperature levels will cause various plant species to experiencing difficulties in adapting to the new climate. The growing season of some plant species will be altered, which in turn will disturb their reproduction cycles, thus giving a drastic blow to the plant population. Even the changes in precipitation patterns can lead to hazardous effects on various plants species. A global warming effect on agriculture is the best possible example one can give to explain the effects of global warming on plants. Frequent rains will lead to flooding, whereas less rain will result in drought, both of which will only lead to the destruction of agricultural fields.

iii. **Global warming effects on weather:** Increasing temperatures will lead to adverse effects on weather as well. Even minor alterations in global temperatures will trigger a series of weather extremities, and alter the climatic patterns of the planet. On one hand, heating of the ocean due to global warming gives rise to ferocious hurricanes, while more than the normal temperature on land gives rise to intense heat waves. Higher temperature leads to faster evaporation of water and leads to drought in one part, and brings in heavy rain falls and causes flooding in other part of the world.

iv. **Global warming effects on sea levels:** One of the most grievous among the various global warming effects on earth is the rise in sea levels, which are threatening to encroach up on land. If the sea levels rise it will result in a watery grave to several low laying areas. Rising global temperatures are causing the water bodies to heat, expand, and thus encroach on land.

v. **Global warming effects on humans:** Human will be the worst affected beings because directly or indirectly we are dependent on all the above-mentioned components of the environment. Animals and plants are related to each other, extinction of either will put tremendous pressure on other, eventually leading to its extinction. Humans, in turn, are dependent on both for many purposes, so extinction of animals or plants will also affect humans to a great extent.

vi. **Global warming effects on economy:** Global warming will affect the economy of various countries. The most affected would be the countries with agriculture-led economy. Global warming will trigger a series of changes in weather conditions which will take a toll on agriculture and allied activities. Owing to unnatural precipitation pattern, crop failure will become a very common phenomenon. Economies dependent on tourism will also bear the brunt of global warming.

The impact due to contribution of the project to global warming during the operation phase cannot be mitigated at the project level. Like anywhere else, an effort by the government by enforcing relevant legislation are enforced to ensure that only railway track worth vehicles are allowed to operate on the railway track will be required.

6.3.5.18 Contribution to depletion of ozone layer

Increased traffic volume will contribute to increased depletion of ozone layer due to increased emissions of GHGs.

The Earth's atmosphere is divided into five layers - stratosphere being one of them. Within the stratosphere, there lays a layer, made of a specialized form of oxygen, known as the ozone layer. The layer is made up of three oxygen atoms, contradictory to the usual two oxygen atoms. With no demarcated boundary, the ozone layer is found between 10 to 20 miles above the surface of the Earth. This layer traps the harmful ultraviolet-B (UV-B) radiation emitted by the Sun, and hence plays a crucial role in supporting life on the Earth.

The ozone layer is threatened by a global warming because the fall of its temperature increases the rate of its depletion. This is because GHGs trap the Sun's radiation which in turn makes the planet warmer. This actually means that the heat which is supposed to be reflected back to the space is trapped within the troposphere. When this heat is trapped, it does cause the temperature in the troposphere to increase, but at the same time, it also causes the temperature of the stratosphere to decrease. As the temperature in the stratosphere falls, the ozone molecules in this layer become vulnerable to destruction by the harmful emissions. The impact will be indirect, moderate, trans-boundary, and long term. The effect to increased depletion of ozone layer cannot be mitigated at the project level and therefore a residual impact.

- **Reduced life span of the railway racks due to climate change**

Variation or increase in temperatures resulting from global warming is likely to affect the life span of the railway track. Excessive temperatures are likely to cause bleeding of expiation and contraction of railway structures if mitigation measures are not in place. High temperatures are likely to cause damages of concrete hydraulic structures, especially culverts due to expansion. In addition, flooding resulting from global warming is likely to cause serious damages to or overtopping of hydraulic structures (culverts). The impact will be ***indirect, moderate, trans-boundary, and long term.***

Wildlife railway track Kills

Increased traffic volume and speeds across the wildlife crossing areas is likely to cause wildlife road kills along the project access roads since the railway track will be provided with electrified fence and underneath animal crossings in the adjacent SGR embankment. This concern was also raised by district authorities and TAWA entrusted to manage the protected areas. The impact will ***be indirect, moderate, and long term***.

Premature Siltation of Culverts

The railway track is going to have many culverts and bridges especially along the flood plains which are quite extensive especially in the Kilosa Gulwe segment of the railway track. Conditions created by the flood plains are likely to lead to premature silting of the culverts. The impact will be ***indirect, moderate, long term, reversible***.

Habitat Fragmentation

The Rail way corridor will act as a barrier or filter to animal movement and lead to habitat fragmentation. Many wildlife species will be hesitant to cross the open and shiny space/ corridor created by the rail way track due to the threat of predation or being trapped. This barrier effect can prevent species from migrating and recolonizing areas where the species has gone locally extinct as well as restricting access to seasonally available or widely scattered resources.

Habitat fragmentation may also divide large continuous populations into smaller more isolated populations. These smaller populations are more vulnerable to genetic drift, inbreeding depression and an increased risk of population decline and extinction.

Other impacts as per EHS-Guideline for railway

Under the World Bank Group (WBG) Environmental, Health, and Safety (EHS) Guidelines for railways, the following operational impacts and mitigation measures are covered for fuel management, wastewater, waste, occupational health and safety (OHS), and community health and safety

1. Fuel Management:

- Impact: Inefficient fuel management in railway operations can lead to increased fuel consumption, resulting in higher greenhouse gas emissions and air pollution. It can also have economic implications due to higher operational costs.
- Mitigation: TRC can adopt several measures to optimize fuel management. This includes investing in fuel-efficient locomotives and rolling stock, such as those with improved aerodynamics and advanced propulsion systems. Hybrid systems that recover and reuse energy during braking can also reduce fuel consumption. Additionally, implementing regenerative braking systems can help save energy by converting the kinetic energy of trains into electrical energy. Staff training programs on fuel-efficient driving practices, including speed management and proper maintenance, can contribute to reducing fuel consumption and emissions.

2. Wastewater Management:
    - Impact: Railway operations generate wastewater that may contain pollutants such as oils, greases, heavy metals, and cleaning agents. Improper management and disposal of wastewater can result in contamination of soil, water bodies, and groundwater resources.
    - Mitigation: TRC should establish comprehensive wastewater management systems. This involves the design and installation of appropriate treatment facilities to remove contaminants from wastewater. Techniques such as oil-water separation systems and sedimentation tanks can effectively remove oils, greases, and sediments. Proper storage and disposal of treated wastewater or its safe release into appropriate drainage systems should be ensured. Railways should also develop spill response plans to address accidental releases of pollutants and minimize their environmental impact.
3. Waste Management:
    - Impact: Railway operations generate various types of waste, including solid waste, hazardous materials, and construction debris. Inadequate waste

management practices can result in environmental pollution, habitat degradation, and potential health risks to workers and nearby communities.

- Mitigation: TRC should develop and implement waste management plans that prioritize waste reduction, reuse, recycling, and proper disposal. This involves establishing waste segregation systems at the source to separate recyclable and non-recyclable waste. Railways can promote recycling by providing recycling facilities and encouraging staff to participate actively. Hazardous waste generated from maintenance, such as oils, solvents, and chemicals, should be handled, stored, and disposed of properly in accordance with relevant regulations. Construction debris should be managed through proper disposal practices and recycling, where feasible. Staff training programs should emphasize waste management practices and ensure compliance with waste segregation requirements.

4. Occupational Health and Safety (OHS):

    - Impact: Railway operations present various occupational health and safety risks to workers. These include falls, collisions, electrocution, exposure to noise and vibration, and handling hazardous materials. Failure to address these risks can result in accidents, injuries, and long-term health issues.
    - Mitigation: TRC should establish comprehensive OHS management systems that prioritize the safety and well-being of workers. This involves conducting thorough risk assessments to identify hazards associated with railway operations, including track maintenance, construction activities, and train operations. Based on the risk assessments, appropriate control measures should be implemented, such as fall protection systems, safety barriers, warning signs, and equipment guards. TRC should provide adequate training to workers on safe work practices, including the proper use of personal protective equipment (PPE) such as helmets, gloves, safety glasses, and hearing protection. Emergency response procedures should be developed and communicated to workers, along with regular drills to ensure preparedness.

5. Community Health and Safety:

- Impact: Railway operations can impact the health and safety of nearby communities. These impacts include noise and vibration, air pollution from locomotives and maintenance facilities, and the potential risk of accidents.

- Mitigation: TRC should implement measures to address community health and safety concerns. Noise and vibration control measures can include the installation of noise barriers, insulation of buildings, and the use of low-noise track materials. Implementing speed restrictions in residential areas and employing quieter technologies can also help reduce noise impacts. Monitoring air quality and controlling emissions from locomotives and maintenance facilities can mitigate air pollution. This can involve the use of cleaner fuels, emission control technologies, and regular maintenance of locomotives and equipment. TRC should engage with local communities through communication and consultation programs, providing information on health risks and addressing concerns. Developing and practicing emergency response plans, including coordination with local emergency services, can help manage potential accidents and ensure prompt and effective response

6.4 Alternative analysis

Analysis of Alternatives (AoA) aims to identify alternate project options and should be conducted during project design and planning stage in order to identify cost-effective alternatives, reduce adverse impacts and risks, improve performance and validate the appropriateness of the selected option. The proposed project passes through different environmental and socio-economic aspects that may influence the route alignment, construction methods, rolling stock, traction technology, type of carriageway, materials and services, etc. This chapter presents a comparative analysis between several alternatives considered to avoid or minimize environmental and social impacts.

6.4.1 Alternatives analyzed prior to ESIA

6.4.1.1 With or Without Project Scenario

The 'with' or 'without' project scenarios are a major consideration of the cost-benefit analysis of a project. Providing better and faster connectivity across TRC will ensure that goods and people can move in and out of the areas more efficiently. The project is expected to spin off increased trade and commerce activity throughout the corridor as the project has been designed to connect the various urban economic growth centers within the country. Without this project, it is expected that there will be an increase in air pollution, due to slow moving traffic and congestion. Travel will take longer thus impacting productivity and reducing the economic growth of the area. Overloading of existing transport infrastructure will also affect safety and lead to loss of human life due to increase in accidents. Benefits of the improvement of central Rail way line under TIRP 2 project over the other mode of transportation are presented in table 6.10.

Table 6.10: Comparison between with other mode of transportation

Parameter	Rail way line	Other mode of transportation (Road/ Air/ Water way)
Cost	**Rail transport can be cost effective.** Shippers who convert long-haul freight from road to rail, can save 10-40%. Rail has lower fuel costs compared to road transport, especially when shipping a high volume of freight.	Cost of transportation is high
Environment	Shipping via train is more environmentally friendly. Trains burn less fuel per ton mile than trucks.	A lot of fuel resulting to the pollution of environment are burned
Haulage	Trains are capable of hauling large loads. Trains can handle high volumes of freight. In fact, one double-stacked train can hold	To haul a lot of load is difficult

Parameter	Rail way line	Other mode of transportation (Road/ Air/ Water way)
	approximately the same amount as 280 trucks. This can be very beneficial for shippers with large loads.	

6.4.2 Proposed alternatives

The preliminary assessment of the environmental and social impact of the project alignment has observed the different scenarios as depicted in the table 6.11.

Table 6.11: Alternative per scenario

S/N	Existing Scenario	Picture presentation	Proposed alternative
	Rail passing to low areas with high level of siltation example Godegode		Rail way location should be changed or raised above
	Rail passing to the area with high level of soil erosion example at Kidete and Mkadage where there is Mkondoa River which runs parallel with the rail way		Rail way location should be changed or raised above
	Rail Passing to the bank with Stone falling example at Muguru		Rail way should be shifted from the existing corridor or the bank should be

S/N	Existing Scenario	Picture presentation	Proposed alternative
			protected with gabion

6.4.3 No Project Alternative

Alternatives assessment was conducted using a simple cost-benefit analysis, through assessing various environmental attributes, which include physical (geology and soils, surface water quality and quantity, groundwater quality and quantity); biophysical (flora and fauna, sensitive environments); and social attributes (site of archaeological or cultural importance, land use issues, social health and welfare). The impact of each alternative was then evaluated in terms of whether it has a positive, negative, or no impact. In this instance, the impact is not evaluated in terms of significance but rather whether or not it will arise.

- Positive impacts are assigned a value of 1;
- No impact a value of 0; and
- A negative impact a value of -1.

By adding all of the attribute scores for each alternative, a suitability score is derived that indicates the preferred alternative. A total positive score indicates that the project benefits outweigh the potential negative impacts, while a total negative score indicates the project environmental costs outweigh the potential benefits. Essentially, the highest scoring alternative is then carried forward for full impact evaluation.

The potential impact of the preferred project option on environmental and socio-economic attributes identified during the assessment phase is evaluated against the potential impact of the No-Go option on the same attributes. The summary of this assessment is provided in the Table 6.12.

Table 6.12*: Development vs. No-Go option decision table*

ATTRIBUTE	DEVELOPMENT OPTION	NO-GO OPTION
Physical environment		
Landscape and Visual	-1	0
Air Quality	-1	0
Water contamination	0	0
Aquifer Depletion	-1	0

ATTRIBUTE	DEVELOPMENT OPTION	NO-GO OPTION
Noise Pollution	-1	0
Vibration	-1	0
Public Health Hazard	-1	0
Biophysical environment		
Fauna and Flora	0	0
Sensitive Environment	0	0
Social environment		
Enhanced income, employment opportunities and local business	1	-1
Employment Opportunities	1	-1
Infrastructure development	1	-1
Impacts on local, regional and national economy	1	-1
Traffic	0	0
Safety and security	1	-1
TOTAL	**-1**	**-5**

From the table above, the development option is preferred over the No-Go option, as derived from comparative analysis. Most of negative impacts in the Development options when mitigated or when the technology used is eco-friendly, they will lower down the impact to the environment, then -1 is more likely to be reduced compared to the -5 of No-Go option.

6.4.4 Alternative site

The project proponent had only one site for the proposed construction/ rehabilitation. Hence there was no assessment of an alternative site rather than changing technological options of the rail or bridges available along the entire corridor so that to minimize the impacts.

6.4.5 Energy Alternative

Assessment of alternative technologies, process and materials for this project is the key component to ensure feasibility and sustainability of the project. The proponent is planned to use power from TANESCO, however the analysis of available alternative technologies conducted shows that the most prominent alternative source of energy is diesel generator and photovoltaic (PV) system as the backup energy in case of emergency. The initial investment cost of PV system may seem to be quite higher compared to diesel generator but in a long run it has better cost implications and environmental benefits compared to diesel generator.

6.4.6 Alternative for Kilosa Gulwe Flooding Area

Among other permanent solutions and alternatives provided to encounter the disturbing and flood related problems to this location are;

- Raising rail track embankment relying on the obtained highest flood level from hydrological analysis. This will enhance adequate headroom and freeboard and minimize flooding and related risks on embankment and installed structures;
- Design and Installation of drainage structures and water ways associated by adequate erosion control measures;
- Construction of sedimentation ponds which will increase the hydraulic efficiency of installed structures which are negatively affected by sedimentation process. In this aspect, The Government has established a multi-agency Technical Committee from 15 Government Agencies to lead the assignment towards a permanent solution for addressing the flood challenge in the Kilosa - Gulwe section. The team comprises members from the Vice President's Office, Ministry of Lands, Housing and Human Settlements Development (MoLHHSD), Ministry of Livestock and Fisheries (MoLF), Ministry of Water (MoW), Ministry of Agriculture (MoA) and TRC. At this stage, the Team has prepared a draft Terms of Reference (ToRs) for conducting a feasibility study and design of flood relief structures (ponds) at the Kinyasungwe catchment area.
- Provision of sufficient side drains, and any other drains such as mitre drain where deemed necessary

Contribution to Climate Change

The Climate Science community sources a suite of global climate models to help decision makers understand the projections of future climate change and related impacts.

The Intergovernmental Panel on Climate Change (IPCC) – the United Nations body for assessing the science related to climate change – is the leading and most accredited source of the models.

At the moment, the IPCC has released (and is in the process of finalizing) the Sixth Assessment Report (AR6), which is a compilation of several separate reports from different work groups; as below:

i. AR6 Climate Change 2021: The Physical Science Basis [August 2021]
ii. AR6 Climate Change 2022: Impacts, Adaptation and Vulnerability [February 2022]
iii. AR6 Climate Change 2022: Mitigation of Climate Change [April 2022]
iv. AR6 Synthesis Report: Climate Change 2022 [*September 2022*]

From the above, it is clear that the details from the Sixth Assessment Report (AR6) are the latest, recent and still in finalization stages, as for the *AR6 Synthesis Report*.

However, the current Climate Projections model, i.e., the *Coupled Model Intercomparison Project, Phase 6 (CMIP6)* is already available included in the IPCC's Sixth Assessment Reports (AR6), and was referenced from *Tanzania Climatic Projections [to 2100]*

The model offers key and current projected climate trends for Tanzania (as well as the world at large) for the period of the current 21st Century. Upon finalization of extraction of the projection details from the model, the results will be presented, discussed and summarized.

For the purpose of this stage of the study, the projections of the previous model, the *Coupled Model Intercomparison Project, Phase 5 (CMIP5)*, are provided as below:

Temperature

- More warming is projected over the Western side of the Country, whereby a warming of up to 3.4°C is projected by year 2100.
- A warming of less than 1.76°C for year 2050 and 3.28°C for year 2100 is projected over parts of the Northern Coast regions and North-Eastern Highlands.
- A warming in excess of 1.77°C for year 2050 and 3.3°C for year 2100 is projected over the Lake Victoria zone.
- A warming in excess of 1.39°C for year 2050 is projected in Central Tanzania zone.
- And a warming of 3.18°C for year 2100 is projected for the southern coast including Mtwara and Lindi regions.

Precipitation

- Rainfall projections indicate that some parts of the Country may experience an increase in mean annual rainfall of up to 18-28% by year 2100, particularly over the Lake Victoria Basin and North-Eastern Highland.
- The South Western Highlands and Western Zones of the country are projected to experience an increase in annual rainfall by up to 9.9% in year 2050 and by up to 17.7% in year 2100.
- The North Coast Zone is projected to have an increase of about 1.8% in year 2050 and 5.8% in year 2100 while the Central Zone is projected to have an increase of up to 9.9% in year 2050 and up to 18.4% in year 2100.
- The Southern Coast Zone is projected to have a decrease of up to 7% in year 2050 and an increase of annual rainfall of about 9.5% in year 2100.

Adaptation to Global Climate Change in the Project

Since the project area is located from the Eastern through the Central to Northern part of the Country, it is projected to experience an increase in annual rainfall by up to 9.9% in year 2050 and by up to 18.4% in year 2100, then, the design of proposed solutions and alternatives will take into consideration quarterly increase in storm events, where by increment in terms of 10 years, 25 years, 50 years and 100 years depending on life span of structure or railway facility will be multiplied by current storm event to simulate future scenario due to climate change. Ensuring the capacity of all drainage structures take care of multiplied increment factor see table 6.13; This is according to the current Climate Projections model, i.e., the *Coupled Model Intercomparison Project, Phase 6 (CMIP6)* included in the IPCC's Sixth Assessment Reports (AR6), referenced from *Tanzania Climatic Projections [to 2100]*

Table 6.13: *Climate factor adopted for Design life*

Structure Type	Design Life (years)	Adopted factor
Pipe Culvert	50	1.099
Box Culvert	50	1.099
Bridge	100	1.184

The aforementioned factors have to be incorporated in the hydrological analysis and eventually, the hydraulic design/sizing of the drainage facilities to be constructed in the project.

Climate resilience design

Climate resilience as defined as the capacity for a system to: (1) absorb stresses and maintain function in the face of external stresses imposed upon it by climate change and (2) adapt, reorganize, and evolve into more desirable configurations that improve the sustainability of the system, leaving it better prepared for future climate change impacts.

In accordance with African Development Bank Information, African countries have experienced more than 1,400 weather recorded disasters. These disasters have killed more than 600,000 people and about 460 million people were left homeless.

Therefore, in order to alleviate the impact of climatic change, the alternatives proposed by the Consultant has and will at all levels of project implementation incorporate all climatic change stressors with emphasis placed on the proper return periods and climate change projections in design of drainage structures as well as timely maintenance of the railway lines including its drainage structures and embankments. Up the time of the study a climate and disaster risk assessment study of the Dares Salaam to Isaka Railway line was about to commence. The results and recommendations from this study will be incorporated in the ESMP of this ESIA.

Therefore, the design will adopt engineering measures to reduce the impact of climate change during design and construction of the project railway so as to ensure that tracks become climatic resilient such that can retain its passability after both periodic and extreme climatic events such floods etc. the listed below are the likely climate changes to occur which may affect the embankment and structure design:

- Decrease in precipitation and longer drier periods
- Increase in extreme weather events
- Increase in wind speed

It should be noted that, the proposed recommendations from the results of Climate Resilience study will be incorporated to update the ESMP for implementation.

Screening for climate and disaster risks

The aim of climate screening assessment is to identify the current and future climate disaster risks that might impact the project at hand. This have been adopted as a guide in carrying out consultations for project area studies. Figure below shows screening procedures extracted from WBG screening tools see figure 6.3.

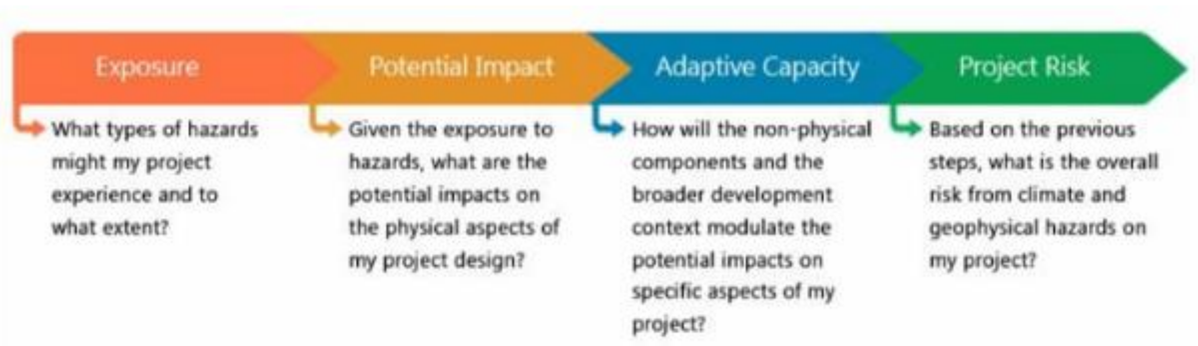


Figure 6.3: ***Steps to screen for climate and disaster risks***

Disaster and climate risk management approach

For an infrastructure to be designed following disaster and climate resilience approach the Consultant has focused much on the type of hazard to be addressed (and to a lesser extent, the type of infrastructure). With this approach the following two extremes have been considered to effectively undertake the tasks;

i. At one extreme, infrastructure will be designed to be climate resilient through appropriate engineering practice and updated design standards, with increased safety factors and appropriate details.

ii. At the other extreme, climate modelling data are translated (such as through hydrological modelling) into locally specific risks to inform infrastructure planning and design[1]. At this extreme appropriate modelling results are used to inform infrastructure (and non-infrastructure) choices.

In contrast with the Standards-led infrastructure delivery approach, the adopted resilience led infrastructure delivery approach by the Consultant involves the general understanding of risks and climate resilience which basically set the context for decision making with (risk and climate) modelling sufficiently interpreted to inform investment choices and selection of alternative solutions. Resilience of infrastructure, economic resilience, resilience of communities and sustainable livelihoods, wider service systems and economic resilience are considered together. Considering all of these factors necessitates risks to be perceived from the point of view of affected communities.

Under the climate resilience design approach carried out by the Consultant, the main performance components of design (used in the whole process of decision making) in relation to the possible hazards caused by the change of climatic conditions are comprised of;

- **Redundancy** where spare capacity with increasing diversity of options is of most importance such that one fails to perform as required others that serve similar functions can substitute and take their place.

[1] This will address the increased uncertainty associated not just with individual hazards, but with the probability that different risks occur together. For example, increased frequency, severity and variability of wind surge and flooding events can combine with earthquake event to create a greater impact, which may furthermore be greater in the future, either within or beyond the design life of an infrastructure or wider infrastructure system.

- **Safe failure** which involves designing the facility in such a way that when one component fails it does this progressively with minimal disruption to other parts of the facility and network.
- **Flexibility** where a designed facility is able to change and evolve in response to changing conditions
- **Robustness** where the intended capacity of the designed facility to withstand expected stresses and shocks to a level that is designed tolerable and cost effective

Possible Hazard to be caused by change of climatic condition and proposed solutions

Increase in rainfall is likely to cause the following hazards to the project road as shown in table 6.14;

Table 6.14: ***Possible hazards caused by change of climate (precipitation) and proposed solutions.***

POSSIBLE Problem	Proposed solutions
Flooding, excessive surface water	Provide sufficient side drains, and any other drains such as miter drain where deemed necessary
	Installment of additional drainage structures
	Raising of rail track embankment
Softening of the surfacing materials	Use of appropriate surface seals
Blockage (siltation) of drains and sedimentation	Use of wide and deep drains
	Construction of sedimentation ponds
Loss of strength of layer materials	Provide camber and wide side drain such that the surface runoff can be taken out of the road as rapidly as possible
Damage to surface dressing	
Damage to pavement and embankment edges	
Blockage (siltation) of drains	Use wider and deep drain
Erosion of unpaved shoulder	It is proposed to pave the shoulder
Increased slope instability	During the design check the short term and long-term slope stability

POSSIBLE Problem	Proposed solutions
Saturation and weakening of the embankment layers	The design of the embankment will be done using 4 days soaked CBR
Erosion of soil surface and drains	Soil will be tested for depressiveness, also the flow velocity will be computed using manning formula, if the velocity will be found to be more than 2 m/s, the side drains will be concrete lined.
Embankment erosion	The embankment will be top soiled, also if the embankment, if possible, will be made of shallow slop of at least 1:3, steeper slope, if possible, will be avoided
Blockage (siltation) of drains	Use wider and deep drain
Expansion and cracking of volumetrically unstable materials	Expansively potential of the subgrade soils will be investigated, if the soil will be found to be expansive, the pavement will be designed following standard procedures as given in Pavement and Materials Design Manual
Collapse and settlement of collapsible soils	During site investigation, collapsible potential of soil will be investigated
Softening of pavement support materials	The pavement will be designed using four days soaked CBR
Deformation of rigid structure	The bridge structures will be designed such that the settlement is limited to maximum of 25 mm
Erosion in railway reserve	The railway reserve will be planted with grass in case of bare land so as to reduce the impact of erosion
Endangering the pier and abutment foundations with scour;	The proposition of protection works relying on the expected flow velocity and runoff discharge at extreme events.
Damaging approach embankments on bridges;	The design of embankment drainage.
Scour caused by changes to the river channel upstream or downstream of the bridge site	The proposition of protection works relying on the expected flow velocity and runoff discharge at extreme events.

Hazards related to increase in temperature is tabulated in table 6.15;

Table 6.15: ***Possible hazards caused by change in temperature and proposed solutions.***

possible problem	proposed solution
More rapid drying out the road	We propose to use surface dressed road
Increased cracking of clay layer	The clay layer will be protected using fill material of good quality, by overlaying the clay soil with suitable fill material, the moisture variation within the soil layer will be minimized, in so doing, the cracking potential of the clay soil will be controlled
Drying and cracking	Earthwork layers will be overlain with suitable material to minimize embankment evaporation of moisture
Increase in erosion due to loss of vegetation	Grassing in area where vegetation will be lost during road construction, pay item for grassing and environmental mitigation measure will be provided in the BoQ

CHAPTER SEVEN
7. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

7.1 Introduction

The Environmental and Social Management Plan (ESMP) (see table 7.1) for this project is intended to set forth "environmental and social conditions" that are to be abided by the proponent (TRC). It aims at ensuring effective implementation of the proposed mitigation measures. Therefore, the Contractor shall also develop their own C-ESMP before any construction begins.

7.2 Roles and Responsibilities

7.2.1 TRC

TRC is responsible for the overall implementation, administration, and enforcement of the recommendations of the ESIA. TRC Environmental Section shall:

- Ensure that the ESMP provisions are included in all tender documents issued for construction work and activities on site and shall monitor/enforce that the Contractors abides by the specifications thereof,
- Coordinating the implementation of the ESMP by the contractors,
- Provide NEMC with reports on environmental and social compliance as part of their annual progress reports and annual environmental monitoring reports.

7.2.2 Supervising Consultant

The supervising Consultants (Engineers), who will be supervising the construction works, will be responsible for overall project management. The Consultant will be responsible for ensuring day to day implementation and compliance with the portions of EMPs relevant to their specific tasks.

The Engineer will ensure that the Contractors provide appropriate training for their staff on the ESMP and HSMP. The Contractor will be responsible to ensure that all site personnel fully understand both the objectives of the ESMP and details of the plan that are relevant to their individual tasks. The Contractor will therefore be obliged to provide appropriate training to their staff.

To ensure effective implementation of the mitigation measures, the Engineers shall deploy an Environmental Specialist (ES), Health and Safety Specialist and a Social Specialist (SS) for regular monitoring of day-to-day implementation of ESMP. The ES and SS shall as well be responsible for ensuring reporting of implementation of the measures is completed in accordance with the requirements.

7.2.3 Contractor

The contractor will have contractual obligation to ensure the control and limitations of disturbance to the project site, routes, and its surrounding environment and communities during the construction cycle of the project. The contractor shall therefore be required to comply with the ESMP requirements.

Within 45 days upon notification of contract award, the contractors shall prepare and submit a site-specific Environmental Management Plan (SSEMP) and Land scapingPlan (LSP). The plans shall describe measures that shall be followed by the Contractor to protect the environment, public, local communities, workers, and ecological habitat in proximity to the project working areas. The ESMP and LSP shall describe in a detailed manner specific actions and measures that will be required by the main contractors and their sub-contractors as appropriate, in order to comply with minimum with the commitments made by this ESIA.

7.2.4 National Environment Management Council

The National Environment Management Council National (NEMC) is the main responsible agency for foreseeing development projects carried out in the United Republic of Tanzania adequately address environmental and social issues during the lifetime of the program. NEMC shall therefore:

- Ensure ESIA is carried out appropriately in accordance to ESIA guidelines,
- Review ESIA and all its related subproject documents to warrant or refuse to issue an environmental permit,
- Periodically carry out or assign an independent evaluator to carry out compliance monitoring in cases when claim has been raised from any member of the community, Community Based Organization, or Non-Governmental Organization on the negative impacts of the project. During monitoring, the District Environmental Officer shall accompany NEMC or an independent evaluator.
- Have the power to request for compliance report on ESMP and take necessary measures including fines to enforce compliance of the ESMP.

7.2.5 Local Government Authorities

Local government authorities through appointed Environment Management Officers shall therefore perform the following tasks:

- Ensure the enforcement of EMA, 2004 in the respective area to which it belongs;
- Advise the environment management committee to which it belongs on all matters relating to environment;
- Gather and manage information on the environment and utilization of natural resources in the area;
- Promote environmental awareness in the area he belongs on the protection of the environment and the conservation of natural resources.

7.2.6 Communities along the project corridor

Local communities along the project corridor shall therefore perform the following tasks

- Act as an informer whenever there is any burden want to appear in the project,
- Supporters to the implementation of the project as they will be hired as causal or skilled labor,
- Helpers in case of the cultural or social issues in the project.

7.2.7 NGOs

NGOs along the project corridor shall therefore perform the following tasks

- Rising awareness to the communities regarding to the project,
- Rising awareness on the environmental protections,
- Community sensitization on gender, HIV, Safety and COVID 19 issues.

7.3 Awareness and Education

The Contractors shall encourage environmental awareness among his foremen before and during implementation of the railway line. The education will include:

- Provide copies of the ESMP and discuss its contents with all construction foremen,
- Discuss techniques and answer questions about erosion and pollution control at regular site safety meetings,

- Demonstrate proper housekeeping methods,
- Inform the foremen of actions to take in the event of spill of hazardous materials (oil, fuel, concrete, etc.),
- Post sign at key locations reminding foremen how to properly store construction materials, handle and dispose of toxic wastes, wash water, and similar instructions.
- Remind foremen of fines, penalties that may be levied against the project by the local permitting agencies control environmental destruction is not adhered to.

Table 7.1: Summary of Proposed Environmental and Social Mitigation Plan

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
Mobilization Phase						
	Establishment of Construction Campsite	i. Creation of employment	In adherence to the WB Environmental, Health, and Safety (EHS) Guidelines, priority of employment is given to the local people Contractor Complies with Labor Relations Act Wages paid to workers are in accordance with WB-ESF_ESS2 and Government Notice No. 196 of June 2013 which state Contractor shall not employ workers who are below the age of 18 years	TRC, Contractors Engineers, village governments,	6 months	300,000,000/=
		ii. Loss of vegetation at campsite or in any construction site nearby or	• Unnecessary removal of vegetation shall be avoided and where needed; prior to any construction activity, a specific	TRC, Contractors, Engineer, local authorities,	6 months	120,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		around critical habitat	biodiversity assessment to identify and important biodiversity hotpsots including natural and critical habitats before any vegetation clearance is done. • Minimize the footprint of construction activities in these areas to reduce disturbances • Establish buffer zones around critical habitats to prevent direct impacts from construction activities • Prohibit heavy machinery and other disruptive operations within these zones.			

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			• Biodiversity Management Plan to be developed and implemented within the identified biodiversity sensitive areas. • Cleared vegetation shall be replaced by original species during reinstatement due to closure of the camp and material borrow areas and Top soil shall be stockpiled to be used for re-vegetation process.			
		iii. Deterioration of scenic and visual quality	Water shall be sprinkled regularly on diversion, access, and railway track across settlements.	TRC, Contractors, Engineer, local authorities,	6 months	6,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			New borrow pits shall be located at least 100 from the railway track so as to comply with ESS3 of the WB-ESF			
		iv. Generation of noise and vibrations	According to the World Bank Environmental, Health, and Safety Guidelines adopting operational practices like scheduling noisy activities during off-peak hours, maintaining equipment to minimize vibrations, and providing personal protective equipment for affected workers can help mitigate the impact on surrounding communities and individuals. Regular monitoring and assessment of noise and vibration levels, along with effective communication and stakeholder	TRC, Contractors, Engineer, local authorities	6 months	30,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			engagement, are also essential for identifying and addressing potential issues.			
		v. Deterioration of ambient air quality by dust	Sprinkling water on the access road to material borrow sites, use of dust masks	TRC, Contractors, Engineer, local authorities,	6 months	15,000,000/=
		vi. Risk of Traffic accidents	Limit project vehicles speeds to 60 Km/hr Post warning signs at junctions to material stock routes. Install speed humps and speed limit signs across routes to material stocks.	TRC, Contractors, Engineer, local authorities,	6 months	10,000,000/=
Construction Phase						
	Extraction, processing and delivery of naturally	i. Loss of vegetation and farmland	Contractor shall use existing borrow pits before opening new ones. Site clearing shall be minimized.	TRC, Contractors, Engineer, TFS management	36 months	40,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
	occurring construction materials		Fertile top soil shall stockpile to be used for re-vegetation of borrow pits. All borrow pits shall be rehabilitated before TOC is issued to the Contractor by trimming slopes, landscaping, and backfilling with top soil to promote re-vegetation. Runoff control measures shall be put in place prior to opening a borrow pit. Minimum distance from a borrow pit to any water course shall be 100m. If is it necessary to open a borrow pit within forestry reserves and WMA or any other forest protected area, the Contractor shall seek approval of authority entrusted to manage it.	and WMA management		

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Owner of land for borrow areas shall be compensated accordingly to the satisfaction of the Engineer			
		ii. Generation of noise and vibrations	Ensure that machinery is well maintained and properly fitted with exhaust mufflers. Ensure that workers exposed to noise level above the limit of 85dB are equipped with ear plugs. Prevent blasting of rocks at quarry site during the night. One day advance notice given to the local community surrounding the quarry Sound siren 30 minutes before blasting Orient work face of quarry and borrow pit away from nearby settlements The Contractor shall consult management WMA and	TRC, Contractors, Engineer, TFS management and WMA management	36 months	100,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			FRS management for approval of borrow pit within the game reserves No quarry shall be located within WMA or forest reserved area No borrow pit shall be pit shall be located nearby sensitive areas e.g. animal migration corridor In accordance with the World Bank Environmental, Health, and Safety Guidelines (WB-EHSGs) measures should be implemented to address the generation of noise and vibrations. This includes adhering to noise limits to minimize community exposures and implementing appropriate mitigation measures such as using noise barriers, damping materials, and low-noise			

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			equipment. Additionally, for blasting activities, specific measures should be taken, such as conducting pre-blast surveys, employing blast design techniques to minimize ground vibrations, and implementing effective communication and notification protocols to minimize disruptions to nearby communitie			
		iii. Deterioration of ambient air quality	In order to mitigate the deterioration of ambient air quality caused by dust during the railway rehabilitation project, the following measures can be implemented according to the World Bank Environmental, Health, and Safety Guidelines (WB-EHSGs): 1) Implement dust control measures such as regular	TRC, Contractors, Engineer, local authorities,	36 months	30,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			watering of construction areas, use of dust screens or barriers, and covering of stockpiles; 2) Properly maintain construction equipment to minimize dust emissions; 3) Limit construction activities during periods of high wind or low humidity; 4) Provide adequate training and personal protective equipment for workers to minimize their exposure to dust; 5) Regular monitoring of air quality to ensure compliance with applicable standards.			
		iv. Deterioration of visual and scenic quality	Water shall be sprinkled regularly on diversion, access, and railway track across settlements. New borrow pits shall be located at least 100 from the railway track	TRC, Contractors, Engineer, local authorities,	36 months	20,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		v. Risks of accidents to livestock and humans	If it is necessary to locate a borrow pit within protected areas, the Contractor shall seek approval to do so from authority entrusted to manage the protected areas. The Engineer shall not approve any borrow pit within the game reserves if it has not been approved by the authority of the game reserves. Maximum depth of borrow pits shall be 3m All borrow pits shall be made self-draining All borrow pits shall be rehabilitated, slopes trimmed, and proper landscaping done before TOC is issued As much as possible, spoil material shall be spoiled in borrow pits no longer in use.	TRC, Contractors, Engineer, TFS management, WMA management	36 months	10,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			The Engineer, prior to approving a new spoil area, shall make sure that there is no exhausted borrow pit nearby the proposed spoil area or there is no possibility of using a nearby borrow pit Maximum depth of quarry face shall be 10 m and quarry face shall be benched to 4m high and at least 4m wide			
		vi. Soil erosion	Unnecessary clearing of vegetation shall be avoided. Control measures for runoff (catch water drain, cut off drain, berms and drainage swales) shall be put in place to redirect surface runoff away from access roads	TRC, Contractors, Engineer, TFS, local authorities,	36 months	10,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			The Contractor shall not open borrow pits within a buffer of 100m from a water course			
		vii. Impact on wildlife areas	Under any circumstances, the Engineer shall not approve borrowing of materials from forest reserves and WMA if it doesn't have the relevant consent. Borrowing of material from village forest reserves must obtain permits from relevant authorities.	TRC, Contractors, Engineer, TFS management and WMA management	36 months	5,000,000/=
		viii. Impacts related to blasting, drilling and rock excavation	Explosives shall be stored in licensed magazines. Handling and use of explosives shall be done by a person holding blasting certificate issued by Commissioner of Mines.	TRC, Contractors, Engineer, local authorities, Commissioner for Mines	36 months	18,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Drilling sites for blasting shall be clearly marked with flags. Where possible large charges shall be divided into smaller multiple time delayed charges Equipment and machinery shall be kept in good working condition and free of fuel leaks.			
	General earthworks	i. Creation of employment	Priority of employment is given to the local people. Contractor Complies with Labour Relations Act. Wages paid to workers are in accordance with Government Notice No. 196 of June 2013. Contractor does not employ workers who are below the age of 18 years.	TRC, Contractors, Engineer, local authorities, Commissioner for Mines	36 months	200,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		ii. Risk of social conflict iii. Increased risk of illicit behavior and crime iv. Influx of additional population (“followers”)	Development of a management plan for social and environmental impacts in consultation with affected communities; Implementation of appropriate mitigation and monitoring programs, which includes development and implementation of a stakeholder engagement program; Establishment of a grievance redress mechanism (GRM) for workers and host community; and Monitoring and supervision, and, as needed, adaptive management actions. Consultations with and involvement of local communities in project planning and implementation;	TRC, Contractors, Engineer, local authorities	36 months	150,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Awareness-raising among local community and workers.			
		v. Loss of vegetation along the railway track	Top soil shall be stockpiled on approved areas for top soiling purpose in the future Unnecessary removal of vegetation shall be avoided Affected surfaces shall be reinstated by re-vegetating with natural species appropriate to the area, 1,710 trees shall be planted to compensate for the lost trees Spoiled areas shall be vegetated with indigenous tree species as approved by the Engineer	TRC, Contractors, Engineer, TFS Manager, WMA Manager	36 months	40,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		vi. Trackside soil erosion	High fills and cuts not paved or not covered by permanent structures shall be grassed Shallow fills and cuts shall be top soiled to promote grass growth Extent of disturbance shall be limited and soil surface shall be Stabilized, Existing vegetation shall be preserved by confining construction activities to Railway alignment, Storm water shall be diverted from undisturbed area by excavating catch water drain Long slopes shall be broken to reduce velocity of water	TRC, Contractors, Engineer, TFS Manager, WMA Manager	36 months	40,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Slopes shall be maintained to minimize the velocity of sheet flow over disturbed area Barriers such as check dams, sediment traps or silt fence shall be installed to control erosion on long steep slopes adjoining water courses Kerbstones shall be installed on the edges of carriage way to direct runoff from pavement to down chutes that will be installed at determined intervals			
		vii. Displacement and loss of properties	The project shall utilize only 15m right of way it has therefore no structure or facility will be demolished; contactor will be guided to protect peoples' facilities or structures.	TRC, Contractors, Engineer, TFS Manager, WMA Manager	Before commencement of construction works	50,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		viii. Disruption/ destruction of public services: domestic water supply	Consult water supply authorities to establish exact locations of utilities within the RoW Work carefully not to damage domestic water utilities along and across the Railway track. When excavating, carefully remove pipe lines Reinstated immediately after completion of earth works in the Railway track section Provide ducts for water pipe line and irrigation channel crossing and future expansion/ extension of the existing pipe lines networks as instructed by the Engineer All costs to be borne by the project.	TRC, Contractor, Engineer, local authorities, DWE, TTCL	36 months	150,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		ix. Disruption of telecommunication lines	The Contractor shall take diligent care not to damage the lenses during construction In the event that the cable is damaged, the Contractor shall without delay inform TTCL authority in the area	TRC, Contractor, Engineer, TTCL Regional Manager	36 months	70,000,000/=
		x. Noise and vibrations by construction equipment and machinery (all along the Railway track)	Avoid siting stationery equipment near sensitive sites (wildlife home range and migration corridors) To address the impacts of noise on local communities in the railway rehabilitation project, along with the measures mentioned earlier, additional mitigation measures can be implemented. These include adhering to noise limits specified in the WB-EHSGs guidelines, implementing	TRC, Contractor, Engineer, TFS Manager, WMA Manager	36 months	10,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			construction schedules that minimize noisy activities during sensitive hours, regularly maintaining construction equipment to reduce noise emissions, and providing workers exposed to high noise levels with appropriate personal protective equipment such as earplugs. These measures aim to mitigate noise-related disturbances and protect the well-being of both local communities and project workers			
		xi. Deterioration of ambient air quality by dust, and fumes (along the Railway track)	Project, material haul/ access roads and diversion roads across settlements and active construction sites shall be sprayed with water at least twice a day.	TRC, Contractor, Engineer,	36 months	10,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Haulage trucks carrying dusty material shall be covered with tarpaulin When equipment not in use, they shall be switched off prevent the impact of fumes Contractor shall provide to workers dust masks and ensure that they are used			
		xii. Generation of Solid and liquid wastes	Green cutting and top soil to be used to cover cleared land to promote vegetation. Excess top soil will be used in the reinstatement of borrow pits Metal wastes collected by NEMC certified metal scrap collectors for recycling. Used oil filters (with metallic housing) to be hot drained and collected by	TRC, Contractor, Engineer,	36 months	50,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			NEMC certified companies for recycling. Used lead-acid batteries collected by a NEMC certified company for recycling at Yuasa battery factories in Dar es Salaam Motor oil (engine, transmission, and hydraulic oils) collected by NEMC certified company to be used as energy source in steel rolling furnaces in Dar es Salaam. Sanitary wastewater at camp disposed of by the use of water closets, septic tanks, and soak away pits, while at active construction sites will be disposed of by the use of mobile toilets or pit latrines on degradable			

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			wastes such as plastic bottles collected by NEMC certified waste collectors for recycling by plastic recycling factories Biodegradable wastes treated by composting or using as mulching agents Non-bio gradable wastes treated on site will be temporarily stored on site and transported to the municipal landfills. Owners of buildings allowed to salvage valuable demolition materials prior to demolishing Non-degradable demolition materials (e.g. cement blocks and clay bricks			

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			wastes) used to fill pits and quarries during their reinstatement Empty hydrocarbon drums collected by NEMC certified companies for recycling in steel foundries Excess concrete to be used as bottom materials during reinstatement of pits and quarries Food wastes treated by composting Used tyre be disposed of through NEMC certified companies			
		xiii. Road traffic congestion and accidents (all along the road crossing and black spots)	During construction of cross drainage structure, provide suitable temporary crossing structure to accommodate traffic and flow of water prior to demolishing existing crossing. Devise proper traffic management, including	TRC, Contractor, Engineer, local authorities,	36 months	35,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			deploying a traffic management personnel at all active construction sites. Provide appropriately post night-reflective traffic signs to notify the public about potential dangers. Separate working area from public traffic by providing physical barriers such (e.g. reflective barricade blocks, guardrails, reflective warning tape, and diversion roads or walkways) Use guards to protect employees and the communities from physical hazards. Shield all moving plants and machinery Install warning signs [stating HATARI (DANGER), TAHADHARI			

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			(WARNING)] to give warning on potential dangers. Install speed humps at approaches to and settlements			
		xiv. Increased consumption of energy and natural resources	Limit unnecessary idling of construction equipment and adequately tuning of their engines Contractor not allowed to use firewood and charcoal for cooking Contractor not allowed to cut trees to make marker pegs	TRC, Contractor, Engineer, local authorities,	36 months	10,000,000/=
		xv. Resource use conflict	Construction campsite to be sited away from existing settlements Camp to be furnished with all necessary social services	TRC, Contractor, Engineer, local authorities,	36 months	200,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		xvi. Impact on Cultural sites	Graves shall be protected in accordance with Grave Removal Act, 1969 and WB-ESF	TRC, Contractor, Engineer, local authorities,	36 months	80,000,000/=
		xvii. Reduction in River Flows	The Contractor shall obtain water abstraction permit from relevant authority The Contractor shall not abstraction water for construction not done from water resources used for domestic purposes	TRC, Contractor, Engineer, relevant river basin authority	36 months	40,000,000/=
	Construction of cross drainage structures	i. River bank erosion during riparian zone construction (areas adjoining all rivers	Areas adjoining rivers to be left undisturbed as buffers Disturbed river banks and heads in the neighborhood of box culverts shall be stabilized by grassing	TRC, Contractor, Engineer, relevant river basin authority	36 months	38,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		ii. Surface water and soil pollution	If wells or other water sources, are polluted, the Contractor shall compensate for this and provide the consumers with clean drinking water transported through pipes from an unpolluted source if required in the opinion of the Engineer As much as possible, concrete works shall be isolated from water courses Concrete handling equipment shall not be allowed near watercourses Servicing and/or re-fueling of equipment shall be restricted at the workshop Construction equipment working near riverbanks shall be well serviced to prevent oil leak	TRC, Contractor, Engineer, relevant river basin authority	36 months	100,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Excavated and other materials shall not be stockpiled near water course			
		iii. Surface water flow modification	Bridged and culverts shall be provided to ensure they are capable to sustain possible peak water flows	TRC, Contractor, Engineer, relevant river basin authority	36 months	350,000,000/=
		iv. Modification of Water table (across all flood plains for rivers)	Boundaries of flood zone shall be properly studied and used to design cross drains to minimize ponding on one side of embankments Fill materials shall be borrowed from borrow pits rather than adjacent to the Railway track alignment	TRC, Contractor, Engineer, relevant river basin authority	36 months	200,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		v. Generation of wastes	Concrete wastes and steel reinforcement bars shall be disposed of as described in 2(ix) Hard stone shall be disposed of by reuse sleepers shall be transported to TRC regional office for future reuse	TRC, Contractor, Engineer	36 months	150,000,000/=
	Construction of rail way roadside drainage systems	i. Increased risk of Railway track roadside soil erosion	In addition to mitigation measures in 2(ii): Line drains sections with slopes higher than 4% shall be lined Unnecessary disturbance of sensitive areas like steep slopes shall be avoided Areas with steep slopes shall be extended far from the Railway track and protected by gabions Existing vegetation shall be preserved to the extent possible, by confining	TRC, Contractor, Engineer	36 months	90,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			construction activities to Railway track alignment			
		ii. Disruption of community access to dwellings and business areas (at settlements and road junctions)	The contractor shall provide temporary/ permanent concrete slabs across line drain to enable pedestrians gain access to their business and residential premises. The Railway track design has provided access culverts to enable motorists gain access to their feeder roads	TRC, Contractor, Engineer	36 months	50,000,000/=
	Concrete works during construction of drainage structures	i. Health problems associated with handling of cement and cement products	**Use of Protective Gear** Alkali-resistant gloves shall be used Coveralls with long sleeves and full-length trousers shall be used Water proof boots shall be used, Dust masks and eye safety protection shall be used	TRC, Contractor, Engineer	36 months	25,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Work practices Mix dry cement in well ventilated areas - Work upwind from dust sources - Use ready-mixed concrete instead of mixing on site - When kneeling on fresh concrete, use a dry board or waterproof kneepads to protect knees from water that can soak through fabric - Remove jewelry such as rings and watches because wet cement can collect under them			

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Hygiene • Skin in contact with wet cement shall be washed immediately with large amounts of clean water • Adequate hygiene facilities shall be provided on site for workers to wash hands and face at the end of a job and before eating, drinking, smoking, or using the toilet			
		ii. Soil and water pollution by concrete wastewater	• Concreting shall not do if rain is forecast • Concrete slurry/wastewater shall not be allowed to enter storm water system	TRC, Contractor, Engineer	36 months	20,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			- Concrete slurry and concrete waste water shall be collected or diverted to grass or bare soil. - Slurry control shall be put in place before concreting is started - Concrete slurry or waste water runoff shall be diverted using sandbags, soil or other materials, to a grassed area, pit or bare ground to soak in			
	construction camps	i. Generation of solid and liquid wastes, including medical wastes	Metal wastes shall be collected by licensed metal scrap dealer before being recycled in steel foundry factories in Dar es salaam	TRC, Contractor, Engineer	36 months	120,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Wood wastes shall be given freely to local people as fire wood Plastic and glass bottles shall be collected by NEMC licensed company for recycling in plastic and glass factories in Dar Hessian and paper bags shall treat by controlled burning Waste oil shall be collected by NEMC licensed company and transported to Dar where will be used as source of energy in steel smelting factories Used lead-acid batteries shall be collected and transported to Dar es salaam by NEMC licensed company for recycling at Yuasa battery factory			

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Sanitary wastes shall be disposed of/ treated onsite pour flush toilet with soak away pits latrines Medical wastes shall be handled and disposed of in accordance with section 32 of Environmental Management (Hazardous Wastes Regulations, 2008). Medical wastes shall be handled in a safe manner before being transported to a nearby medical waste incineration facility.			
		ii. Fire and explosion risks at quarry	Fire extinguishers shall be appropriately placed in the workshops Workers shall be trained on the use of fire extinguishers Smoking in in hot work areas shall be prohibited	TRC, Contractor, Engineer	36 months	10,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		iii. Risks of leakage of hazardous materials	Fuel shall be to be transported in special fuel tankers equipped with fire extinguishers Fuel storage tanks at the site shall be installed in secondary containment Underground fuel storage tanks shall not be allowed Fuel station equipment service bay and pits shall be concrete paved and provided with drain valve All power generators shall be kept within secondary containment to contain any oil or fuel or leak Fueling shall be done by a pump Refueling of equipment shall be closely supervised to avoid leaks	TRC, Contractor, Engineer	36 months	25,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			If leakage occurs it will be cleaned up by absorbent materials Chemicals shall be stored in a locked place			
		iv. Generation of human sanitary wastes	Treated by pour flush toilet with septic tank and soak pit	TRC, Contractor, Engineer	36 months	30,000,000/=
	General construction works	i. Poaching of wildlife by construction workers	The Contractor shall create awareness on wildlife laws and regulations to his workers	TRC, Contractor, Engineer	36 months	15,000,000/=
		ii. Gender-Based Violence (GBV)	Develop and Implement GBV and SEA plans whereby it will address the following: Sexual Harassment at Worksite:	TRC, Contractor, Engineer	Throughout the project	56,000,000

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			• Implement strict anti-sexual harassment policies with clear consequences for offenders. • Conduct mandatory training sessions on respectful behavior and zero tolerance for harassment. • Establish a confidential reporting mechanism for victims to report incidents safely. Unequal Access to Employment: • Promote gender diversity in hiring through targeted recruitment efforts.			

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			• Provide equal opportunities for training, skill development, and promotions for all genders. • Implement quotas or affirmative action programs to ensure equitable representation of women in the workforce. Mobility Restrictions: • Provide safe transportation options for female workers, especially during early morning or late-night shifts. • Implement security measures on transportation routes to ensure the safety of all workers.			

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Increased Stress and Mental Health Issues: • Provide mental health support services, including counseling, for workers affected by harassment. • Promote a supportive work environment that encourages open conversations about mental health. Lack of Gender-Sensitive Policy: • Develop and implement gender-sensitive working policy that addresses harassment, discrimination, and gender-based barriers.			

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			• Train all employees, including management, on this policy and its enforcement.			
	Occupational health and safety hazards associated with general construction works	Physical hazard due to fall from height or being hit by falling objects or materials	Prevent fall from height due to scaffold collapse by: Prevent of overloading by avoiding accumulation of materials and stacking materials Carefully examine scaffold board before use to be free from unacceptable faults e.g. as large knots, knot clusters, large splits Erect scaffold by experienced scaffolders and competent supervision Prevent fall from ladder by: Ladders used for access shall be securely tied at their upper ends	TRC, Contractor, Engineer	36 months	200,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Make sure that ladders stand on a firm and level ground The rung and user's footwear shall be kept clean and free from slippery mud, for example Ladders secured to prevent sway Ladders to be footed if cannot be tied at the top or secured at the bottom The ladder shall extend beyond the place of landing by at least 1 m unless adequate handhold is available Ladders with missing or defective rungs shall never be used Ladders shall always be inspected to identify defects and timber ladders shall not be painted since this may hide defects – transparent varnish or			

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			linseed oil will be used as a preservative Prevent accident due to workers working below platform beings truck by falling materials: Whenever there is any possibility of people below being struck by materials or tools falling through a gap in the working platform, on all scaffolds the boards will be laid close boarded (side by side) and end without space between the edges of adjacent boards. Workers under the platform shall wear safety helmet and shoes at all times			
		Physical health hazard due to stepping on sharp object or	Maintain at good housekeeping at work sites all the time to prevent	TRC, Contractor, Engineer	36 months	100,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		striking/ tumbling against objects	possible accidents due to slipping, tumbling, or striking against an object Equip all the workers with steel-toe safety shoes			
		Physical hazard due to manual handling – overexertion	Team handling e.g. using two or more persons Use mechanical aid (e.g. wheelbarrow, hydraulic crane etc.) that requires the use manual loading and unloading. Where applicable, breaking down the load into manageable components Using persons strong enough for the task to be undertaken	TRC, Contractor, Engineer	36 months	20,000,000/=
		Physical hazard due to workers being struck or crushed by Mobile equipment	Prevent person within swivel radius of machine during excavation People in the trench shall be well away from the face and those at ground	TRC, Contractor, Engineer	36 months	8,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			level kept outside slewing radius of the machine. When the excavator operator cannot see all parts of the jib and bucket during the excavation cycle, or when the machine used as crane, to lower materials inexperienced banks man shall be used to guide the operator and to ensure that other workers remain well clear of the operation being carried out Provide all workers on-site with training in site specific safety procedures and in hazards they may encounter at the site			

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Use barriers to separate workers, pedestrians, and vehicles from moving equipment Continually evaluate safety plans to address changing conditions at the worksite Do not approach machinery without first signaling the operator to shut down the equipment and receiving acknowledgment from the operator Wear PPE that is provided, such as high visibility reflective vests and hard hats, to increase visibility			
		Physical hazard due to electrocution	Ensure control panels and cabling are well insulated and earthed	TRC, Contractor, Engineer	36 months	10,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		Fire and explosion	Refer to No. 6 (impact due to operation of camp)	TRC, Contractor, Engineer	36 months	10,000,000/=
		Chemical health hazard due to chemical contact with skin	Refer to 5(i) health problems associated with handling of cement and wet cement products	TRC, Contractor, Engineer	36 months	10,000,000/=
		Chemical health hazard due to inhalation of harmful chemicals	Refer to 5(i) health problems associated with handling of cement and wet cement products.	TRC, Contractor, Engineer	36 months	10,000,000/=
		Physical health hazards	Noise hazard shall be mitigated as for stated in 3(iii) Manual handling hazard shall be mitigated as stated in 8(iii)	TRC, Contractor, Engineer	36 months	10,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		Biological health hazards due to drinking unsafe water and contaminated food	Provide adequate sanitation facilities at work site. Provide adequate safe drinking water to workers at all work site Provide food waste collection bins with lids. Dispose wastes at authorized waste collection point	TRC, Contractor, Engineer	36 months	10,000,000/=
		Biological health hazard due to exposure to ionizing radiations	Obtain license to own and use nuclear gauge Store, transport, and use the nuclear gauge in accordance with legislations Ensure that the gauge is used only by trained workers Ensure that the gauge is used in manner that protect the public as specified by legislations	TRC, Contractor, Engineer	36 months	10,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
			Appoint a radiation officer, whose duties and responsibilities are as specified by the law Ensure that records of exposure to radiations by users of the gauge are kept and available for inspection by relevant authorities			
		Increased rate infection of HIV/AIDS	A sub-contractor shall be hired by the Contractor to conduct prepare and implement HIV/AIDS alleviation programme Condoms shall be regularly supplied to workers	TRC, Engineer, Contractor, DEDs, Communities, NGOs,	36 months	35,000,000/=
Demobilization Phase and Defect Liability Period						
	Closure of the project,	i. Generation of Solid and liquid wastes	Mitigation measures proposed in 2(ix) and 6(i) shall be applied	TRC, Contractor, Engineer	12 months	15,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
	including campsites					
		ii. Deterioration of ambient air quality	Water shall be sprinkling on the access roads to spoil and borrow areas Transport trucks shall be covered with tarpaulin	TRC, Contractor, Engineer	12 months	18,000,000/=
Operational and Maintenance Phase						
	Operation of the Railway track	Improved hydrology and drainage	Enhanced through proper and timely maintenance of the Railway track	Government of Tanzania/TRC	Throughout its operation phase	100,000,000/=
		Reduced rate of energy consumption	Enhanced through proper and timely maintenance of the Railway track	Government of Tanzania	Throughout its operation phase	70,000,000/=
		Improved access to social services	Enhanced through proper and timely maintenance of the Railway track	Government of Tanzania	Throughout its operation phase	50,000,000/=
		Increased interaction of people drive for social change	Enhanced through proper and timely maintenance of the Railway track	Government of Tanzania	Throughout its operation phase	90,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		Reduced transport and transportation costs	Enhanced through proper and timely maintenance of the Railway track	Government of Tanzania	Throughout its operation phase	7,000,000/=
		Increased household income due to increased trading activities	Enhanced through proper and timely maintenance of the Railway track	Government of Tanzania	Throughout its operation phase	8,000,000/=
		Improved quality of water courses across Railway track	Enhanced through proper and timely maintenance of the Railway track	Government of Tanzania	Throughout its operation phase	9,000,000/=
		Increased noise and vibrations	Cannot be mitigated at the project level however, during operation phase there will be consideration of planting trees along some areas of the project corridor to buffer the noise level effects to be produced	Government of Tanzania	Throughout its operation phase	8,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		Deterioration of ambient air due to emissions by vehicles/trains	Effort by government to encourage proper maintenance of emission control systems, use of fuel-efficient (low carbon) vehicles, and zero carbon vehicles, and introduction of carbon tax for diesel vehicles	Government of Tanzania	Throughout its operation phase	5,000,000/=
		Contribution to climate change due to emissions of GHGs	Ensuring trucks are well maintained, ensuring tracks and any other machineries that might be source of greenhouse gaseous are switched off to avoid emissions.	Government of Tanzania	Throughout its operation phase	80,000,000/=
		Contribution to depletion of ozone layer	Ensuring trucks are well maintained	Government of Tanzania	Throughout its operation phase	70,000,000/=
		Reduced life span of railway track due to climate change	Design has to consider climate zoning in determining the type and treatment of materials.		Throughout its operation phase	400,000,000/=

NS	Activity	Impact	Mitigation/ Enhancement measures	Responsible Institution	Time Frame	Cost Estimates (Tzs)
		Wildlife (Flora and Fauna) Railway track kills	• Posting of speed limits and warning signs • Use of constructed wildlife crossings, such as wildlife bridges and underpasses, that allow animals to cross over or under the tracks without risk of collision NOTE • This will be as parrarel with the provisions that provided from SGR		Throughout its operation phase	70,000,000/=

7.4 Other Requirements in the Implementation Mitigation Measures

7.4.1 Site Specific Management Plans

It is recognized and appreciated that the environmental and social impacts identified and documented in this report are not exhaustive. Among others, the following are the main causes of this:

- Unknown sites for borrowing materials (contractually the Contractor is not bound to use the sources of materials listed in the Materials Report)
- Unknown location for siting construction camps,
- Possible change in construction methodology,
- Variations in type of equipment to be used,
- Variations in type of materials to be used for construction,

Within two months after signing the Contract, the Contractor shall develop a Contractor's Environmental Management Plan (C-ESMP) Occupational Health and Safety Management Plan (C-OHSMP), Waste Management Plan, Traffic Management Plan and Emergency Response Plan These documents shall be reviewed and approved by the Engineer andthe Employer.

7.4.2 Staffing Requirements

To ensure effective implementation of the proposed mitigations measures, the Contractor shall mobilize qualified (formally trained) and dedicated Environmental and Social Manager, Sociologist, Health and Safety Manager, and Traffic Safety Officer, who shall work hand in hand with Engineer's Environmental, Health, Safety and Social Experts (EHSS). The EHSS will guide the Contractor to ensure that ESIA, ESMP, C-ESMP, and C-OHSMP and other developed plans are implemented accordingly. The above Contractor's staff shall be based on site and shall work on full time basis. They shall also be required to be Tanzanian citizens and will have the following duties and responsibilities:

Environmental and Social Manager

- Develop SSEMP
- Ensure that the Contractor complies with ESIA, SSEMP, and other environmental and social related legislation
- Train workers on Contractual requirements to environmental management
- Prepare Contractor's monthly Environmental and Social compliance reports

Sociologist

- Act as a liaison officer between the Contractor, local communities, and local government within the project area. The Sociologist, shall be fluent in Kiswahili and conversant with national legislations pertinent to compensations.
- Assist the Environmental and Social Manager in the implementation of SSEMP, in particular training workers on HIV/AIDS and training the local communities on Railway track safety issues.

Health and Safety Manager

- Develop SSHSMP
- Train workers on health and safety requirements of the Contract
- Ensure that the Contractor complies with EIA, SSHSMP, and other health and safety related legislations
- Prepare Contractor's monthly Health and Safety compliance report
- Prepare and implement Railway track safety awareness campaign

Traffic Safety Officer

- Ensure that temporary traffic accommodation requirements comply with the Specifications
- Control and co-ordinate movement of construction vehicles
- Conduct induction to workers
- Conduct tool box meetings
- Train Contractor's staff in terms of Railway track safety
- Be responsible for erection and maintenance of all traffic signs necessary for the accommodation of traffic

Human Resources Officer

- Provide guidance to ensure that the Contractors complies with the Labour Relations Act and regulations and other government orders.

A Nurse

- Provide basic first aid services to Contractor's and Engineer's

Nevertheless, the Supervision Engineer/Consultant and the Borrower are required to have qualified and experienced EHSS experts in their Project Implementation Teams {PIU) with main responsibility of supervise, monitoring and training at field level ensuring compliance with Environmental and Social Standards. The Supervision Consultant shall be a full time based on sites while the Employer/Borrower shall focus on monthly and quarterly monitoring.

CHAPTER EIGHT

8. ENVIRONMENT AND SOCIAL MONITORING PLAN

8.1 Introduction

. The Environmental and Social Monitoring Plan is an objective, periodical, reliable, and continuing process of observation and assessment of environmental and social changes Baseline data should be objective of the ESIA. During implementation there will be monitoring activities to compare the pre-construction value with construction and operational monitoring data.

It is therefore based on monitoring indicators, which will have to be compared with targets to gauge the effectiveness of the mitigation plans. The environmental and social monitoring plan is one of the most important elements of the ESMP and has the following objectives:

- Collection of environmental and social baseline data (Table 8.1) as basis for gauging the effectiveness of implementation of proposed mitigation measures
- To ensure that mitigation and benefit enhancement measures have been adopted and are effective
- To identify any negative impacts unforeseen during EIA stage and propose appropriate mitigation measures
- To provide information on the actual nature and extent of key impacts and effectiveness of mitigation and benefit enhancement measures

8.2 Monitoring Plan

8.2.1 Modes of Monitoring

Typically, there are two basic types of monitoring: impact monitoring and measurement-based inspection, and both will be implemented in this project.

Impact monitoring: Impact monitoring will record the consequences of activities on one or more environmental components. it will involve physical measurement of selected parameters or the execution of surveys to establish the nature and extent of induced changes.

Measurement Based Inspection: This will involve evaluation of trends in the values of environmental and social parameters systematically measured (quantitatively and/or qualitatively) and collected, to ensure that they are within acceptable legal and technical standards. This will involve collection of samples for analysis. In this, water and air samples will be collected and analyzed.

The main tools that will be used for monitoring are checklists, visual examinations, and quantitative measurements of environmental effects monitoring parameters. Written records will be kept detailing the dates that monitoring took place and the findings of the monitoring.

8.2.2 Baseline Data Collection

Prior to commencement of construction activities, during mobilization phase, the Contractors shall collect and document baseline data for different environmental aspects at strategic locations: settlements, camps, quarries, borrow sites, and water courses. The baseline data that shall be collected shall include air quality (dust level), water quality (pH, turbidity), and noise levels. The baseline data collected will be used to compare environmental impacts of the "No Project" and in the presence of the project and so determine the extent of impacts caused by the project. The following table (Table 8.1) lists baseline environmental quality parameters that shall be monitored and the respective monitoring places.

Table 8.1: Locations of sites where baseline data shall be collected

NS.	Impact	Parameter	Location for Data Collection
1.	Dust-related air quality deterioration	Dust levels	Across settlements, borrow sites, quarries, camp sites, crusher plant, batch plant, active Railway track construction sites
2.	Water quality	Turbidity and pH	Main rivers and streams; selected ground water abstraction points and campsites, major ponds/water holes
3.	Noise pollution	Noise level	Across settlements, borrow area, quarries, camp sites
4.	Vegetation cover loss	Vegetation cover	Access or diversion routes, WMAs, Forest resource protected areas, quarries and borrow sites
5.	Soil erosion	Soil cover loss, soil loss,	Wherever vegetation cover has been removed: access or diversion routes, across river systems, quarry, and borrow sites, wherever earthmoving activities (cut or fill) take place, the camp site, stock pile areas, and spoil disposal areas

8.2.3 Monitoring of Environmental and Social Parameters

The following table (Table 8.2.) describes how monitoring of the implementation of proposed mitigation measure will be carried out. The table lists the monitoring actions to be taken, the frequency of monitoring actions, locations where such actions are required to be taken, the units of measurement (where applicable), the target levels established and the responsible bodies. Notwithstanding the table-listed key issues, other unanticipated impacts shall also be monitored, and accordingly similar procedures for dealing with these impacts shall be followed to the satisfaction of the Engineer, the Employer, and legal provisions.

Table 8.2: Environmental and Social Monitoring Plan

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
1.	Creation of employment where, triggers the ESS2 of the world bank ESF and national EMA Act of 2004.	Age of employees Ratio of local people to immigrants employed by the Contractor, Workers employment contract Wages paid to workers Working hrs.	Camps, quarry, active construction sites	Throughout mobilization construction & demobilization phases	Interview with workers and Contract review of employment records (payrolls)	Age of workers Percentage of employee especially non-skilled from the local community Percentage of women workers	No workers under the age of 18yrs is employed by the Contractors Non- skilled workers dominated by people from the local community All workers have employment Contract Working hrs are in accordance with Labour relations act Wages are in accordance with GN 196	Contractor under supervision of Engineer, village government leaders along the project	50,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
							of 28 June 2013.		
2.	Generation of Dust where, triggers the ESS3 of the World Bank ESF and national EMA Act of 2004	Level of dust Generated by construction activities Implementation of dust suppression measures Use of dust masks/ respirators	Railway track and diversion roads across dwellings and work sites Access roads to material borrow areas Quarry sites, and	Weekly during dry season for project, diversion, and access roads Weekly throughout the year for quarry, crusher	Visual observation Use of Dust Level meter Interview of workers and communities along the Railway track	Percentage of workers using dust masks in areas with high Whether water is sprayer on the roads Level of dust $PM_{2.5}$ scale	Dust abatement measures are done as prescribed Absence of clouds of dust All workers working in high dust level equipped with dusk mask Zero complains by	Contractor under supervision of Engineer, communities along the Railway track	40,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
			crusher plant				workers and local communities $PM_{2.5} \leq 25 \mu g/m^3$		
3.	Gaseous emissions where, triggers the ESS2 of the world bank ESF and national EMA Act of 2004	Level of exhaust generated by equipment, hydrocarbon fumes Working environment for workers exposed to hazardous gaseous fumes Use of respirators and masks by	Borrow pits, quarry sites, crusher plant, campsite, mechanical workshop, construction sites	Weekly during mobilization and construction period	Visual observation	Presence of high level of smoke Whether engine tuning, spray painting, and welding works are carried out in well ventilated areas Whether appropriate	No excessive smoke from equipment engine tuning, spray painting, and welding done in a well-ventilated area Appropriate respirators used by workers during spray	Contractor under supervision of Engineer	35,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
		workers carrying out spray painting, pre-coating of and chippings				PPEs are worn by workers during spray painting and chipping pre-coating	painting, and pre-coating of chipping		
4.	Generation of noise and vibrations	Level of noise, generated by equipment Presence of exhaust mufflers Use of ear plugs by staff working in very noisy environment	Mechanical workshop, quarry site, crusher plan, batch plant	Weekly Daily	Visual observation Listening Interview with workers Sound level meter	Percentage of workers in high noise environment using ear plugs, of ear plugs Whether all equipment have exhaust mufflers Noise level in dBA scale	Equipment engines properly tuned All equipment fitted with mufflers All workers working in very noisy environment equipped with ear plugs Noise level ≤ 85 dBA	Contractor under supervision of Engineer	30,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
5.	Loss of vegetation where, triggers the ESS6 of the world bank ESF and national EMA Act of 2004	Implementation of measures to prevent or minimize loss of vegetation Implementation of compensation of lost vegetation Management of cleared trees No borrowing of materials is done from wildlife and forestry protected areas without written permit from authorities entrusted to	Along WMAs such borrow areas and quarries Diversion and access roads	Once after every one week during mobilization Weekly during construction period	Visual observation Interview with WMA management and TFS management in all regions	Whether width of clearing is limited to within CoI Whether unnecessary clearing of trees is avoided Whether top soil removed during clearing and grubbing, material borrowing stockpiled for future use whether grass planted on bare soil around streams and steep slopes, whether	Width of clearing confined to CoI Top soil removed during clearing and grubbing and material borrowing stockpiled for top soiling Cleared trees left around borrow pit and Railway track side for the local people Contractor does not use trees as a sources of energy or Contractor does cut	Contractor under supervision of Engineer, local people, WMA management, TFS management,	18,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
		manage the protected areas				cleared tree are not buried but left for the local people to use for fire wood Whether borrowing of material is done after receiving written consent from authorities entrusted to manage the protected areas	trees or use cleared trees to make marker pegs Contractor has permit from authorities entrusted to borrow material from relevant TFS and WMA, prior to borrowing material wildlife/ forestry protected areas		
6.	Loss of land which triggers ESS5 of the World Bank ESF and national	Land acquisition procedure	Camps, all borrow pits, quarries,	Monthly	Review of Borrow pits documents Interview	Whether compensation of land and crops done in accordance	Land acquisition done in accordance with		80,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
	EMA Act of 2004		and spoil areas		of owners of land	with of standard specs, Land Act and its Regulations	Standard specifications and Land Act and its Regulations		
7.	Soil erosion where, triggers the ESS6 of the world bank ESF and national EMA Act of 2004	Implementation of measures to prevent/ minimize soil erosion Condition of areas adjoining rivers Management of storm water during construction of culverts	All rivers Borrow pits, quarry, and culverts Where there has been clearing of ground cover During earthworks (fill and cut) take place, fill	Monthly	Visual observation	Whether specified temporary erosion control measures are in place Whether specified temporary measures to control surface runoff are in place Whether specified permanent erosion control measures	Specified temporary erosion control measures are in place Specified temporary measures to control surface runoff are in place Specified permanent erosion control measures (top soiling, grassing, checks, stone	Contractor under supervision of Engineer	18,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						(top soiling, grassing, checks, stone pitching, and tree planting) are implemented	pitching, and tree planting) are implemented		
8.	Soil pollution by fuel, oil, and hydrocarbon where, triggers the ESS3 of the world bank ESF and national EMA Act of 2004	Implementation of measures to prevent and deal with oil / fuel spill Operations of mechanical workshops Operations of chipping pre-coating facilities Management (including storage) of lubricants	Workshops at both camps hydrocarbon storage and Chipping pre-coating site	Weekly throughout construction period	Visual observation Interview with local communities, turbidity meter Review of Contractors documents	Whether lubricants containers placed on concrete-paved ground with secondary containment Whether filling and topping up of lubricant is done by a hand pump/funnel Whether topping up of	Lubricants containers placed on concrete-paved ground with secondary containment Filling and topping up of lubricant is done by a hand pump/funnel Topping up of lubricant done in the presence of	Contractor under supervision of Engineer	25,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
		Management of used oil and fuel filters				lubricant done in the presence of drip pan Whether there is no leakage of fuel or oil from equipment Whether used oil is kept in sealed leak- proof containers on concrete-paved ground with secondary containment Whether used oil and fuel filters are stored in leak proof containers on	drip pan There is no leakage of fuel or oil from equipment Used oil is kept in sealed leak-proof containers on concrete-paved ground with secondary containment Used oil and fuel filters are stored in leak proof containers on concrete-paved ground secondary containment Hydrocarbon drums stored		

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						concrete-paved ground secondary containment Whether hydrocarbon drums are stored on polythene lined level ground with at least 10 cm layer of sand	on polythene lined level ground with at least 10cm layer of sand Waste oil, used oil and fuel filters, and empty hydrocarbon drums collected for disposal by NEMC certified		
9a.	Sedimentation of river systems	Implementation of measures to prevent sedimentation of rivers Level of sedimentation of river systems	All river systems	Weekly week during construction across the river systems	Visual observations, Interviews with local communities, turbidity meter	Whether spoil or construction materials are disposed or stocked near water courses Whether there is no	Measures to prevent sedimentation are implemented. Turbidity as measured in NTU ≤ 10% deviation from the	Contractor under supervision of Engineer	45,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						disturbance on areas adjoining rivers Whether there is any complaints from downstream users on water pollution	baseline No complaint is received from downstream users of a river		
9b	Pollution of river systems by hydrocarbons (oils where, triggers the ESS3 of the world bank ESF and national EMA Act of 2004	Implementation of measures to prevent pollution Presence of hydrocarbons in river course	All rivers	Twice per week during construction across the river systems Weekly when waster is abstracted from any river for construction works	Visual observation	Whether equipment working on river banks has fuel or oil leaks Whether refueling is done near water courses Whether refueling is	No fuel or oil leak from equipment working on river banks No refueling is done near water courses No sign of floating hydrocarbon product	Contractor under supervision of Engineer	32,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						done by pump Whether there is any sign of floating hydrocarbon product (thin-film, rainbow sheen)			
9c.	Pollution of river systems by fresh cement products (concrete, concrete slurry, cement wastewater which triggers the ESS3 of the world bank ESF and national EMA Act of 2004	Level of pollution by cement Implementation of measures to prevent pollution Level of water pollution in acidity unit	All major rivers	Once per week during construction of culverts	Visual observation pH meter	Whether concrete are isolated from water courses Whether washing of concrete handling equipment is done near water courses Complains	Concrete works are isolated from water courses No washing of concrete handling equipment is done near water courses No complaints from local	Contractor under supervision of Engineer	30,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						from local people in the downstream Acidity in pH scale turbidity in NTU scale	people in the downstream pH ≤ 1 deviation from the baseline		
10.	Disruption of domestic water supply pipe line utilities	Damages to pipe lines Implementation of measures to prevent damages to water supply utilities Response to complaints with regard to damaged water supply utilities Reinstatement of damaged	Where there are water supply utilities within the CoI.	Weekly during construction of the Railway track section	Visual observation Interview with local communities	Whether Contractor liaise with local water authorities whenever construction is being done across sections with utilities within CoI Whether utilities within CoI carefully removed before	Contractor liaise with local water authorities before commencement of construction across sections with utilities within CoI Utilities within CoI carefully removed before commencem	Contractor under supervision of Engineer, Water Engineers for districts, local communities	15,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
		water supply utilities Installation of service ducts				commencement of construction Whether utilities not damaged Whether there is timely response to complaints with regard to damages to water supply utilities Whether installations of service ducts done in consultation with local water supply authorities	ent of construction Utilities not damaged There is timely response to complaints with regard to damages to water supply utilities Locations of service ducts determined in consultation of local water supply authorities		

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
11.	Telecommunication lines	Damage to fiber optic cable	Active earthworks, line railway track side drainage worksites	Daily	Visual	Whether the Contractor work carefully to prevent damage to fiber optic cable Whether damage to fiber optic cable is immediately reported to TTCL authority	Dame to fiber optic cable is rare Damage to fiber optic cable is immediately reported to TTCL authority	Contractor under supervision of Engineer, TTCL Regional Managers	16,000,000
12.	Generation of wastes (visual impact, soil and surface and ground water pollution)	Management of wastes Treatment and disposal of wastes	Camps and work sites	Weekly throughout mobilization, construction and demobilization periods	Visual observation	Whether wastes are managed, treated, and disposed of properly or Whether Contractors have written	Wastes are managed, treated, and disposed of as prescribed in Sub-Section 2.4.2.5 and 7.1.3	Contractor under supervision of Engineer	10,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						agreements with NEMC certified for collection and disposal of hazardous wastes	Contractors have written agreements with NEMC certified contractor for collection and disposal of hazardous wastes		
13.	Impact to wildlife and forestry protected areas which triggers the ESS6 and EMA Act of 2004	Requests and approval of material borrow areas	animal spill over area, WMAs	Weekly	Visual observation Review of Contractors' submissions	Whether Contractor does not borrow material from wildlife and forestry protected areas without written approval by management of game reserves Whether no	Contractor does not borrow material from wildlife and forestry protected areas without written approval by management of game reserves Whether no borrowing of	Contractor under supervision of Engineer, TFS and WMA management in the regions	35,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						borrowing of material is done near wildlife home range Whether the Engineer approves opening of borrow pits within village forest reserves only after he is satisfied that beyond reasonable doubt that the Contractor has permit from TFS and the act will not have serious	material is done near wildlife home range Prior to approving opening of borrow pits within village forest reserves the Engineer verifies that the Contractor has permit from District Executive Director and respective village governments and ensures that act will not have serious		

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						environment impact	environment impact		
14.	Reduction in river flows	Compliance with water resources Management Act	Sources of water for construction works	Monthly	Visual observation Review of Contractors' submissions	Whether the Contractor has permits for all sources of water Whether the Contractor complies with environment conditions specified by permits Whether the Contractor does not abstract water from rivers	The Contractor has permits for all sources of water used for the project The Contractor complies with environment conditions specified by permits The Contractor does not abstract water from rivers	Contractor under supervision of Engineer	8,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
15.	Increased consumption of energy and natural resources which triggers the ESS3 of the world bank ESF and national EMA Act of 2004	Sources of energy for cooking and other construction activities	Camps and work sites	Monthly	Visual observation Interview with laborers	Whether the Contractor uses charcoal and firewood for cooking Whether the Contractor does not cut trees or use trees cleared from Railway track side or borrow pits to make marker pegs	The Contractor does not use charcoal and firewood for cooking The Contractor does not cut trees or use trees cleared from Railway track side or borrow pits to make markers pegs	Contractor under supervision of Engineer	52,000,000
16.	Damage to graves	Measures to prevent damage to graves	Around grave yard	During construction across sections with grave yards specified in sub-section 4.3.5	Visual observation Review of Contractors' submissions Interview with local	Whether all the graves within CoI are relocated in accordance with Grave (removal) Act Whether graves	Before commencement of construction of section with graves: All graves within CoI are relocated	Contractor under supervision of Engineer	25,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
					communities	outside CoI are clearly marked/ and protected from damage during construction of respective sections Whether there are any complaints from local communities	in accordance with Grave (removal) Act Before commencement of section with graves, Whether graves outside CoI are clearly marked/ and protected from damage during construction of respective sections Whether there are any complaints from local communities		

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
17.	Surface water modification and prevention of backflow	Measures to prevent backflow	Culverts for major rivers	During construction of culverts for	Visual observation	If construction of culverts is done during rainy season,	If construction of culverts is done during rainy season	Contractor under supervision of Engineer	12,000,000
18.	Premature siltation of culverts	Planting of trees and grass	Upstream of Railway track along major rivers	After completion of culverts	Visual observation Review of proposal for planting request	Whether trees and grass have been planted on the upstream of relevant rivers	Trees and grass have been planted on the upstream of relevant rivers accordingly	Contractor under supervision of Engineer	33,000,000
19.	Poaching of wildlife by construction workers which triggers the ESS6 of the world bank ESF and national EMA Act of 2004	Awareness of Contractor's workers about Wildlife Conservation 2009	General work site	Monthly	Visual observation Interview with workers and local communities	Whether Contractor's staff are aware of wildlife conservation act Evidence that Contractor's staff is hunting from	Contractor's staff are aware of wildlife conservation act There are no evidence that Contractor's staff is hunting wild animals from	Contractor under supervision of Engineer	25,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						the nature reserves	the protected areas		
20.	Disruption of community access to dwellings and business areas	Availability of temporary pedestrian crossings at settlements	Dwellings	Monthly	Visual observation Interview with local communities	Whether appropriately spaced temporary pedestrian crossing are availed at all dwellings Whether local communities complain about the absence of pedestrian crossings	Appropriately spaced temporary pedestrian crossing are availed at all dwellings There are no complaints about lack of pedestrian crossings	Contractor under supervision of Engineer, local communities	7,000,000
21.	Health problems associated with handling cement and concrete	Work practice Use of PPE Hygiene	Bridge and culvert work sites Concrete batch plant	Monthly	Visual observation Interview with workers	Whether appropriate PPE are used by workers working with	Workers working with cement and concrete are equipped	Contractor under supervision of Engineer	12,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
			area Precast yard Where there is laying of cement			cement and concrete Whether workers work in the manner that minimizes release of cement dust and contact with wet cement product Whether PPE are issued as required and worn-out PPE are replaced as required	with appropriate PPE (gloves, coveralls, with long sleeves, water- proof boots, suitable dust masks, eye protection gear) are used Workers work in the manner that minimizes release of cement dust and contact with wet cement product PPE are issued and worn-out PPE are		

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
							replaced immediately		
22.	Risks of fire and explosion	Workers behaviors Implementation of measures to prevent fire and respond to fire incident	Workshop	Monthly	Visual observation Interview with workers	Whether adequate, appropriate, and easily accessible fire extinguishers are availed at strategic locations Whether there is evidence that workers are trained how to use fire extinguishers	The Contractor avail adequate, appropriate, and easily accessible fire extinguishers are availed at strategic locations The Contractor has evidence that workers are trained how to use fire extinguishers	Contractor under supervision of Engineer	5.000.000
23.	Generation of human sanitary wastes	Availability of ablution facilities	Work sites	Monthly	Visual observation Interview	Whether there are ablution	All work sites that last for at least	Contractor under	40,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
					with workers	facilities at all work sites that lasts for at least a month	month have ablution facilities	supervision of Engineer	
24.	Traffic congestion and accidents	Implementation of measures to prevent traffic congestion and accidents Implementation of Railway track safety training programme for schools Travel speeds of project vehicles	Project, diversions, and access roads across residents and schools	Weekly for monitoring implementation of measures to prevent accidents Monthly for monitoring implementation of Rail way track/road safety training programme	Visual observation Interview of Railway track users, schools, local communities Review of contractors monthly EMP and HSMP compliance reports	Whether there are flagmen at approaches to all active construction sites and material borrow area junctions Whether there are appropriately posted night-reflective warning signs to warn the public about potential danger	Flagmen are deployed at approaches to active construction sites and material borrow area junctions Night-reflective warning signs (speed limit, speed humps, works ahead, etc.) appropriately posted to warn the public about	Contractor under supervision of Engineer, school children/ teachers	55,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						(Speed limit, speed humps, works ahead, etc.) Whether there are physical barriers (concrete barricades, tape etc.) to protect employees and other Railway track users Whether there are speed-restraining humps on approaches to all accident black spots (e.g., school	potential danger (Speed limit, works ahead, etc.) Physical barriers (concrete barricades, tape etc.) are in place to protect employees and other road users Speed-restraining humps are installed at approaches to all accident black spots (e.g. school children crossing, dwellings,		

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						children crossing, dwellings, etc.) Whether pedestrians and other traffic are rerouted away from active construction sites Whether the public is protected from all ground openings into which a person or vehicles could fall by night-reflective barricades	etc.) Pedestrians and other traffic are rerouted away from active construction sites The public is protected from all ground openings into which a person or vehicles could fall by night-reflective barricades Review of Contractors' compliance reports and interviews		

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						Whether the Contractor has evidence that there is awareness creation program on Railway track safety issues among school children Whether parked construction equipment are guarded Whether works are protected immediately at the end or end of the day, Whether all accidents and incidents are reported	with school children and teachers provide evidence that the Contractors implement awareness creation program on Railway track safety issues among school children Parked construction equipment are guarded Works are protected immediately at the end of the day All accidents and incidents are		

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						to the Engineer soon after their occurrence Whether drivers of project vehicles are formally informed of speed limit of 60km/hr and that they adhere to this speed limit Whether measures to prevent re-occurrence of accidents and incidents	immediately reported to the Engineer Drivers of project vehicles are formally informed of speed limit of 60km/ hr and that they adhere to this speed limit There are measures to prevent re-occurrence of accidents and incidents		
25.	Risk of accidents to animals and	Management of material	Dwellings Forestry	Weekly	Visual inspection	Whether procedure	The Contractor	Contractor under	16,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
	human associated with material borrowing	operational borrow areas Closure of material borrow areas No borrowing of materials is done from wildlife and forestry protected areas without written permit from authorities entrusted to manage the protected areas	protected area and WMA Material borrow areas and quarries		Reviews of requests by Contractors' for approval of material borrow areas Interview with TFS and WMA management in a regions	for approval of material borrow areas by Contractor are in accordance with of Standard specifications Whether only borrow pit at minimum distance of 500m from dwellings are approved by the Engineer Whether all borrow pits and quarries are self-draining when operational	complies with of Standard specifications during land acquisition for borrow pits and quarries Only request for borrow areas located at minimum distance of 500m from dwellings are approved by the Engineer The Contractor ensures that all borrow pits and quarries are self-draining when operational	supervision of Engineer, TFS and WMA in regions, and TFS and WMA in regions	

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						and after their closure Whether borrowing of material from wildlife and forestry protected areas is done only after receiving written consent from authorities entrusted to manage the protected areas Whether maximum	and after their closure Contractor has permit from authorities entrusted to borrow material from relevant TFS and WMA, prior to borrowing material wildlife/ forestry protected areas prior to borrowing material Depths of borrow pits		
26.	Safety risk associated with to blasting,	Storage and management of explosive	Magazine Quarries Rock	Monthly	Visual observation Review	Whether Contractors have licenses	Contractors have licenses for explosive	Contractor under supervision	15,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
	drilling and rock excavation which triggers the ESS1 of the world bank ESF and national EMA Act of 2004	For Operations quarries	excavation site along the Railway track		of documents from Contractor Interview of local communities near quarries	for explosive storage magazines Whether blasting done by holders of blasting certificates issued by Commissioner of Mines Whether blasting done between 08:00 hrs and 16:00 hrs	storage magazines Blasting is done by holders of blasting certificates issued by Commissioner of Mines Blasting is done between 08:00 hrs and 16:00 hrs.	of Engineer, Inspector of Mines and Explosives	
27.	Hazard due to workers fall from height or being hit by falling objects or materials which triggers the ESS3 of the world bank ESF	Conditions of scaffold, ladders, and work platform Use of PPE by workers	Workshops Culverts construction work sites	Weekly	Visual observation Interview with workers	Whether overloading of scaffold is prevented Whether scaffold board is free from unacceptable	Overloading of scaffold is prevented Scaffold board is free from unacceptable faults Scaffold is erected by		8,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
	and national EMA Act of 2004					faults Whether scaffold is erected by experienced scaffolders and competent supervision Whether ladders used for access are securely tied at their upper ends Whether ladders stand on a firm and level ground Whether ladders are secured to prevent sway Whether ladders that cannot be	experienced scaffolders and competent supervision Ladders used for access are securely tied at their upper ends Ladders stand on a firm and level ground Ladders are secured to prevent sway Ladders that cannot be tied at their top secured at the bottom are footed Ladders extend beyond the		

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						tied at their top secured at the bottom are footed	place of landing by at least 1m unless adequate handhold is available		
28.	Hazard due to stepping on sharp which triggers the ESS3 of the world bank ESF and national EMA Act of 2004 object or striking/ tumbling against objects	Housekeeping at work sites Use of PPE by workers	Workshops Culverts construction on work sites	Weekly	Visual observation Interview with workers	Whether a good housekeeping is maintained all the time Whether all the workers are equipped with steel-toe safety shoes	A good housekeeping is maintained all the time All the workers are equipped with steel-toe safety shoes	Contractor under supervision of Engineer	16,000,000
29.	Hazard due to manual handling – overexertion	How manual handling of loads is done Implementation of measures to	Workshops Culverts construction on work sites	Weekly	Visual observation Interview with workers	Whether team handling is practices when carrying heavy loads	Team handling is practices when carrying heavy loads	Contractor under supervision of Engineer	15,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
		prevent over-exertion				Whether mechanical aid (e.g. wheelbarrow, hydraulic crane etc.) is used when loads being carried are heavy	Mechanical aid (e.g. wheelbarrow, hydraulic crane etc.) is used when loads being carried are heavy		
30.	Hazard due to workers being struck or crushed mobile equipment	How excavation and lifting by crane is done Implementation of measures to prevent workers and the public being hit or crushed by mobile equipment	Culverts and bridge work sites Line drain work sites Where rolling works is being done	Weekly	Visual observation Interview with workers	Whether there is no worker or member of public within swivel radius of machine during excavation Whether workers in the trench are kept well away from the face and	There is no worker or member of public within swivel radius of machine during excavation Workers in the trench are kept well away from the face and those at ground level		7,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						those at ground level kept outside slewing radius of the machine. Whether experienced banks man is used to	kept outside slewing radius of the machine. Experienced banks man is used to guide the operator and to		
31.	Risk of excessive exposure of workers and communities to ionizing radiation resulting from the use of nuclear gauges which triggers the ESS3, ESS2 of the World Bank ESF and national EMA Act of 2004	Storage of gauge Transport of gauge it is transported Protection of workers and public against exposure to radiations	Storage facility for nuclear gauges Work site (where the gauge is used)	Weekly	Visual observation Interview with workers	Whether the Contractor has a license to own and use the nuclear gauges Whether the gauges are stored in a facility approved by TAEC Whether transportatio	The Contractor has licenses to own and use the nuclear gauges are stored in a facility approved by TAEC Gauges transported by a dedicated car	Contractor under supervision of Engineer, TAEC	9,000,000

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
						n of gauges done by a dedicated car marked with warning signs in accordance with law and regulations Whether staff operating the gauges are trained in accordance with the law Whether working areas are demarcated by reflective tapes	marked with warning signs in accordance with law and regulations Only staff trained in accordance with the law are allowed to operate the gauges Working areas are always demarcated by reflective tapes		

NS.	Impact	Parameter/ Activity to be Monitored	Sampling area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/ Indicator	Responsibility	Cost
32.	Increased incidence of HIV / AIDS	HIV/AIDs alleviation program Distribution of condoms	Camps, work sites, toilets	Monthly	Visual observation Review of training reports Visual observation Interview with workers	Whether condoms are distributed at strategic points Whether there is evidence that the Contractor conducts training Whether No. of trainings conducted are in accordance with approved training programme	Condoms are distributed at strategic points There is evidence that training that the Contractor conducts training Whether No. of trainings conducted are in accordance with approved training programme	Contractor under supervision of Engineer, approved HI/AIDs training NGO	45,000,000

	Impact	Parameter/Activity to be Monitored	Sampling Area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/Indicator	Responsibility	Cost (TSH)
33	Sexual Harassment at Worksite	Incidents of sexual harassment	Worksite and facilities	Ongoing/ Real-time	Reporting and anonymous surveys	Count	Reduction in reported incidents	HR Department, Project Managers	70,000,000
34	Unequal Access to Employment	Gender distribution in workforce	HR and recruitment	Annually	Workforce demographic analysis	Percentage	Increase in female workforce representation	HR Department	45,000,000
35	Inadequate Facilities	Availability and condition of facilities	Washrooms, changing areas	Regularly	Inspection and user feedback	Assessment	High satisfaction rate for facilities	Site Management	55,000,000

	Impact	Parameter/Activity to be Monitored	Sampling Area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/Indicator	Responsibility	Cost (TSH)
36	Unsafe Work Environments	Well-lit and secure areas	High-risk work zones	Regularly	Lighting assessment, security audit	Rating	High scores for safety and security	Safety Department	20,000,000
37	Mobility Restrictions	Availability and quality of transportation	Transport routes	Ongoing/ Real-time	Monitoring transportation services	Assessment	Safe and reliable transportation services	Transport Coordinator	25,000,000
38	Unequal Pay and Benefits	Salary and benefits data	HR records	Annually	Data analysis	Currency	Reduction in gender-based wage disparity	HR Department	35,000,000

	Impact	Parameter/Activity to be Monitored	Sampling Area	Monitoring Frequency	Measuring Method	Measuring Unit	Target Level/Indicator	Responsibility	Cost (TSH)
39	Limited Participation in Decision-Making	Women's participation in meetings	Project meetings	Regularly	Attendance tracking	Percentage	Increased female participation	Project Managers	15,000,000
40	Increased Stress and Mental Health Issues	Workers' mental health	Worksite and campsites	Ongoing/ Real-time	Mental health assessments	Assessment	Improved overall mental well-being	Health and Safety Team	45,000,000

8.2.4 Details on Monitoring for Pollution of Surface Water

As indicated in Table 8.2, the effects of construction activities across/along rivers monitoring and reporting on water quality shall be done by the Contractor (through E & S Manager). The monitoring shall basically entail routine monitoring of rivers across the project during earthworks and construction of culverts. It shall consist of making field measurements of turbidity and pH. The procedure for routine monitoring shall be as follows:

- Two water sampling points shall be established at all major rivers and those used for domestic purposes, one 100m upstream, and the other point will be placed 50 down streams
- Measurements of pH (a gauge for effectiveness of control of water pollution during concreting activities) and Turbidity (NTU) (a gauge for effectiveness of soil erosion control) shall be taken at a point approximately 30 minutes before the start of construction activity each day.
- pH measurement shall be taken at each site twice/day during construction activities
- Measurements for Turbidity and pH will be taken at mid depth in the water column.

It is noteworthy that many of the rivers in the project area are seasonal, which means monitoring of water in the rivers will apply during the rainy season only. Otherwise, wells, water holes and boreholes will be given more emphasis in the monitoring.

8.2.5 Responsibilities for Monitoring Implementation of EMP

To ensure effective implementation of the mitigations measures, the Supervising Engineer shall deploy an Environmental and Social Specialist (ESS), who will be responsible for regular monitoring of implementation of ESIA, ESMP, Site Specific Environmental Management Plan (SSEMP), and Site-Specific Health and Safety Management Plan (SSHSMP) by the Contractor. He/she should as well be responsible for ensuring that reporting of implementation of the measures is completed in accordance with the requirements. The ESS will have the following responsibilities:

- Review Contractor's SSEMP and SSHSMP
- Monitoring the effectiveness of the EMP and other mitigation measures.
- Assess the performance of environmental controls and proposed mitigation measures
- Ensure that the Contractor corrects/ review mitigation measures that are not functioning acceptably

- To provide regular reports on monthly basis on the status of the Contractor's compliance with the ESIA, ESMP, SSEMP, and SSHSMP.
- When available on site, attend monthly progress meetings

CHAPTER NINE

9. GRIEVANCE REDRESS MECHANISM

9.1 Introduction

The grievance redress mechanism (GRM) is an integral part of ESIA approach to meet requirements related to stakeholder engagement and deal with the community issues arising in the project area. The GRM is a process to receive, evaluate and address the project related grievances from the communities. A transparent and legitimate process of grievance redress will help in building relationship between the project developer and communities through mutual trust and better communication. Nonetheless, a GRM must be designed to fit the context and needs of the proposed project, such that the local communities and other key stakeholders have faith and confidence in the system.

For the proposed project, GRM will be implemented during mobilization, dredging and demobilization phases of the project to ensure that complaints, if any, arise from local communities together with internal grievance received from employees are dealt with appropriately, with corrective actions being implemented, and the complainant being informed of the outcome. It will be applied to all complaints from affected parties. The mechanism will be accessible to diverse members of the community, including more vulnerable groups such as women and youth. However, as per ESS10 of the WB Environmental and Social Standard Frame Work, the scope, scale and type of grievance mechanism required will be proportionate to the nature and scale of the potential risks and impacts of the project.

9.2 Principles of GRM

In accordance with Guidance Practice Note on Addressing Grievances from Project Affected Communities (IFC, 2009)[1], following five principles have been recommended:

a) **Proportionality:** Scaled to risk and adverse impact on affected communities

b) **Cultural Appropriateness:** Designed considering culturally appropriate ways of handling community concerns

c) **Accessibility:** Clear and understandable mechanism that is accessible to all segments of the affected communities/ parties at no cost

d) **Transparency and Accountability:** To all relevant stakeholders

e) **Appropriate Protection:** A mechanism that prevents retribution and does not impede access to other remedies.

9.3 Types of grievances

The grievances received can be classified into two categories:

i) **Internal Grievances:** This mainly comprises grievances from employees hired specifically for the site. Likely complaints may include but not restricted to the following:

- Complaints related to amount of wage, salary, other remuneration or benefits,
- Timely disbursement of remuneration,
- Unethical behavior between senior and subordinates,
- Working conditions and health and safety concerns,
- Gender discrimination,
- Workplace harassment.

ii) **External grievances:** Grievances received by Work Contractors and/or workers who are directly/ indirectly controlled by TRC and complaints from local communities in project areas. The on-site workers and migrant workers are likely to have grievances related to the following:

- Risk to health and safety of the workers hired by the Contractors,
- Working condition of the workers,
- Wage discrimination among the workers,
- Timing of the payments,
- Adequate basic facilities for workers including water supply and sanitation,
- Unjustified deduction from the wages,
- Minimum wage rates for the labor,
- Extended working hours,

- Prevention and protection of child labor from hazardous work condition,
- Issue of forced labor,
- Gender discrimination.

Community grievances that will be considered for resolution under this GRM will include the following (not limited to):

- Risks to community, health & safety (e.g. ship traffic),
- Accidents (e.g. collision with dredging vessels),
- Unethical behavior by Work Contractor or its sub-contractors,
- Noise/dust/air emissions, waste discharges or any other impacts.
- Demand for development interventions in the community,
- Issues related to cultural conflicts or opportunity conflict owing to presence of migrant workers in the community or in the nearby areas.

9.4 Redress process

A step by step process along with competent personnel for proper handling of grievances is crucial for effective grievance management. The steps that can ensure effective implementation of grievance mechanism are listed below.

9.5 Proposed GRM for TRC

The Project proponent (TRC) will implement GRM through establishment of a Grievance Redress Committee (GRC) that will address any complaints, which may arise during the project implementation. A Single Point of Contact (SPOC) or a Grievance Officer (GO) at the site level will be assigned by the Committee at project site area, who will register the grievances, and take care of the registering process and action taken for resolving the grievance, timelines necessary for completing each step and escalation criterion.

A two-level approach is proposed for addressing the grievances. Depending on the severity of the case, resolution can be undertaken at each level.

i) Receive and Register a Complaint

- Any worker / stakeholder (including local people within project area) with issues pertaining to on-site project work such as occupational health and safety, terms of employment, wages, issues with communities or co-workers, etc. may register their complaint in writing to the TRC/ Consultant at site (Level 1). Template of Complaint Form is Appendixes as **Appendix 1**.
- Secured boxes to submit grievances in writing should be placed at certain identified locations. In case the complainant wishes to maintain anonymous, he/she can write the grievances and drop them in these boxes. The box must contain slots at the top or sides and be clearly marked in the local language. It must be kept locked with the keys to be retained in the custody of the Grievance Officer.
- Once a complaint has been received, it shall be recorded in the register or data system. An acknowledgement sheet will be provided to the complainant. Template of such register is given below in **Table 9.1**.

Table 9.1: Sample Format for Grievance Register

Form no.	Date	Ward / Area	Name of Complainant	Details of Grievance	Mode of Grievance Registration	Date of Action Taken	Reason for not Acting	Status to be filled Date wise	Remarks

ii) **Assessment and Addressing of Complaint/ Grievance**

- The GO will inform the Project Site Manager about the complaints registered in data system for further action.
- An assessment of the complaint made will be performed to ensure that it falls within the scope of grievance mechanism or not. During such an assessment, the Level 1 team consisting GRC will collect information about key issues and concerns and help in determining whether and how the complaint might be resolved. GO will visit the respective areas and interact with the affected persons/families for

understanding their concerns if found necessary. The visits will be critical in creating goodwill, improving rapport building and communication between all stakeholders and reducing conflicts.

- In case, no decision is made within 2 days by the GRC at Level I, the issue will be forwarded to the Chief Grievance Officer based at the TRC (Level II) to screen and assess the grievance. If the complaint seems to require intervention, then it will be considered for further action, else it will be rejected and the same will be communicated to the concerned complainant by the GO based at the site level within 2 working days. The grievances will be addressed at the Level-I by the GRC and Contractor Supervisor (in cases involving contract workers) within 15 working days.
- At Level 2, the Chief Grievance Officer of TRC will discuss the issue with other senior level members including Director (of TRC) to address the grievance. The Chief Grievance Officer will provide support in terms of decision making. If necessary, meetings will be conducted with the complainant and evidence will be examined. The grievance will be closed within 5 working days of referral.
- The worker/ complainant will have the opportunity to be present at the committee meetings and discuss the grievance at both the levels if the grievance remains unresolved even after going through both the levels, the complainant will have the option to approach the appropriate court of laws for redress. However, it is not a preferred option and hence, highly recommended that any such dispute is amicably solved because resolution through procedures of the court may take very long time before final decision is made.

Below is a flow diagram (Figure 9.1) illustrating the overall steps that will be included in the GRM.

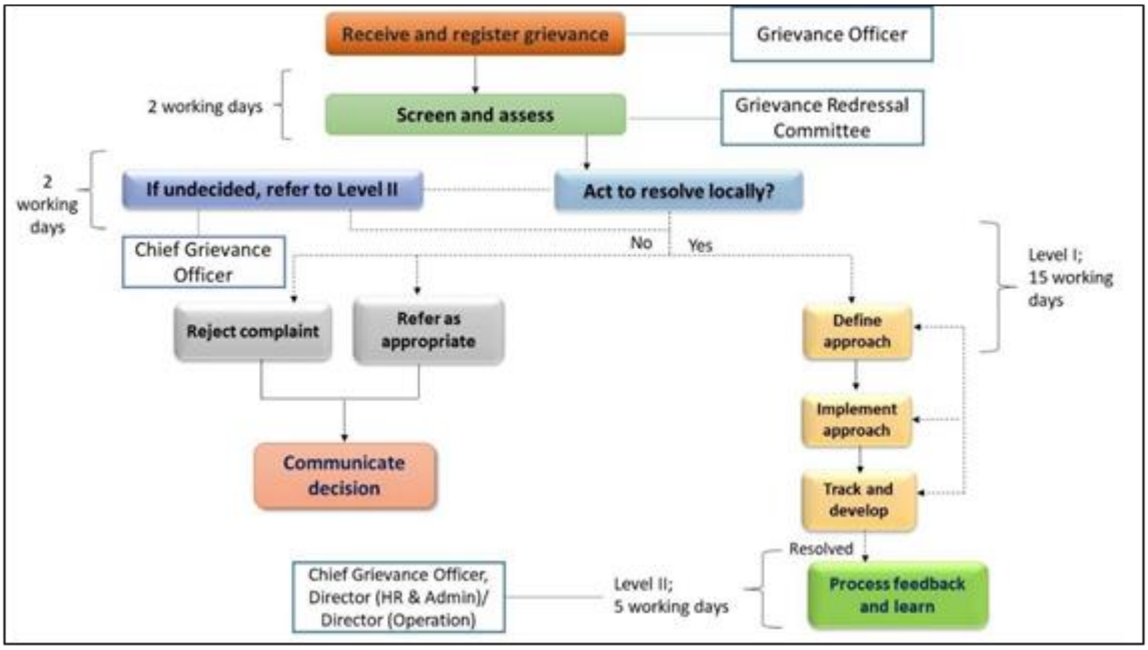


Figure 9.1: Flowchart for Addressing Grievances

iii) Monitoring and Evaluation of Grievance Mechanism

Monitoring and reporting can be tools for measuring the effectiveness of the grievance mechanism and the efficient use of resources and for determination of trends and recurring problems, such that they can be resolved proactively. Grievance Records will provide the background information for regular monitoring. All grievances registered have to be recorded and regularly updated. This activity will also create a base level information that can be used by TRC to report back to workers and local communities on its implementation of the mechanism and the modification/ changes proposed to make it more user-friendly.

9.6 Grievances mechanism procedures

9.6.1 Channels to register a grievance

The Project shall establish channels through which District or Municipal and stakeholders can forward grievances regarding project activities. The channels shall include: -

- A dedicated email address of institution implementing the project,
- A dedicated telephone number which shall toll free i.e. **0800 11 00 42**
- On the project implementers websites i.e. www.trc.co.tz

- Feedback boxes to be located at selected points where the project activities shall be implemented,
- Project/site offices will also receive grievances through Community Liaison Officers.

9.6.2 Project Grievance Committees

I. Village/Mtaa Grievance Redress Committee

Village/Mtaa Chairperson – Chair Person Village Executive Officer (VEO) - Secretary, Neutral Person - Member Representative from the PAPs Members Community Development Officer from the Ward, Representative from NGO within village level – Member,

II. Ward Grievance Redress Committee

WDC Chairperson – Chairperson Ward Executive Officer (WEO) – Secretary, Neutral Person - Member Representative from the PAPs Members Community Development Officer from the Ward, Representative from NGO within Ward level – Member,

III. District/Municipal Grievance Redress Committee

District Commissioner – Chairperson District/Municipal Executive Director - Secretary District/Municipal land officer - Member District/Municipal Land Valuer - Member Lawyer - Member DAWASA - Member BWB - Member Ministry - Member Neutral Person (Not PAP) - Member PAP representative Local NGO within District/Municipal level - Member Consultant - Member (depend on complaint)

The Implementing agencies will collaborate with local government offices to appoint team members as outlined above to be committee members. The committee should contain equitable proportional of Gender. There is no charge for making a complaint or conveying comments or suggestions. The project will facilitate the effective operations of the committees. The project shall ensure flexibility in the channels available and make sure that different contact points are available for a person to make a verbal complaint, and if the complaints addressed to the wrong person or entity are redirected to right provided channels. The initial investigation of the complaints shall take about 10 working days. If more time is needed, then the complainant will be notified with explanation of when she/he can expect the resolution.

Once the investigation process has been established, the person responsible for managing the GRM will record and enters data and information into the log book prepared as per table 9.2.

Table 9.2: Sample Grievance Log/ matrix

GRIEVANCE LOG FOR THE TIRP II PROJECT																	
Serial No.	Name of complainant	Address of complainant	Telephone No.	Location				Grievance	Nature of complaint/grievance	Date Received	Action Recommended	Responsible Person	Due Date	Status of resolution	Date of resolution	Resolution summary
				Area of project site	District	Ward	Village/Mtaa									

CHAPTER TEN
10. COST BENEFIT ANALYSIS

10.1 Introduction

This chapter presents the extended cost-benefit analysis (ECBA) of the proposed Project. The purpose of the ECBA is to assess the economic viability of the project once the environmental and social costs and benefits reported in the EIA of the project had been incorporated into the analysis. The ESIA of the project has identified environmental and social impacts that could lead to benefits and costs, i.e., positive or negative effects to the economy. The ECBA is based on the principles of discounted cash flow analysis. The standard investment assessment criteria of net present value (NPV), cost-benefit ratio (CBR) and internal rates of return (IRR) were used as decision rules of the analysis.

An Economic Evaluation for this project has analyzed the transport reliability before and after the improvement of the Rail Way Line, calculated the economic benefit indices as a result of the improvement. These indices included Economic Internal Rate of Return (EIRR), Net Present Value (NPV), Benefit/Cost ratio (B/C), and First Year Rate of Return (FYRR).

Nature of the Investment and Economic Contribution of the Project

The project involves investments leading to establishment of improved and reliable mode of transport in the existing central corridor railway network in the country. It is an identified network that is mainly provides connectivity from Dar es Salaam port to upcountry as well as the neighboring countries of Uganda, Rwanda, Burundi and DRC, stabilizing the economic aspect through passenger and freight business by increasing the demand for transport facilities in this corridor at a rapid rate.

The project involves substantial cost of capital investments on civil works for rehabilitation of the line including stations yards, intermodal yards, culverts and bridges, upgrading of railway track to 80-pounds, as well as operational running costs. It will increase the capacity of total transit system while simultaneously reducing the burden of overloading the existing transit facilities by attracting freights from modes of private transport on road. Hence, the project will offer a modal choice for passengers and freight with lower travel time, increased safety and comfort to their destinations.

Data Sources of ECBA

The key data sources used for the CBA are draft final report of the Feasibility Study prepared by the Consultant team from Canarail Consultancy and CPCS Transcom International Ltd, final report of ESIA Study and Resettlement Action Plan (RAP). The feasibility study team has undertaken an economic evaluation of the project using output parameters of the demand forecast modelling study and other relevant economic data from secondary sources The ESIA and RAP studies have identified environmental and social impacts of the project during construction and implementation phases. The ECBA is mainly based on information from these study reports.

Decision making criteria

The based criteria for this analysis is mainly descriptive focusing on the projected benefits from the project and the estimated investment that is to be put in the Project (Project Cost).

Benefits of the Project

The project generates both transport and environmental benefits to the national economy. The project being a transport sector project, transport benefits can naturally be considered as the most important category of the benefits.

- *Transport-related Benefits of the Project:*

In the Project Feasibility Study, the following transport system benefits have been identified as the key benefits of the project. x Vehicle operation cost savings x Travel time cost savings x Savings of accident costs

(1) Vehicle Operations Cost Savings: Vehicle operating costs (VOC) are the costs associated with the running of a motor vehicle such as fuel, oil, tires, repair and maintenance and depreciation costs. Smooth vehicle running conditions created due to operation against the base case situation of the existing road network can be expected generate VOC savings as main economic benefit.

(2) Travel Time Savings: Savings in travel time is a primary economic benefit sought from many transport sector projects. These savings are enjoyed by passengers as well as freight consignees.

(3) Savings of Accident Costs: Compared with situation of the existing road network (base case), reduced number of accidents is another advantage of this Project. This results in the economic benefit of accident cost savings.

- *Environmental and Social Benefits of the Project*

The major environmental benefit that can be expected from the project is reduction of emissions due to modal shift from private freight moving vehicles to railway and low traffic congestion. This could lead to improved public health and climate change mitigation due to reduction of GHG emissions. Main social benefits could be improved community life and services, job creation and improved (formal and informal) employment opportunities as well as access to crop markets

However, there are costs that must be incurred in order to gain the expected benefits. Table 10.1 below gives the list of benefits and costs of the project from the environmental and social point of view.

Table 10.1: Benefits and Costs of the Project

Environmental and Social Benefits	Environmental and Social Costs
- Contribute to economic growth; - Increased access to crop markets; - Improved passenger and freight transportation services; - Reduction of travelling time - Improved community life and services; - Job creation and improved employment opportunities;	- Water and Soil Pollution - Soil erosion; - Loss of natural habitat; - Noise, vibration and air pollution ; - Safety and health risks - Increased Wastes production - Increased water abstraction - Increased natural resources exploitation rates; - In-migration /influx of people from other areas; - Increased spread of HIV/AIDS and other diseases

10.2 Results of Analysis

Given the long term, extensive, trickle-down positive impacts from the individual to national level (socio-economic), undertaking of this Project outweighs the 'no-project' option given the amount of investment that will be put for implementation. The benefits of the project outweigh the costs in a long-term basis and hence it is a good investment to the country if implemented in adherence of the recommended mitigation measures.

CHAPTER ELEVEN

11. CONCLUSION AND RECOMMENDATION

11.1 Conclusion

The rehabilitation of the existing Dar es Salaam – Isaka (970 km) railway infrastructure is socially and economically desirable and viable because it will enhance transportation and social – economic development in various Regions of Tanzania. It will also contribute to the enhancement efficiency and safety of railway operations.

Expectedly, the project will have both positive and negative impacts on the natural and human environment; it will affect both the environment and human communities that are found along the railway, and in its vicinity as well as all that interact with it.

The negative significant social impacts that will result from the project will be disruption of public utilities, increased noise, and vibrations, and deterioration of ambient air quality during construction, increased traffic accidents, loss of vegetation and habitats, soil erosion, and soil and water pollution.

The spread of HIV/AIDs, STIs associated with immigrant railway track construction workforce, siting of the construction camps and later the presence of truck drivers that will use the project have been identified as social impacts of the project. This was a major concern during public consultation meetings. Mitigation measures applicable to this concern were pointed out to the stakeholders during the consultation meetings.

Measures have been proposed to enhance impacts which are positive to the environment and the local communities. For those impacts that are negative, mitigation measures have been proposed to avoid or abate them to the extent possible for the purpose of maximizing benefits of the project and minimizing detrimental effects of the project.

11.2 Recommendations

The detailed environmental and social impact assessment in this report points to the desirability as well as technical feasibility of this project. It also reveals the positive reception of the project among its key stakeholders. It is therefore recommended to undertake the project, and this should be done as soon as practicable. The enthusiasm, expectations, and anticipation aroused through public consultation efforts should be allowed to proactively address towards the objective of the Project implementation. Moreover, the enthusiasm and anticipation is a useful social capital that can be used in favor of the project provided there are no delays that can lower its value and utility. Also, an additional specific study on operational noise impacts using modelling in order to project the expected impacts and respective mitigation measures which will then be updated in the ESMP. Moreover, the specific management plans for OHS, Traffic Management, Waste Management and Emergency response plan are recommended as documents that the Contractor should prepare using the guiding WBG templates on EHS.

To ensure that the mitigation measures put forward to address the identified environmental and social impacts achieve their desired goal of protecting the environment and public health, they should be implemented as prescribed and the outcome of their implementation should be monitored for integrity and effectiveness additional to that there must be the development of a detailed Operational ESMP prior the start of the Operational phase. The supervision of the implementation of the proposed mitigation measures should be ensured and be carried out as strictly as the one for the rest of the project components.

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- The world bank environmental and social framework, 2017

- USAID "Climate Change Adaptation in TANZANIA
- Village Land Act Cap. 114 (No. 5), 1999
- Water Resource Management Act, 2009
- Wildlife Conservation Act, 2009
- Workers Compensation Act No 20, 2008

APPENDICES

APPENDIX I: GRIEVANCE FORMS

Grievance Intake Form

Grievance Intake Form Record No.:	ID #		
Received by: (phone/letter/ email /verbally/ what sap)			
Date received (to Action Log)	DD/MM/YY	Yes	No
Acknowledgement Date (To action log)	DD/MM/YY	Yes	No
Required resolution date: (To action log)	DD/MM/YY	Yes	No

Summary of Issue:

Remedy Sought by Grievant:

I have read / had this form read to me and agree with the content_____signed

Complaint Grievant
Request Sent to request Management Process
Suggestion Acknowledgement send and Follow up required (To action log)
Closed
Fast tracked Explanation:

Internal (HR) Grievance to be managed by (drop down)	External (Community, Government, NGO etc.) Grievance to be managed by (drop down)

Other departments involved in the grievance:

Environment Health and Safety	Human resource

Type of Complaint

Employment
Property damage
Disagreement
Dispute
Misconduct of company employee/contractor
Access to information

Name of Contractor's Person to Address the Grievance: _

Location:___________ Phone Number: ___________

Grievance Follow-up Form

Grievance Intake Form Record No.:	ID #
Processed by:	Staff name (drop down)
Checked by:	Staff name (drop down)
Received by:	Staff name or department (drop down)
Date received (To Action Log)	DD/MM/YY Yes No
Acknowledgement Date (To action log)	DD/MM/YY Yes No
Required resolution date: (To action log)	DD/MM/YY Yes No
Summary of Issue: Remedy Sought by Grievant: **I have read / had this form read to me and agree with the content_____signed**	

Acknowledgement sent out and received Investigation started Investigation results Resolution determined	Resolution shared and approved Remedy outstanding Remedy complete Closed

APPENDIX 2: PROJECT REPRESENTATION MAPs

APPENDIX 3: STAKEHOLDER CONSULTATION FORMS

APPENDIX 4: PROPOSED SANITATION FACILITIES DRAWINGS

APPENDIX 5: LIST OF FIGURES/PHOTOS

APPENDIX 6: ADJACENT FEATURES

APPENDIX 7: LIST OF STRUCTURES

APPENDIX 8: SUMMARY OF SOCIAL ECONOMIC ACTIVITIES

APPENDIX 9:
CONCEPT NOTE FOR MAJOR WORKS CONTRACTS ACHIEVEMENT

APPENDIX 10: PROJECT OHSP AND EPRP

APPENDIX 11: INVASIVE SPECIES